



Forestry



Outdoor Skills



Ecology



Leadership



LEADER MANUAL

*Good leaders inspire others to perform
at extraordinary levels.*



The Purpose

The Junior Forest Warden Program is a challenging and rewarding outdoor-oriented experience designed to develop an awareness, appreciation and respect for, and responsible use of our natural environment.

The Pledge

"As one who believes in the aims of the Junior Forest Wardens, I pledge myself and my services to the appreciation and responsible use of our forests, wildlife, and natural heritage."

The Code

"We have been given the earth for our life. It is a great entail. It belongs as much to those who come after us as to us, and we have no right by anything we do, or neglect to do, to involve them in unnecessary penalties or to deprive them of benefits which are theirs by right."

The Traditional Version

"God has given us the earth for our life. It is a great entail. It belongs as much to those who come after us as to us, and we have no right by anything we do, or neglect to do, to involve them in unnecessary penalties or to deprive them of benefits which are theirs by right."

The Watchword

"Keep our Forests Green"

The Motto

"Watch and Warn"





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Forestry

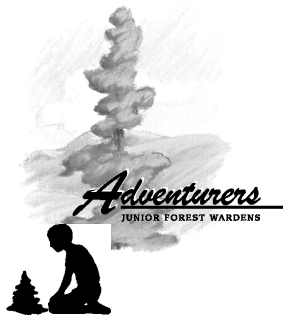


MODULE

*Never doubt that a small group of
concerned people can change the world.
Indeed, it's the only thing that ever
has.*



Dr. Margaret Mead
Anthropologist



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Introduction

Welcome to the revised Forestry Module. This edition contains many new activities and information. It is hoped that this version of the Forestry Module is easier to follow and clearer for leaders to use. The program framework is basically the same; however, some program objectives have been simplified or deleted so the topics are more engaging for Wardens and Leaders to tackle.

There is a lot of information to cover in this module. To a new JFW leader, it appears like a daunting task. Keep in mind that this module does not all have to be done in one year. The best strategy is to familiarize yourself with the program; get to know all the four modules (Forestry, Leadership, Ecology and Woodstravel) inside and out. Decide which program objectives you can combine into one activity. Here's one example of combining various module requirements: Set up an orienteering course with challenges along the course: identify the tree diseases on three specific trees, measure the height of a tree, make a ladder to get the prize (marshmallows) out of the tree, continue along the course to the last stop and make a fire to cook the marshmallows. That activity covers some of the program objectives from Woodstravel, Forestry, and Leadership modules. How would you include a program requirement from Ecology into that activity?

Open your mind to new ideas and try not to get too bogged down in the details. You are the leader and you want to have fun, as well as teach the program. You know what the limiting factors are; maybe it is financial, your location, group size or knowledge base. The beauty of this program is that you are able to adapt the activities to suit your circumstances. You can make adjustment to custom fit the activities to your group's knowledge level BUT be true to the program's objectives.

Generally, most of the Wardens find the outdoor pursuits and activities more attractive than learning basic knowledge—"It's too much like school!" The learning of forest concepts is an

PROGRAM OBJECTIVES

**Plan. Adapt.
Improvise. Be
creative. Have
fun.**



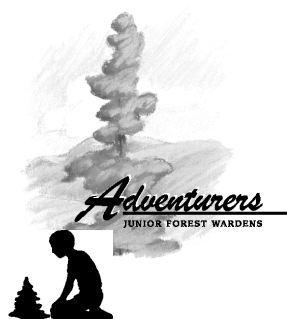
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important component prior to the skill work or field trips in the forestry industry. Wardens will be required, from time to time, to refer to books, memorize facts and know information before they can be successful outdoors. Be patient with their eagerness to be on the go all the time. How can you make the information meaningful to them? Use your interest and enthusiasm with the Wardens. It is contagious. There is no greater gift than a love for learning.

The Forestry Module is an exciting topic full of knowledge and skills. Wardens will gain insights and knowledge that will pave their way to lifelong learnings about the natural world, their community and their own lives. The concepts in the Forest module are important to our culture's use of natural resources, the land, air and the water. It is important to pass on meaningful knowledge to our young people who are our future leaders and caretakers. Let us do our part in teaching our children well.

Warden Manual

The Warden's manual is similar to but not exactly the same as the Leader's Manual. The Leader Manual has the Answers to activities, and in most cases, a list of Suggested Discussion topics and Instructions for activities where a leader can adapt the instructions to suit his/her own teaching style. Wardens are given instructions if the activity is something they can do together in small groups. The Leader Manual has two sections which the Warden Manual does not have included: Supporting Resources and the Phone Book Yellow Pages. The Warden Manual has a separate list of Websites Worth Surfing (which is included in Supporting Resources in the Leader Manual).



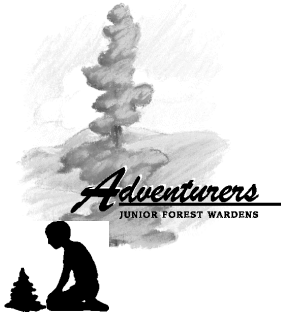
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Framework

I. Forest Fire Protection

Humans have influenced fire frequency from the time of First Nations to the arrival of Europeans and to present day either through carelessness or by design. Forest Fire Protection requires an understanding of the weather patterns, landscape and what resources and methods are appropriate to suppress or control forest fires.

- ☐ Develop a Fire Safety Plan and coordinate a club fire drill.
- ☐ Teach a fire safety activity to your club.
- ☐ Develop and implement a project to inform the public about fire safety.
- ☐ Demonstrate the preparation and management of a campsite fire. Show the proper use and maintenance of hand tools.
- ☐ Tour one of the following sites: air tanker base, rap attack crew, initial attack base, look out tower, Provincial Fire Centre, an old or recent burn site, Forest Fire Training Centre in Hinton or other fire suppression sites.

II. Forest Uses

Understanding the interrelationships between people and the environment is a key factor in ensuring that what we do does not have a major impact on future generations. Wardens will learn to recognize that some aspects of our forests are necessary for people's use and other require nature to take its course.

- ☐ Participate in a land use planning game.
- ☐ Describe wood processing for two wood products and two wood by-products. Visit a lumber yard, pulp mill or a sawmill.
- ☐ Make a presentation on the uses of the forest.



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III. Forestry Practices

Forestry practices and management looks at all aspects of sustainable development. Timber, wildlife, water, weather, cultural, recreational use and protection are all important in terms of integrated forest management.

- ☐ Describe why silviculture is an important aspect of timber management.
- ☐ Practice one silviculture technique with professional assistance.
- ☐ Demonstrate how to measure the volume of a tree.
- ☐ Conduct a pre or post survey of a planting project that your club is involved in.
- ☐ Participate in or tour a reforestation project.
- ☐ Tour a wood-harvesting operation or a wood-processing plant.
- ☐ Discuss methods that can be used when harvesting trees to reduce environmental impact.

IV. Wildlife Stewardship

Wildlife management and habitat improvement are key components of forest stewardship. Protection and enhancement of flora and fauna species and endangered populations are critical to the interactive management of forests.

- ☐ Investigate the biological diversity of a forest ecosystem.
- ☐ Inform your community about the importance of flora and fauna.
- ☐ Participate in the provincial Conservation & Hunter Education Program.
- ☐ Manage a portion of a club habitat improvement project.
- ☐ Participate in a wildlife observation activity.

V. Outdoor Recreation and Appreciation

Wardens will learn to value the forest for the healthy lifestyle it provides in pursuit of leisure, as well as, the esthetic and spiritual values that are part of our natural heritage.

- ☐ Investigate the outdoor recreation potential of an area.
- ☐ Explore personal values of the forest.



VI. Watershed Stewardship

Wardens will learn that the importance of conserving and protecting watersheds at all levels is critical to our survival as a species. Forests play a critical role in both global weather patterns and water supply and we must protect this role at all costs.

- ☐ Investigate how vegetation and ground cover affects water quality.
- ☐ Conduct a water quality experiment.
- ☐ Describe the uses of water in a local watershed.
- ☐ Participate in a watershed enhancement project.

VII. Range Stewardship

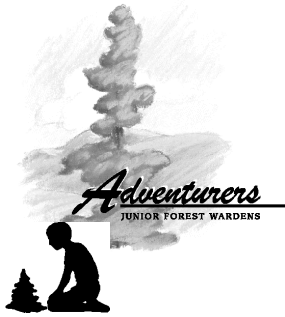
Grazing and range stewardship are both a tool and a strategy to ensure sustainable agriculture on public and private lands.

- ☐ Discuss issues associated with grazing on Crown and private rangeland
- ☐ Discuss characteristics of a healthy rangeland.
- ☐ Identify six forage plants that grow on local rangeland.

VIII. Community Service

Junior Forest Wardens learn to accept responsibility and the challenge to contribute to and improve their local and global communities. Every activity in our learning circle should be focused on making our communities environmentally safer places to live.

- ☐ Help organize and implement a club community service project.



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FOREST FIRES

Humans have influenced fire frequency from the time of First Nations to the arrival of Europeans and to present day either through carelessness or by design. Fighting forest fires requires an understanding of the weather patterns, landscape and what resources and methods are appropriate to suppress or control forest fires.

date completed



_____	☐	Develop a Fire Safety Plan and coordinate a club fire drill.	page 3
_____	☐	Teach a fire safety activity to your club.	page 7
_____	☐	Develop and implement a project to inform the public about fire safety.	page 10
_____	☐	Demonstrate the preparation and management of a campsite fire. Show the proper use and maintenance of hand tools.	page 13
_____	☐	Tour one of the following sites: air tanker base, rap attack crew, initial attack base, look out tower, Provincial Forest Fire Centre, an old or recent burn site, Forest Fire Training Centre in Hinton or other fire suppression sites.	page 16

I. Forest Fire Protection

1. Develop a Fire Safety Plan and coordinate a club fire drill.

BACKGROUND

Having a Fire Safety Plan is common sense and the JFW club should have Fire Drills while at camp and at meeting sites. The plan should be reviewed annually and when renovations or construction takes place to affect the plan. A Fire Safety Plan prepares people for an emergency and consists of the procedures to follow which will ensure the safety of people on or near the site and control of the fire. Every building should have an emergency plan.

A Fire Safety Plan should have the following components:

1. Emergency procedures in case of fire should include:
 - sounding the fire alarm
 - notifying the fire department
 - instructing wardens on procedures when the fire alarm sounds
 - special provisions for disabled
 - confining, controlling and extinguishing the fire.
2. Organize designated people to carry out the fire safety duties
3. Instruct designated people of their responsibilities for fire safety.
4. Prepare a drawing of the location and identify the emergency exits.
5. Conduct a fire drill.
6. Control fire hazards
7. Inspect building and grounds for everyone's safety.

FIRE SAFETY PLAN

The Fire Safety Plan should be kept in the main building at camp (prominently posted on a bulletin board) for camp staff and wardens to see. It should show all exits from the building(s) and the site. A copy of the plan should be given to supervisory staff.



Fire Drills

The procedure for conducting fire drills in buildings should be developed in consultation with the fire department and the person in charge of the building. A Fire Drill must consider the following:

- building occupancy and its fire hazards
- safety features
- a degree of participation of occupants other than supervisory staff
- testing the fire emergency systems in the facility.

The frequency of fire drills varies, for example day cares should have one a month, schools three times in the fall and spring, and high rises at least every 6 months. Wardens should have at least two fire drills while at camp and at least twice a year at the meeting facility. The person in charge of a Fire Drill should record the date of the drill, evacuation time and any comments and recommendations.



Activity Summary

Wardens will develop a Fire Safety Plan and conduct a Fire Drill while at the club meeting site or at camp.

Procedure

Have Wardens discuss some of the components they have experienced in participating in a fire drill. There may not be too many variations from this example: the fire alarm bells go off, the teacher/leader stays calm and reaches for the roll call book. If it's winter, you were allowed to get your boots and coats. Line up as a group and follow the teacher outside through a designated exit in a calm and orderly fashion as quickly as possible. Someone in the class was assigned to look around the room and close the door when everyone was out. When outside in a designated area, you were to remain as a group while the building was being inspected. In the meantime, the teacher took attendance to make sure all people in the groups were accounted for. You waited outside for about 10 minutes and then returned to the classroom in an orderly fashion.



If you have your JFW meetings in a school or church, there should already be a Fire Safety Plan in place. In a school, for example, the custodian is in charge, and may lock up after your meetings. Have wardens check what the procedures are at the site already

Ask the group to think about why fire drills are done. Fire Drills are designed to be practical exercises so there is group agreement in the procedure. Fire drills are practiced so everyone knows what to do when they have to react to a real fire. There must be group consensus to ensure that all the people using the site or facility have the same set of ideas as to how to behave in an orderly fashion. Practicing a fire drill in the same way every time ensures safety for all.

Planning is the first thing done before a fire drill. A Fire Safety Plan is developed to enable a fire drill to be conducted in a safe and orderly fashion. A Fire Safety Plan states where small groups are to meet outdoors, the building exits to be used and by which groups, some people are assigned specific responsibilities, and so on.

Have the Wardens back up their thinking and develop the Fire Safety Plan and then conduct a Fire Drill. Have them develop a list of things they have to remember in a time of high panic, for example phone numbers and contacts, a map of the building and/or site, meeting areas outside.

Here are some things for the Wardens to consider

- Telephone numbers for Fire Department, RCMP, Facility Administrator. Have alternative phone numbers.
- Identify the locations of all the fire extinguishers, exits, washrooms, telephones and outside meeting areas.
- What do you do in the case of fire alarms? Should you be concerned?



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Have Wardens put their plan to the test by conducting a Fire Drill. Make changes if required. Each Warden should keep a copy of the Fire Safety Plan in her/ his manual.

- Roles to be assigned:
 - Who is in charge?
 - What are his/her responsibilities?
 - Who checks the washrooms?
 - Who checks the other areas in the building?
 - Who will attempt to assess and put the fire out?
 - Who sounds the alarm?
 - Who is in charge of accounting for everyone.
- The procedure must be fast and thorough so everyone is safe.
- Decide on alternative meeting sites should something happen and you cannot go to the original site as planned.
- Be prudent. If the fire gets out of hand, don't be a hero. Leave the building or site and allow the professional fire fighters to do their jobs. If a fire extinguisher can extinguish the fire, then do it!

If you see a wildfire in a forested area, report it immediately to the nearest ranger station or by phoning 427-FIRE (3473) and on a cellular telephone # FIRE.





2. Teach a fire safety activity to your club.

BACKGROUND

The responsibilities of a leader for a group of wardens is great no matter what their age. When it comes to out-tripping whether for an overnight or a week, safety is foremost for the entire group.



Activity

Have small groups of Adventurers discuss and report on various fire situations. Give each group a scenario from page 8 or develop your own. Time limit should be no longer than 15 minutes. The scenarios will test their knowledge about fires. If the wardens don't have a lot of previous information, it will come forth in discussions later.

The scenarios were selected because they will point out specific concepts. Listen to the Adventurers as they discuss the scenarios. Share the situations later as a group and cover the

SCENARIOS

1. COLOR OF SMOKE

key concept for each situation.

Smoke Colour	Approximate Fuel Conditions and Fire Behaviour
● Dense White	Very moist fuels, mild behaviour
● Grey	Moist fuel, mild/moderate fire behaviour
● Black	Dry fuels, high fire behaviour
● Copper-bronze	Very dry fuels, high to severe fire behaviour

2. TYPE OF FIRE

Flames in tree tops mean a crown fire. Harder to control than a ground fire. Crown fires can travel quickly depending on the wind conditions.

3. DIRECTION FIRE TRAVELS

Fire burns faster uphill than it does on the level or down a slope because the fire causes uphill drafts.

4. STORM CLOUD AND DOWN DRAFTS

Where you want to be is between the storm cloud and the fire. The fire will move further because the storm cloud creates down drafts.

5. IF THERE IS NO WATER, CONTAIN THE FIRE, COVER AND SMOTHER WITH SOME MINERAL SOIL

Do not leave the area until the fire is completely out.



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Divide the Wardens into five groups. Copy this sheet and cut apart. Give each group a scenario.



Scenario # 1

You and the rest of your JFW group are backpacking in the high country. In the distance you see black smoke. You think it may be from a forest fire. What should you do and why?

Scenario # 2

Your JFW group are building and flying kites in Kananaskis Country. You can see a forest fire to the east. The fire is traveling over the tops of the trees. What do you do and why?

Scenario # 3

You can see a forest fire ahead in the direction you are traveling. It happens to be the only way out that you know. What do you do and why?

Scenario # 4

There is a big, dark storm cloud to the west and a forest fire burning to the east. Your group is between the cloud and the fire. What do you do and why?

Scenario # 5

What do you do if you come across a camp fire still burning and there's no one around. There is also no water around either.



Wardens Teach Fire Safety

Have Wardens choose a topic to teach their peers about fire safety. Allow them time to prepare, one week, to gather any materials they need. Tell them they have 10-15 minutes to teach a fire related fire safety activity.

Below are some topics and suggestions for Wardens to teach as a fire safety activity.

- ☐ How to use a fire extinguisher.
- ☐ Relationship of weather conditions and forest fires.
- ☐ Relationship of topography and forest fires.
- ☐ What to do if you are on fire.
- ☐ What can smoke tell you about a fire.
- ☐ What are some hazardous fire conditions in a forest.
- ☐ Lightning and forest fires.
- ☐ Explain the Fire Hazard Indicator rating system.
- ☐ Explain how to use a swatter. (or any of the fire fighting tools)
- ☐ Safety zones in a forest fire.
- ☐ Danger zones in a forest fire.
- ☐ Communications when fighting a forest fire.
- ☐ What to do if trapped in a forest fire.



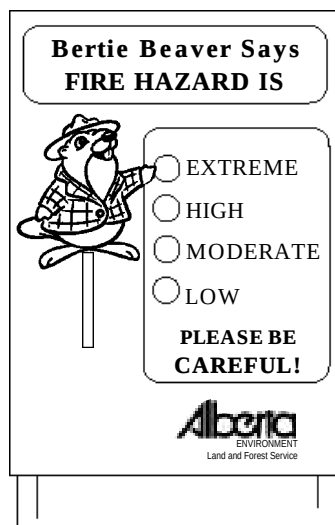
3. Develop and implement a project to inform the public about fire safety.

BACKGROUND

Forests are perfect sites for fires because of the readily available amount of fuel. In Alberta, forest fires are either started by lightning or through human carelessness. Examples of human activities that can start forest fires are: throwing cigarette butts out the car window; trash fires; an unguarded campfire; a campfire out of control and so on.

Fire Danger Rating System

Fire Danger measures the probability of fires starting and the estimated burning intensity and the rate of spread of fires which do start.



- ☐ Low
Fires do not start readily and burn slowly.
- ☐ Moderate
Rate of spread is moderate. Control not difficult.
- ☐ High
Fires start easily. Spread rapidly. Spotting occurs. Direct attack difficult.
- ☐ Extreme
Fires start rapidly from all causes. Burn intensely. Spread rapidly. Control confined to flanks. Direct attack unlikely.



People who have homes on the edge of the forest between the Green (forested area) and White (developed, non-forest area) Zones. Here is a checklist that Wardens may use to help them develop a project to educate the public about fire safety.

Home Protection

All forest residents should know the three needs of a fire: fuel, heat and oxygen. Removal of any one of these will cause the fire to go out. For example, remove the fuel by constructing fire breaks that are fuel-free and down to the mineral soil, remove heat by spraying with cold water or preventing a spark from having any effect, and remove the oxygen by smothering the flame with water or other material.

- Reduce surrounding wildfire fuels, for example rotting logs, branches, brush and other flammable materials.
- Remove overhanging tree limbs and moss within 10 metres from the roof, as well as needles from the gutters
- Maintain a fuel-free area around the home. A large green lawn is ideal in a wooded setting and can act like a fire line.
- Do not stack firewood against the house.
- Remove highly flammable plants immediately beside the house, especially on the downside or the side most exposed to prevailing winds.
- Clean chimneys and stove pipes, check their screens.

Wildfire Safety Precautions

- Develop a plan with family and friends in the case of a wildfire.
- Have an adequate water supply available.
- Have a large barrel of water and a 10 litre pail if there is a non-pressurized water system.
- Keep basic fire fighting tools on hand: shovels, buckets, axe, mattock, grub hoe, backpack sprayer, and a ladder long enough to access the roof.



Evacuation Plan

- Develop a standard evacuation route everyone knows and has practiced.
- Establish an alarm system that everyone can recognize, a whistle or boat horn.
- Have an agreed upon meeting place where the family can meet to be accounted for.
- Know how to turn off the gas and power.
- Turn the sprinkler on before you leave if you have an independent well.
- Do not panic!



A c t i v i t y S u g g e s t i o n s

- Have Wardens promote fire safety about campfires or fires in the backyard at a mall display, in a provincial park or other event. Target specific groups such as campers, cottagers, picnickers or motorists.
- Design and photocopy a small brochure about fire safety with 10 reasons why forest fires are dangerous.
- Develop a fire prevention tip sheet that may include the following: Do not smoke while walking through a forest or field. Do not throw matches, ashes or burning materials into the woods. Make sure the ashes in a campfire are cold before you leave.
- Lead an activity with the entire Junior Forest Warden Club that can be used to teach others about forest fires.
- Be Aware and Be Prepared.



4. Demonstrate the preparation and management of a campsite fire. Show the proper use and maintenance of hand tools.

HAND TOOLS REQUIRED
○ axe or hatchet ○ shovel or spade ○ five litre container full of water ○ car-size fire extinguisher

A person who desires to light or maintain an outdoor campfire for cooking or warming purposes during the fire season shall take the following precautions: (The precautions are underlined in the text below).

from The Forest and Prairie Protection Regulations Sec. 17

1. *Selecting a Site*

Without a Pit

Select a site for the fire that is away from dry grass, heavy bush, leaves, logs, tree trunks, peat areas and overhanging branches. The ground should be level and sheltered from wind that may blow sparks.

With a Fire Pit

It is ideal to build a fire in a site that has already been used.

2. *Preparing Your Campsite*

The pit should be dug or scraped down to the mineral soil or placed on a flat rock, gravel bar or sand. The pit's diameter should be one metre or less. Pay attention to



roots and cut them back. Surround the pit with rocks, gravel or sand to contain the hot ashes and coals. All flammable material (dry leaves, grass, twigs and moss) must also be removed another one metre surrounding the prepared pit. Keep the fire extinguisher and pail with water nearby in case the fire escapes or gets out of control.



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Preparing the Fuel (wood not gasoline)

Begin with small kindling that are match-size, progressing to finger-size, two fingers and so on. Build the fire gradually until you have a steady blaze. Keep the fire under control and attended to at all times. Lay pieces of wood on fire to avoid sparks.



3. *Putting Your Fire Out*

Extinguish the fire before you leave the site. Think about when you will be putting the fire out. Begin by stopping to add wood to the fire and allowing it to burn down. You can spread the fire around the pit to help it burn out. Slowly add water to the fire and stir with a stick. Continue to add water until smoke and steam are no longer visible. Do the hand test, the campfire is not out until you can touch it.



TOOL TIPS

Axecraft

The following are some general tips about having and handling an axe. It is recommended, however, that wardens have a short course from an expert. Learn about sharpening an axe, chopping down trees, splitting logs, splitting stove wood, removing bark from a tree, trimming branches, and replacing axe handles.

- The axe should be sharp, well-balanced and the correct size for you and the job being done.
- Have secure footing.
- Clothing should not obstruct your movement.
- Swing with short, smooth strokes to help you stay on target.
- A 45° angle is the most efficient cut and is five times deeper than a perpendicular cut. It also ejects the wood chips easily.
- Use both hands when chopping with an axe.
- Chop wood on wood. Don't place wood to be chopped on a rock or the ground. Even a small pebble can chip the axe blade.
- Don't use an axe as a maul or as a wedge.
- Store the axe in a sheath.

OTHER REFERENCE MATERIAL

Mors Kochanski has excellent information (Firecraft beginning on page 45 and Chapter 2, Axecraft) in his book entitled, Northern Bush Craft.

Shovels

- The army surplus folding shovels are good camping shovels and appropriate for preparing a fire pit.
- Store the shovel folded and in the case. Around the campsite, lean it against a tree instead of laying it open on the ground.
- A sharpened shovel is an effective tool.



5. **Tour one of the following sites: air tanker base, rap attack crew, initial attack base, lookout tower, Provincial Forest Fire Centre, an old or recent burn site, Forest Fire Training Centre in Hinton or other fire suppression sites.**

Provincial Forest Fire Centre

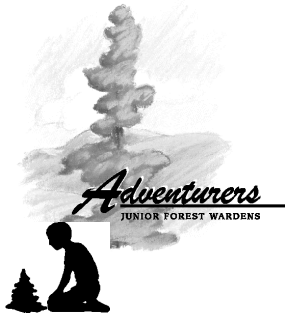
Arrange a tour of the Fire Centre. You will see The Operations Room and the Fire Weather Room. In the Operations Room a computer is hooked up to two large screens where you will see where all the resources are throughout the province. Weather briefings are held in the Fire Weather Room where daily weather is accumulated on charts to show trends in precipitation, drought codes, lightning strikes, temperatures, and satellite pictures. When booking, please keep in mind the fire season and what the conditions are like. Refer to the Phone Book Yellow Pages in this program for contact information.

Environmental Training Centre

You may also arrange a tour of the Environment Training Centre in Hinton. Refer to the Phone Book Yellow Pages for contact information.

Land & Forest Service Office Locations

Contact the Land and Forest Service office nearest you. Personnel will help find your group a suitable site to tour. Refer to the Phone Book Yellow Pages in this program for phone numbers.



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II FOREST USES

Understanding the interrelationships between people and the environment is a key factor in ensuring that nothing we do has a major impact on future generations. Wardens will learn to recognize that some aspects of our forests are necessary for people's use and others require nature to take its course.

date completed



	☒	Participate in a land use planning game.	page 19
	☐	Describe wood processing for two wood products and two wood by-products. Visit a lumber yard, pulp mill or a sawmill.	page 26
	☐	Make a presentation on the uses of the forest.	page 28

II. Forest Uses

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1. Participate in a land use planning game.



Activity Summary

Wardens will participate in a role playing activity where they will discuss the renewal of a pulp mill's discharge permit.

Procedure

1. Provide the set-up for your group. The situation is that the Wardens will be role playing (pretending with an identity and a viewpoint which may or may not be their own.) They will be participating in a public hearing where people will be putting forth their viewpoints about an issue. The issue is whether to renew the local pulp mill's discharge permit issued by the Minister of Environmental Protection.
2. There is concern about the renewal because many locals make a living off the land, the very land being affected. Sports fishing and people who take care of the tourists (hotels, restaurants, stores) are worried about the health of the river. People who have homes on the river are worried because the river has algae and looks like pea soup which doesn't make it fun to swim in, nor is it healthy for people.

There is also urban and agricultural run-off pollution, but there are point sources of pollution on the shores of the river, including the mill. The mill discharges some of the wastes as a result of the pulp making process into the river. Although the pulp mill works at removing pollutants from wastewater in much the same way the wastewater treatment is done in the large city. The mill is monitored by the Minister of Environmental Protection which decides on the quantities and kinds of chemicals that the mill may release into the river.

Some residents complain that the mill causes tremendous environmental damage, while other people claim that the mill's discharge of pollutants is low enough so that the river can clean itself of them. The mill is important because it employs so many people.



last updated: 06/99

You will notice that in role playing, consensus in environmental issues is rare. What people want and need play an important role in making decisions and these wants and needs are not invalid. It is easy for Wardens at this age to be altruistic, and think everyone should be too—that is, stop making pulp and paper. But, if their fathers and mothers were going to lose their jobs and probably their homes, how would they feel?

3. The role playing situation is a hearing. The public will be invited to comment on whether or not to renew the mill's permit to dump certain wastes into the river. The organizations used in this activity do not exist but they may be patterned after some real-life organizations.
4. The leader will chair the public hearing. Each individual or representative from an organization will have one minute to explain why the permit should or should not be renewed. After each person has delivered her or his position, a vote is taken to determine whether the paper mill gets the permit renewed. One vote per person.

Remind the Wardens that they do not have to agree with the other members of the group, but they have to defend their opinions based on the role, not their personal opinions.

There are seven roles: Homeowners Association, Mill Officials, Department of Environment, Uptown Chamber of Commerce, Downtown Chamber of Commerce, Sport Fishing Association, and the Keep the River Clean Committee. Copy the following sheets and cut apart. Distribute one viewpoint to each Wardens or small group. Give them five minutes to think about how they will deliver their viewpoint at the hearing.

As the chair of the hearing, you will have to encourage the Wardens to speak out, they are usually inclined to say, "I'm for the permit." or "I'm against the permit." Remind them to stay in character. Keep asking, "Why do you support the permit renewal?" "What do you have to gain if the permit is renewed/or denied?"



ROLES

Copy the following sheets and cut apart. Distribute one viewpoint to each Warden or small group. Give them five minutes to think about how they will deliver their viewpoint at the hearing.



Homeowners Association

This association is made up of people who own property on the river. These people are concerned about the quality of the water because they have invested a lot of money in their homes. They know that if the river becomes more polluted, the value of their property will decrease and they will lose money if they sell their homes.

They love the river and enjoy swimming, fishing, and boating. Increasing pollution means they will be unable to enjoy these things in the future. The association blames pollution on farmers for agricultural run-off, cities with inefficient wastewater treatment plants and the mill.

The Homeowners Association wants restrictions placed on farmers so they cannot use fertilizers and pesticides on fields next to the river. They want the government to allocate funds for upgrading wastewater treatment plants.

Mill Officials

The management of the mill is tired of being blamed for all the pollution problems in the river. They do release chemicals into the water, but only the amounts permitted by the Department of Environment. Finding some other ways to dispose of these chemicals would be very costly and the company cannot afford to change without laying off workers or going out of business.

The mill officials know that the water around their mill in the town is yellow because of the chemicals they release and that the air and water don't smell very good. The mill employs hundreds of people and the money they earn and spend in the town and area amounts to several million dollars. These people support families with the money they earn working at the mill. Mill officials point out that their employees and the residents of the town deserve to derive some benefits from the river. "The river is not just for wealthy folks who can afford property along the banks."



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ROLES

Copy the following sheets and cut apart. Distribute one viewpoint to each Warden or small group. Give them five minutes to think about how they will deliver their viewpoint at the hearing.



Department of Environment

The Department of Environment permits the mill to discharge a limited amount of chemicals. Mostly they are lignins, ugly yellow in colour but a component of wood that is not used in making pulp and paper. The Department of Environment claims that the river has the capacity to cleanse itself of these chemicals and that they are not harmful to humans. They admit they make the water an ugly, yellow colour.

The Department of Environment pointed out that the mill is working hard to treat wastes it creates while making pulp. They also point out that the plant employs many people and that the company spends a lot of money in the region.

The Department of Environment believes that the pollution in the river is the result of many things, including urban and agricultural run-off. But they also say that river front homeowners have faulty septic systems and that those wastes are leaking into the river causing more problems than the discharge from the mill.

Uptown Chamber of Commerce

The Uptown Chamber of Commerce represents businesses in the mill area. These businesses depend on the mill. They are afraid that if the mill's permit is not renewed, the plant will go out of business or move to a place where labour is cheaper and pollution control is weaker.

The mill and its employees spend \$3.7 million a year in Uptown. The employees buy their gas and their groceries there, get their hair cuts and buy their homes there. The mill pays a big tax bill every year and these taxes help pay for roads, sewer and water systems and many things Uptown needs.

There is no other major employer in the area. Without the mill, few people would have enough money to shop in Uptown stores or even to keep making payments on their homes.



ROLES

Copy the following sheets and cut apart. Distribute one viewpoint to each Warden or small group. Give them five minutes to think about how they will deliver their viewpoint at the hearing.



Downtown Chamber of Commerce

Downtown is located directly downstream from Uptown. The distance between the two towns is fairly close and sometimes the wind sends the stink and the yellow-coloured water from the mill to Downtown.

Downtown is a scenic area, with a lot of open land along the river and a pretty downtown area. Tourists enjoy visiting Downtown. The Downtown Chamber of Commerce is working with a developer to bring 80 condominiums into town. The building of condominiums along the river bank would mean construction jobs, and the condominiums would be taxed to raise revenues for Downtown. The developers are worried that no one will buy a condominium in Downtown because of the smell from the mill and the yellow-coloured water that runs by the town.

The Chamber of Commerce does not think that the residents of Downtown have to suffer because of what happens at the mill upstream.

Sport Fishing Association

The Sport Fishing Association is made up of people who are concerned about the decline in the number of fish in the river. They believe that pollution is only one of the causes of the decline in the fish population. Many members of the Association work at the mill.

The Association supports controls on urban and agricultural run-off, but they believe that the Department of Environment should spend more money stocking local areas and the river. They believe that more money should be spent on lampricides, chemicals that kill sea lampreys. Sea lampreys are eel-like creatures that kill good fish such as trout and salmon.

The Association believes that improving fishing is a good way to improve the economy. More anglers and their families would visit the region and spend money at Uptown's restaurants and stores.



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ROLES

Copy the following sheets and cut apart. Distribute one viewpoint to each Warden or small group. Give them five minutes to think about how they will deliver their viewpoint at the hearing.



Keep the River Clean Committee

The Keep the River Clean Committee is comprised of people from all over the province who are concerned about the environment in general and the river in particular. They are afraid that people pay too much attention to issues like the mill's permit renewal. They want people to take responsibility for their own actions instead of blaming pollution on someone else.

The Committee wants more restrictions on the use of fertilizers and pesticides by farmers. They want everyone with property on the river to have their septic system tested and replaced if necessary. They believe that wastewater treatment plants in cities must be expanded to handle the increasing amounts of sewage and runoff that reach them.

They are afraid that without some sort of rules and restrictions, the river will become overcrowded with sport fishing and tourists. The result will be more pollution (human wastes, gas and oil.)

The Committee wants stricter laws passed so that there will be less river bank development. Development means erosion of soil from the construction, increased use, more people and pollution.



Wrap-up the Role-playing

Discuss what unfolded in the role-playing.

- What was the most important issue raised by the role-playing?
- Are people more important than the river or is the river more important?
- Imagine the area in 500 years. What do you think the water quality will be like? Why?
- How do their views change if their lives were directly intertwined with the mill?
- Can the needs of people and the balance of nature be separated?
- Can the wants of people and the balance of nature be separated?

Humans need to pay more attention to natural systems. Even when people change nature unintentionally, it has a negative impact on the life support systems of the planet. Clean air, water and soil are necessary to sustain life and humans must decide what their priorities are.



2. Describe wood processing for two wood products and two wood by-products. Visit a lumber yard, pulp mill or a sawmill.

Wood Products are of two types, primary and secondary:

1. *Primary - Trees processed and cut into dimensional lumber or pulp for paper.*

- Visit a sawmill, portable sawmill or a pulp mill, refer to the Phone Book Yellow Pages for contact numbers.
- Before you go, develop a list of questions to ask your tour guide.
- Bring along a camera and make a photo album about the tour.
- Write an article for the regional newsletter about the tour.
- Determine how much waste is created in the process.

Wood by-products are materials left from processing lumber which can be used for:

- packing materials,
- shavings for animal bedding
- bark chips for soil
- sawdust and chips for value added products.



Supporting Information
Products of Canada's Trees, Alberta Forest Products Association Educational Resource

2. *Secondary - Finished products that are made or carved out of primary wood products.*

- ☐ Visit an artisan who carves wood or uses wood as a medium for creative expression.
- ☐ Visit furniture makers, carpenters, house builders.
- ☐ Make a list of things made of wood in your home, school, recreational activities.



Activity

Visit a local lumber yard and "Window Shop" (don't buy, just look) for the following products:

☐ 2 X 4s	☐ 2 X 6s
☐ 2 X 10s	☐ 2 X 2s
☐ 1 X 6s	☐ sheet of OSB
☐ sheet of particle board	☐ 4 X 4 posts
☐ 4 X 6s	☐ 3/4" plywood sheet



3. Make a presentation on the uses of the forest.

Making Presentations

It's said that the success of a presentation is largely due to planning. Wardens will be less nervous and more successful if they make a concerted effort into planning their project. One resource that may be helpful is entitled, Ten Easy Steps to Planning and Delivering a Presentation available from Alberta Agriculture. Also refer to Appendix III - Helpful Guidelines, for some ideas on presentations.

Have Wardens develop a list of qualities that are common in presentations that appeal to them. Ask them what do they think the presenter did that was so appealing to them.



A c t i v i t y S u g g e s t i o n s

- ☐ Make a collage using pictures from magazines.
- ☐ Produce a video about the forest.
- ☐ Gather artifacts of things humans receive from the forest.
- ☐ Develop an exhibit on any topic that relates to uses of the forest. Find thick three sided, cardboard display boards at teacher stores for about \$10.
- ☐ Make a Tree Key
- ☐ The Importance of Snags.
- ☐ Make a diary (or baby book) on the life of a tree.
- ☐ Write and perform a commercial.
- ☐ Re-write the words to a familiar song and perform to group.
- ☐ Write a children's book.
- ☐ The forest as habitat



- Write and perform a musical.
- Develop a significant project that can be used as the focal point in a campfire program.

Invent Some Great One Liners

Here are a few one liners from the Pulp Fiction + Forest Facts, 1997 National Forest Week supplement produced by the Canadian Forest Service. (There was a written explanation under each one liner.)

- You can go in circles figuring out the age of a tree.
- Forests are community-minded by nature.
- It takes a creative spark to deal with forest fires successfully.
- When a forest is under the weather, a doctor will often advise it to 'take two willows and call me in the morning.'
- City dwellers resist planting trees because they fear neighbours will view it as a shady pastime.
- Clear away the underbrush of misconception and plant seeds of knowledge.

This one was on the back of an envelope from the Ontario Forestry Association - The Forest Works for you . . . don't fire it!



last updated: 06/99

Make a Slogan

Here is an example of an acoustic poem that could be adapted to show how the forest is used.

Trees Are Our Friends

Take action
Restore a woodlot
Enhance a habitat
Engage your friends
Spruce up a yard

Approach your community
Request help
Explain your vision

Offer ideas
Use native species
Reclaim a gravel pit

Find solution to problems
Revitalize a garden
Improve a street block
Energize your school
Nurse a tree
Dig in and . . .
Surround yourself with wildlife!

Adapted from Learning About Wildlife, Unit 10, Canadian Wildlife Federation.



The Tree Identification Song

Words written by Janice Park-Wong

Sung to the song entitled, Davey Crockett, King of the Wild Frontier

There in the muskeg where I grow so slow
Old man's beard on my branches, I'll show
My wood is soft and it's almost white
My leaves are short, thick four-sided spikes.

Black, Black Spruce
Queen of the muskeg site.

I'm known as Alberta's provincial tree
I grow straight and as tall as can be
My needles grow in bundles of two
Mr. Jack Pine, I like growin' next to you.

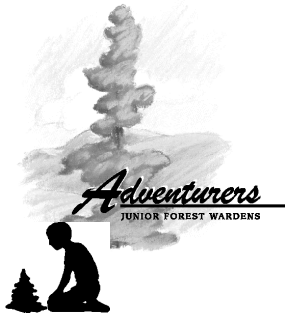
Lodge, Lodgepole Pine
Seeds are released by fire.

My leaves like to tremble in the gentle breeze
When I'm young my bark's as smooth as can be
Short wooden fibres are not very strong
But pulp me up for the paper that you long.

Trembling, trembling aspen
Boreal mixedwood king.

Supporting Resources

The following posters may be useful for wardens: Native Trees of Alberta available from Information Centre, Alberta Environmental Protection, Smokey Bear When You Lose a Forest, You Lose More Than Trees from Alberta Forestry Association, and Between the Stands available from FEESA. Refer to Supporting Resources section.



LEADER
MANUAL



FORESTRY PRACTICES●

Forestry practices and management look at all aspects of sustainable development. Timber, wildlife, water, weather, recreational use and protection are all important in terms of integrated forest management.

date completed



_____	☐	Describe why silviculture is an important aspect of timber management.	page 35
_____	☐	Practice one silviculture technique with professional assistance.	page 44
_____	☐	Demonstrate how to measure the volume of a tree.	page 45
_____	☐	Conduct a pre or post survey of a planting project that your club is involved in.	page 62
_____	☐	Participate in or tour a reforestation project.	page 70
_____	☐	Tour a wood-harvesting operation or a wood-processing plant.	page 73
_____	☐	Discuss methods that can be used when harvesting trees to reduce environmental impact.	page 75

III. Forestry Practices

1. Describe why silviculture is an important aspect of timber management.

BACKGROUND

Silviculture is the art and science of growing trees. An analogy common to our understanding is that silviculture is like tending a garden. We plant seeds or seedlings, remove weeds to ensure that the plant has enough room and sunlight to grow, attend to any pests that attack the plants, and some pruning to encourage plant vigor. The garden in forestry is much larger than our backyard vegetable patch. Silviculture is to forestry as agriculture is to farming.

A silviculture system is a planned program of activities involved in producing trees from sites before and after a harvest. The program includes seedling establishment, tending the young forest, thinnings (intermediate harvests), preparations for the regeneration of the next tree crop and the final harvest. The period of time over which these are done is called the rotation. The silviculture program are named after the method of final harvest which can be even-aged or uneven-aged.

The final harvest can be done in different ways. For example, single tree selection and group selection (both good for uneven-aged forests), and patchcut, shelterwood, seed tree and clearcutting (appropriate for even-aged forests.)

Partial Cut Harvest Systems

Partial cut harvest systems do not remove all the merchantable trees from the area. Partial cut methods are intended to encourage natural regeneration. Three partial cut systems are selection method, shelterwood method and seed tree method.



Single Tree Selection

The single tree selection system means that trees which are selected for cutting are scattered throughout the stand. It is best suited to stands that contain even distribution of all ages, height and diameter classes. The space created by removal of these trees, should theoretically encourage the establishment of regeneration which will continually be reduced through thinnings or suppression until harvest time when one tree is left.

Group Selection

In this silviculture system, groups of trees are harvested in patches which are not large enough to be called true clearcuts because of the influence of the surrounding trees on the climate of the harvested area. This system is more economical to apply than the single tree selection method because the volume to be harvested is concentrated in patches thus minimizing effort per unit volume.

Shelterwood is gaining popularity because it provides continual habitats for cavity-nesting birds and other wildlife that depend on benefits from large dead or live trees in a stand. In ecosystem-based management the trees are left as wildlife trees.



Silviculture Systems

Appropriate for Uneven-aged Forests

Single tree selection

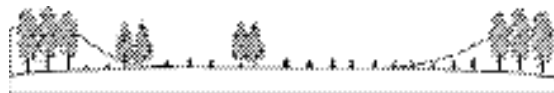


Group selection



Appropriate for Even-aged Forests

Patchcut



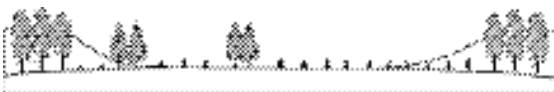
Shelterwood



Seed tree



Clearcutting





last updated: 06/99

Advantages and Disadvantages of Silviculture Systems

CLEARCUT

The Situation: Stands with a high volume of dead, dying, diseased or windfall trees; mature or overmature stands; where you want to regenerate shade intolerant species; where you want an even-aged stand; most effective with pure stands of shade intolerant species such as aspen and pine

SELECTION

The Situation: mixedwood and uneven-aged stands; trees that can reproduce and grow in considerable shade; parts of riparian areas; near roadsides, urban areas or high traffic recreation areas; works well with white spruce, Douglas-fir, balsam fir, green ash and Manitoba maple.

Advantages	Disadvantages
1. Economic to log. 2. More accessible and economical for site preparation and planting. 3. Best for converting to new tree species. 4. Best for regenerating shade intolerant species. 5. Damage to 'leave' trees from logging, windfall, etc. is not an issue. 6. Easy to plan and supervise. 7. Good for many wildlife and bird species.	1. May increase the potential for erosion and rapid runoff for a few years. 2. Appearance is undesirable until regrowth well established. 3. No timber products available for a long time. 4. Unwanted grasses, shrubs or trees may get established. 5. May increase impact of wind and temperature changes. 6. Debris may create a fire, insect or disease problem. 7. Natural regeneration may be inadequate and require further treatment.
1. Visually pleasing. 2. Provides a more regular income and a variety of products. 3. May reduce the chance of insect and disease outbreaks. 4. Excellent protection from wind and water erosion. 5. Provides good habitat for many bird and wildlife species. 6. Improves genetic quality of future stand through superior parent seed trees. 7. Allows opportunities to salvage damaged trees.	1. Harvest costs are higher. 2. Income lower versus large cuts. 3. Complex method. Requires good knowledge of trees to avoid high-grading and balance growth with harvest. 4. High damage potential for seedlings and other trees. 5. Frequent entries may cause soil compaction and damage to residual stems. 6. Trees may have too much space, developing a large taper and too many limbs. 7. Not well suited for shade intolerant species. 8. Need permanent trails. 9. May spread Armillaria.



SHELTERWOOD

The Situation: Softwood and mixedwood stands of shade intolerant species including Douglas-fir; shelterwood stands on well drained soils; works well with birch stands (controls soil temperature to reduce the chance of temperature fluctuations killing the roots.)

SEED TREE

The Situation: similar to clearcut situations but leaves sufficient seed source to encourage natural regeneration; where artificial regeneration is difficult or uneconomical; usually with shade intolerant species; works best with white spruce, occasionally black spruce and possibly tamarack

Advantages	Disadvantages
1. Partial shade means seedlings less subject to drying out and frost damage. 2. Reduces competition, as many weed species are shade intolerant. 3. More pleasant visually, beneficial to wildlife. 4. Preparatory cut acts like a thinning, remaining trees can add significant wood volume. 5. In mixedwood stands, younger maturing species may be removed before they die. 6. Less slash, so fire risk low. 7. Income more evenly distributed over the years. 8. Low erosion potential.	1. Logging and repeated entries may damage regenerating plants and crop trees. Final harvest requires good thinning and care. 2. Logging and management costs are higher. 3. Marking stands for prep and seed cuts require knowledge and skill. 4. Windfall losses may be high. 5. Markets may be limited for small and low-quality products from early cuts. 6. Roads and extraction trails must be efficient.
1. Similar to clearcutting. 2. Superior parent tree selected. 3. Seed more uniformly spread than with clearcutting. 4. Should not require tree planting. 5. Should lower cost of regeneration.	1. Lightning may strike seed trees, destroying them and starting fires. 2. Wind may damage seed trees before they can be harvested. 3. Species need light seeds that will carry in the wind, germinate and grow in the open. 4. Cost of harvest increases if you return later for seed trees. 5. Spot planting may be needed if seed is unevenly spread. 6. May have to wait for a seed producing year.

From the Woodlot Management Guide for the Prairie Provinces.



last updated: 06/99

Thinning

Thinnings are important because some young stands have trees very close together. Too much crowding slows growth and puts growth on stems which are not useful in the final crop. Thinning opens up the stand for better growth and in some cases, encourages natural regeneration. In some cases, poorer trees are cut leaving the better ones for a later cut. When possible, concentration is on removing trees of inferior species, trees of poor form (crooked, forked, thin and narrow crowns), and trees with defects such as rot, disease, insect damage and large heavy limbs.

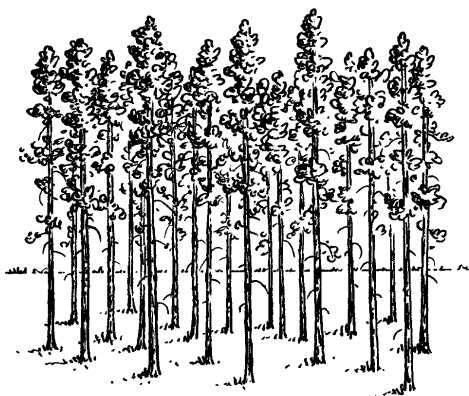
The Benefits of Thinning:

- Speeds the growth of remaining trees and shortens rotation time.
- May reduce insect and disease outbreaks by removing defective trees and improving stand vigour. In some cases it may create conditions that increase insects and disease problems.
- May improve the aesthetics of the woodlot.
- May improve wildlife habitat for some species. May also reduce habitat for other species.
- Provides early income from products sold, where markets exist. In many cases, more than half the final harvest volume can be achieved from thinnings.
- Improves access for livestock, wildlife, recreation, future thinnings or other management practices.
- Produces more valuable end products by controlling tree species and stem form.
- Reduces final harvest costs by growing more merchantable volume on less trees, with larger and more uniform stem sizes.
- Increases merchantable volume by concentrating growth on selected crop trees, rather than on trees lost through natural mortality.
- Increases light to the understory, which may increase production of forage and browse.

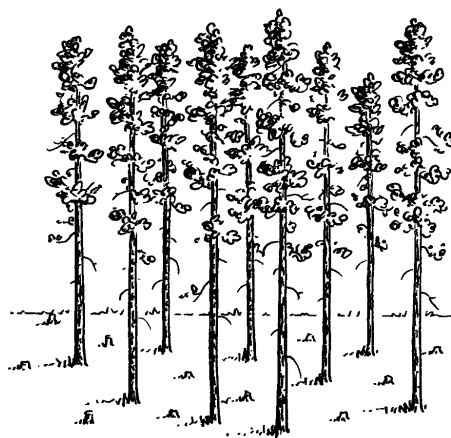
From the Woodlot Management Guide for the Prairie Provinces.



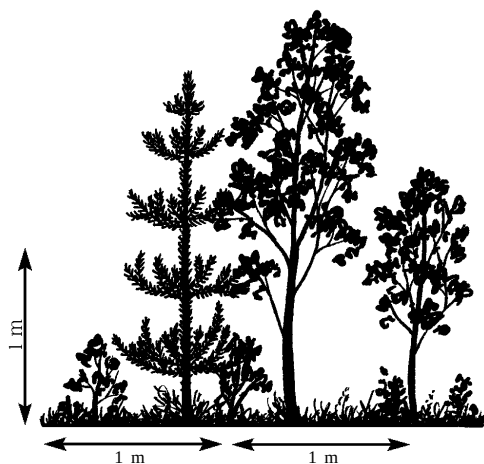
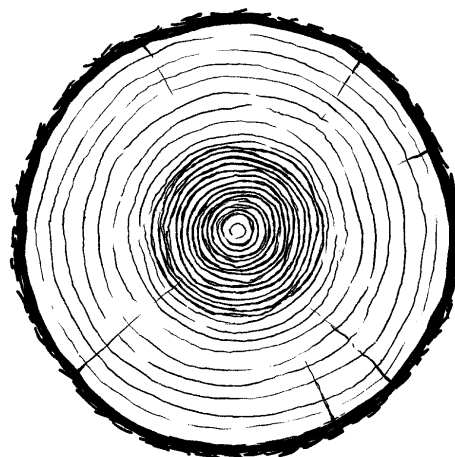
Effect of Spacing



DENSE



SPACED

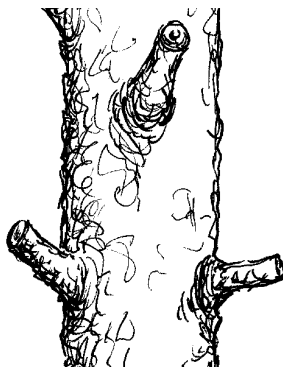




last updated: 06/99

Pruning

Pruning can be done by trimming the end of branches (for a better shape in Christmas trees or elm trees) or by removing branches close to the tree trunk with saw and shears to yield knot-free wood (new wood grows over the branch base.)



Poor pruning

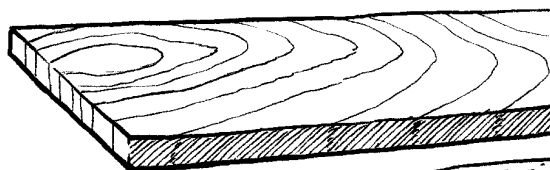


Good pruning

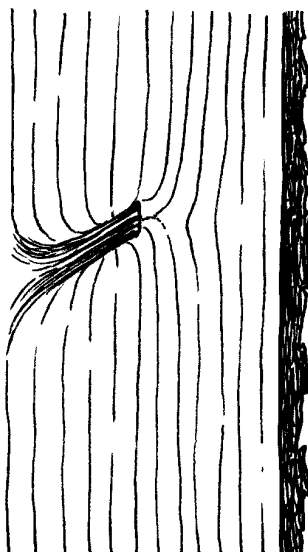
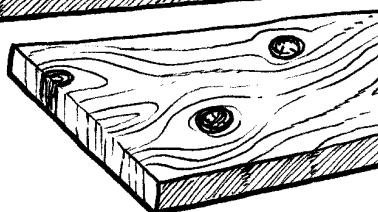
Advantages of Pruning:

- produces high value, clear timber
- wood has fewer and smaller knots
- controls the spread of pests like mistletoe
- reduces the risk of crown fire by removing branches that would allow ground fires to move up the trees
- stands may be aesthetically pleasing and park-like
- trees may be harvested quickly and easily with less time spent limbing the logs.

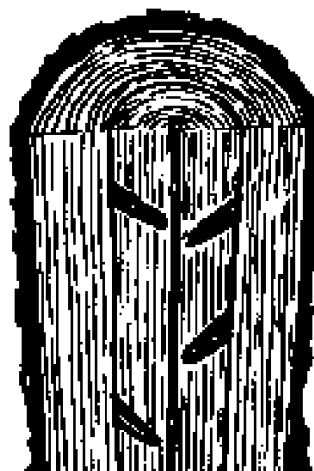
Board from pruned tree



Board from unpruned tree



clear wood produced after pruning



outer shell of clear lumber which will be sawn into boards



Disadvantages include:

- reduces thermal cover necessary for some wildlife species
- increased line of sight reduces hiding cover for some wildlife species
- removal of lower branches eliminates lichen growth, which is food source for some wildlife
- removing small, thick, low-growing branches removes a physical barrier to porcupines that girdle or debark trees

From the Woodlot Management Guide for the Prairie Provinces.

Silviculture, however, does not only include the planting, thinning and harvesting of trees. During a rotation, it also includes protecting trees from competition, fire, insects, diseases, animals and wind. Refer to Appendix IV - Damage To Trees for more information about specific damage.

Some of the ways competition to trees are controlled is by cutting down the other plant, spraying with herbicides (weeds, grasses, other trees) and by girdling. Unwanted large trees are girdled with a chain saw (a strip of bark is removed around the circumference cutting off food supply to the roots.)



A c t i v i t y I d e a s

- Review with the Wardens the various aspects of silviculture and discuss the advantages and disadvantages.
- Have Wardens walk through a woodlot with a forester and discuss various methods of silviculture and their advantages.
- Invite a forester to your club's meeting for a slide and/or talk about various silviculture systems.
- Combine this program objective with the next one, "Practice one silviculture technique with professional assistance."



2. Practice one silviculture technique with professional assistance.

A community that has a silviculture department will likely have a plan with five components:

1. Pruning - Pruning removes dead and diseased branches as well as improves the tree's shape and vigor.
2. Plant Replacement - After a tree dies in a community (along roads, boulevards and parks) they are generally replaced with a tree of the same species. It is usually 6 to 9 feet high with a 60 mm caliper diameter measurement. This size makes it less susceptible to vandalism.
3. Naturalization Program - The areas of a community which are chosen for the planting of seedlings are along banks, roads and ditches. Naturalization reduces the amount of acreage mowed.
4. Monitoring for Disease - Usually an administration has a Pest Control Section which looks after the pests that harm trees. These can range from insects that defoliate, leaf miners, leaf borers, caterpillars, satin moth, wilts and galls.
5. Public Education - Since all the trees in a community are part of the urban forest, education is very much a component of silviculture. Policies and advice to the public about their tree concerns happen in the urban forest.

Program fulfillment

- With a professional forester, Wardens can investigate some of the diseases in the local community trees and methods used to keep them in check. Refer to Appendix IV - Damage to Trees for charts and information about tree pests.
- Wardens can participate in a tree planting (seedlings or tree replacement) project in a local woodlot or community.



- Wardens can learn about pruning methods and participate in the actual pruning of trees.
- If the Wardens decide to do some public education, some actual silviculture should accompany this component.

3. Demonstrate how to measure the volume of a tree.

SUMMARY

Wardens will measure the heights and diameters of trees to determine their volumes.

BACKGROUND

There are two tools required to measure the volume of a tree: a diameter at breast height (dbh) measuring tape and a clinometer to measure the height of a tree. Wardens can successfully do this activity without having the professional tools at hand. Wardens will make a clinometer and use a bit of math to calculate the information required.



A c t i v i t i e s

Measuring Tree Diameter

The easiest and most accurate way to measure the diameter of a tree is to use a diameter tape. A diameter tape is a metal tape, similar to a carpenter's tape with a hook in the end that can be fixed in the tree bark. The scale on the tape translates the tree circumference into a measure of its diameter.

The diameter tape is wrapped around the circumference of the tree at breast height or 1.3 metres above the ground level. The tree diameter is read directly from the tape to the nearest of a centimeter.

If a regular tape measure is used, the circumference is divided by 3.1416 to convert to diameter.



last updated: 06/99

This tree has a DBH of
23 cm.

Calculate Diameter

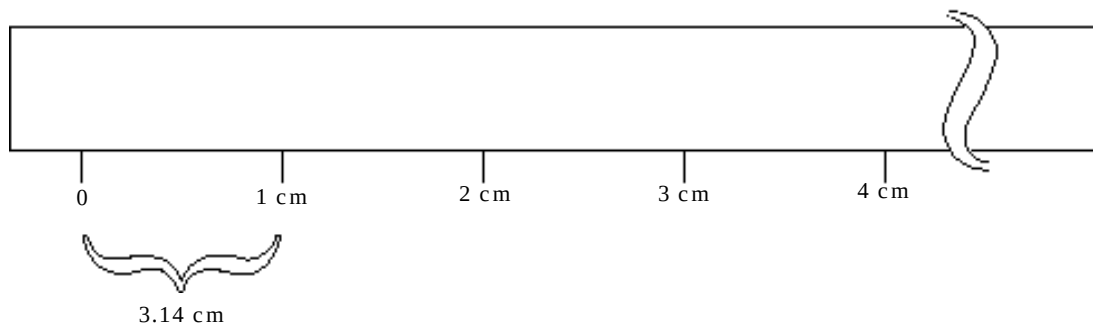
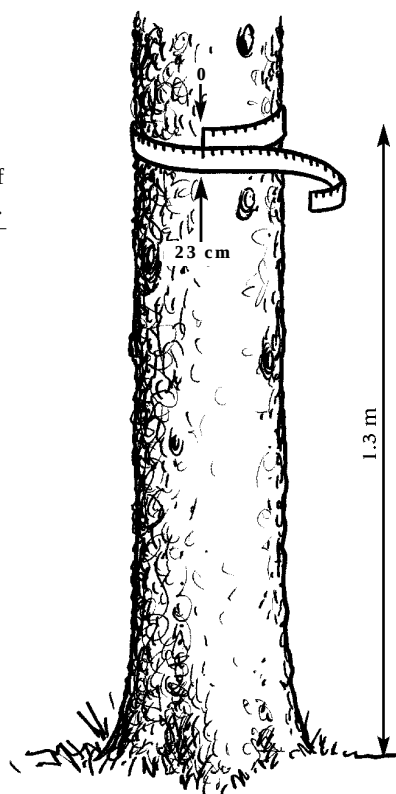
For example, a tree's circumference measure at breast height (1.3 m from the ground) is 124.3 cm

Mathematical operation: $\frac{124.3}{3.1416} = 39.565 \text{ cm}$

Or

Make a Diameter Tape

If you want things a bit easier than using a mathematical calculation every time, make a diameter tape. You can use adding machine paper tape or a 5 cm wide strip of cloth about 1.5 metres long. Go in about 3 cm and mark a small vertical line and label it 0. Measure 3.14 cm, make a small vertical line and mark 1, measure another 3.14 cm and mark 2, and so on. Each graduation should be numerically numbered starting at 0 and every 3.14 cm interval after that.



* centimetres are graduated for diameter

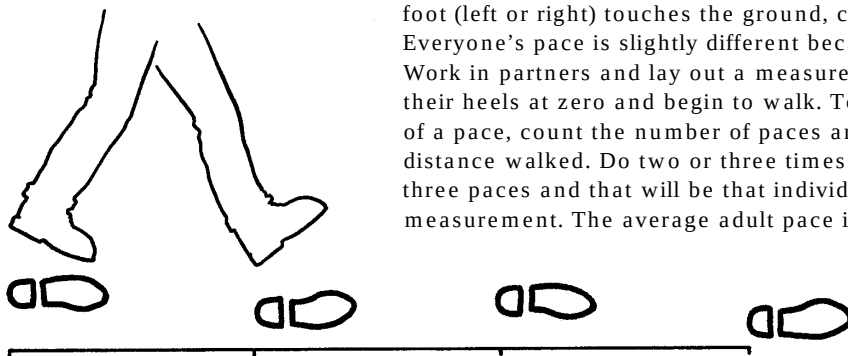


Measuring Tree Height

There are several ways to measure the height of trees. These methods range from using scientific instruments to methods with varying degrees of accuracy. Several methods are described below. The best method for Wardens is the one where they make a clinometer. It's easy and gives the Wardens some idea of what is really used in the field. Have Wardens work in partners and try the different methods on the same tree. Which ones tend to be more accurate?

First Things First - Measure Your Pace

A pace is the measurement of a double step. Every time your foot (left or right) touches the ground, count a pace. Everyone's pace is slightly different because of leg length. Work in partners and lay out a measured course. Have one put their heels at zero and begin to walk. To calculate the length of a pace, count the number of paces and divide into the distance walked. Do two or three times and take an average of three paces and that will be that individual's pace measurement. The average adult pace is 1.5 metres (5 feet.)





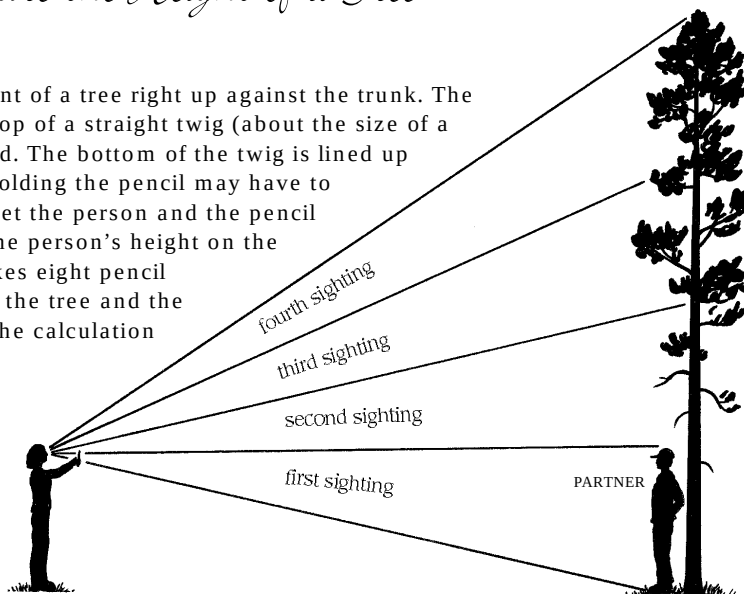
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Five Ways to Measure the Height of a Tree

1. Artists Method

Have a person stand in front of a tree right up against the trunk. The other person lines up the top of a straight twig (about the size of a pencil) to the person's head. The bottom of the twig is lined up with the feet; the person holding the pencil may have to move forward or back to get the person and the pencil the same height or mark the person's height on the stick with a thumb. If it takes eight pencil lengths to reach the top of the tree and the partner is 1.6 metres tall, the calculation goes like this:

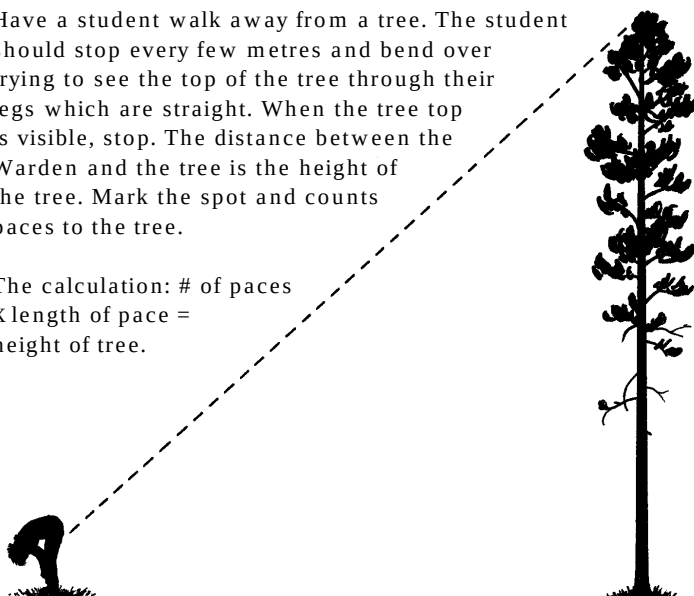
$$8 \times 1.6 = 12.8 \text{ metres high}$$



2. Bend Over Method

Have a student walk away from a tree. The student should stop every few metres and bend over trying to see the top of the tree through their legs which are straight. When the tree top is visible, stop. The distance between the student and the tree is the height of the tree. Mark the spot and counts paces to the tree.

The calculation: # of paces
X length of pace =
height of tree.

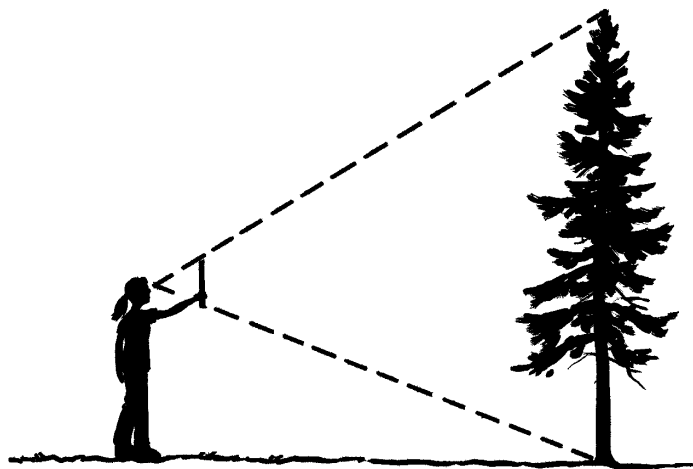




3. Felling the Tree

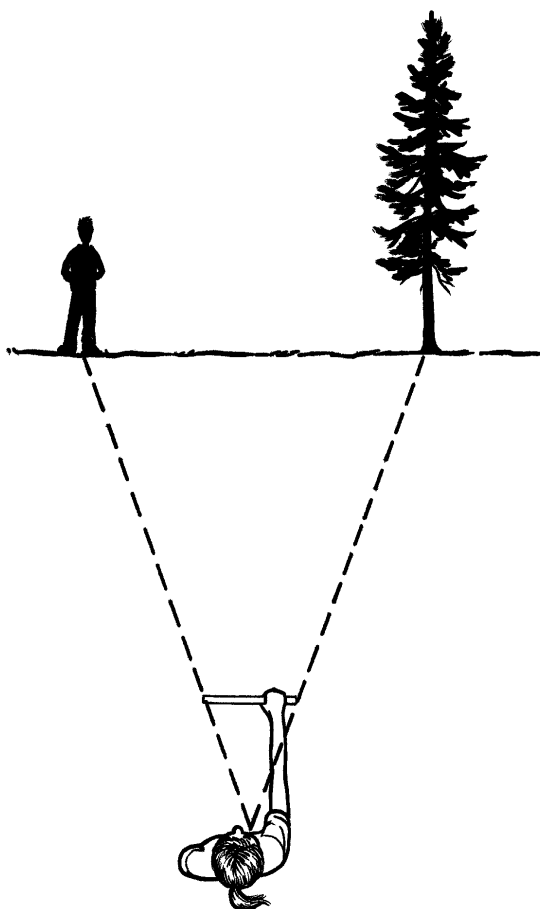
Method

Have one person stand 7 to 10 metres from the tree. With a straight stick in hand (about the size of a 30 cm ruler), the second person closes one eye and moves the stick backward and forward until the top of the ruler is lined up with the top of the tree and the bottom of the ruler is lined up with the bottom of the tree.



When the stick and the tree are the same size, turn the stick on its side so it is horizontal to the ground with one end visually butting up to the tree trunk. Tip: The person holding the stick must keep the same eye closed and the arm in the same position. Have the second person walk from the tree in the direction the stick is pointing.

When the walker is sighted at the end of the stick yell, "Stop!" (please of course) Mark the spot. Have the walker count his/her paces to the tree. The calculation: # of paces X length of pace = height of tree.



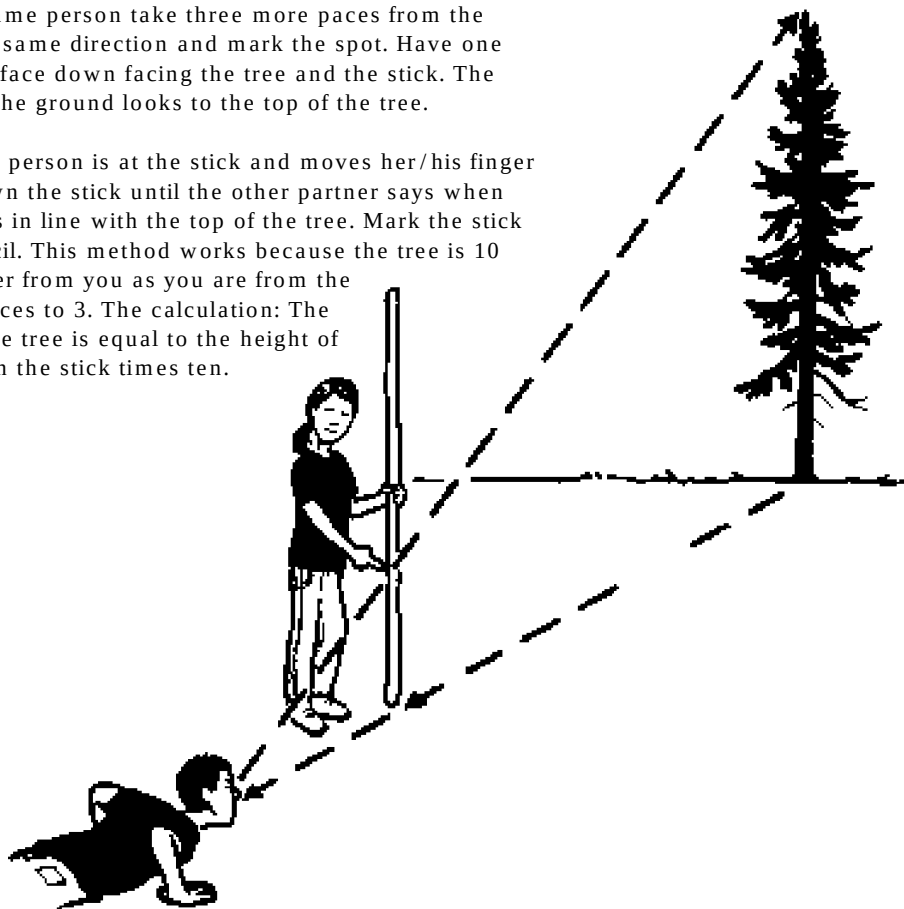


last updated: 06/99

4. Proportional Method

This is an easy method for measuring trees about 20 metres high. You need a fairly straight stick about 2 metres high. Have one partner walk with a steady pace, 27 paces from the tree. Stop and plant the stick on the 27th pace. Have the same person take three more paces from the stick in the same direction and mark the spot. Have one Warden lie face down facing the tree and the stick. The person on the ground looks to the top of the tree.

The second person is at the stick and moves her/his finger up and down the stick until the other partner says when the finger is in line with the top of the tree. Mark the stick with a pencil. This method works because the tree is 10 times farther from you as you are from the stick, 30 paces to 3. The calculation: The height of the tree is equal to the height of the mark on the stick times ten.

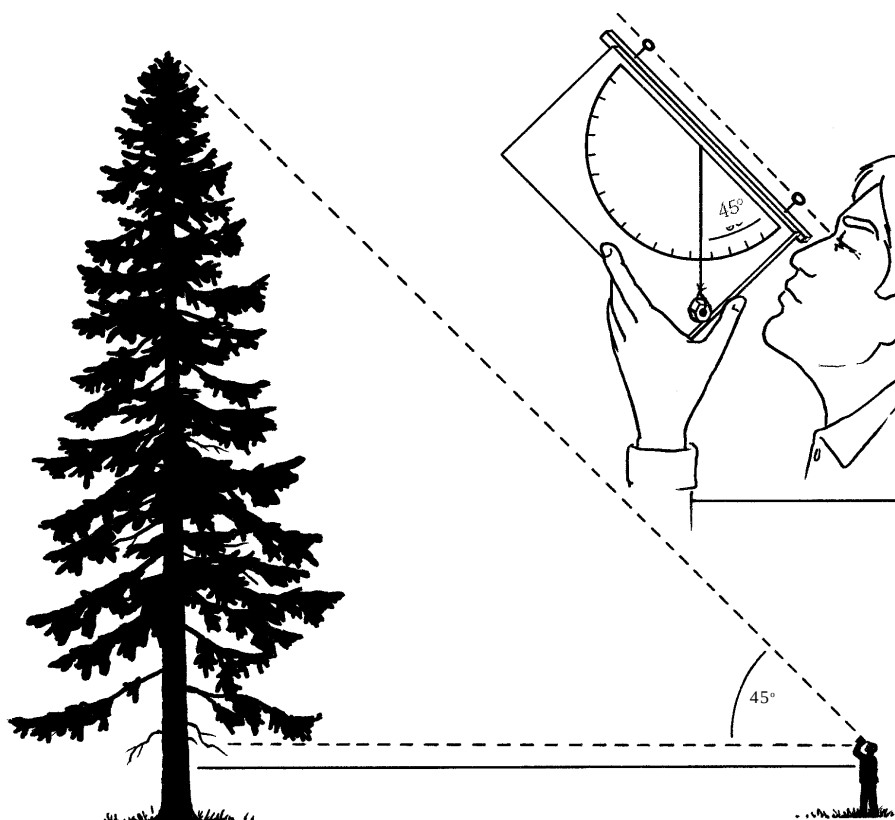




5. Measuring by Angles

This method of measuring heights is more complicated but is also more accurate as long as the tree and you are on level ground. Wardens work in partners. For those who are mathematically-challenged, the easiest way to use the clinometer is to walk away from the tree until the top of the tree is sighted at 45° . The person without the clinometer watches the plumb line and lets the observer know when the angle is at 45° . Here, the calculation is: the distance from you to the tree + your own height from the ground to your eye = the height of the tree.

For the more mathematically minded, bring along those mathematical tables and you'll be able to calculate the tree's height from any position. Here goes: If a is the distance from the observer to the tree, b is the angle shown on the clinometer and c is the height of the observer's eye, then the height of the tree equals $c + (a \times \tan b)$. The value of $\tan b$ is found by looking up the natural tangents in the mathematical tables. The tangent of 45° is 1 and that's why it makes measuring easier for the mathematically-challenged. But it is not always easy to go bush whacking and spreading branches and looking for the top of a tree hidden from view, so if the Wardens know how to use mathematical tables, great!

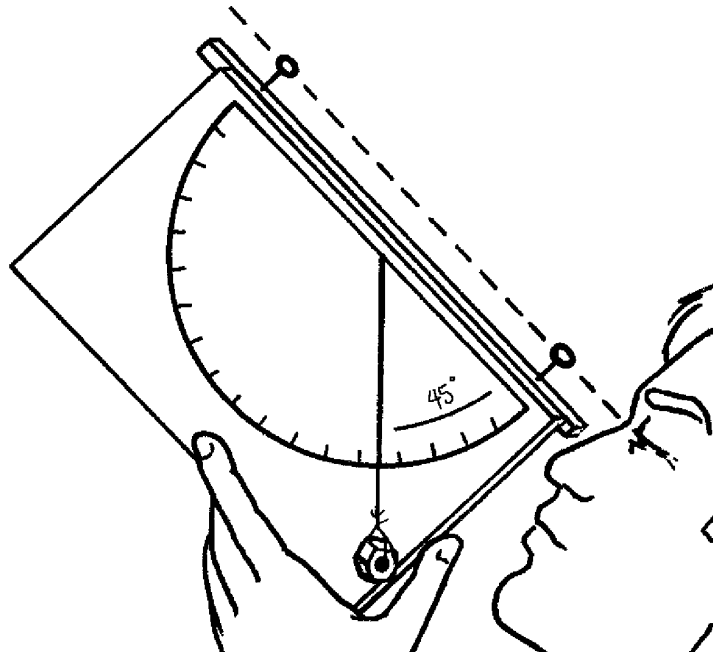




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Make a Clinometer

A simple clinometer is shown in the drawing. It consists of a protractor and a plumb line attached onto a piece of corrugated cardboard. Two screw eyes at the top will give you a sight line but a straw glued or taped down the top edge is even better. To make the plumb line, tie a metal nut onto the end of a string which is attached to the protractor in the centre at 90°.

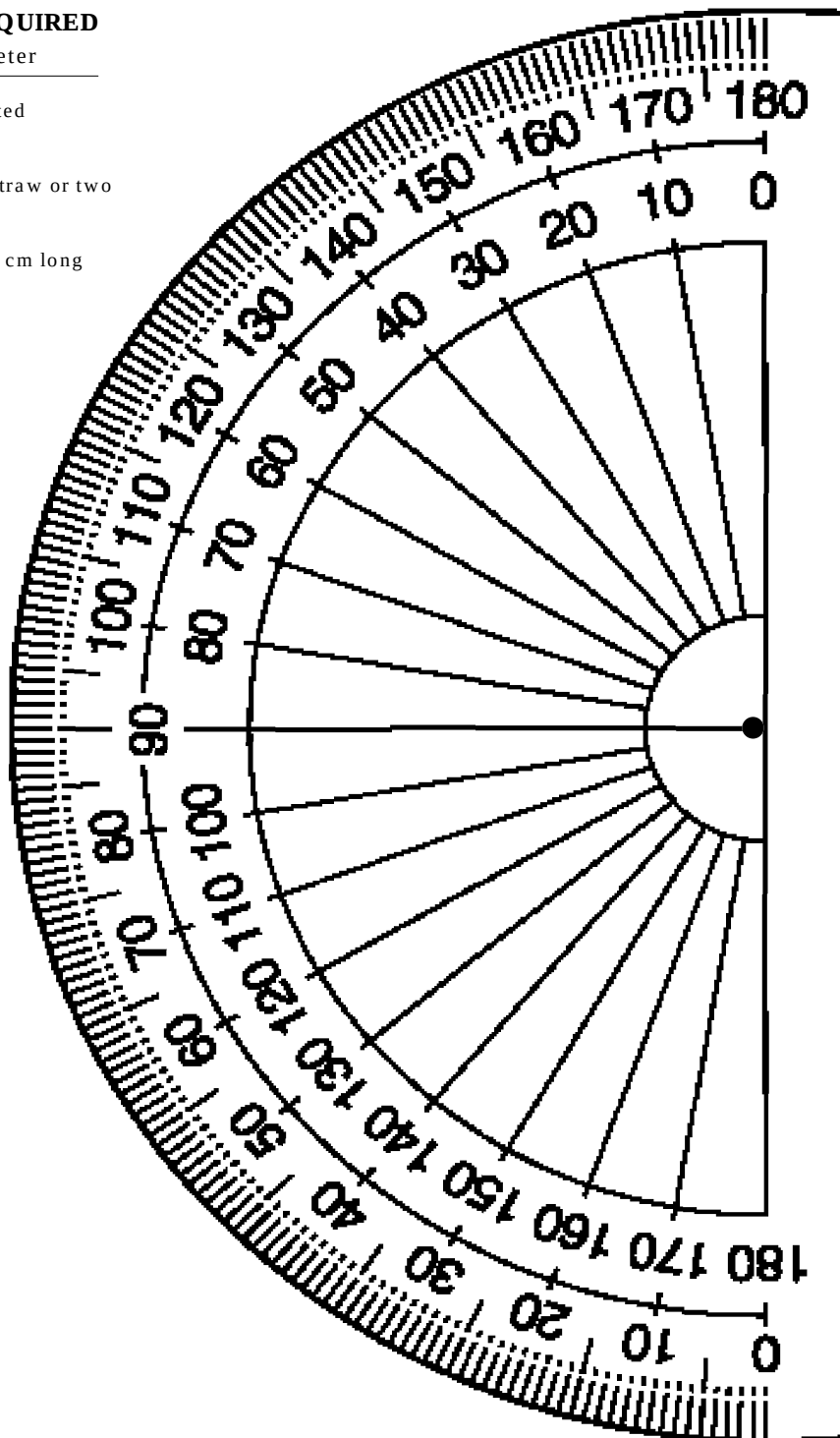




MATERIALS REQUIRED

for a clinometer

- ☐ pieces of corrugated cardboard
- ☐ large milkshake straw or two small screw eyes
- ☐ string, approx. 20 cm long
- ☐ scissors
- ☐ glue stick
- ☐ metal nut
- ☐ protractor





Processing the Information

Okay, now that you have the dbh (diameter at breast height) and the height of the tree, calculate the volume. It's easy if you have Volume Tables, which in themselves can be difficult if you are not accustomed to using them. There is an easier way, of course, and it is below.

In this example, the tree's height is 15 metres and the dbh of the tree is 25 cm.

It is very important to keep the calculations in the same unit of measurement. (ie. imperial OR metric, not both)

Here are some unit changes to the dbh:

dbh	= 25 cm	Tree Height
	= .25 m	15 metres
r	= .125 m (radius)	

To calculate the rough volume of a tree, the formula for finding the area of a cone is used.

$$= \frac{1}{3} \times (\text{area of trunk at dbh}) \times \text{height (H)}$$

Here's the formula:

$$= \frac{1}{3} \times (\pi r^2) \times H$$

$$= \frac{1}{3} \times (3.1416 \times .125 \text{ m}^2) \times 15 \text{ metres}$$

$$= \frac{1}{3} \times (3.1416 \times .015625 \text{ m}^2) \times 15 \text{ m}$$

$$= \frac{1}{3} \times (.049087 \text{ m}^2) \times 15 \text{ m}$$

$$= \frac{1}{3} \times .7363125$$

$$= \frac{.7363125}{3}$$

Volume of Tree = .2454375 m³ (round off to .25 m³)



Here's another example

In this example the tree's height is 30 metres and the dbh of the tree is 30 cm.

Here are some changes to the dbh:

dbh	= 30 cm	Tree Height
	= .30 m	30 metres
r	= .15 m (radius)	

To calculate the rough volume of a tree, the formula for finding the area of a cone is used.

$$= \frac{1}{3} \times (\text{area of trunk at dbh}) \times \text{height (H)}$$

Here's the formula: →

$$= \frac{1}{3} \times (\pi r^2) \times H$$

$$= \frac{1}{3} \times (3.1416 \times .152 \text{ m}) \times 30 \text{ metres}$$

$$= \frac{1}{3} \times (3.1416 \times .0225 \text{ m}^2) \times 30 \text{ m}$$

$$= \frac{1}{3} \times (.070686 \text{ m}^2) \times 30 \text{ m}$$

$$= \frac{1}{3} \times 2.12058$$

$$= \frac{2.12058}{3}$$

Volume of Tree = .70686 m³ (round off to .71 m³)



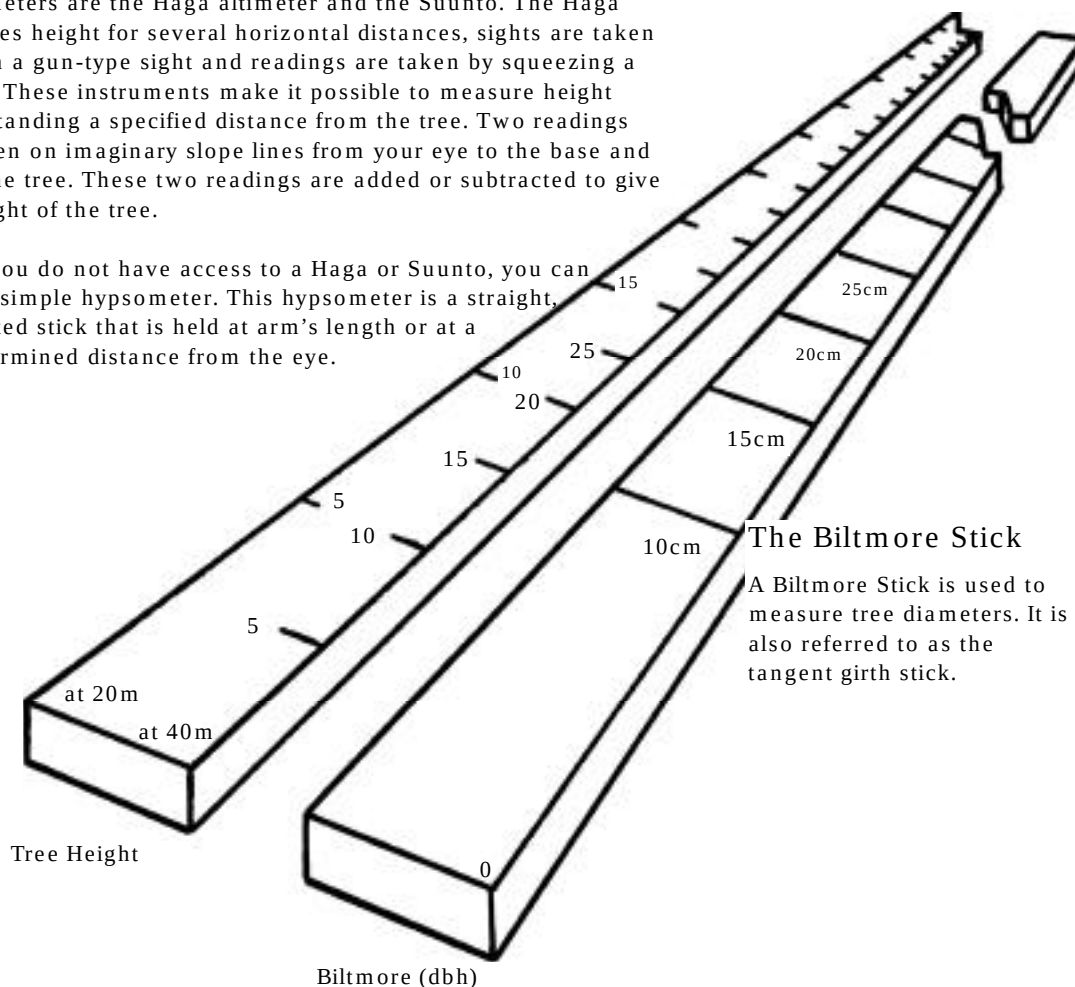
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Two, Two Sticks in One: Constructing a Hypsometer and a Biltmore Stick

The Hypsometer

Hypsometers measure tree heights. The most common hypsometers are the Haga altimeter and the Suunto. The Haga estimates height for several horizontal distances, sights are taken through a gun-type sight and readings are taken by squeezing a trigger. These instruments make it possible to measure height while standing a specified distance from the tree. Two readings are taken on imaginary slope lines from your eye to the base and tip of the tree. These two readings are added or subtracted to give the height of the tree.

When you do not have access to a Haga or Suunto, you can build a simple hypsometer. This hypsometer is a straight, graduated stick that is held at arm's length or at a predetermined distance from the eye.



The Biltmore Stick

A Biltmore Stick is used to measure tree diameters. It is also referred to as the tangent girth stick.



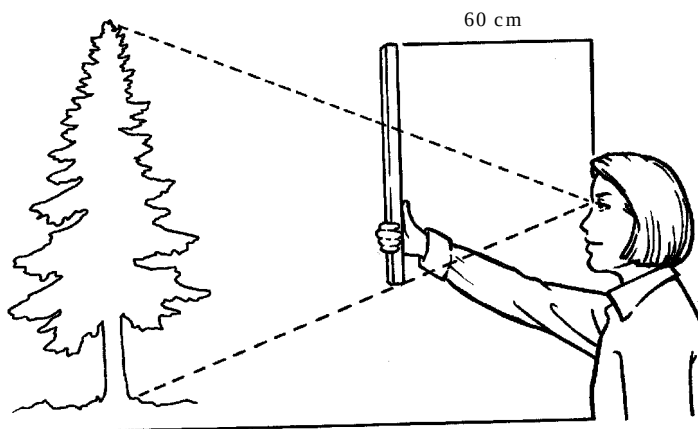
Making the Hypsometer

Procedure

MATERIALS REQUIRED

- wooden molding (similar to a metre stick) cut 1.3 m length for each Warden
- sand paper
- permanent fine-tipped colored markers/pens (3 colours)
- metric measuring tapes

1. For one hypsometer, cut a piece of wood molding 1.3 metres in length.
2. Sand both sides to prepare for marking and labeling.
3. Place a colour mark at 60 cm along the stick. This is the distance where the measuring stick is held from the eye, regardless of whether you are measuring tree heights or diameters. Some Wardens may decide to draw a small eye at his mark to remind them what this mark is for.
4. Have Wardens practice holding the stick 60 cm from their eye. Remind them that they should periodically check this distance to see if they are maintaining its accuracy.



5. There are two scales to be marked on one surface (the other side will be used to mark the Biltmore Stick.) Tell the Wardens the number, should be marked vertically.

Beginning on the left side, use a permanent marker. Begin at zero and mark every 15 mm down the stick. Label the marks as follows: the first mark at 15 mm is labelled 5, the 30 mm is labelled 10, the 45 is labelled 15 and so on up to the 300 mm mark which will be labelled 100. These labels correspond to the height of a tree in meters. Use a symbol to remind you that this scale is for measuring tree height 20 metres from the tree, i.e. write 20 m at the zero mark.



On the right side of the stick, use a different coloured permanent marker and mark off the following 20 graduations (but do not label yet): 8 mm, 15 mm, 23 mm, 30 mm, 38 mm, 45 mm, 53 mm, 60 mm, 68 mm, 75 mm, 83 mm, 90 mm, 98 mm, 105 mm, 113 mm, 120 mm, 128 mm, 135 mm, 143 mm, and 150 mm.

Label the marks the same as you labelled the left side, the 8 mm mark is labelled 5; the 15 mm is labelled 10; the 23 mm mark is labelled 15, the 30 is labelled 20 and so on up to 150 mm which is labelled 100. Use a symbol to remind you that this scale is for measuring tree height 40 metres from the tree, i.e. write 40 m at the zero mark.

Calculating Height

To estimate height, measure or pace to the specific tree (either 20 or 40 m), hold the stick vertically to the specified distance (60 cm) from the eye, align the bottom to the tree, look toward the top of the tree and read the point where the top of the tree coincides with the scale on the stick.

Height accuracy is a three-step process:

1. accurately measure your distance from the tree;
2. accurately hold the hypsometer 60 cm from the eye; and
3. accurately read where the tree top coincides with the scale.

Now, onto the other side of the stick.



Making the Biltmore Stick

MATERIALS REQUIRED

- same as for the hypsometer

Procedure

1. The scale for the Biltmore Stick is on the other side of the hypsometer stick. The scale for the Biltmore is horizontal. Tell Wardens when they write the numbers to do so such that they can read them horizontally.
2. Start 25 mm from the left end and mark zero. At the following marking points from zero, label the following diameters:

Marking Points (cm)	Diameter Class (cm)
9.3	10
13.4	15
17.3	20
21.0	25
24.5	30
27.8	35
31.0	40
34.0	45
36.9	50
39.7	55
42.4	60
45.0	65
47.6	70
50.0	75
52.4	80
54.7	85
56.9	90
59.1	95
61.2	100

Approximate number of Trees Required to Make a Cord

Refer to Appendix V - Volume Tables, for specific information about the tree volume for specific tree species such as aspen, pine and white spruce.

dbh (cm)	trees per cord
10	67
15	23
20	10.5
25	5.8
30	3.5
35	2.4
40	1.7
45	1.3
50	1.0
55	0.82
60	0.67
65	0.54
70	0.46
75	0.4



last updated: 06/99



Tree Measurement Event

Organize a small event where the Wardens work in teams composed of two pairs. Each pair will measure two tree heights, two diameters and two ages. [All of the trees are pre-selected by the leaders and the three measurements for each tree have been verified correct by the leaders before the event.]

Wardens may use any of the equipment such as the clinometer, a dbh (diameter at breast height) tape and an increment borer. (The increment borer is used to take a sample 1/4 inch core from a tree and the rings are counted. Contact your nearest Land and Forest Service office to see about borrowing some tree borers.)

Scoring

Each pair can receive up to 60 points: 10 points for each question.

Since this is a team event, the scores from each round will be added together giving each team a maximum of 120 points.

1 point deduction for each 1/2 metre of error **iheight**

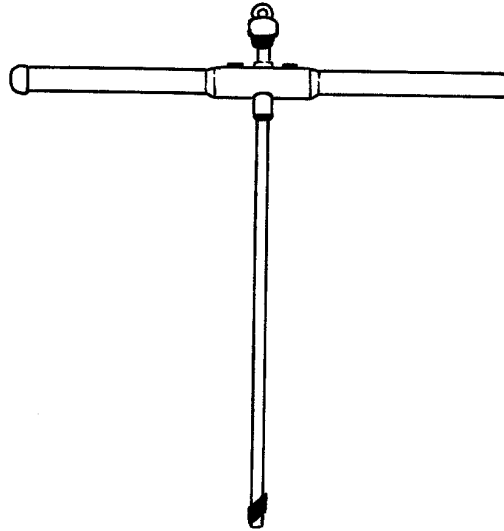
1 point deduction for each 0.1 centimeter error **idiameter**

1 point deduction for every year of error **iage**

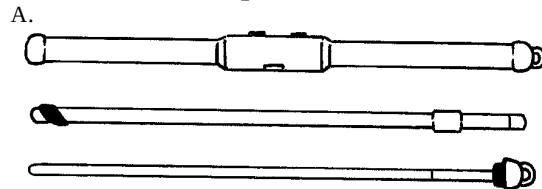
Note: Regardless of the degree in error, no score will show a minus value.



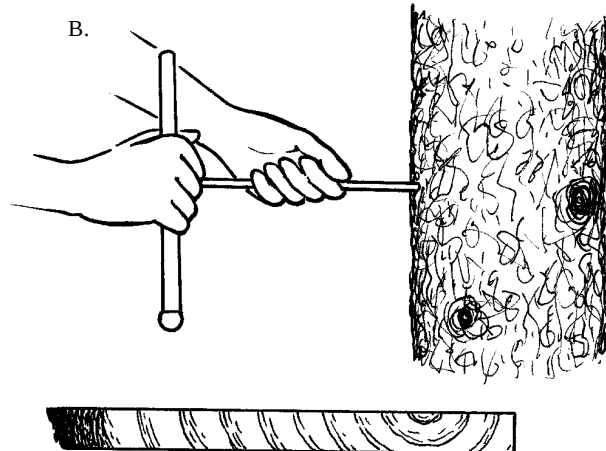
Increment Bore



A. parts of an increment bore



B. Using the increment bore





4. Conduct a pre or post survey of a planting project that your club is involved in.

Post Survey

BACKGROUND

Reforestation must meet government standards as set out in reforestation regulations. A survey in a cutblock is necessary several years after harvesting to know whether the forest is successfully regenerating and growing back. There are two main types of post surveys: Establishment and Performance.

Establishment surveys look at trees in their early stage which have been planted four to eight years after harvesting. It also looks at how well they are established.

An area will be considered successfully restocked when:

- 80% or more of the sample plots are stocked with at least one acceptable established seedling (refer to Tree Heights for Two Types of Reforestation Surveys, page 66)
- 60% of the sample plot are stocked with at least one acceptable established seedling and 20% with at least one conditional established seedling (refer to Tree Heights for Two Types of Reforestation Surveys, page 66)
- of the established saplings, the proportion of deciduous and/or fir plots must not exceed 10%.

Performance surveys look at how well the trees have grown eight to 14 years after harvest. (Government regulations require new trees to be tended for up to 14 years after they are established to ensure they meet height and density standards and are developing into healthy forests.)



An area will be considered successfully restocked when:

- 80% or more of the sample plots are stocked with at least one acceptable established sapling that is Free to Grow. (refer to Tree Heights for Two Types of Reforestation Surveys, page 66)
- 60% of the sample plot are stocked with at least one acceptable established sapling that is Free to Grow and 20% with conditional established saplings (refer to Tree Heights for Two Types of Reforestation Surveys, page 66)
- of the established saplings, the proportion of deciduous and/or fir plots must not exceed 10%.

A sapling of the future crop is considered Free to Grow if there are no deciduous trees that are equal to or taller than two-thirds of the height of the crop tree (coniferous) within one metre of the crop tree (measures stem to stem.)



Activity Summary

Wardens will work in small groups and count the number of seedlings in a one-metre plot to assess reforestation success.

MATERIALS REQUIRED

- Reforestation Survey, one per plot per group, page 52 (in Warden's manual)
- clipboards, pencils
- Reforestation Survey Summary, one per group, page 53 (in Warden's manual)
- flagging tape for one-metre plot
- 4 wooden stakes for plot corners per group

Procedure

1. Wardens will need accurate identification skills, carefully counting and precise measurement of heights which are necessary to conduct a basic survey.
2. Break Wardens up into partners. The size of the sample plot each pair of Wardens will survey is one metre by one metre (10,000 such plots cover one hectare.) Wardens should survey a minimum of 10 one-metre plots per hectare. These plot surveys will provide enough data so Wardens can decide whether the reforestation of the harvested stand has been successful. The results are pooled to calculate percentages on their Reforestation Survey Summary sheet.
3. In advance, have Wardens practice pacing using a compass. If your group is to conduct 10 plots per hectare, how many plots does each pair of Wardens have to do?



4. A square hectare is 100 metres X 100 metres which totals 10,000 one-metre plots. Have Wardens develop a plan as to how they will layout the plots in a hectare? For example, pace 10 metres on one compass bearing and setup a plot, pace another 10 metres on the same bearing and conduct another survey, and so on.
5. Give each pair of Wardens a clipboard with a Reforestation Survey sheet, page 66 for the number of plots they will survey, and a Reforestation Survey Summary and Determination of Restocking Success, pages 67 and 68 to calculate the restocking/ reforestation success.
6. Have Wardens discuss the results.

Suggested Discussions

- What is the purpose of setting standards?
- What steps might need to be taken if an area does not meet standards?



Reforestation Survey

Plot Number	1. Count the number of young trees on the plot for each type of tree	2. Count the number of trees taller than Acceptable Height (see below)	3. Count the number of trees shorter than Acceptable Height but taller than Conditional Height (see below)
Lodgepole pine			
White spruce			
Aspen			
other species			



last updated: 06/99

Tree Heights for Two Types of Reforestation Surveys

Type of Tree	Establishment Survey		Performance Survey	
	4 to 8 years		8 to 14 years	
	Acceptable	Conditional	Acceptable	Conditional
White spruce	50 cm	40 cm	150 cm	100 cm
Engelmann spruce	50	40	150	100
Black spruce	50	40	150	100
Lodgepole pine	100	75	200	150
Jack pine	100	75	200	150
Whitebark pine	100	75	200	150
Limber pine	100	75	200	150
Tamarack (all species)	100	75	200	150
Douglas-fir	50	40	150	100
Balsam fir	—	50	—	150
Subalpine fir	—	50	—	150
Aspen	—	150	—	200
Balsam poplar	—	150	—	200
White birch	—	150	—	200



Reforestation Survey Summary

	All Species	Lodgepole pine	White spruce	Aspen	Other Species
Total plots sampled =	N				
Number of plots with one or more saplings of Acceptable height =	A				
Number of plots without saplings of Acceptable height but have one or more saplings Conditional in height =	C				
A/N x 100%=	Y%				
C/N x 100%=	Z%				
Total saplings for each species from all plots combined =	T				
Calculate trees per hectare =	$\frac{T}{N} \times 10,000$				



Determination of Restocking Success

- ☐ If Y% is 80 percent or more then the area has been successfully restocked.
- ☐ If Y% is from 60 to 70 percent and Z% is 20 percent or more, then the cutblock has been successfully restocked.
- ☐ If values are lower than above then the forest has not been successfully restocked.
- ☐ Another measure of restocking success is the number of young trees per hectare. A good indication of a successful restocking is 800 trees per hectare.

The basic sample plot is considered stocked if it has at least one acceptable established seedling with the following characteristics:

- ☐ has reached a standardized height requirement
- ☐ the tree is alive
- ☐ the tree is not damaged
- ☐ the tree must have grown on the site for a least three years (in an establishment survey)

The Big Question

Has the cutblock been successfully restocked for each species to meet government standards?

	Yes	No
Lodgepole pine	☐	☐
White spruce	☐	☐
Aspen	☐	☐
Other species	☐	☐



Determine How Many Seedlings are Needed

You have to know two things first:

1. how much area is to be planted
2. tree and row spacing.

Note: Common spacing for conifer seedlings is 2 X 2 metres resulting in 2,500 trees planted per hectare (or 1,000 per acre.) If you use 2.5 m X 2.5 m spacing, there will be 1,600 trees per ha. 75% survival rate in a few years is considered adequate.

Let's use the tree and row spacing of 2 metres. The area needed by each tree will be 2 metres X 2 metres. As an example, let's say the area to be planted is 60 metres X 60 metres.

$$\begin{aligned} \text{\# of seedlings} &= \frac{\text{Area of Planting Site}}{\text{Area Required by Each Tree}} \\ \text{needed to cover} &= \frac{60 \text{ metres X } 60 \text{ metres}}{2 \text{ metres X } 2 \text{ metres}} \\ \text{area} &= \frac{3,600 \text{ metres}^2}{4 \text{ metres}^2} \\ &= 900 \text{ seedlings} \end{aligned}$$



Pre Survey Activity

Pre surveys are conducted before an area is reforested. A survey can determine the number of cones on the ground and how much natural regeneration has taken place after a harvest. A site that has not regenerated at least 80% seedlings will require a manual replant.

Pre surveys, however, differ depending on the ecosystem. For example:

- In an aspen forest, the aspen trees reproduce by suckering. A parent tree's roots will spread out and shoot up new saplings.



- A lodgepole pine tree, on the other hand, reproduces by the seeds from its cones. A survey includes the number of cones per one metre plot. A successful site will have three to four cones per plot. Lodgepole pine seeds are protected between the scales in the cone. The scales are tightly closed with a natural resin. The resin is softened in the hot sun when the cones are exposed in the open after a harvest or fire. The cones scales open and the seeds fall out.
- A spruce tree also has cones which release seeds. A spruce forest is usually replanted with seedlings.

The same procedure for measuring plots is followed when doing pre surveys.

5. Participate in or tour a reforestation project.

Reforestation Tour

Reforestation is a forestry industry term. It has been asked by many if you can actually replant a forest after it has been cut down. Is a forest just trees? We know it's not. Our generation, let alone an individual, has never seen the whole life of a tree. Are we sure we are cutting forests and reforesting the right way. The industry, although planning for it, has not started to harvest the second generation of forests yet. We are still harvesting the original forest. Ask Wardens what they know about reforestation? Visit a site to see how it compares to a forest regenerating after a fire, after a harvest.



There are many agencies you may contact who may be involved in a reforestation project. Some may be:

- a local woodlot owner
- a local forestry company
- a community naturalization project
- Alberta Forest Products Association may know if any of its members are planting seedlings. (Refer to the Phone Book Yellow Pages in this program for phone numbers of AFPA members.)
- contact the town office or local Chamber of Commerce who may know of such projects.

Participate in Reforestation

Planting seedlings is extremely important in establishing new forested areas. There are several ways to replant a cut over area when there are no natural seed sources. Seedlings grown in nurseries may be planted by hand or machine.

Once the wood is cut and removed, the real work of reforestation begins. The first step is site preparation. The land is prepared by a process called scarification. Scarification is when the soil is exposed by large tractors that drag heavy, spike equipment over the forest floor. This process also includes the removal of logging debris called slash and some reduction of the duff layer (needles and moss.)

Proper Tree Planting

Several planting methods and tools may be used when planting tree seedlings. No matter what is chosen, the following things must be done properly by tree planters:

1. Spread the roots out well for bareroot stock, never roll them up in the soil.
2. Only one seedling per hole.



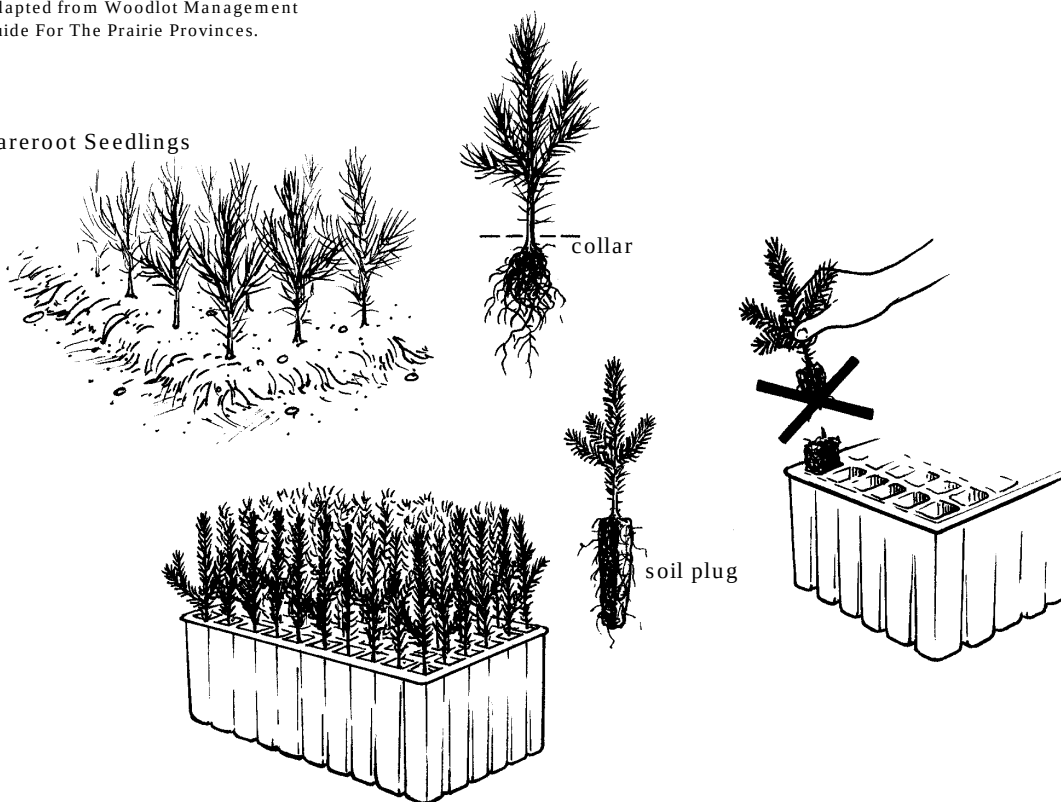
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3. Plant the seedling as upright as possible. On a slope, the seedling should be no more than 10% from vertical.
4. Never plant a seedling in duff because it dries out regularly and the roots will die. Select the best microsite. In scarified soil, plant where the duff and mineral soil meet.
5. Plant the seedling at the proper depth which is what they grew at the nursery. The collars of bareroot seedlings should be at ground level while the top of the soil should be 1 to 2 cm below the ground level.
6. Never leave the roots exposed or bury the branches.
7. Pack the soil well, press gently but firmly to prevent shocking the roots (air pockets will kill roots). Do not over pack the soil or slam the hole shut.
8. Plant seedlings on the edge of furrows in scarified sites, away from rocks, stumps, and water holes.
9. Space the seedlings properly, do not plant near a natural seedling.

Adapted from Woodlot Management
Guide For The Prairie Provinces.

Bareroot Seedlings

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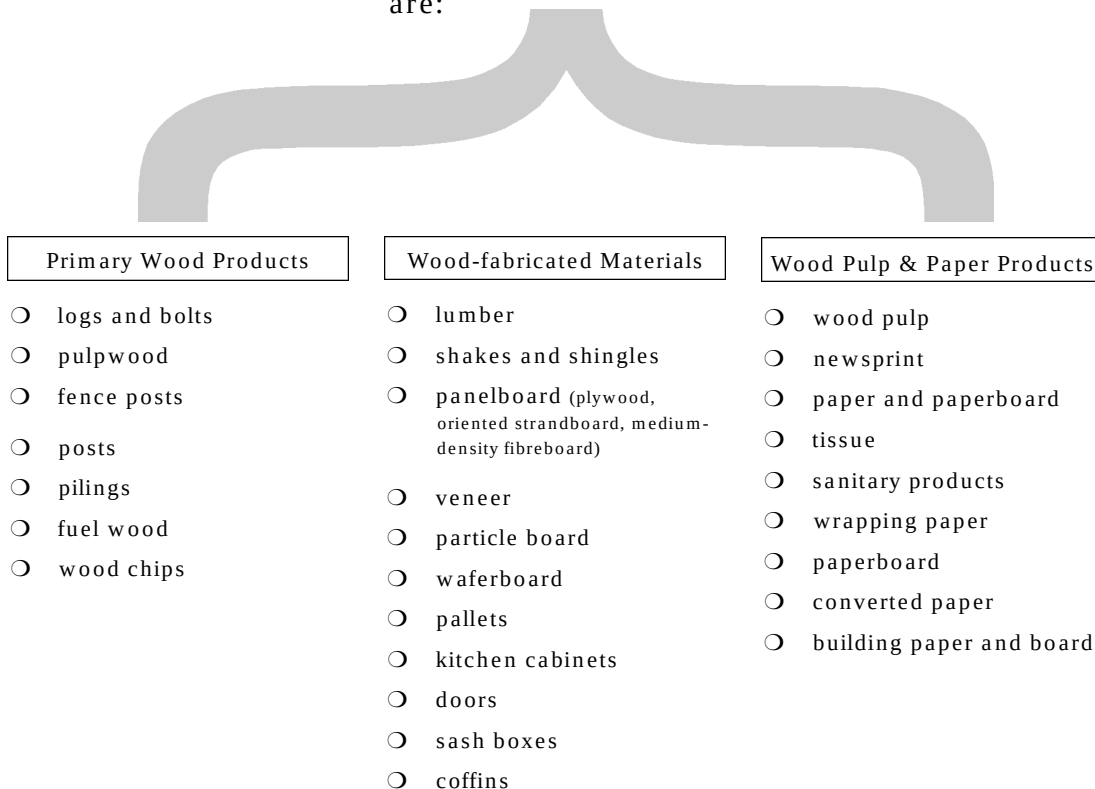
6. Tour a wood-harvesting operation or a wood-processing plant.

BACKGROUND

Wood-harvesting is the cutting and removal of trees from a forested area. Wood-processing is that segment of the forest industry that manufactures lumber, paper, plywood and other primary forest products.

Our Growing Resource booklet (64 pages) contains a section entitled, Production and Products. Pages 48 to 59, contains descriptions of the production processes of the sawmill, panelboard, oriented strandboard (OSB), medium-density fibreboard, bleached kraft pulp, and bleached chemithermo-mechanical pulp (BCTMP).

Some of the products derived from our forests are:





last updated: 06/99

Alberta Forest Products Association

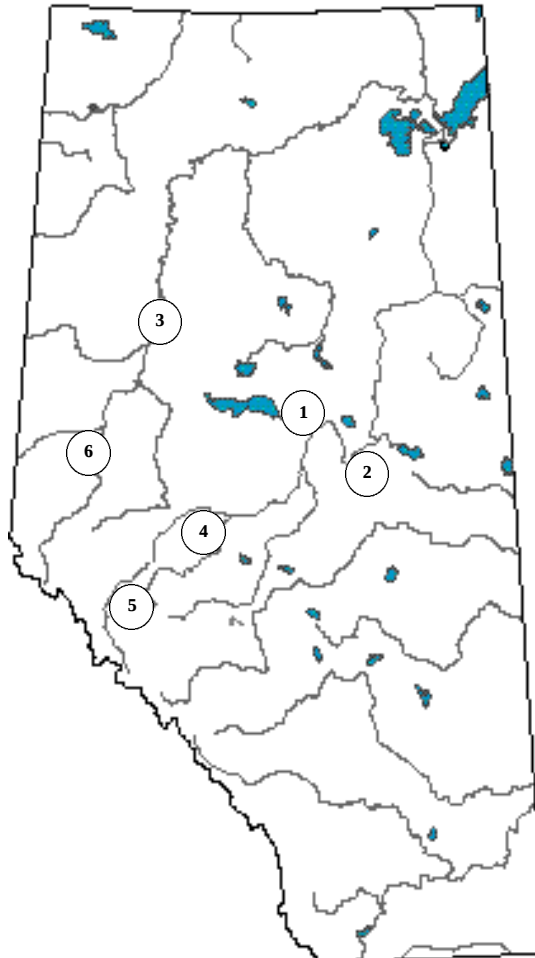
Alberta Forest Products Association (AFPA) is a private, non-profit organization representing 67 companies involved in the manufacture of lumber, panelboard, pulp and paper and secondary manufactured products. Their mandate is the wise use, conservation and protection of Alberta's forests.

Forest Care is a program that evaluates and communicates members' commitment to protect the environment. AFPA members pledge to lead progressive operations and improve their performance. Part of Forest Care's responsibilities is a multi-faceted auditing system to ensure promises are being fulfilled.

AFPA members are listed below in alphabetical order by where they are located in Alberta. Junior Forest Wardens clubs may contact AFPA members to obtain information and tours to fulfill their program objectives. Refer to the Phone Book Yellow Pages in this program for a list of the AFPA members and their telephone numbers.

SIX PULPMILLS IN ALBERTA

1 Alberta Energy Co. Ltd. Slave Lake	4 Millar Western Pulp Ltd Whitecourt
2 Alberta-Pacific Forest Industries Ltd. Athabasca	5 Weldwood of Canada Hinton
3 Diashowa Canada Co. Ltd. Peace River	6 Weyerhaeuser Canada Ltd. Grande Prairie





Supporting Activity

Focus on Forests. Module #4 Forest Resources and Technologies, From Pulp to Paper (and Back Again!), pages 49 to 67.

This activity has a lot of information: Background Information, a Pulp and Paper Glossary, Two Pulping Processes (Thermomechanical and Chemical), Comparisons of Pulping Processes, How to Make Recycled Paper, and a Pulping Crossword Puzzle that Wardens may do after a visit to pulp mill.

7. Discuss methods that can be used when harvesting trees to reduce environmental impact.

BACKGROUND

Harvesting timber can have many negative effects on the environment such as: increased soil erosion; increased siltation of water bodies; altered water tables; reduced fish and wildlife habitat; harsher climate for nearby crops and livestock; increased fire hazard; and lost aesthetic appeal.

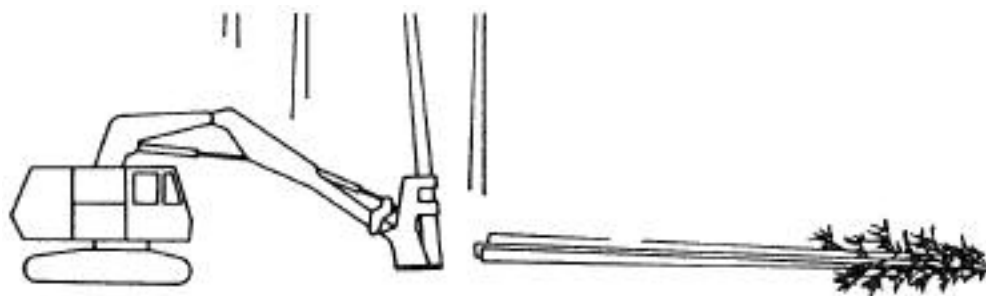
Trees are living pumps that draw moisture out of the soil and release it into the atmosphere. Shelter and shade from trees also prevent excessive evaporation from dry sites. Clearing trees can have many effects on water tables and the site: fluctuating water tables cause increased soil salinity or change the soil pH; problems with water quality; and soil moisture is reduced.

Harvesting practices are highly mechanized for efficiency and safety. Large companies contract work out for harvesting (stump to roadside) and loading and hauling. This provides a lot of local employment when in full operation.



last updated: 06/99

Harvesting is done with a highly maneuverable, feller-buncher machine to protect the operator in the high hazard falling operation. A feller-buncher is able to cut and lay down a tree with a minimum of disturbance to surrounding vegetation. It has broad treads to ensure a 'light' footprint on the ground.



Harvesting during the winter on frozen ground has a lesser 'footprint' than during seasons when the ground is softer. Horse logging and winter logging usually results in less disturbance of surface vegetation and the duff layer. Harvesting on frozen ground prevents soil compaction. Summer logging should be stopped during wet weather to avoid activities that cause ruts. To reduce surface disturbance during the summer, low impact equipment is used and travel reduced on erodible soils or steep areas. Slopes over 45 per cent are too steep to harvest with conventional equipment.

There is a system installed on large industry trucks transporting the trees called CTI, central tire inflation. The system allows truck operators to increase or decrease their truck's tire pressure to suit road and load conditions while the truck is moving. When at lower pressures, the 'footprint' of the tires grows longer, increasing traction and making it possible to operate when ordinary vehicles are bogged down or have to chain up.

Roads significantly affect soil and water resources because they expose bare soil and may alter surface drainage patterns. Better roads and bridges are being built to lessen the effects of erosion, however, roads open areas and increase public access to areas that otherwise would not be available. Larger cutblocks may have less impact than smaller ones if less road is required to access them.

If a road and bridge crossing is necessary in a cutblock, it is built on stable soil; at right angle to the watercourse, located where the channel is well defined and straight; approaches at



a direct and gentle slope, and is located at a narrow point along the watercourse.

Various methods of harvesting affect the impact on the surrounding area. For example, clearcutting affects soil and erosion. Forestry companies are beginning to look at ecosystem-based management (also called new forestry). Cut blocks resemble fire burned patterns (irregular not straight-edged borders provide more edges and reduce line-of-sight). These edges and various clumps are better for large mammals such as deer and moose).

Some other considerations for designing cutblocks to lessen impacts of harvesting are:

- cutblock boundaries should follow natural terrain features, contours and timber types (similar species and age.)
- cutblocks that are windfirm (able to withstand moderate to heavy winds without toppling) will reduce the damaging impacts on aesthetics, soil erosion and sediment loads on the watershed.
- To enhance natural regeneration by seedfall, spruce blocks should be laid out in narrow strips perpendicular to the prevailing winds. No part of the block should be more than 150 metres from the seed source.
- Leaving a few standing trees and old fallen logs will improve wildlife habitat. In particular, trees with existing nests are identified and protected.
- Young healthy trees are protected from damage during harvest. These trees form the next crop, saving time and reforestation costs.

Treed buffer strips along watercourses or other riparian areas create a barrier to equipment traffic, preventing soil disturbance. A cover of duff and vegetation protects against erosion and helps filter runoff before it enters the watercourse.

Buffer on riparian areas also provide important habitat and travel corridors for wildlife and enhance fish habitat by shading the water course. Wide buffer strips are recommended for larger water bodies because more wildlife is concentrated there.



last updated: 08/99

To maintain habitat for a variety of wildlife species, a number of measures must be taken:

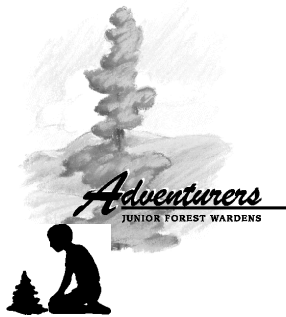
- Maximize the edge (the transition between forest and clearer areas) to provide better habitat for many species.
- The line-of-sight is limited along clearings and trail systems to improve protection from predators.
- Some dead and dying trees (snags) are left to provide important roosting and denning habitat for birds and small mammals.
- Dead and downed logs and brush piles are left to provide habitat for birds and small mammals.
- Travel corridors are left between small parcels of habitat to improve habitat value.
- Sometimes small clearcuts and selective harvesting is used to conserve important components of wildlife habitat.

Discussion & Activities

SUGGESTED

- Have Wardens discuss the steps of harvesting and impacts on the environment at each stage.
- Focus on the machines used in harvesting. What impacts do they have on the environment?
- Focus on the season. Does it matter what season harvesting takes place regarding environmental impacts?
- Look at the impacts of harvesting on flora and fauna.
- Invite a forester to talk to your group about the impacts of harvesting on the environment. And if possible, have the speaker bring slides.
- Discuss what the forestry industry has learned over the years. How has it come from horse logging to mechanization. What changes have occurred in the mechanization of harvesting trees?
- Visit a site where steps are taken to lessen their impact on soil, water and wildlife.

Harvesting trees is a long term decision



LEADER
MANUAL

IV WILDLIFE STEWARDSHIP

Wildlife stewardship and habitat improvement are key components of forest stewardship. Protection and enhancement of flora and fauna and endangered populations are critical to the interactive management of forests.

<i>date completed</i>	✓		
_____	☐	Investigate the biological diversity of a forest ecosystem.	page 81
_____	☐	Inform your community about the importance of flora and fauna.	page 88
_____	☐	Participate in the provincial Conservation and Hunter Education Program.	page 91
_____	☐	Manage a portion of a club habitat improvement project.	page 92
_____	☐	Participate in a wildlife observation activity.	page 96

IV. Wildlife Stewardship

last updated: 06/99

1. Investigate the biological diversity of a forest ecosystem

BACKGROUND

There is consensus in the scientific community that biodiversity is being lost at an unprecedented rate. David Suzuki and others have conveyed through television to the general public the message predicting dire economic and ecological consequences if current rates of biodiversity loss continues.

The dominant land practice of the boreal forest is industrial logging. Almost all of Alberta's public forests (excluding provincial and national parks) are allocated to fibre production, mostly in a short, high yield manner. This will result in the reduction of older stages in forest succession.

Boreal Forest Biodiversity

Alberta's boreal forest contains a remarkable variety of life including 40 fish species, five amphibians, one reptile, 236 birds and 45 mammals. Entomologists believe there are between 8,000 to 12,000 insect species and that we may not have described 50 percent of the species. There is also a rich diversity of plants in the boreal forest including 600 vascular species, 17 ferns, 104 mosses, 12 liverworts and 118 lichens.

The biodiversity of species in Alberta is below:

Plant & Animal Species	Number of known Species	Number of Canadian Species
Vascular Plants	1767	42%
Non-vascular Plants (mosses, lichens)	1180	10% approx.
Resident Mammals	90	47%
Breeding Birds	270	63%
Fish	50	5%
Reptiles & Amphibians	18	22%
Insects	20,000	30%



The forest ecosystem contains living (biotic) and non-living (abiotic) components. They interact creating a balance. The living parts are the plants, animals and micro-organisms. The non-living is made up of chemical (water, air, and minerals) and physical (light and heat).

Forest biodiversity is more than an inventory of different types of ecosystems, landscapes, species or genes. Conserving native forest biodiversity depends on conserving a diversity of forest types, age structure, functions and patterns across the landscape.

- Structure is the layering of trees, shrubs and other plants.
- Functions in a forest refer to nutrient cycling or habitat.
- Patterns of different forest ecosystems.

Some of the concerns about forest biodiversity in Canada are:

1. Forest-dependent species at risk - COSEWIC, the Committee of the Status of Endangered Wildlife in Canada, in 1997, listed 83 forest-dependent species as being at risk of extinction. Permanent habitat loss or degradation is the major threatening factor.
2. Development pressure on forests - Expansion of urban and agricultural use has greatly reduced the area of some forest ecosystems. Other factors such as air-borne pollutants, climate change and UV radiation are putting pressure on forest ecosystems.
3. Loss of old-growth forests - Old-growth forests have taken centuries to establish and are coveted for natural heritage conservation, scientific study and commercial timber harvesting. Some of the conflicts are in places such as Temagami, South Morseby and the Toboatic Wilderness Area.
4. Changes in managed forests - Approximately 1/4 of Canada's forests are under some level of forest management. Clearcutting, site preparation and planting, fire suppression, and other forestry practices affect the composition, age structure and habitat value of the forest.



5. Stewards of a global resource - Canada is composed of 10% of the world's forests, 35% of the world's boreal forest and 20% of the global temperate rainforest. Alberta and Canada have a global responsibility for conserving forest biodiversity.

There are four considerations of biodiversity:

1. Ecosystem Diversity - The variety of different natural systems (pond, forest, marsh, lake) found within a given area.
2. Landscape Diversity - The variety of physical features of the land.
3. Species Diversity - The variety of species of living things within a given area.
4. Genetic Diversity - This refers to how an individual is different in some way from each other individual of its species.



A c t i v i t y S u g g e s t i o n s

- Identify six common pests in the forest (three insect and three diseases). Refer to Appendix IV. Discuss how each pest has carved out a niche in the forest.
- Develop a checklist of the various plant species and animal species in a forest in your area, for example, the aspen parkland, boreal forest, alpine or subalpine.
- Have Wardens investigate an area and look at landscape, species, genetic and ecosystem diversities.
- As a group break up into different flora and fauna teams and make a photograph album to show the biological diversity in the forest ecosystem.
- Compare species in a climax forest with those in a successional forest.
- Have a naturalist or specialists in different areas (birds, amphibians, trees, mushrooms, large and small mammals, carnivores, animal tracks) conduct an outdoor session/walk with a focus on biodiversity.



- Construct a display of various books to inform Wardens how they can help them learn about forest biodiversity.
- Study food chains and how the resources are linked together.
- Make a display or something creative entitled, The Forest is Like a Salad or Variety is the Spice of Life.
- Study nature, not only books. In a wooded area, count the number of items that can be seen around the trunk of a tree. Choose several spots and compare.
- Study the diversity of the six natural regions of Alberta. Contact Environmental Protection for information.
- Map Canada's forest regions to explore landscape diversity.

Discussions

SUGGESTED

- Does a climax forest have the variety of species as a forest in succession?
- Talk about the similarities and differences between the boreal forest and the Amazon rainforest.
- How is biodiversity affected when one part of a forest is disturbed?
- Discuss the factors or disturbances which affect biodiversity in a forest. (economy, disease, fire, over-harvesting, and various other uses)
- Are human beings part of biodiversity?
- Do humans have their own diversity? (linguistic, cultural and intrinsic diversity)
- What are some strategies Wardens can do to help conserve Alberta's biodiversity? Global biodiversity? Think globally, act locally!



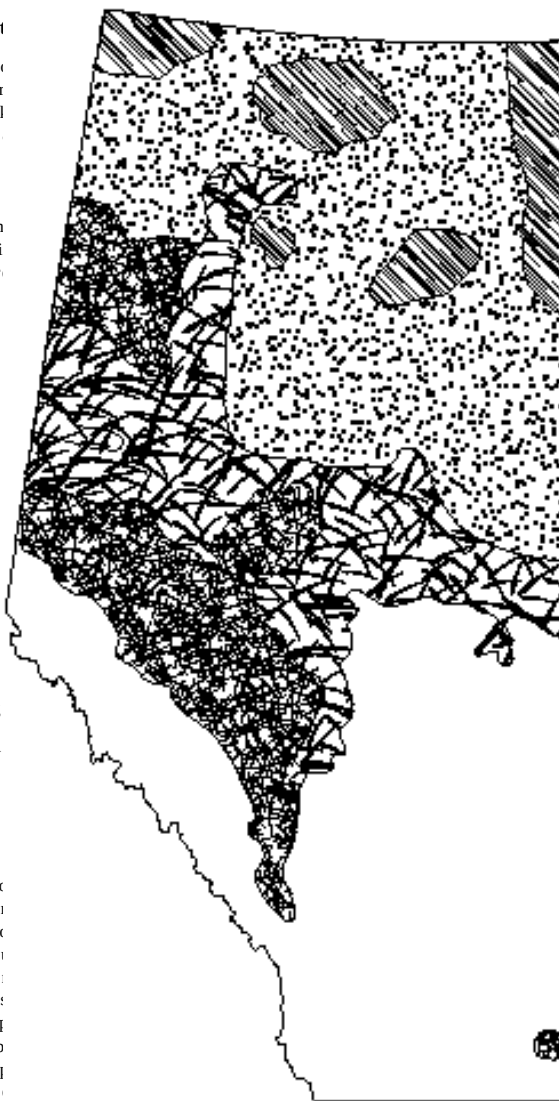
The Boreal Forest Regions of Alberta

High Boreal Forest

Normal sites support closed-canopied coniferous forests of black spruce and jack pine, as well as some poplar with understories of feathermoss, bog cranberry, blueberry, Labrador tea and lichen. White spruce, balsam fir and trembling aspen are restricted to warmer, moister sites. On drier sites, the black spruce and jack pine stands are more open. Black spruce is the climax species, though frequent fires have restricted its abundance. Rock exposures are treeless, covered instead with rock and ground lichens. Where the land is poorly drained, bogfen sequences consisting of black spruce, Labrador tea, vaccinium species (bog cranberry, blueberry, bilberry), bog rosemary and cloudberry dominate.

Foothills

This region is a transition between boreal and Cordilleran (mountain) vegetation. On the slopes of the Rocky Mountains, normal sites, there are stands of trembling aspen, balsam poplar, paper birch, lodgepole pine and black spruce, and black spruce. Trembling aspen and poplar stands characterize open and closed forests of low elevations. Black spruce and tamarack are associated with drained depressions. White spruce, and balsam fir are climax species on upland sites. The black spruce and tamarack climax trees on poorly drained sites. Mid and late-successional stands commonly have feathermoss carpets.



- High Boreal Forest
- Mid Boreal Forest
- Low Boreal Forest
- Foothills

Mid Boreal Forest

North of the Low Boreal belt, this region consists of mixedwood forests of trembling aspen and balsam poplar with white spruce, balsam fir and black spruce occurring in late-successional stands throughout much of this region. Deciduous stands have diverse herb and deciduous shrub understories, but when spruce and fir begin to take over and suppress this vegetation a feathermoss understory begins to develop. Jack pine and black spruce occur more commonly on moderately well and imperfectly drained soils than they do in the Low Boreal Subhumid Region. Cold sites and poorly drained areas are covered by ferns and black spruce-dominated bogs that may have localized permafrost.

Low Boreal Forest

The southernmost belt of boreal forest in Alberta, this region is characterized by deciduous forests of trembling aspen with secondary quantities of balsam poplar, and mixed herb and shrub understories. White spruce and balsam fir are the climax species, but are not well represented because of the frequency of fire. Open jack pine stands occur on dry sites. Water-filled depressions and poorly drained lowlands are vegetated by sedges, willows and/or black spruce. Black spruce is the climax species in these wetlands.

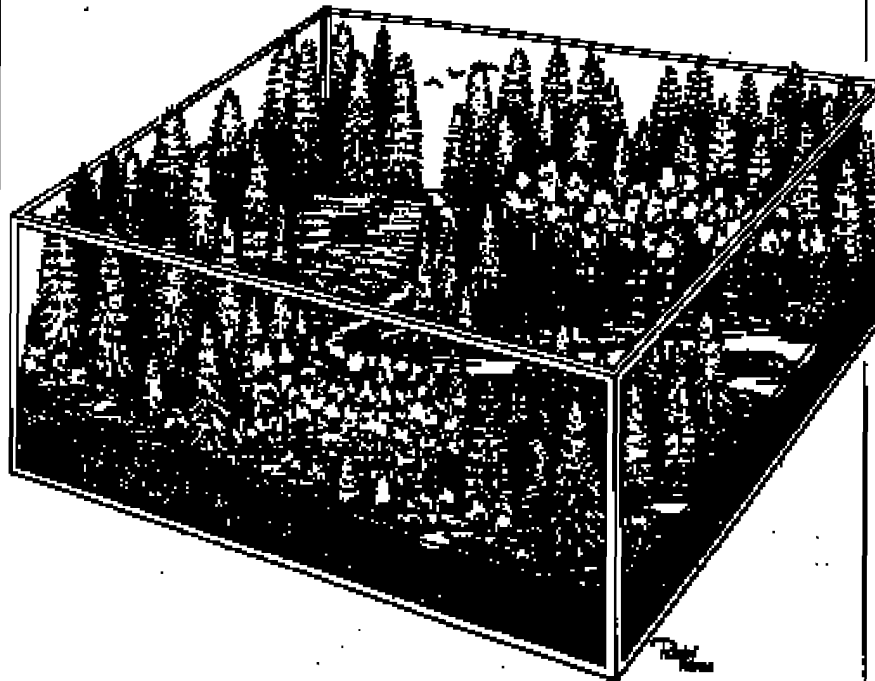
Adapted from the Ecoclimatic Regions of Canada, a publication of Environment Canada



last updated: 06/99

Boreal Forest Cube

Clear-cutting
disturbs the forest's
hydrological cycle,
sending some of the
precipitation directly
into rivers and oceans,
while ecologically
sound forestry
practices maintain the
cyclical living bio-
chemical groundwater
cycle.



Boreal forests make cover 11% of the Earth's surface woodlands and include white and black spruce, balsam fir, jack or lodgepole pine, tamarack, white, black, and trembling aspen. On the forest floor lichens, mosses, ferns, flowering plants, and shrubs are found. Upright trunks, the canopy overhead, fallen moss, leaf litter, and snags provide habitats for myriads of life forms — from tiny invertebrates and bacteria to larger animals such as white-tailed ptarmigan, moose, caribou, and plants.

Compared with tropical rainforests, the diversity of species is low. However, boreal forests support distinctive species, and their large areas perform essential ecological services. For example, woody plants and other organic matter last about 500 years on the forest floor (where clear-cutting and burning is not allowed and)

compared with 0.7 years in tropical forests. The forests therefore function as important global carbon banks, slowly releasing nutrients into the soil for the next generation of trees.

In addition, boreal forests hold unseen underground lakes with clouds in the sky. Rain and snow feed the water table, which swamps at the surface as soil or running water. In the soil, hundreds of kilometers of tree roots and fungal filaments collect nutrients and moisture, which flow up to the leaf food factories that are powered by sun's rays. Water is then transpired or "breathed" from small openings in the leaves — at least as 25,000 times from a hectare of forest — and clouds form from the evaporated moisture. Soon rain falls, and the cycle begins again.

19

CANADIAN MUSEUM OF NATURE



A Canadian/Amazonian Index

The transformation of Canada's forest rivals the exploitation of Brazil's Amazon rainforest. Both countries search for economic development and jobs and by doing so flood and log important watersheds, clear forests for farmland, treat rivers and oceans like sewers, poison fish and drive native people out of their ancestral homes.

- Size of Canada is 9.9 million km²
- Size of Brazil is 8.5 million km²
- Size of all Canadian forestlands is 4.5 km² (45% of country)
- Size of Canadian Boreal forest region is 3.3 km², (34% of the country)
- Size of Brazil's Amazon rainforest is 3.5 km², (41% of the country).
- Amount of Canadian forests cleared each year is 12,220 km²,
- Amount of Brazilian Amazon cleared or burned each year is 35,000 km²,
- Average amount of timber produced by Canada annually from 1984 to 1986: 421 million cubic metres
- Average amount of timber produced by Brazil annually, 1984 and 1986: 493 million cubic metres.
- Estimated amount of Canadian forest that is regenerated to a productive new forest (capable of supporting an industry in the future) within five years of logging is 55 percent.
- Amount of Brazilian Amazon that regenerates to a productive new forest after logging: virtually none.
- Amount of productive Canadian forest that is now barren or "not sufficiently restocked" with a quality or species of tree capable of continuing to support industry: 10.3% or 450,000 km².
- Amount of Brazilian Amazon that has disappeared: 12 % or 420,000 km².
- Estimated number of species in Canadian Boreal forests: 25,600 to 27,600 (58 mammals; 200 birds; 70 reptiles and amphibians; 22,000 insects; 50 trees; 1,200 - 2,200 flowering plants; 2,000 - 3,000 fungi)
- Estimated number of species in Brazilian Amazon: between 1 and 2 million (known species: 125 mammals; 400 birds; 100 reptiles; 60 amphibians; 3,000 fish; 300,000 insects; 750 trees; 55,000 flowering plants; 50,000 fungi)
- Amount of Canada's Boreal forest region protected from development and commercial extraction of resources: 2.6% or 85,318 km².
- Amount of Brazilian Amazon protected (in parks, research sites and extractive reserves): 9.4% or 328,704 km².
- Estimated number if Indians and Métis living in the Boreal forest: 100,000
- Estimated number of Indians living in the Amazon forest region: 170,000

Reprinted from the article Heartwood by Christie McLaren, with permission from Equinox, Sept/Oct 1990.



2. Inform your community about the importance of flora and fauna.

BACKGROUND

Canadians are lucky, our country is green and lush with forests. Life on earth would not exist as we know it without green plants. Thus the relationship of plants and animals is an important and vital one.

Animals and humans need four basic things for habitat: food, water, shelter and space.

- Food - all species of wildlife have unique food requirements. They change seasonally. If you are promoting backyard habitats, encourage residents to plant a variety of food sources (berries, fruit, nuts, grasses, legumes such as peas and beans) and aquatic plants.
- Water - Animals need water year round, even in winter. Backyard water sources can be puddles, birdbaths, fountains, and natural water sources can be lakes, ponds, streams and swamps.
- Shelter - Animals need cover and protection from inclement weather and predators. Natural features such as trees, shrubs, grasses and flowers provide cover, as well as structures such as rock piles, brush piles, hollows in trees and bird houses.
- Space - Each species has a unique territorial or spatial need, for example, trumpeter swans and loons will defend a 40 hectare lake whereas, ruffed grouse need approximately four hectares.

Plants and animals enhance our lives and can remind us that the human being is not the most important species on Earth. Although all species can live independently we are, at the same time, all interconnected. What befalls the earth, befalls us all. It is difficult, sometimes, to feel optimistic about the future when so many species and their habitats are disappearing. Don't be discouraged, outside of ourselves there is a large untapped reservoir of support and interest in the community. Folks just have to hear about it.



Ecological Benefits of Wildlife

Plants

- Release oxygen into the air
- Add moisture to our climate
- Moderate weather extremes
- Fertilize soil
- Prevent erosion
- Stabilize water levels in the soil
- Provide food and shelter for humans and wildlife

Animals

- Are an important part of complex food chains.
- Microscopic animals decompose plant material to produce nutrients necessary for the growth of new plants.
- Plant seeds by burying or dropping them. Animal droppings often contain undigested seeds which are deposited in a natural fertilizer.
- Help control insect populations. (One brown bat can eat 7,000 insects a night. A flock of grosbeaks (260) consumed nine million spruce budworm larvae in 55 days.)

Recreational Benefits of Wildlife

- Hunting
- Fishing
- Birdwatching
- Photography
- Nature Study



Economic Benefits of Wildlife

- Direct Income: guiding, trapping, harvesting.
- Indirect Income: lodging, food, transportation.

Wardens can develop a list of ideas that are important to their community. Phone the local agriculture office or Fish and Wildlife. Specialists in these areas can give you some ideas of the key issues in the area and may be able to supply support.



Activities

SUGGESTED

- Write a letter to The Editor of a local paper. Call first to get some idea of length, for example, the number of words (ranges around 300 words) and you must sign your name to the bottom for publication. Your group may be able to write an article or have a short series containing wildlife profiles, tree species, catch and release when fishing, activities to do outdoors and outdoor etiquette.
- Make a bulletin board display for a mall or supermarket.
- Plan a special event where the general public is invited to attend.
- Conduct a workshop on building nest boxes. Refer to Appendix II for more information.
- Set up a booth to pass out tree seedlings and planting instructions to the public.
- Set up a trail with signs or sign an existing trail in the community with signs purchased from the Watchable Wildlife program.
- At a public event show visitors how to build a bat house and inform them of the habitat requirements for a bat.
- Save Our Snags. To many people a dead tree is just firewood but a snag is a bird's version of a fast food restaurant and condominium, it's a valuable habitat filled with nutrients. Snags are also used as nesting and perching sites. Educate landowners on the importance of snags.



- Display Nesting Bags. These are mesh onion bags stuffed with nesting materials such as feathers, yarn and thread lengths, hair and dried grass. This is an inexpensive project that homeowners can easily do and place in their backyard tied to a branch or attached to a fence.

DOUBLE HITTERS

Double Hitters are activities and projects Wardens can participate in that cover both flora and fauna.

- Promote the growth of a butterfly garden or plant a Butterfly Garden. Take photographs on its development, construction and growth. Show others how easy it is.
- Make a display or write leaflet on how to improve a backyard for wildlife habitat (butterflies, birds)
- Save Some Frogs: Some animals are considered indicator species by scientists. Indicator species serve as early warnings for environmental trouble. Amphibians are also considered an indicator species because they spend part of their lives in water and on land, their decline may be a sign that the environment is in serious trouble.

3. Participate in the provincial Conservation and Hunter Education Program.

Leaders need to plan a minimum of 20 hours of meeting time to complete the entire Conservation and Hunter Education Program with the Wardens.

The Conservation and Hunter Education Program is no longer a provincial program, it is now privatized. All in-servicing for leaders wishing to be certified, are booked through the Alberta Hunter Education Instructors Association in Calgary, refer to this program's Phone Book Yellow Pages for contact information.



Leaders wishing to be qualified to teach Conservation and Hunter Education must take a short workshop. Book through the organization above and they will place you on a waiting list until there are enough people to warrant a workshop.

If you are a qualified Conservation and Hunter Education teacher, you may purchase the manuals from the agency above. Manuals alone cost approximately \$5. ea or \$10, for one kit: a manual, crest, certificate and wallet card. You will also receive testing materials. The manuals will be shipped to a Fish and Wildlife office near you or by bus.

The Conservation Education WISE Foundation and the Alberta Hunter Education Instructors Association together offer other services and programs. The programs are Project WILD, a wildlife program and Fishing Education, an education program about Alberta's fishes and sport fishing.

The services and facilities available for use are:

- Alford Lake near Caroline
- Narrow Lake near Athabasca
- A Summer camp (May and June) at McGilvary Creek in the Crowsnest Pass.

Junior Forest Wardens may book these facilities. The cost is \$10 for each Warden, leaders do not have to pay. Your expenses will amount to travel and food costs.

4. **Manage a portion of a club habitat improvement project.**

Adventurers may work with Challengers on the same project. Challengers can delegate components of the habitat improvement project so both age groups are able to complete these program requirements. Adventurers and Challengers can tap into existing habitat programs or develop their own ideas. Habitat projects may vary amongst Junior Forest Warden groups throughout the province depending on the natural region and local issues that are presented in each.



Established Habitat Improvement and Monitoring Programs

Feather Care Program

The Telus Feather (previously AGT) program helps Alberta's birds. Orange, cylindrical signs that mark the location of Telus' buried telecommunications cables have been converted into nestboxes for many of Alberta's feathered friends. Help is required to convert the cylinders into nestboxes and to monitor these nesting sites. For more information on becoming a Feather Care volunteer, call 1-800-667-1125.

Bluebird Project

Volunteers can assist the biologist at the Ellis Bird Farm in Lacombe with monitoring nest boxes, recording productivity information and assist with nest box construction, and possibly some research project and banding. Refer to Phone Book Yellow Pages for contact information.

Operation Grasslands

This was formerly known as Operation Burrowing Owl and now includes the entire grassland ecosystem. If your group lives in southern Alberta, you may already know some landowners involved in protecting the habitat of Burrowing Owls. Contact Operation Grasslands. You club may be able to make underground burrows for the Burrowing Owls. Refer to Phone Book Yellow Pages for contact information.

Plant a Butterfly Garden

You need a sunny place to grow plants that butterflies like. Wardens can plant a garden in the spring and have beautiful butterflies to enjoy in the summer. You can purchase most of the plants and seeds from a garden supply store. A butterfly garden has plants to supply food for each stage of growth, from the egg to caterpillar to pupa and adult.



last updated: 06/99

Here's the Butterfly Menu

* good for adults and caterpillars,

**especially good for caterpillars

Wild Flowers

Asters
Bee-balm
Black-eyed Susan*
Blazing Star
Clover ** (red & white)
Goldenrod
Hawkweed
Milkweed**
Phlox
Queen Anne's Lace*

Herbs

Catnip
Dill**
Hyssop
Lavender
Lemon Balm
Marjoram
Parsley**
Peppermint
Rue** (common)

Vegetables

(grow until they flower)

Broccoli*
Cabbage*
Carrots**
Kale**

Other Plants

Butterfly Bush
Cosmos
Garden Phlox
Marigold
Pansy**
Zinnia



Build a Butterfly Hibernation Shelter

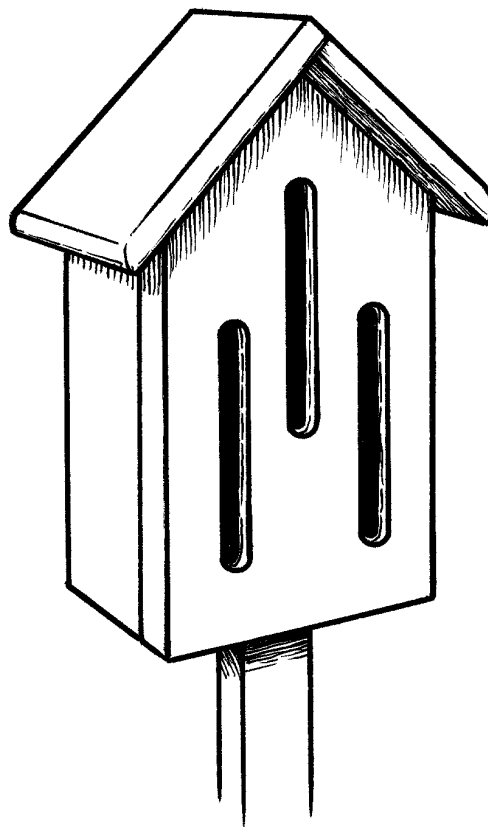
Some butterfly and moth species survive the Canadian winter as eggs on host plants and some hibernate under tree bark, in woodpiles or under building eaves.

Assemble pieces with coated screws. Nail strips of coarse tree bark to the inside surface of the back board. Make two narrow openings approximately 3/8 X 8" in the front board. See illustration below. Secure the butterfly hibernation shelter in a shaded spot to the side of a building or tree.

MATERIALS REQUIRED

- 4 cm (1 1/2 ") coated screws
- 1 X 8 X 34" board - cut into 3 pieces: one 10" (top), two 12" long (sides)
- 1 X 6 X 30" board - cut into 3 pieces: one 8" long (bottom), two 11" long (front & back)

Butterfly Hibernation House





Other Ideas:

Any watershed enhancement project such as a litter/garbage clean up, planting vegetation on banks of water ways, participating in a purple loosestrife pull, talking to property owners with stream running through their property about the riparian zone.

5. Participate in a wildlife observation activity.

Wildlife Viewing Tips

1. Plan Ahead - Do some research and find out where the best viewing sites are and at what times of the year.
2. Choose a Time and Day - The best times for many birds and mammals is in the early morning and late afternoon and evening.
3. Be Patient and Quiet - Wildlife is sensitive to human presence. Move slowly and quietly.
4. Become Invisible - Wear clothes that won't make a noise in the woods, dull, dark and irregular patterns on clothes are helpful but be visible and audible in bear country!
5. Read the Signs of Wildlife - Keep an eye out for signs such as tracks, scats, nests and so on.
6. Bring Some Help - Bring along a pair of binoculars, magnifying glass, field guides and a notebook to record your observations.
7. Time of Year - Spring and fall are good seasons to observe migratory birds.



Ethical Behaviour

Discuss ethical behaviour while viewing wildlife. Have wardens think about proper behaviour or etiquette to be practiced outdoors. Here are a few suggestions:

- Stay on designated trails, viewing platforms and blinds.
- Observe from a distance. Leave nests alone. Do not chase or flush out animals.
- Leave pets at home.
- Leave unattended young animals alone, e.g. fawn, moose calf, baby birds.
- Pack out what you pack in. Leave the area better than when you arrived.
- Share the outdoors with other visitors. Be considerate of their interest too.

One book that will help observation activities is entitled, *Alberta Wildlife Viewing Guide*. It covers viewing sites throughout the province with full colour photographs, site and access maps.

Wildlife Observation Activities Where It Really Counts!

Amphibian Monitoring Program

This program has volunteers surveying ten species of amphibians. If you seriously want to participate, you will receive a manual and audio tape. Volunteers read the manual and listen to the tape to become familiar with Alberta's amphibians and the data sheets. You choose a site and go out and listen for frogs and toads calling. Volunteers repeat the survey year to year. The manual is also on the net, and in colour!

If you are interested contact The Alberta Amphibian Monitoring Program, refer to Phone Book Yellow Pages.



Christmas Bird Count

Two publications are available: How You Can Plan a Christmas Bird Count (8 page pamphlet) and Christmas Bird Count Organizer's Manual (52 pages)

Available free from the Watchable Wildlife Program, Wildlife Management Division, refer to this modules Phone Book Yellow Pages for contact information.

Ladybug Survey

The Canadian Nature Federation has a program that wardens can get involved in monitoring. There are 16 species of ladybugs or lady beetles. CNF will provide a small poster with coloured illustrations to help with identification and reporting cards, as well as additional information. Best done in late spring, summer, and early fall.

Ask for the Ladybug Survey from the Canadian Nature Federation, refer to the Phone Book Yellow Pages for contact information.

Butterfly Survey

This is another great monitoring program for wardens. CWF will provide a small booklet with coloured illustrations to help with identification. You may order one for each warden if you choose to do this project. An excellent book to support this project is Butterflies of Alberta by John Acorn.

Contact the Canadian Wildlife federation, refer to Phone Book Yellow Pages for more information.

Peregrine Falcons

They're back after a 30 year absence! Once again Peregrine Falcons can be seen in southern Alberta. In recent years, Alberta Environmental Protection has been releasing Peregrine Falcons within historic nesting areas. Many of these birds are returning to Alberta to nest. Information on observations is needed to ensure the protection of this magnificent bird of prey. There is a brochure to ensure that observers can distinguish between the Merlin, Prairie Falcon and the Peregrine Falcon.



Contact your local Natural Resources Service, Wildlife Division Office or Alberta Environmental Protection, Wildlife Management Division.

Plantwatch

Plantwatch is a phenology (the study of seasonal timing of life cycle events) program which links wardens as the eyes of science, tracking the green wave of spring moving north. Wardens will develop scientific skills while observing springtime changes in plants and learning about biodiversity. The information gathered allows Plantwatch to measure the earliness of spring and to understand some of the effects of climate change.

Wardens collect information on the flowering times of four of ten plants being watched across Canada:

- saskatoon, serviceberry: *Amelanchier alnifolia*, *canadensis*
- prairie crocus: *Anemone patens*
- common purple lilac: *Syringa vulgaris*
- aspen poplar: *Populus tremuloides*

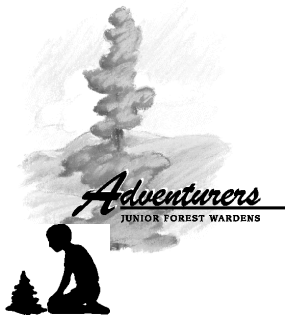
Illustrations of plants and data sheets will be supplied to volunteers.

Contact the Research Assistant at the Devonian Botanic Garden for more information. Refer to the Phone Book Yellow Pages for contact information.

Other Observation Activities

Know Your Ducks.

Ducks Unlimited Canada has a poster 20 pairs (both male and female) species that can be very helpful to wardens near a habitat rich with waterfowl. Poster size: 30 X 60 cm. Coloured illustrations. Available from any Ducks Unlimited office or the Provincial office, refer to the Phone Book Yellow Pages for contact information.



LEADER
MANUAL

V OUTDOOR RECREATION & APPRECIATION●

Wardens will learn to value the forest for the healthy lifestyle it provides in pursuit of leisure, as well as, the esthetic and spiritual values that are part of our natural heritage.

date completed



Investigate the outdoor recreation potential of an area
page 103



Explore personal values of the forest.
page 110

V. Recreation / Appreciation

last updated: 06/09

1. Investigate the outdoor recreation potential of an area.

BACKGROUND

Outdoor recreation refers to the leisure activities that take place in a natural setting and benefit the body and/or spirit. Outdoor recreation can overlap with competitive outdoor activities such as orienteering and ski races. It can also be done with other activities such as environmental education, for example, cross country skiing while looking for birds. Outdoor recreation can be simply enjoying the peace and quiet in a non-physical way.

Outdoor recreational activities benefit people in a variety of ways.

- Physical Fitness - Some activities keep people physically fit when done regularly.
- Relaxation - A quiet setting can be an escape from everyday pressures while enjoying an outdoor activity.
- Adventure - Some activities can challenge physical limits and provide fun and adventure, for example, mountain biking.
- Nature Appreciation - Spending time with nature can increase a desire to better understand and care for the environment.
- Personal Enjoyment - Enjoying scenery and a sense of discovery in finding interesting cultural and natural features can bring many hours of pleasure.

Outdoor recreation is one of the many reasons we value forests and the outdoors. The recreational activities give us the opportunity to get out and truly enjoy natural surroundings firsthand.



Activity Summary

Wardens will look at a natural area near the community and assess its potential for outdoor recreational activities.

Procedure

1. Familiarize the Wardens with outdoor recreation. Ask wardens to list outdoor recreation activities that are non-consumptive, consumptive, motor or animal propelled and indoor/outdoor. Which ones are popular in their community?
2. Ask Wardens to complete the sheet, The Benefits of Outdoor Recreation. Have them rate, on a scale of one to three, what they think the benefits are for themselves. Have a discussion about their thoughts and insights. This exercise may also help them see their own biases and preferences for activities that they will be developing locally.
3. Have Wardens work on the sheet, Considerations for Outdoor Recreation. This sheet will help the group decide which outdoor recreation activities they will be specifically looking at. Integrating outdoor recreation activities with other values is an important combination. Have Wardens think about some of the other considerations that are important for a natural area with some potential for outdoor recreation. Have Wardens discuss and share their decisions.
4. Investigate the local community's plans for future recreational opportunities.

MATERIALS REQUIRED

- sheet, The Benefits of Outdoor Recreation (each have a copy in Warden manual)
- sheet, Considerations for Outdoor Recreation (each have a copy in Warden manual)
- map of area to be studied (optional, Wardens may draw map)

Assessing Community Recreation Opportunities and Goals

It is worth the time and wise to find out what opportunities already exist in the community. For example, you may discover that there are already trails nearby for horseback riding so your goals may change.

Contact your community to find out what the long term recreational plans are. Will it be worth your efforts to plan the same opportunities when there are already similar ones existing or planned recreational opportunities?



Partnerships are becoming increasingly popular because both parties can get into a win-win situation. Partnerships are mutual agreements where both parties give to the project equally and both end up with something that benefits the interests of both. For example, your group may decide to put in some snowmobile trails and the local Snowmobile Association is willing to help.

5. In summary, the project your group of Wardens will be working on, needs to answer the following questions as guidelines:
 - ▶ What outdoor recreational opportunities already exist in the community?
 - ▶ Do we need to duplicate these activities?
 - ▶ Do we want to partner with the community?
 - ▶ Will the land be developed for public or private use?
6. Wardens should also keep in mind the following when investigating a site for outdoor recreation potential:
 - ▶ size of entire area
 - ▶ areas to be preserved
 - ▶ stages of forest
 - ▶ plant species
 - ▶ terrain
 - ▶ waterways
 - ▶ attractiveness
 - ▶ diversity
 - ▶ accessibility
7. Combine all their findings and plan into a report that contains a map of the area with the proposed improvements or developments to the area (trails, resting benches, washrooms, signs, parking, etc.) A short write-up should accompany the map explaining the proposal's contents.
8. Present the report to local officials.



last updated: 06/99

Outdoor Recreation Activities

Non-Consumptive

Land-based Activities

- ☐ Camping:
 - ▶ Family
 - ▶ Group
- ☐ Backcountry Trails:
 - ▶ Nature
 - ▶ Hiking
- ☐ Adventure Rope Courses
- ☐ Rock Climbing
- ☐ Nature Study:
 - ▶ Birdwatching
 - ▶ General
- ☐ Nature Photography
- ☐ Landscape & Nature Painting
- ☐ Archery
- ☐ Paintball Games
- ☐ Wide Games
- ☐ Adopt-a-Forest
- ☐ Biodiversity Plots
- ☐ Running
- ☐ Orienteering

Water-based Activities

- ☐ Ice Skating:
 - ▶ Lakes
 - ▶ Ponds
 - ▶ Wetlands
- ☐ Wind Surfing
- ☐ Adopt-a-Stream
- ☐ River Rafting
- ☐ Swimming Holes
- ☐ Catch & Release Fishing
- ☐ Canoeing
- ☐ Kayaking

Air/Underground

- ☐ Astronomy
- ☐ Hang Gliding
- ☐ Kite Flying
- ☐ Spelunking (caving)

Consumptive

Land-based Activities

- ☐ Butterfly Collecting
- ☐ Berry Picking
- ☐ Lapidary
- ☐ Guiding/Hunting
- ☐ Shooting Range
- ☐ Clay Pigeon Shooting
- ☐ U-Pick Christmas Trees
- ☐ Maple Sugar Production
- ☐ Edible Wilds
- ☐ Forest Pharmacy

Water-based Activities

- ☐ U-Trout Fishing
- ☐ Clam Digging
- ☐ Fly Fishing Workshops
- ☐ Gold Panning
- ☐ Guiding/Fishing
- ☐ Ice Fishing

Air/Underground



Motor/Animal Propelled

Land-based Activities

- ☐ Horseback Riding
- ☐ Sleigh Rides
- ☐ Hay Rides
- ☐ Motorcycling
- ☐ Snowmobiling
- ☐ Four-wheel Drive Club
- ☐ Motor Cross
- ☐ Dog Trails
- ☐ Fox Scent Hunts
- ☐ ATV Trails

Water-based Activities

- ☐ Water Skiing
- ☐ Motor Boating

Air/Underground

Indoor/Outdoor

Land-based Activities

- ☐ Cabin Rentals
- ☐ Campfire Programs
- ☐ Workshops
- ☐ Barbecues
- ☐ Bed & Breakfast
- ☐ Outdoor Cooking
- ☐ Day Camping
- ☐ Hunter Safety

Water-based Activities

Air/Underground

- ☐ Fly Tying Workshops
- ☐ Environmental Education
- ☐ Hunter Safety



last updated: 06/99

The Benefits of Outdoor Recreation

Rate the following benefits people get from participating in outdoor recreation activities from one to three based on how important they are to you.

- 1 - Very Important
- 2 - Somewhat Important
- 3 - Not Very Important

☐ Physical Fitness

Some activities keep people physically fit when done regularly.

☐ Relaxation

A quiet setting can be an escape from everyday pressures while enjoying an outdoor activity.

☐ Adventure

Some activities can challenge physical limits and provide fun and adventure, for example, mountain biking.

☐ Nature Appreciation

Spending time with nature can increase a desire to better understand and care for the environment.

☐ Personal Enjoyment

Enjoying scenery and a sense of discovery in finding interesting cultural and natural features can bring many hours of pleasure.

☐ Other

If you can describe other benefits experienced from outdoor recreation activities, describe in a sentence below.



Considerations for Outdoor Recreational Activities

☒ Check off 4 the outdoor recreation activities you plan on considering for the area you are evaluating.

☐ Hiking	☐ Cross country skiing
☐ Running	☐ Skating
☐ Mountain biking	☐ Snowshoeing
☐ Horseback riding	☐ Snowmobiling
☐ Canoeing	☐ ATV/Dirt biking
☐ Camping	☐ Wildlife viewing
☐ Rock climbing	☐ Nature study
☐ Swimming	☐ Photography
☐ Fishing	☐ Hunting
☐ Other(s) _____	

Other Values for Outdoor Recreation

Integrating outdoor recreation activities and our values is an important combination. What are the reasons you consider the most important for the natural area you are looking at as having potential for outdoor recreation.

☐ Recreation	☐ Habitat for Flora & Fauna
☐ Biodiversity	☐ Soil Conservation
☐ Water Conservation	☐ Wood Production
☐ For Future Generations	☐ Other _____



2. Explore personal values of the forest.

BACKGROUND

The value of forests is not only as a cash crop. Forests contribute significantly to the health of the environment both in Canada and around the world. Forests help regulate atmospheric conditions and moderate the effects of force on soil and water. Forests provide the ecological buffer zone essential for clean air and water. They protect watersheds from erosion, stabilize the flow of streams and minimize flooding, they provide habitat for wildlife which enrich our lives and they provide the scenic background for outdoor recreational activities. Can we calculate the true worth of forests when a large part is intangible?

Tree roots absorb water and nutrients from the soil. Leaves absorb carbon dioxide from the atmosphere and return oxygen as a by-product of photosynthesis. The carbon fixed in branches, roots and forest soils during this process is stored for many years.

In our society, we tend to put value and judgment on everything around us, brand name clothes, people, houses, cars, bikes, the list goes on. When we refer to the forest as a resource, we immediately attach a value to the forest. The value being that resources are assets and property that belong to us with the sole purpose of being there for our use and at our disposal.



Activity Summary

Wardens will explore their values about the forest by rating statements.

Procedure

1. Have Wardens write one sentence that expresses how they feel about the forest. Begin the sentence with "I feel . . ."
2. Have Wardens write a sentence about something that is going on in the forest or forestry industry today. The statement can be absolutely true or based on misconceptions. There are some examples below.

MATERIALS REQUIRED

- ☐ a roll of adding machine paper
- ☐ pieces of paper (sheets of paper cut into quarters across the width)
- ☐ pencils/pens



Statements:

- ▶ Any one with an interest in using the forest should be allowed because it is public land.
 - ▶ Clear-cut logging should be allowed in forests because it provides the requirements for young seedlings.
 - ▶ It is all right for the Alberta government to permit forestry companies to harvest the forest as long as their FMAs (Forest Management Agreements) are approved.
 - ▶ Alberta's forests should be managed primarily for their timber.
 - ▶ The amount of wood cut from Alberta's forests each year should not exceed the amount that re-grows.
 - ▶ Herbicides should be used where trees and other vegetation are competing with commercially viable species.
 - ▶ Northern Forested wetlands should be drained to improve their timber yield.
 - ▶ Clearcutting is a suitable method of harvesting if the aim is sustained yield of the forest.
3. Place all the statements into a box which will be randomly drawn from later.
 4. Place a strip on adding machine paper along the floor, the length of the room. This long strip of paper will be the continuum from which Wardens will stand where they think their opinion lies.

Read one of the statements. Have wardens stand in front of the paper tape at the point which represents their view about the statement. Do they agree with the statement?. Disagree just a little bit? All these variations of agreement/disagreement are along the tape between strongly agree and strongly disagree. You may decide to mark the numbers 1 to 10 on the paper or tell them to imagine a numerical scale, it may be 0 to 100 by 10s. Do not use an odd numbered scale because you may find some fence sitters not deciding one way or the other on the statement by staying on the middle odd number.



last updated: 06/99

PRO

STRONGLY AGREE

NEUTRAL

CON

STRONGLY DISAGREE

After you have said aloud a statement, ask some of the Wardens why they are standing at that spot on the continuum? What is their viewpoint on the statement and why. Check out those Wardens standing in the middle. Are they sure that they don't have any opinion? And those who stand at the ends most likely have very definite opinions. As you are discussing the statements and viewpoints with various Wardens, the rest of the Wardens are free to change their positions along the continuum if their views are changed because of the discussions.

This activity will help the Wardens listen to others and assist in their own formulation of how they feel about the forest. This activity will help them clarify their own views.

Other Activities Ideas

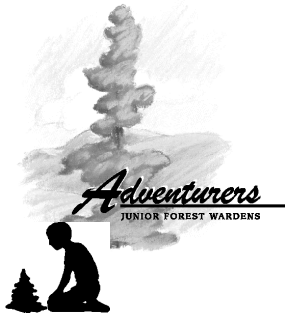
- Keep a journal while at camp and record feelings about the forest.
- Pick a solo spot in the woods at camp and spend 10 minutes in the early morning and 10 minutes in the evening writing about the spot.
- Look in newspapers and magazines for others' viewpoint about the forest. How does the Warden's viewpoint contrast or support that view?
- Do some comparison "viewpoint" shopping. How does a forestry company value a forest? How does one of your parents view the forest? How does your school science teacher and art teacher and physical education value the forest?



Trees Do Their Part

1. Trees store carbon and clean the atmosphere. In 50 years, one tree generates \$30,000 in oxygen, recycles \$35,000 worth of water and removes \$60,000 worth of air pollution.
2. Trees prevent soil erosion.
3. Trees prevent or reduce water pollution.
4. Trees help to recharge groundwater, stabilize the water table, sustain waterflow and keep water clean.
5. Properly placed, trees and shrubs decrease noise along busy streets and highways. A 100-foot strip of trees cuts sound by 6 to 12 decibels.
6. Trees screen unsightly views and provide privacy.
7. Fast-growing trees can provide a steady supply of fuelwood.
8. Properly managed, forests provide a sustained supply of lumber, plywood and other wood products.
9. Shade from trees reduces air conditioning costs in residential and commercial buildings by 15 to 20% thus reducing the need for power from power plants.
10. Windbreaks can shield homes against wind and snow, reducing heating costs as much as 30 percent.
11. Cities are "heat islands", 5 to 9° warmer than surrounding areas, streets and parking lots can be made cooler by the shade of trees. Some areas can be cooled as much as 10°.
12. Crop yields on field with windbreaks are significantly higher than those without windbreaks.
13. Tree shelters for livestock can reduce weight losses during cold winter months and provide shade for moderating heat stress in summer.
14. Farm shelterbelts reduce cooling and heating utility bills, trap snow, reduce wind, provide wildlife habitat and look beautiful.
15. Trees are living snowfences and when strategically placed, hold snow away from roads and reduce maintenance costs.
16. Trees add grace to any community setting. They make life more enjoyable, peaceful and relaxing.
17. Trees provide a multitude of recreational opportunities.
18. Trees, alive and dead, provide habitat for a large variety of wildlife.
19. Trees along rivers, streams and lakes reduce water temperature and prevent or reduce bank erosion and silt. The roots provide hiding places for fish.
20. Research shows that trees help reduce stress in the workplace and speed patient recovery.
21. Police officers believe that trees and landscaping can instill community pride and help cool tempers that sometimes erupt during long, hot summers.
22. Trees enhance the economy by providing wood for industry.
23. People plant and care for trees because they enjoy watching them grow.
24. Trees connect us with nature and reinforce spiritual and cultural values.
25. Trees planted as memorials, leave a valuable gift for future generations.

Adapted from a list developed by Tree Canada Foundation



LEADER
MANUAL

VI WATERSHED STEWARDSHIP

Wardens will learn that the importance of conserving and protecting watersheds at all levels is critical to our survival as a species. Forests play a critical role in both global weather patterns and water supply and we must protect this role at all costs.

date completed



_____	☐	Investigate how vegetation and ground cover affects water quality.	page 117
_____	☐	Conduct a water quality experiment.	page 122
_____	☐	Describe the uses of water in a local watershed.	page 132
_____	☐	Participate in a watershed enhancement project.	page 135

VI. Watershed Stewardship

last updated: 06/09

1. Investigate how vegetation and ground cover affect water quality.

BACKGROUND

Excessive mud or silt entering and clouding the water will clog fish gills and smother fish eggs in spawning areas on the stream bottom. A redd is a shallow depression in the stream gravel into which a female fish deposits her eggs. Mud, sand and silt can be an indication of poor construction practices and use in the watershed. It can also be a normal occurrence, for example, a muddy bottom is often found along a slow-moving section of a stream. The runoff from the banks is not adequately contained or vegetated to prevent erosion. Vegetation acts as a filter for sediment and pollution from the land.

Cloudy water may be a result of natural processes such as glacial sources of streams or of land use in the surrounding watershed. Sediments can adversely affect habitat conditions such as food, health of fish, and breeding environments for macro-invertebrates. The insects that live on the bottom of a stream can tell you about the quality of the water. If there are mayfly, caddisfly or stonefly larva, the stream is probably healthy.

Ground Cover and Water Quality



Activity Summary

Wardens will compare grass ground cover with bare soil at various degrees of slope.

Background

This experiment demonstrates two of the factors that affect soil erosion: plant cover and slope. The soil is covered with plant growth which protects the soil from the impact of falling rain and the wind from drying it out and blowing it away. Wind erosion created the massive dust storms during the Depression, also referred to as the Dirty 30s because of all the dust. Vegetative cover is one of the most effective measures against erosion.



The contour of the landscape is also a critical factor in the preservation of soil. The greater the degree of slope, the more serious an erosion problem can get, especially if there is no ground cover.

Running water can strip away the rich upper layer of topsoil which contains the nutrients necessary for plant growth. When these nutrients are washed away, a vicious cycle is set up where the soil is eroded because there is no protective plant cover to secure it yet no plants will grow there because erosion has washed away the soil's nutrients.

When a water source is muddy it usually means there is soil erosion upstream. Plant cover is especially important by water channels like rivers and streams. If the land is cultivated too close to a stream channel it reduces the amount of vegetation overhanging the water and holding the soil in place.

Soil and run off into water channels causes serious problems for fish habitat (they prefer clear, cold water) and puts an extra burden on water treatment facilities to clarify the water. Trees and vegetation break the force of raindrops before they strike the ground. Grass and tree roots have tiny hairs on their roots that hold the soil in place.

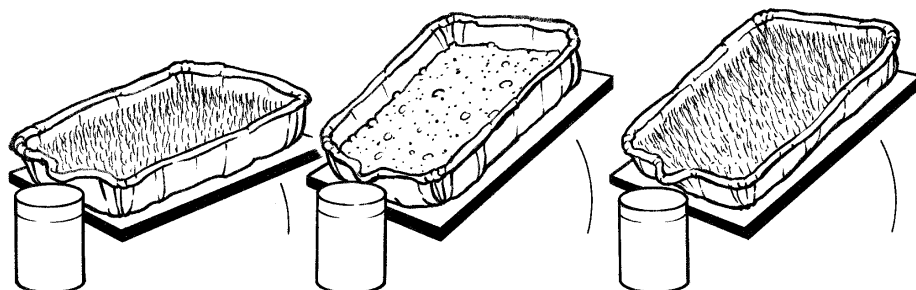
Procedure

MATERIALS REQUIRED

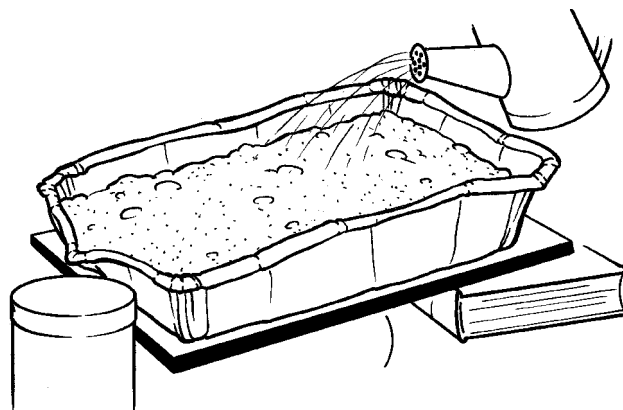
- ☐ 4 aluminum foil baking pans or 2 litre milk cartons
- ☐ some fast growing seed, e.g. rye or grass or grass sod
- ☐ enough soil to fill aluminum pans or cartons
- ☐ 4 water collectors (cans)
- ☐ 4 coffee filters (cheesecloth or paper towel) to go inside collecting cans
- ☐ watering can
- ☐ measuring cup
- ☐ four labels (masking tape and marker)
- ☐ protractor
- ☐ Observation Record Sheet, one copy each

1. Make four erosion pans. Make a spout at one end on the pan or carton by pinching one end. Label each pan as follows:

Pan A: Bare soil at 15° elevation
Pan B: Grass at 15° elevation
Pan C: Bare soil at 30° elevation
Pan D: Grass at 30° elevation.
2. Fill each pan to the rim with the same type of soil. Spread the seed thickly on top of the soil in two pans (Pan B and Pan D) and water. Keep these two seed pans on a flat surface. Nurture them for 10 days to 2 weeks until you have some ground cover.
3. Place a water collecting can at the spout of each pan and elevate the pans. Prepare it by placing a filter inside so the runoff from each pan. Dampen and wring out the filter before you add water to the pan so the water discharged can be accurately measured.



4. Hold the water collecting can under the spout as you sprinkle the same amount of water over the top of each pan. Remove the filter from the can after the run off has finished.
5. Have Wardens record what they see as you sprinkle the same amount of water (250 ml) on each one in turn.
 - ▶ Observe how the water makes channels in the soil in the pans with no vegetative cover.
 - ▶ Compare the sizes of the channels as the slope increases between Pans A and C.
 - ▶ Compare the amount of sediment washed from Pan A and Pan C.
 - ▶ How did the grass affect how much sediment was washed away?
 - ▶ How did an increase in the slope affect the discharge from Pan B and Pan D?
6. Measure the water from each water collecting can and record on the Observation Record Sheet.
7. Compare the amount of soil in each filter using a scale of 1 (least) to 4 (most). Record results.
8. Optional: Repeat the same step in a few days time when the rye or grass need more water. Compare observation between these two days.



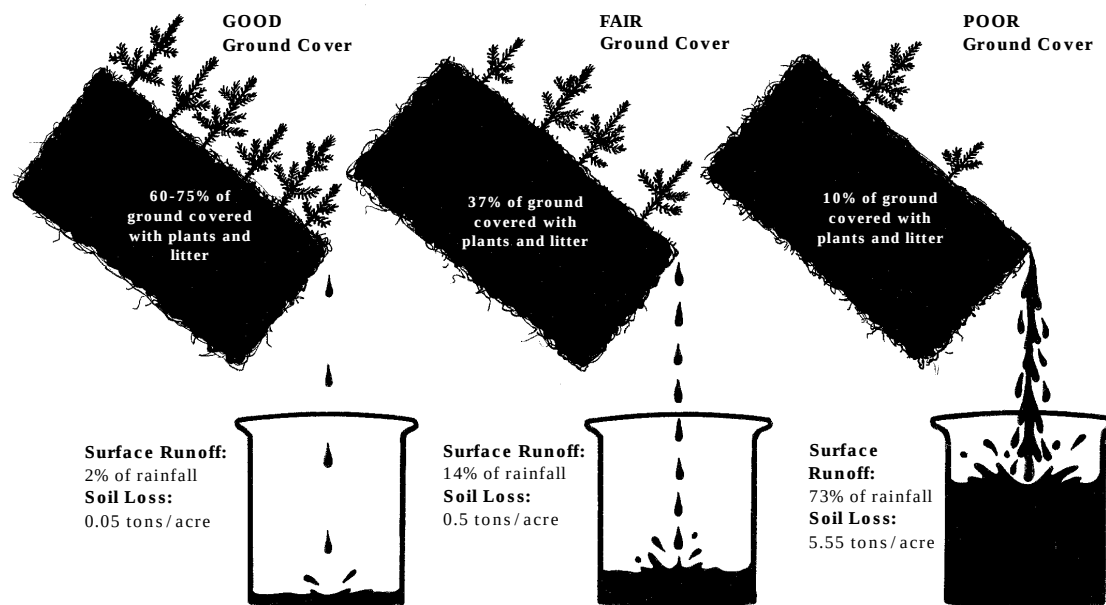


Discussion

- Which pan has the most runoff and soil deposit? The least?
- How would the speed of the water affect the amount of soil being eroded?
- How do the results of this experiment carry over to erosion in nearby streams, rivers, and fields?
- What measures can people take to prevent erosion along stream and river banks?

SUGGESTED

62 mm of rain in one hour



(Adapted from figure 2 in: E.L. Noble, "Sediment Reduction Through Watershed Rehabilitation" in Proceedings: Federal Interagency Sedimentation Conference, 1965, United States Department of Agriculture Miscellaneous Publication 970)

Ground cover can dramatically affect the amount of runoff and soil erosion, as seen in this drawing showing the effects of a very heavy rainstorm in the Utah mountains. (Research conducted by E. L. Noble, Sediment Reduction Through Watershed Rehabilitation)



Observation Record Sheet

<i>Samples</i>	Runoff	Soil Deposit	Observations
PAN A Bare soil 15°			
PAN B Grass 15°			
PAN C Bare soil 30°			
PAN D Grass 30°			



2. Conduct a water quality experiment.

BACKGROUND

Water quality refers to the description of the many characteristics of water. Many of these descriptions result from substances that are suspended or dissolved in the water. Water can be clear or cloudy, warm or cold, sterile or alive with billions of bacteria. Water can be salty, green, brown or clear.

Water quality can be categorized into three features:

- I. Physical
- II.. Chemical
- III. Biological.

I. PHYSICAL

Physical characteristics of water are the oldest set of factors and can be crudely evaluated simply by using the senses, however special instruments are used to accurately measure them. The five most common water quality characteristics are: taste, temperature, odour, turbidity and colour. Turbidity is the amount of solid material floating in the water which can be organic matter from plants or animals or inorganic such as silt and clay.

Turbidity

Summary

Wardens will take two water samples from a stream and make comparisons.

Background

Fine soil and mineral particles are prevented from settling out by the movement of the water. Turbidity is cloudiness caused by fine sediments suspended in the water. It is measured by passing light through a sample of water. Water clarity is important for fish to find prey and aquatic plants need sunshine for photosynthesis. Suspended solids in water also affect fishes' gills. Gills react by secreting a mucous as protection and thus prevents the gills from functioning, resulting in death.



MATERIALS REQUIRED

- Water Sample 1: 2 litres distilled or tap water in a clear bottle
- Water Sample 2: 2 litres of stream water in a clear bottle, upstream site
- Water Sample 3: 2 litres of stream water in a clear bottle, downstream site
- hip waders

Procedure

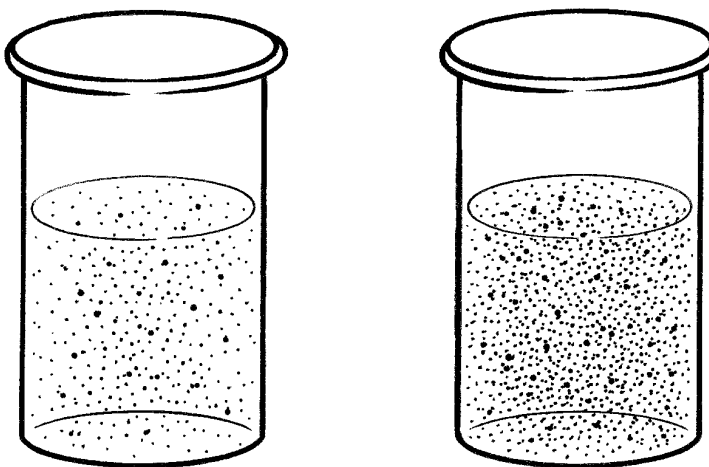
Part A

Choose two sites on a stream at least a kilometer apart, for example, up and downstream from an exposed stream bank where cattle drink. Take the samples from the middle of the stream in the main flow of the water.

Label the bottles and agitate the three water samples. Compare first with the naked eye. Then compare with a magnifying glass or microscope. Look for differences in the particles and organisms. Discuss what could account for the differences.

Part B

Allow the water to stand overnight so the suspended solids will settle. Pour off the water leaving the sediment in the bottom. Or collect the sediment in a white coffee filter. Use a magnifying glass (or a binocular microscope if you can borrow one) to examine the sediment. Compare and discuss.





II. CHEMICALS

There are hundreds of chemicals that might be tested or monitored, but only a few are done routinely. Anything that can dissolved in water and can be measured might be called a chemical water quality characteristic. Some significant ones are: hardness, pH, total dissolved solids (turbidity), dissolved oxygen, phosphorus, nitrates, pesticides, fluoride, chlorine, sodium, cyanide, sulphate, iron and mercury.

Two Experiments

1. Hardness

Summary

Wardens will conduct a simple water experiment using various water samples to determine hardness.

Background

Hardness is a characteristic of water caused by the presence of the mineral salts of calcium and magnesium. Hard water contains a lot of both which makes it difficult to form soap bubbles for human use. When rainwater percolates through the soil, it picks up calcium and magnesium with other minerals and becomes hard water. Groundwater is typically hard water. Water coming from rivers, lakes and streams tends to be softer than groundwater. If water contains the minerals in the right quantity, they are beneficial for the body.

When water is treated in a water treatment facility, lime is added to help soften drinking water by removing the calcium particles. Together, lime and calcium particles form calcium carbonate which settles to the bottom of the water treatment clarifier. The lime sludge has a basic pH and is sometimes spread on fields to neutralize acidic soils.



MATERIALS REQUIRED

- 5 Baby Food Jars with lids
- Liquid Detergent Soap
- Dropper
- 60 ml or $\frac{1}{4}$ cup measurement
- 5 Water Samples: Distilled water, tap water, stream water, mineral water and salt water

Procedure

Fill each jar with 60 ml of a different water sample. Add 2 drops of liquid soap to each and close the lids. Have the Wardens make a prediction. Have them number the jars they think will produce the most suds #1, the next most suds #2 and so on. Ask Wardens to shake the jars for one minute. Have them create a standard so they are able to shake with equal force for the same length of time. Quickly observe the results. How did they do? Discuss the results.

2. pH

Summary

In this water quality experiment, litmus paper is used to measure pH of water from a variety of sources. The litmus paper will change colour depending on the pH of the water being tested.

Background

pH is of concern because it affects the solubility of nutrients and chemicals (natural and introduced) and their availability to stream inhabitants. Alkalinity measures the stream's capacity to buffer or neutralize the effects of acid.

pH is the intensity factor of acidity. Water (H_2O) contains both positively charged hydrogen ions (H^+) and negatively charged hydroxide ions (OH^-). Combined, these two ions form a molecule of water. Water molecules constantly break up these ions, and then reform again. If there is an excess of H^+ ions, the water tends to be acidic (pH below 7). If there is an excess of OH^- ions, the water tends to be basic, (pH above 7). Water of pH 7 is considered neutral, meaning the concentration of H^+ ions and OH^- ions is equal.

pH indicator tests are a good tool for establishing the approximate pH of a system. They are also effective for screen purposes to detect large-scale pH changes.



last updated: 06/99

MATERIALS REQUIRED

- Litmus Paper to detect acids and bases (wide range measuring 1 to 14)
- Colour Chart for pH (usually with litmus paper container)
- Various samples of solutions from pH Scale (see page 98)
- Small bottle tops or containers to put mystery solutions (above) in.

Where to Get Litmus Paper: Order Wide Range pH Paper Strips, Order No. 17-9020, \$1.25 for 100 strips (5mm X 45 mm) in vial with color chart from Northwest Scientific Supply Ltd. Refer to Phone Book Yellow Pages for contact information.

Procedure

In this experiment, litmus paper is used to measure the pH of various materials. The litmus paper will change to various colors depending on the pH of the material being tested. For example, if the material is very acidic (pH 0), the litmus paper will turn dark red. If the material is very basic (pH 14), the litmus paper will turn dark blue. If the material is neutral (pH 7), the litmus paper won't change color. An easy way to remember this relationship is:

Bases are Blue, aciDs are reD.

Dip the indicator strip into the sample water for approximately one minute to assure color change is complete. Hold the wet pH strip across the chart on the test strip pack and compare. Match the sample strip to the closest color strip on the colour chart. Have Wardens look at the pH Scale. Have them measure the pH of various solutions to practice color matching the results to the chart. Make the solutions "Mystery Solutions" by numbering the containers instead of labeling with the solution. Have them figure out what the solutions are using the pH Color Chart and the pH scale on page 97.

Tip: Cut the litmus paper strips in half so they will not be used up too quickly and there will be a lot left for future use. Have Wardens work together in twos or threes.



The pH Scale

The pH scale measures the strengths of acids and bases. The lower the pH, the stronger the acid. The higher the pH is over 7, the stronger the base. It is important to note that one unit on the pH scale represents a ten-fold change in the solution. For example, a liquid with a pH of 2 is ten times more acidic than one with a pH of 3. A change from pH 8 to pH 5 is a 10×10 , or 1000-fold increase in acidity!

	0	acid
battery acid, gastric juice	1	
lemon juice	2	
apples, soft drinks	3	
cream of tarter, tomato juice	4	
black coffee	5	
saliva, milk	6	
egg white, pure water	7	neutral
sea water	8	
phosphate detergent, pancreatic juice	9	
Milk of Magnesia	10	
non-phosphate detergent, drugstore antacid	11	
household ammonia, washing soda	12	
lye	13	
oven cleaner	14	base (alkaline)

The pH of other solutions: Human blood is 7.4, Unpolluted rain is 5.6, Vinegar is 2.2



III. Biological

Biological characteristics of water refer to a variety of organisms found in the water. This includes microscopic viruses, bacteria and protozoans, as well as algae, zooplankton (tiny water animals), insects and plants. Disease-causing viruses and bacteria can enter the water system from sewage, both human and animal.

Experiment

Background

Organisms can be used as an indicator of a certain environmental conditions depending on whether the organisms are present or absent. Plants and animals can be classed as being either tolerant or intolerant. If it tolerates poor conditions it is said to be tolerant. Intolerant species must live in good conditions or they will die. For example, the mayfly nymph is found where the dissolved oxygen levels are fairly high. If this insect disappears from a river where it was once numerous, then it points to a decrease in oxygen.

Invertebrate animals living on the bottom of river and lakes are called benthic fauna. Scientists have learned the effects of poor conditions on various species and have learned to distinguish between those organisms that can survive and those that die in highly adverse conditions.

Tolerant

One example of a very tolerant benthic organism that survives in low oxygen levels is the sludge or tubificid worm. They are segmented worms and have the same basic structure as common earthworms. They are found in the mud and their body length ranges from one to 30 mm. The body wall is thin and delicate to allow for greater gas exchange. These worms are sometimes used as indicators of sewage pollution, especially if there are a lot of them.

Intolerant

The following can be found in both good and poor quality water. Stonefly, mayfly and caddisfly numbers will be reduced and worms and aquatic larvae will be more plentiful in poor quality water.



MATERIALS REQUIRED

- Aquatic Invertebrates poster (available from FEESA)
- Identification Key to River Invertebrates (available from FEESA)
- Dip nets or seine kick nets
- Hip waders
- Stiff brush to remove material from rocks
- Magnifying glasses
- White container to place some water with invertebrates (egg cartons, ice cream buckets)
- White plastic spoons to move invertebrates around

Procedure

Collect invertebrates living on the bottom surface of rocks and in stream vegetation. Simply kick rocks loose in front of the net, the invertebrates will dislodge and flow downstream into your net. Do this at a depth between 20 to 60 cm. Each successive sample should be taken upstream away from earlier samples.

As the invertebrate samples come out of the water, collect and sort them using the spoons and egg cartons. The Identification Key to River Invertebrates will help Wardens identify them. Discuss results.

Please note that this type of sampling is difficult to find some invertebrate species, however, some generalities regarding the biological component of water quality may be made.

Class I: Needs Good Water Quality

Stoneflies
Mayflies
Caddisflies
Hellgrammites
Freshwater clams
Beetles (Riffle Beetle, Water Penny)

Class II: Can Tolerate Some Pollution

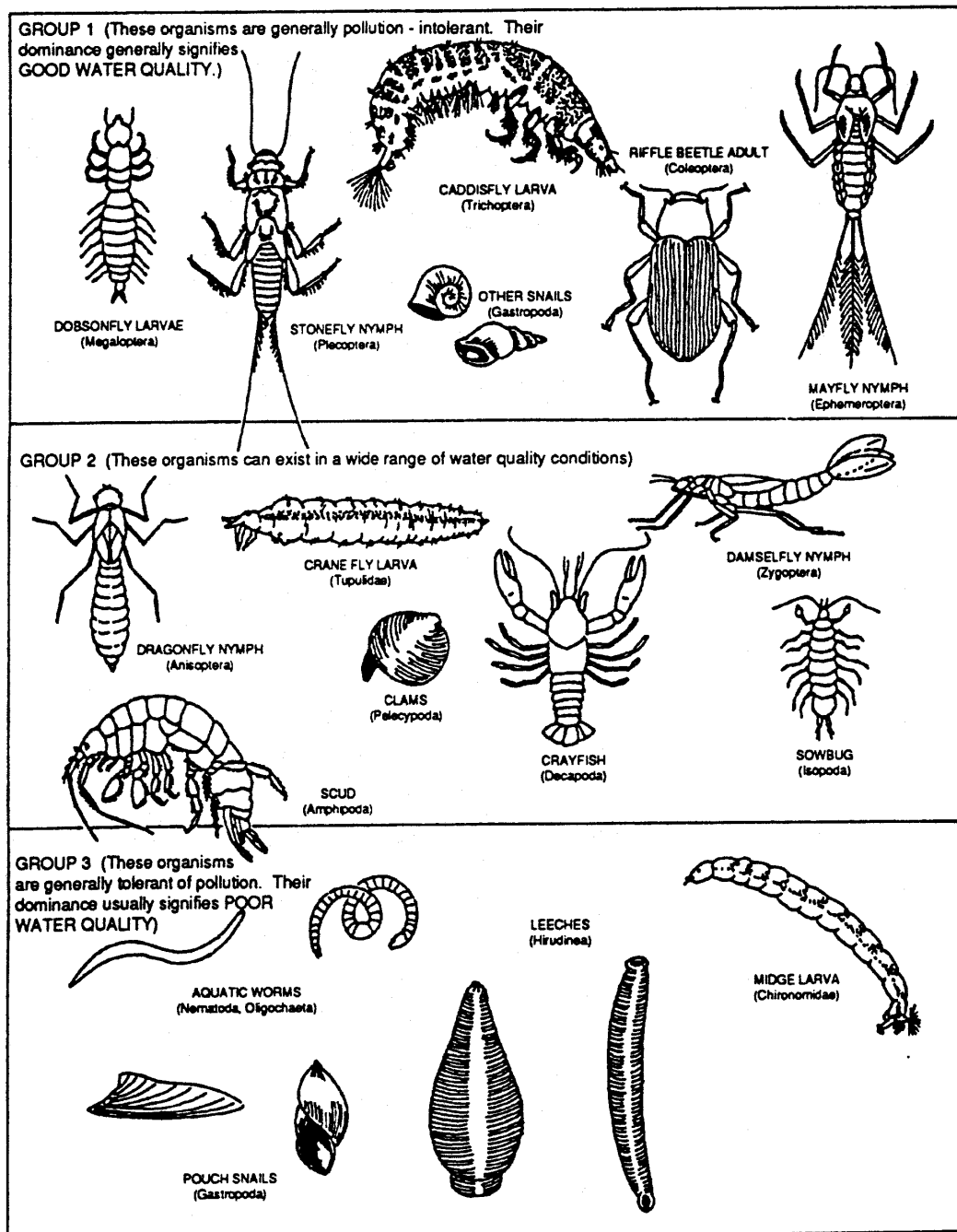
The above mentioned invertebrates are missing.
Damselflies
Dragonflies
Crayfish
Flatworms
Crane flies
Gill snails
Horse flies
Isopods (aquatic sowbugs)
Blackflies

Class III: Found in Polluted Waterways

The above mentioned invertebrates are missing.
Air-breathing snails
Aquatic earthworms
Midges
Leeches
Moth flies



Macroinvertebrate Taxa Groups



From Aquatic Invertebrate Monitoring Program



Make Some Equipment

A seine kick net is made with fine netting strung between two poles and you can easily make one. Use pantyhose or mosquito netting and dowels or broomsticks. Cut the netting in a large rectangle and staple each short end onto a large dowel.

Dip nets can easily be made with a nylon stocking sewn around a circular wire shaped from a coat hanger and attached to an old hockey stick. A dip net can also be with a large finely meshed kitchen strainer attached to a one metre pole.





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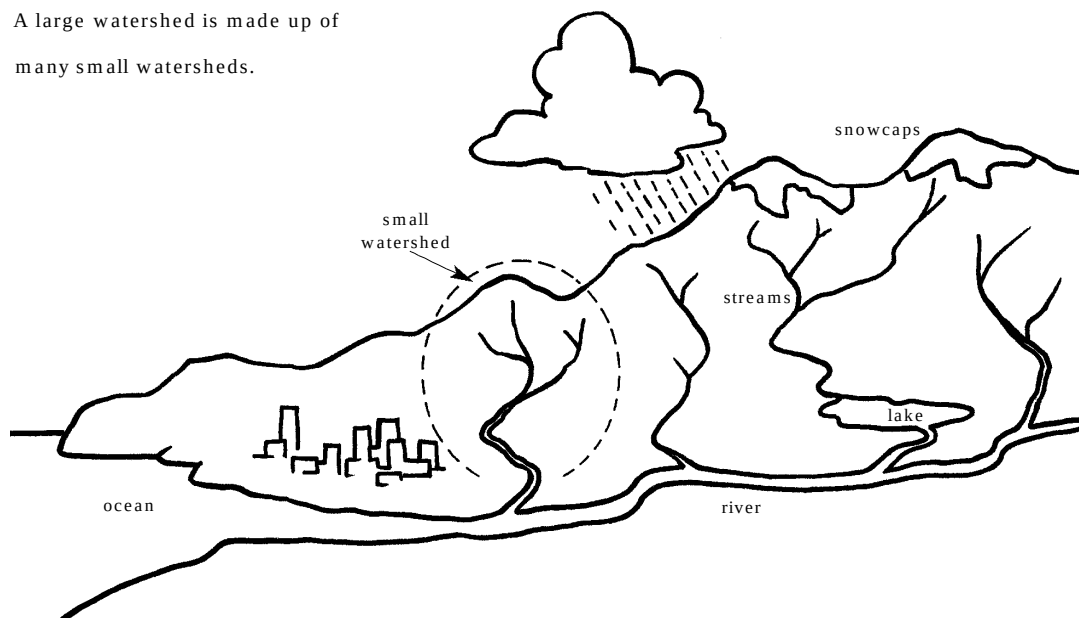
3. Describe the uses of water in a local watershed.

BACKGROUND

Imagine your roof. It collects rainfall which runs over the shingles down into the gutter, through the spout and into the soil in your yard. The landscape around us is like the roof. It collects rainfall and snow which runs across the slope of the land or sinks into the soil. It eventually finds its way into a small creek which joins with a stream to become a river. A watershed is all the area that slopes downhill to a central body of water. Water moves downhill, so the slopes shed water. The body of water may be a river or a lake.

A healthy watershed is one in harmony with the needs of people, the land and the natural resources. A healthy watershed has healthy vegetation. The roots of trees and other plants loosen the soil making the soil a better sponge for rain and snow melt. Tree roots bind the soil together to help prevent erosion. The vegetation covers the ground with leaves and branches which help reduce the impact of pounding rain.

A large watershed is made up of many small watersheds.





Activity Summary

Wardens will explore the use of water in their local watershed.

Procedure

1. Review with Wardens the meaning of a watershed, review Background above. The watershed is the area supplying water to a river or lake. You can demonstrate a watershed to the group with a square of aluminum foil and a medicine dropper.

Make a water basin with the foil. Create wrinkles and folds in the aluminum so there are mountains, valleys, plains and depressions. All the areas should feed into a central low area. Using the eye dropper, drop water from the dropper like rain and observe where the water goes. Note: Do not pour the water. Review the water cycle: the water falling is precipitation, hitting the earth and flowing as surface water (streams, rivers, lakes). The area the rain and snow flow across and through is the watershed.

MATERIALS REQUIRED

- ☐ Map of Alberta
- ☐ topographical maps (optional)
- ☐ aluminum foil
- ☐ medicine/eye dropper





last updated: 06/99

2. Using the map of Alberta, locate your community and the source of your water. Determine from which river and source the water originates and the watershed. If you can obtain a topographical map, it will show the three dimensional features of the landscape such as mountains and lakes.
3. In small groups, have Wardens make a list of some of the activities that take place in the local watershed. They may categorize them by the users for example, recreation, residential, commercial/industrial, and habitat.
 - transportation (water taxi, ferries)
 - recreation (boating, hiking, fishing, water skiing, swimming, scuba diving, jet-skis)
 - commercial fishing
 - industry (various, oil and gas, logging, mining)
 - fire fighting
 - municipal (consumptive use, non-consumptive i.e. fire fighting, wastewater treatment)
 - domestic
 - aesthetic uses
 - aquatic habitats
 - winter roads
 - agriculture (irrigation, storage)
4. Summarize the use of water in their local watershed. Discuss ways the water can be better used and protected. Are there existing projects in place that are taking measures to protect or enhance the habitat in the watershed. How are industrial activities affecting the watershed?

Supporting Resources

The Living Flow: Water in Alberta, available from the Information Centre, Alberta Environmental Protection.

Other Suggestions

- Investigate the effects logging has on a watershed.
- How does road construction affect a watershed?



4. Participate in a watershed enhancement project.

BACKGROUND

The most vital watershed on the prairies is the Eastern Slopes of Alberta's Rocky Mountains. Most people know that water is essential to survival, however, the vital role forests play in ensuring plenty of good water quality is seldom recognized.

A watershed is the area of land that collects and discharges water into a single stream or other outlet. A watershed is determined by its soils, topography and climate. Even the smallest channel can be important in regulating melting snow and heavy rain runoff and in preserving fish habitat.

Protecting our watersheds makes good sense. There are several ways a watershed is protected:

- Vegetation (trees, grasses) strategically planted will hold the soil and prevent it from being washed away by running water.
- The leaves of trees, shrubs and forbs, and organic matter on the ground cushion the impact of falling rain.
- The root systems of forest vegetation control the amount of water retained in the soil. Of course some of that water is absorbed by the plants and returned to the atmosphere through the process of transpiration. The water, not absorbed, filters down through the soil to recharge the water table.
- Forest Roads are major sources of stream sedimentation. Culverts must be properly installed and disturbed areas must be planted with vegetation.
- The size of a continuous cutover should never be more than 50 percent of the watershed at one time. Remaining stands should not be harvested until the regeneration is at least two metres tall.
- Slopes more than 45 percent should not be logged to prevent soil movement.
- Large buffer strips should be left on both sides of waterways.



- Soil compaction can be minimized by using wide tired skidders because tree growth is limited on compacted soil.

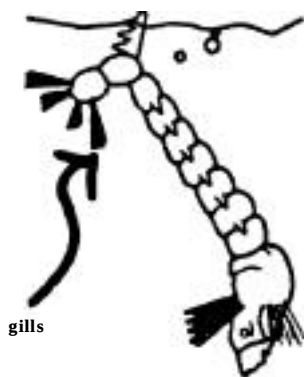
Riparian

The riparian zone is the area along the entire length of both sides of a stream that is affected by the stream. Riparian habitat is a portion of the riparian zone that provides an organism with food, water, space and shelter.

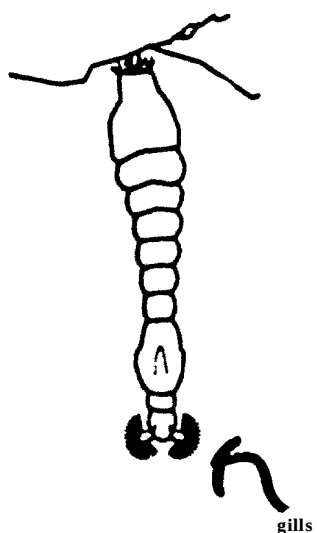
The success of an aquatic environment determines how many fish can reproduce naturally in a suitable spawning habitat. Many natural water bodies are not suitable habitats for fish production. Siltation of a stream is perhaps the biggest problem because it limits spawning success where eggs need lots of flowing, well oxygenated water flowing around them. Human activities such as intensive agriculture, building of roads and pollution have negative impacts on the riparian zones. Much of this, however, can be corrected by enhancement projects.

Trout Habitat

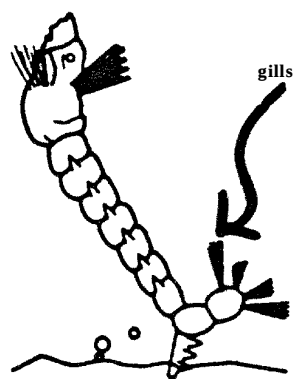
Trout are generally found in water with many high quality characteristics. For example, dissolved oxygen is very important since trout cannot tolerate oxygen levels lower than 20% saturation; turbidity is extremely important because trout are visual feeders and must see their prey, as well in response to high turbidity the gills will secrete mucous that will eventually result in death; temperature governs the survival of trout which should be between 10 to 15°C and must not be warmer than 24°C; and pH is important because the natural food supplies such as phytoplankton and tiny invertebrates and the survival of fish eggs and larva are all sensitive to pH. Fish live in a pH range of 6.0 to 8.5.



Mosquito larva



Blackfly larva



Caddisfly larva



Activities

1. Visit a Stream

Take Wardens out to visit different spots along streams. Investigate the vegetation cover in the riparian zone and all signs of wildlife. Look for areas where there is no vegetative cover, how does the water appear compared to a spot with vegetation. Look for the causes of bare ground in riparian zones. Put on rubber boots and explore the water. Use nets and capture aquatic invertebrates. Use the chart, Macro-invertebrates on page 126 and judge the water quality. Record all observations at each site. Discuss observations and findings.

Quick Test for Dissolved Oxygen:

Invertebrates in water with low dissolved oxygen have relatively large gills while those in colder faster-moving (oxygen rich) water have smaller gills.



2. Adopt A Stream (major project)

Adopt A Stream is an environmental education program designed to increase awareness of stream ecosystems and those habitats which comprise the ecosystems adjacent to streams in the riparian zone. This is a riparian habitat improvement program that will help groups play a positive role in maintaining and/or restoring such ecosystems.

Available from FEESA, An Environmental Education Society, refer to this program's Phone Book Yellow Pages for contact information.

3. Supporting Indoor Adopt A Stream Activities

The Adopt A Stream program not only provides information on organizing a planting project and where to obtain funding, it's full of activities to support the concept of multiple users affecting a watershed. Some activities for Adventurers about the impacts of human activities are:

- Municipal - Where Does Our Garbage Go?, pages 109 to 112
- Wildlife - Diary of a Park Beaver, pages 113 to 115
- Water Management - Who AM I?, pages 116 to 121
- Recreation and Tourism - Tourism ABCs, pages 122 to 124
- Oil, Gas, Utility and Transportation - Crossing the River, pages 125 to 128
- Downstream Charades, pages 129 to 132
- Mining - Coal Crossword, pages 133 to 136
- Agriculture - Harvest Time Game, pages 137 to 141
- The Story of Nid, pages 142 to 145.

Note that the above activities are paper activities. Leaders have to prepare photocopies for most activities in advance and some pre-reading is required. Refer to Support Resources Section for information on obtaining a copy of the Adopt A Stream program.



4. Community Clean Ups

Enhancement to a watershed means improvement. Have the Adventurers discuss what sorts of activities they would like to undertake to improve a watershed.

Some Ideas:

- ▶ Stream bank fencing to keep livestock from trampling the stream bank which creates erosion and siltation of fishes' gravel spawning beds.
- ▶ Deepen small ponds to prevent winter-kill (total freezing of water body and everything in it) and provide winter and summer fishing.
- ▶ Improve stream habitat by placing large boulders in fast flowing streams to provide eddies for fish to rest in.
- ▶ Removal of vegetation. This includes aquatic weeds and vegetation that will choke small bodies of water such as Eurasian Milfoil and Purple Loosestrife. Aquatic plant control requires approval from Alberta Environmental Protection.
- ▶ Contact your nearest Fish and Wildlife Office for more ideas of what Wardens can do to improve watersheds and riparian habitat.



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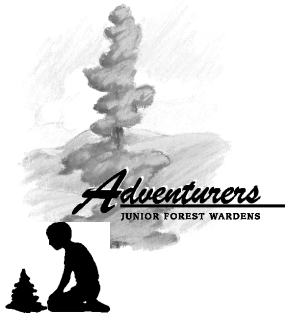
Purple Loosestrife - Beautiful Killer

This weed replaces all native vegetation creating a dense purple landscape nearly devoid of life. It's attractive, vigorous and durable. This plant takes over ponds, beaches, marshes, stream banks, farm dugouts, irrigation and navigation canals, lakeshores and ditches—even effluent purification ponds! One seed from this plant will eventually choke any water body.

Removal: The entire plant must be removed. Especially the root mass which can go down 30 cm. This should be done by mid-summer before the flower begins to seed.



The character Poison Ivy in the Batman movie would have been better named Purple Loosestrife!!



LEADER
MANUAL

VII

RANGE STEWARDSHIP

Grazing and range management are both a tool and a strategy to ensure sustainable agriculture on public lands.

date completed



☐

Discuss issues associated with grazing on Crown and private rangeland.

page 143

☐

Discuss characteristics of a healthy rangeland.

page 148

☐

Identify six forage plants that grow on local rangeland.

page 158

VII. Range Stewardship

last updated: 06/99

1. Discuss issues associated with grazing on Crown and private rangeland.

BACKGROUND

Alberta has 6.5 million hectares (16.1 million acres) classified as rangeland. Approximately 38 per cent (2.4 million hectares or 6.1 million acres) are privately owned.

The greater part of Alberta, 4 million hectares (10 million acres), is under public ownership. Approximately 60 % of the land base is public land. Any Canadian citizen 18 years of age and older can apply for a disposition (lease, licence or permit) issued under the provisions of the Public Lands Act, for permitted use of public land. A disposition is a land use contract that gives specific rights to a land or resource user. Some of the uses include grazing reserves, grazing leases, cultivation permits, forest grazing lease, and hay/grazing permits. Public land is also available for industrial (petroleum and natural gas, oil sands, coal development), commercial, recreational, tourism and residential.

Rangelands are an important resource for livestock grazing. They also have numerous other social and economic benefits such as, habitat for flora and fauna, water source, recreation, and sites for research and education. Both public and private rangelands are used for grazing. The same problems associated with grazing happen on both.

Protecting Rangeland

Livestock overgrazing causes a decline in forage production. Plants accustomed to the rangelands are deep-rooted grasses. Cattle are selective grazers and when the natural grasses are overgrazed, they are replaced with low-producing, weedy, grazing resistant, shallow-rooted species and weeds. These plants change the soil and decrease the vegetation litter which assist in preventing erosion.



The costs of overgrazing are many and varied and affect social and economic sectors. This includes: lost grazing capacity; loss of livestock revenue; replacement costs for lost forage; reduces fishery and water quality; loss of ungulate (deer, antelope) winter range; loss of nesting habitat; and decrease in aesthetic beauty and recreational opportunities.

Rangeland Stewardship

Rangeland soil, water and vegetation can be cared for if the following are common practices of all livestock producers:

1. Proper Stocking

When a range is properly balanced with a number of livestock to the available forage supply then approximately 50 % of the vegetation is not grazed to maintain the plants and the soil. This is the critical and vital to range maintenance.

2. Distribution of Livestock

Sometimes even when stocking is done correctly, overgrazing may still happen if the livestock is unevenly distributed over the area. Land managers must keep in mind the layout and size of the fields and the locations of water and salt.

3. Delay Spring Grazing

There is a shortage of grass in the spring and livestock producers must put off spring grazing. Every day of delayed range use in the spring translates into two or three days of grazing at the end of the season. The full potential of the range and plant vigour is realized in the spring.

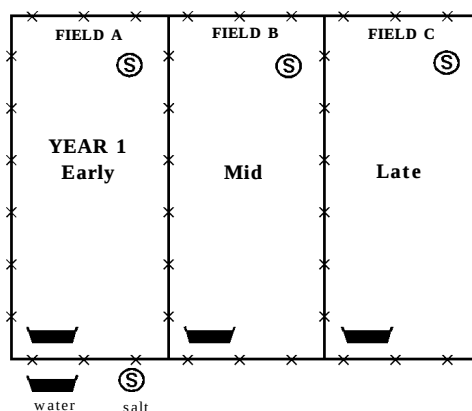


4. Special Grazing Systems

Two easily implemented systems are:

Deferred Rotation

Alternating early grazing between two or more fields.

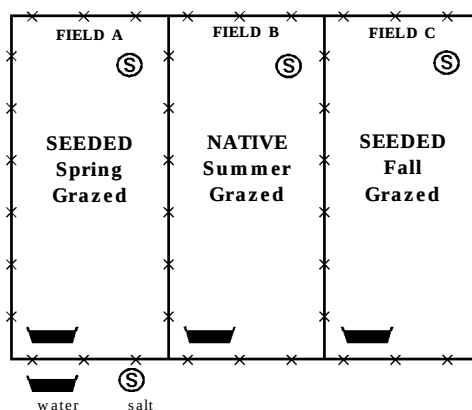


A. YEAR 2 - Late
B. Early
C. Mid

A. YEAR 3 - Mid
B. Late
C. Early

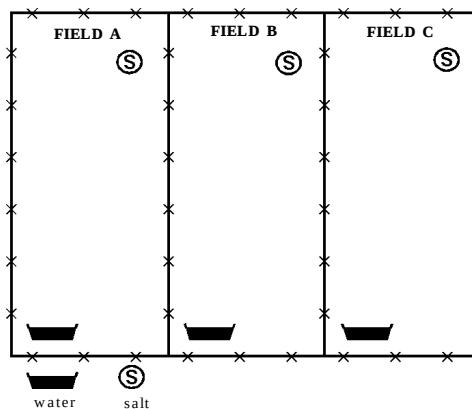
Complementary Rotation

Livestock graze on seeded pasture during the vulnerable spring period rather than on native rangeland.



Rest Rotation

This system of grazing is especially good for soil conservation. Two or more fields are needed so that one field is given a total rest from livestock grazing. The other fields are used in a deferred rotation sequence.





5. Long Rest Periods

If the rangeland has become severely over-grazed, the only effective solution is to have a longer period of rest. To re-establish native grasses, micro-climates created by the accumulation of vegetative litter is necessary.

Range Improvements

Range improvements are undertaken by lease holders to improve and maintain the productivity of the range, to improve livestock and address other resource issues such as wildlife concerns. Projects such as cross fencing, water developments and stock trail improve range use and help with livestock management. Range productivity can be enhanced by controlling bush encroachment, converting brush-covered lands to tame pasture or rejuvenating the land.

Soil conservation on Alberta's rangelands requires that people see the land has value. It is valued for agriculture, forestry, wildlife, watersheds, energy and recreation. Prevention of soil erosion on rangeland begins with proper livestock practices to maintain plant vigour and range health.

**Rangelands are not
wastelands**

Other Issues Associated with Rangeland Use

Alberta has 32 grazing reserves (also called community pastures) which are administered by Public Lands. Reserves are managed for both grazing and other multiple uses such as fishing and hunting. The reserves are best described by the type of forage on them.

- In the south there are two types of grazing reserves: native/natural grassland reserves and reserves that produce forage by irrigation.
- In the central and northern parts the reserves are covered with forests and bush.



Grazing Reserves (community pastures) reflect the government's multiple use philosophy and offer a variety of recreational opportunities such as hunting, commercial recreation (trail riding), cross-country skiing, fishing, snowmobiling, camping and sightseeing. Industrial and other users include wild rice operators, trappers, oil and gas exploration, geophysical exploration, seismic operators, and sand and gravel operators. Grazing reserves close to urban centres become recreational destination points for many people.

Multiple use, also called integrated resource management in government policies, recognizes that specific use of a resource can affect its use and management for other purposes. Although programs and activities are in place to gain the best long-term benefits while minimizing conflicts, conflicts do arise when there are several different uses by many interest groups on one piece of land.

Use Respect Program

The Use Respect Program began in 1983 in response to the concerns of farmers and ranchers about the general public crossing onto their land. Increasing pressures grazing leaseholders and recreational users make the Use Respect Program more important than ever.

Conflicts often arise when hunters, anglers and other recreationists use private land or public land under lease without first consulting the landowner. Posting Use Respect signage encourages recreationists to show respect regarding access to private and leased land.



Activities for Wardens

SUGGESTED

- Have livestock producer speak to your club or visit the producer's land. Find out what grazing system the producer is using.
- Invite a speaker from Land Division or a local rancher to speak to your club about grazing systems and grazing leases.
- Visit various sites to compare their issues (a grazing reserve with multiple uses, a livestock producer with a grazing lease outside the grazing reserve, a private land owner)
- Have Wardens determine if the issues associated with grazing are the same throughout Alberta.

2. Discuss characteristics of a healthy rangeland.

BACKGROUND

Good pasture management involves more than turning livestock on to the forage. The ultimate purpose of pasture is to convert forage into a saleable animal product. For a rancher to get the maximum animal production, an understanding of the animals' needs and plant interactions need to be understood. A farmer can get more forage when legume and grasses are grown together rather than alone.

Good range management practices imitate a natural grazing system and foster healthy native plant communities. Riparian zones should be healthy, lush and green along the waterways. Overgrazing by cattle will destroy the green zone along streams. Stream banks will erode, the variety of plants will decrease and the elements holding the system together disappear and become ineffective. One of the reasons why riparian zones tended to become damaged by cattle was because of the shade cover available in the summer and cover during the winter. Riparian zones are more important than one would think for their size. Of the 2% of Alberta rangelands that have riparian areas, more forage is produced per acre than drier pastures.



A good video which supports the concepts of range land management and riparian improvement is *Along The Waters Edge* (refer to Supporting Resources.) The video contains several testimonials from southern Alberta ranchers all sharing the same watershed.

Management of a riparian zone imitates the natural ecosystem. Some of the effective steps that ranchers are practicing are listed below:

- Stocking Rate - The animals are distributed so the cattle are forced to use the landscape more evenly.
- Place an attractant such as salt in the uplands away from the riparian zones where the landscape has little variation.
- Rotational Grazing - Rotate the cattle to other grazing areas so the grazed plants have a chance to regain vigor and aren't repeatedly stressed. To get the maximum benefits from rotational grazing, three rules must be followed:
 1. Livestock are moved to the next pasture before the animal has a chance to graze twice during the same stay.
 2. Livestock graze while the plants are in a leafy stage.
 3. Forage pastures containing less than 20% legume should receive additional amounts of nitrogen.
- Reduce grazing near riparian zones during vulnerable periods such as spring runoff when the stream banks are fragile and easily trampled.
- More effective use of upland forage by implementing uniform grazing to reduce intensity in riparian areas.



Understanding the Range

There are three key components to understanding the range ecosystem: soil, water and plants.

Soil

Soil is the fragile component of the range environment. Vegetation helps to reduce erosion and increase water penetration. To keep range soil productive, vegetation must be left on the range carried over from the previous year; approximately 45 to 50 %. When animals graze too much of the vegetation then expensive soil conservation practices are needed to hold the soil in place, for example, terracing, furrowing, damming and reseeding of grasses.

Water

Plants on the range need water to grow and water is the limiting factor to a productive rangeland. Plants on the rangeland are adapted to catching and holding moisture. Grasses have deep root systems, and when parts of the root system die every year, they leave small channels for water to run down into the soil.

Plants

Plants tell us what kind of range we have. The presence or absence of certain native plants tell us how the range has been used and what should be done to improve or maintain it. Hundreds of different plants may be found on the range. In general, however, 10 to 25 plants found in one area will be important. Plants are commonly groups into grasses, grass-like plants, forbs and shrubs.



Plant Communities and Grazing Response

Native rangeland plants are groups according to their response to grazing. These groups are called decreaseers, increasers and invaders. They are indicators of range conditions.

Decreaser plants are the most desirable as they are the tallest and most productive of the range plants. Decreaser plants are abundant on a range where grazing is properly managed. Decreaser plants are plentiful in climax range but are the first to decrease as grazing becomes heavy. The poorer the condition of the range, the fewer decreaseer plants there will be. Some examples are, Western porcupine grass, Green needlegrass, Slender wheatgrass, Tufted hairgrass, Northern hairgrass, Indian ricegrass, Sand dropseed, Nuttall alkali grass and Winterfat.

Increaser plants are also native plants of the climax range, but are less palatable and often less productive. Many are short stemmed and escape grazing because they are short and less tasty to livestock. Increaser plants are the ones to watch with caution. They increase in numbers as grazing becomes heavy. They replace decreaseer plants that are weakened by overgrazing. Some examples, Blue gamma, Sandberg's bluegrass, lute grass, Plains reed grass, Sand grass, Plains muhly, Mat muhly, Saltgrass, Baltic rush, Western snowberry, Fringed sage, Sagebrush and Greasewood.

Invader plants are the ones that invade and take over a range as decreaseer and increaser plants die. Invader plants are absent or in very small amounts in climax vegetation. Some examples, Cheatgrass, Foxtail barley, Russian thistle, Gumweed, Broomweed, Dandelion, Goosefoot's, Goatsbeard, Tumbleweed and Canada thistle.



Range Condition Classes

The condition of range land throughout Alberta is not the same. Range land has been separated into a standard with four classes: excellent, good, fair and poor.

Excellent condition range exists when forage yield from climax (decreaser and increaser) plants is 75 to 100%. Heavy mulch is present, rain soaks in rapidly and there is no erosion. It is the ideal and has the most productive set of plants possible on a piece of range.

Good condition range exists when forage yield from climax plants is 50 to 75%. The ground is covered with vegetation, the plants are vigorous and erosion is light.

Fair condition range exists when forage yield from climax plants is 25 to 50%. Increaser plants produce most of the forage. Climax grasses are in a weakened condition. Perennial forbs and shrubs and some annual grasses are present and forbs are numerous. The ground is not completely covered. Production is low, water penetration is poor and water-run off is large.

Poor condition range exists when forage yield from climax plants is 0 to 25%. The amounts of annual grasses are large. Forbs and shrubs have become vigorous and abundant. The soil is poorly protected, soil fertility is low, topsoil is hard, and dry and loss of water from run-off is considerable.

The Alberta Forest Service uses a score card to assess the condition of the range in the forest area. The higher the score, the better the range condition. The scoring is based on four important factors: soil condition, plant density or cover, plant composition, and plant vigor. All four factors are taken into consideration at the same time and a range should not be judged on one factor alone.



Activity

Have Wardens make arrangement to visit a farmer or rancher in the community. A farmer may have another view of the land and how he/she uses it for forage, whether for beef or dairy cattle or sheep than a rancher who may see the land as an ecosystem with native grass species.

A rancher wanting to keep the range land as a natural ecosystem practices short-term intensive grazing. He/she may move the livestock every three days, but this varies depending on conditions and resources. Some of the native species included fescues (Sheep, Idaho, Foothills and Rough), Hooker's Oat grass, Parry's Oat Grass, Green Needle Grass and Thread and Needle Grass; if the range land has been overgrazed, invaders such as Timothy, Blue Grass and Brome Grass which makes it less productive. Canadian Thistle and Larkspur (poisonous to livestock) are invader plants and will take over a range when it's in serious condition. Refer to Plant Characteristics for Judging and Identifying Range Plants, pages 117 and 118, for more information.

Have Wardens determine the qualities that comprise a range land properly managed. (ground cover, erosion, plant species and plant vigor.) Have them develop a list of questions to ask the landowner.

Walk the land with the landowner. What are some of the practices the landowner takes to ensure that the land has high quality forage for livestock annually.

- ☐ Does the farmer rotate the livestock to different fields?
- ☐ Examine the stream banks if there is a stream flowing through the land.
- ☐ What do the cattle like to eat?
- ☐ What are some common plant pests on forage land?
- ☐ Are there salt licks distributed throughout and away from watering points? Does the livestock know where they are? Are the salt locations moved periodically?
- ☐ How is water delivered to the livestock?

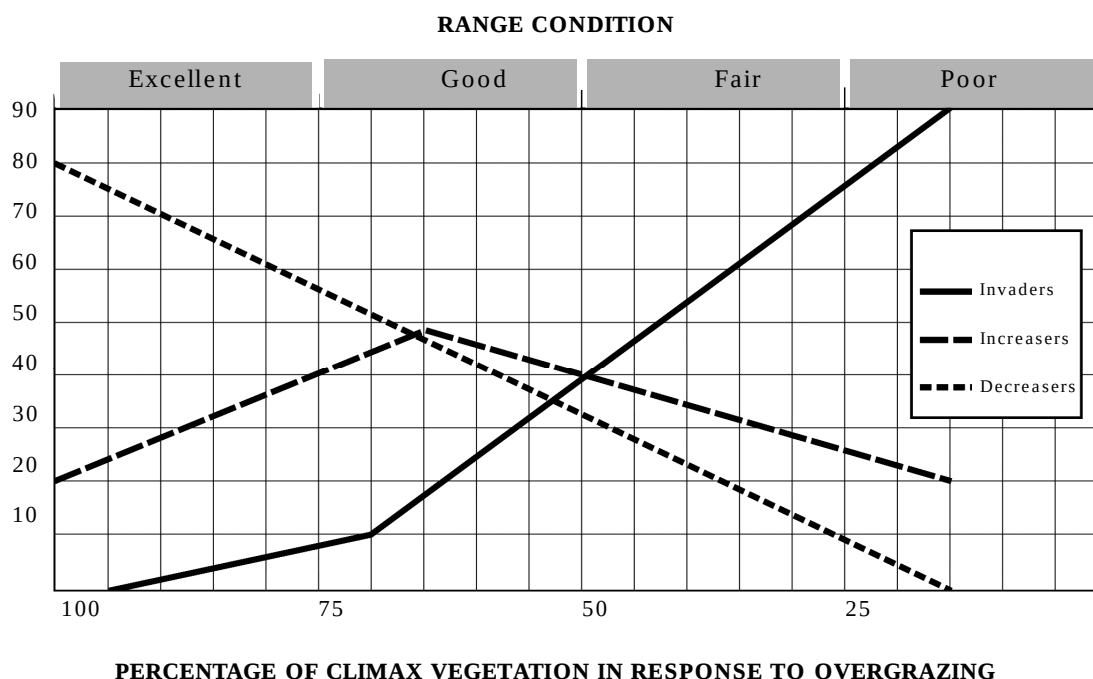


last updated: 06/99

As the Wardens are touring the land, identify plant species. Use the table entitled, Plant Characteristics for Judging and Identifying Range Plants, pages 117 and 118, to determine if the plants are decreaseers, increasers or invaders. Have Wardens determine the percentage of decreaseers, increasers and invaders visible on the land.

The following graph will be helpful for Wardens to understand the relationship among decreaseers, increasers and invaders and the range condition.

Relationship Among Decreaseers, Increasers and Invaders.





Suggestions

- Have Wardens break up into small groups and conduct a one metre square plant survey to determine with some accuracy the percentage of plant species on the land.
- Ask the landowner how they rate their own range land, excellent, good, fair or poor.

Cows and Fish

Cows and Fish is a project with many partners: Alberta Cattle Commission, Trout Unlimited Canada, Alberta Environmental Protection, Alberta Agriculture, Food and Rural Development, Canadian Cattlemen's Association and Fisheries and Ocean Canada.

Cows and Fish have a proactive approach with a focus on watersheds, especially riparian grazing management. The office is located in Lethbridge but the message is the same in the southern Alberta foothills as it would be in northern Peace Country. An understanding of the function of landscape and how all land uses fit together will enhance sustainability of grazing land and proper riparian management.

For more information, contact the Cows and Fish Program Coordinator.



last updated: 08/99

Plant Characteristics for Judging and Identifying Native Range Plants

Name of Plant	Type of plant	Origin of Plant	Season of Growth	Grazing Response	Forage Value
Arrowgrass	Forb	Native	Cool	Increaser	Poor, poisonous
Balsmroot	Forb	Native	Cool	Increaser	Fair
Baltic rush	Grass-like	Native	Cool	Increaser	Poor
Bearded wheatgrass	Grass	Native	Cool	Decreaser	Good
Blue gamma	Grass	Native	Warm	Increaser	Good
Canada bluegrass	Grass	Introduced	Cool	Invader	Good
Canada wildrye	Grass	Native	Cool	Decreaser	Good
Canby bluegrass	Grass	Native	Cool	Decreaser	Good
Cheatgrass brome	Grass	Introduced	Cool	Invader	Poor
Common chokecherry	Shrub	Native	Warm	Decreaser	Fair, poisonous
Dandelion	Forb	Introduced	Cool	Invader	Poor
Death camas	Forb	Native	Cool	Increaser	Poor, poisonous
Foxtail barley	Grass	Native	Cool	Invader	Poor
Fringed sage	Shrub	Native	Cool	Increaser	Poor
Geranium (sticky)	Forb	Native	Cool	Decreaser	Good
Giant wildrye	Grass	Native	Cool	Decreaser	Fair
Goatsbeard	Forb	Introduced	Cool	Invader	Poor
Greasewood	Shrub	Native	Warm	Increaser	Fair, poisonous
Green needlegrass	Grass	Native	Cool	Decreaser	Good
Gumweed	Forb	Native	Warm	Increaser	Poor
Hairy wildrye	Grass	Native	Warm	Increaser	Fair
Hoary sagebrush	Shrub	Native	Warm	Increaser	Fair
Hooker's oatgrass	Grass	Native	Warm	Decreaser	Fair
Idaho fescue	Grass	Native	Cool	Increaser	Good
Indian ricegrass	Grass	Native	Cool	Decreaser	Good
Junegrass	Grass	Native	Cool	Increaser	Good
Kentucky bluegrass	Grass	Native	Cool	Invader	Good
Little bluestem	Grass	Native	Warm	Increaser	Poor
Loco-weed	Forb	Native	Cool	Increaser	Poor, poisonous
Larkspur	Forb	Native	Cool	Increaser	Poor, poisonous
Lupine	Forb	Native	Cool	Increaser	Poor, poisonous
Marsh reed grass	Grass	Native	Cool	Decreaser	Fair
Mountain brome	Grass	Native	Cool	Decreaser	Good
Narrow milkvetch	Forb	Native	Cool	Increaser	Poor, poisonous
Needle-and-thread	Grass	Native	Cool	Increaser	Good
Northern wheatgrass	Grass	Native	Cool	Decreaser	Good



Plant Characteristics for Judging and Identifying Native Range Plants

Name of Plant	Type of plant	Origin of Plant	Season of Growth	Grazing Response	Forage Value
Nuttall's saltsage	Shrub	Native	Warm	Decreaser	Good
Parry's oatgrass	Grass	Native	Cool	Increaser	Good
Peavine	Forb	Native	Warm	Decreaser	Good
Phlox	Forb	Native	Cool	Increaser	Poor
Plains muhly	Grass	Native	Cool	Increaser	Fair
Prairie Sage	Shrub	Native	Warm	Increaser	Fair
Prairie bulrush	Grass-like	Native	Cool	Increaser	Fair
Prickly rose	Shrub	Native	Cool	Increaser	Poor
Red-root pigweed	Forb	Native	Warm	Invader	Poor
Rough fescue	Grass	Native	Cool	Decreaser	Good
Russian thistle	Forb	Introduced	Warm	Invader	Poor
Sandberg bluegrass	Grass	Native	Cool	Increaser	Good
Sand grass	Grass	Native	Warm	Increaser	Fair
Saskatoon	Shrub	Native	Cool	Decreaser	Fair
Shrubby cinquefoil	Shrub	Native	Cool	Increaser	Poor
Slender wheatgrass	Grass	Native	Cool	Decreaser	Good
Slough grass	Grass	Native	Cool	Increaser	Fair
Streambank wheatgrass	Grass	Native	Cool	Decreaser	Good
Threadleaf sedge	Grass-like	Native	Cool	Increaser	Good
Timber oatgrass	Grass	Native	Cool	Increaser	Good
Tufted hairgrass	Grass	Native	Cool	Decreaser	Good
Two-grooved milkvetch	Forb	Native	Cool	Increaser	Poor, poisonous
Vetch	Forb	Native	Warm	Decreaser	Good
Western porcupine grass	Grass	Native	Cool	Decreaser	Good
Western snowberry	Shrub	Native	Cool	Increaser	Poor
Western wheatgrass	Grass	Native	Cool	Increaser	Good
Winterfat	Shrub	Native	Cool	Decreaser	Good
Yarrow	Forb	Native	Cool	Increaser	Poor

Adapted from Range Its Nature and Use, 1986.



3. Identify six forage plants that grow on local range land.

Forage crops include annual and perennial legumes and grasses, grass-like plants, forbs and shrubs consumed by grazing livestock or as stored feed. These crops are valuable not only in supplying food but in conserving soil and water resources.

The forage value of a plant species is determined by how it tastes to livestock, nutritional content and its dependability as a forage supply. Cattle like a grass that is high enough to let them wrap their tongues around it and get a big bite.

The best way to know range plants is to collect, mount and name them. One resource to support tame forage identification is Alberta Forage Manual published by Alberta Agriculture, Food and Rural Development. Refer to Supporting Resources section. The illustrations in the manual are limited to tame forage plants, not native forage plants. Native forage plants may be identified with the help of field guide books such as Plants of the Western Boreal Forest and Aspen Parkland. Refer to Supporting Resources section for more information.



Activity

Summary

Wardens will make a plant press to prepare plants for a forage folder.

How to make a Plant Press

MATERIALS REQUIRED

- sheet of 1/2" plywood (full size is 4' X 8') for 12 plant presses
- 1/4" carriage bolts 4" length (4 per person)
- winged nut (4 per person) to fit carriage bolt
- washers (4 per person) to fit carriage bolt
- newspaper
- corrugated cardboard (cut to size of plant press)
- labels
- glue or tape
- blotting paper (optional)

Cut the sheet of plywood into 24 equal pieces of 12" X 16" each.

Drill four 1/4" holes in the corners of the plywood pieces. Drill a pair of plywood pieces at the same time to ensure the press will fit together properly. The holes can be approximately 1/2" in from the top and side edges.



Each Warden will get two pieces of plywood, four carriage bolts, four washers and four winged nuts. Have them cut newspaper sheets to fit the size of the press. Each press should have at least two cm of newsprint.

If possible, collect stalk, leaves, flowers, seeds and roots of plant.

When Wardens gather a plant samples, the plant is carefully laid between blotting paper (the right stuff for pressing plants) or white paper to prevent the newsprint from marking the plant leaves. Layer the plant sandwich between layers of newsprint. And sandwich again between corrugated cardboard. The cardboard helps with proper air circulation when drying. Place the plywood cover on top, the washers and tighten each with the carriage bolts. Leave the plants in the press for about a week to dry. The newsprint paper absorbs moisture from the plants, as well as helps to press the plants.

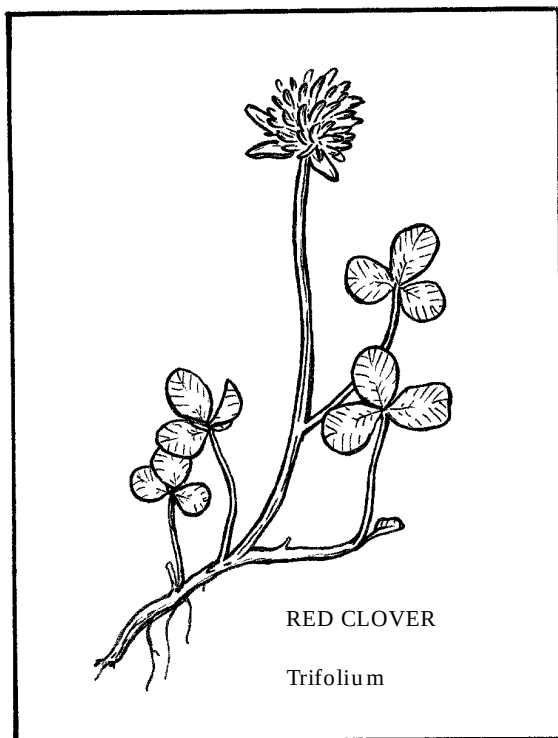
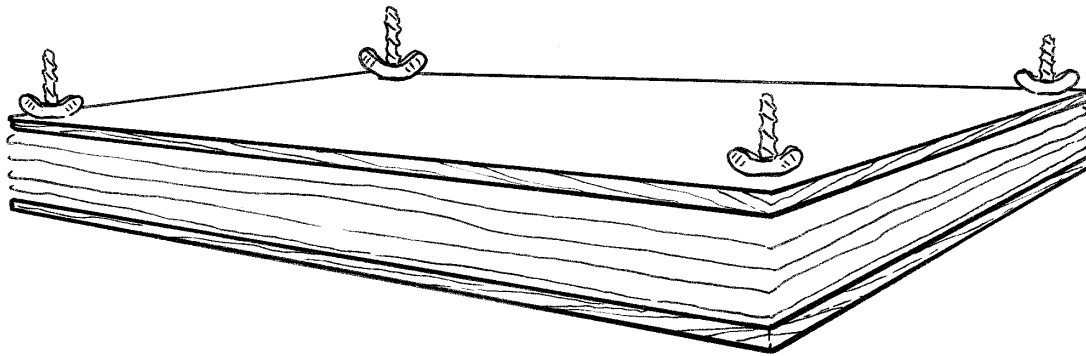
When the plant sample is pressed and dry, mount on paper by gluing or taping the plant's parts in place. Before mounting, have Wardens make notes about the plant, where found, native or introduced, decreaser, increaser or invader, on the back side of the page (so the plant impression will not interfere with writing.) On the front, write the name of the plant in the lower right hand corner. Fold the corner up to cover its identity. Place the samples in a folder or binder. Wardens can self-test their identification skills by looking at the forage samples. They can check their guess by flipping the corner down.

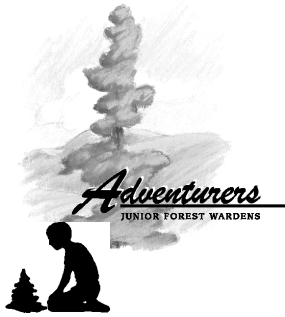
Other Suggestions

- You can make forage books for other members of your club by photocopying the pressed samples and stapling into booklets. Other leaders may find this a useful resource for up and coming Adventurers.
- Have Wardens find and identify at least two plant species that are increasers, decreasers or invaders.



Plant Press





LEADER
MANUAL

VIII

COMMUNITY SERVICE

Junior Forest Wardens learn to accept responsibility and the challenge to contribute to and improve their local and global communities. Every activity in our learning circle should be focused on making our communities environmentally safer places to live.

date completed



Help organize and implement a club community service project.

page 163

VIII. Community Service

1. Help organize and implement a club community service project.

Sowing the Seeds - One Person's Impact on the World

If you participate in a campout or a Junior Forest Warden Conference, you will certainly see someone with a bushy white beard and a gaggle of people following him, all with seedlings in tow, then you will be seeing Ernst Klaszus. A leader with Junior Forest Wardens since 1983, Ernst has been the unofficial tree planting guru for hundreds of Wardens, their parents and leaders. In recent years, tree planting and Ernst Klaszus have become synonymous.

To say it all started in the garbage would be stretching it, but not by much. When Ernst and his wife, Laila first came to Canada in 1965, they visited the Northern Forestry Centre in Edmonton. Ernst remarked to one of the staff that he had seen seedlings in the trash and was curious why people would throw such a thing out. Somewhat alarmed that this was common practice for experimental seedling stock, Ernst made arrangements to receive any of the garbage-bound seedlings. That first year the Canadian Forest Service gave the Klaszus' 3,000 seedlings!

Ever since that first batch, Ernst has planted on the average of 1,000 seedlings a year. To date, Alberta has over 30,000 seedlings planted by Ernst who has never accepted anything for his efforts. He continues to plant even after his retirement as a school teacher.

If you ask Ernst why he does it, he will have a dozen reasons but it all comes down to leaving a legacy for future generations to nurture and enjoy. Ernst finds that everything in the world has become so transitory, so passing. Everything we use and acquire is disposable and isn't meant to last long. Trees, on the other hand, have a lifespan of a few hundred years; some trees have been in existence longer than Europeans have been in North America. Through tree plantings, Ernst is able to leave behind more than just a wonderful family and friends who will remember him fondly. He is leaving a legacy with a positive impact on our ever increasingly strained environment.



last updated: 06/99

In the past few years, Ernst has worked with school children to excite them about tree planting. If only one out of fifty children that Ernst talks to gets excited about and continues to plant trees, then he has had a tremendous impact. Sowing the seeds for conservation of our natural world with today's youth is as important an act of community service as the tree planting itself.

Community Service Projects

Community service is voluntary work done for the greater good in one's own community. Service gives a benefit and value to the community and is given freely with no labour cost and without financial obligations. Community service, therefore, cannot be a fund-raiser for a JFW club while at the same time providing a service to the community. It can be any of the following to complete this component of the Forest Module:

- Tree planting
- An Arbor Day event in the community
- Yellow Fish Program
- Cleanup
- Exhibit booth at a Sportsman Show/Trade Fair
- Educational Activity at a large public event
- Any of the Habitat Improvement Projects. See pages 71 and 72.





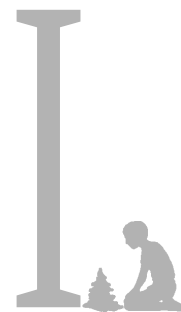
Yellow Fish Program

The Yellow Fish Program has wardens learning about wastewater treatment, storm drainage and actions they can take to reduce their impact on the river. Wardens paint a yellow fish symbol on storm drains in their community. This symbol helps the public recognize that what we put down the drain ends up in a river. There is a Teacher's Guide for a 41 page booklet entitled, Follow the Yellow Fish Road for grades 4 to 6 students. This can still be a useful guide for Junior Forest Warden Leaders and Adventurers who wish to develop leadership skills and lead this activity with younger Wardens.

Contact the Yellow Fish Program, Drainage Branch, City of Edmonton, refer to the Phone Book Yellow Pages for contact information.

Wardens are expected to organize and carry through on the community project. A publication that may help Wardens organize a community project is entitled, A Working Guide to Planning An Event, available from the Publications Office, Alberta Agriculture, Food and Rural Development. Refer to the Resources Section in this program.

APPENDIX



Mathematical Conversion Factors

Adventurers
JUNIOR FOREST WARDENS

APPENDIX

Miscellaneous Conversion Factors

Units	FBM	FT3	Cord	Cunit	M3(st)	M3
1000 fbm (board feet)	1000	155	1.83	1.55	6.7	4.4
1 cubic foot	6.43	1	1/85	.01	.043	.028
1 cord	546	85	1	.85	3.6	2.4
1 cunit	643	100	100/85	1	4.3	2.8
1 cubic metre (stacked)	150	23.4	.27	.234	1	.67
1 cubic metre (solid wood)	227	35.31	.41	.353	1.5	1

Factors for Converting to Metric (st) Units

Length

inches X 2.54 = cm
 feet X 0.3048 = cm
 yards X 0.9144 = cm
 chains X 20.1168 = cm
 miles X 1.60934 = km

Area

square inches X 6.4516 = cm²
 square feet X 0.0929030 = m²
 square yards X 0.836127 = m²
 mil-acre X 4.04686 = m²
 acres X 0.404686 = ha
 square miles X 2.58999 = km²

Volume Capacity

cubic feet X 0.0283168 = m³
 gallons X 4.54690 = L
 cubic yards X 0.764555 = m³
 cords X 3.62456 = m³ (stacked)
 cunits X 2.83168 = m³
 cords (8 ft softwood) X 2.298712 = m³
 cords (4 ft softwood) X 2.406377 = m³
 cords (8 ft hardwood) X 1.982177 = m³
 cords (mixed inventory) X 2.152078 = m³
 fbm X 0.00564972 = m³ (logs)

Mass (Weight)

ounces X 28.3495 = grams (g)
 pounds X 0.453902 =
 kilograms (kg)
 tons (short, 2000 lbs) X
 0.907185 = tonnes
 ton X 907.2 = kilograms

Ratios

cords per acre X 8.95647 = m³ (stacked)/ha
 cords per acre (8 ft softwood) X 5.457838 = m³/ha
 cords per acre (4 ft softwood) X 5.947672 = m³/ha
 cords per acre (8 ft hardwood) X 4.898058 = m³/ha
 cords per acre (mixed inventory) X 5.417892 = m³/ha
 fbm per acre X 0.0139607 = m³/ha (logs)
 fbm per acre X 0.0058309 = m³/ha (lumber)
 square feet per acre X 0.229568 = m²/ha
 cubic feet per acre X 0.069972 = m³/ha
 tons per acre X 2.24170 = t/ha
 pounds per acre X 1.12085 = kg/ha
 imp. gallons per acre X 11.23332 = L/ha
 miles per gallon X 0.354 = km/L

Map Ratios

Map Scale	Imperial	Metric
1:10 000	1 inch = 12.63 chains	1 cm = 100 m = 0.1 km
1:15 000	1 inch = 20.00 chains	1 cm = 158 m = 0.16 km
1:25 000	1 inch = 31.57 chains	1 cm = 250 m = 0.25 km
1:50 000	1 inch = 63.13 chains	1 cm = 500 m = 0.5 km

Factors for Converting Metric to Canadian Units

Length

cm X 0.393701 = inches
 m X 3.28084 = feet
 m X 1.09361 = yards
 m X 0.047097 = chains
 km X 1.09361 = yards

Area

cm² X 0.155000 = inches²
 m² X 10.7639 = feet²
 m² X 1.19599 = yards²
 m² X 0.247105 = mil-acre
 ha X 2.47105 = acres
 km² X 0.386102 = miles²

Volume (Capacity)

m³ X 35.3147 = cubic feet
 L X 0.219969 = gallons
 m³ X 1.30795 = yards³
 m³ (stacked) X 0.275896 = cords
 m³ X 0.353147 = cunits
 m³ (2.44m softwood) X 0.452753 = cords
 m³ (1.22 m softwood) X 0.415460 = cords
 m³ (2.44 hardwood) X 0.504496 = cords
 m³ (mixed inventory) X 0.464667 = cords
 m³ (logs) X 177 = fbm

Mass

g X 0.0352740 = ounces (oz)
 kg X 2.20462 = pounds (lbs)
 tonnes X 1.10231 = (short)
 tons

Ratios

m³ (stacked)/ha X 0.11161 = cords per acre
 m³/ha (2.44 m softwood) X 0.183223 = cords per acre
 m³/ha (1.22 m softwood) X 0.168133 = cords per acre
 m³/ha (2.44 m hardwood) X 0.204163 = cords per acre
 m³/ha (mixed inventory) X 0.188044 = cords per acre
 m³/ha (logs) X 71.6295 = fbm per acre
 m³/ha (lumber) X 171.5 = fbm per acre
 m³/ha X 4.35600 = square feet per acre
 m³/ha X 14.2913 = cubic feet per acre
 t/ha X 0.446090 = pounds (lbs) per acre
 kg/ha X 0.092180 = pounds per acre
 L/ha X 0.0890208 = imperial gallons per acre
 km/L X 2.82481 = miles per gallon

Notes

- GMT means green metric tonnes with bark on.
- M3 means cubic metres, solid wood, no bark
- STM3 means stacked cubic metre with bark on.
- Cunit is a measurement which means solid wood, no bark.
- Cord means with bark on.
- ODMT means oven dry metric tonne, solid wood, no bark.
- MFBM is 1000 foot board measure, solid wood, no bark.
- Scale conversion factors based on 2.44 metres bolt

Miscellaneous Conversions

1 acre = 0.40 hectares (ha)
 1 hectare (ha) = 2.47 acres
 trees / acre X 2.47 = trees / ha
 1 cunit / acre = 7 cubic metres (m³) / hectare (ha)
 1 cubic metre (m³) / hectare (ha) = 0.14 cunits / acre
 1 mile = 1.61 kilometers
 1 kilometre = 0.62 miles
 1 chain (66 feet) = 20.12 metres (m)
 1 metre (m) = 0.05 chains
 1 gallon = 4.55 litres (l)
 1 litre (l) = 0.22 gallons
 1 inch = 2.54 centimeters (cm)
 1 centimeter (cm) = 0.393 inches
 1 foot = 0.3048 metres (m)
 1 metre = 3.28 feet
 km X litre X 2.84 = miles per gallon

fbm or foot board measure is one board measuring

1" X 12" X 12" or 2" X 6" X 12", and so on.

Map Scale Conversion Table

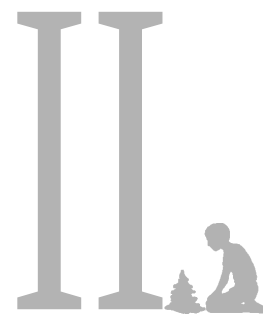
Scale	Metric (1 cm=)	Imperial (1 inch= approx.)
1:15 000	0.15 km	/ mile
1:20 000	0.20 km	1 / 3 mile
1:30 000	0.30 km	fi mile
1:40 000	0.40 km	2 / 3 mile
1:50 000	0.50 km	fi mile
1:60 000	0.60 km	1 mile
1:100 000	1.00 km	1 fi miles
1:250 000	2.50 km	4 miles
1:500 000	5.00 km	8 miles
1:1 000 000	10.00 km	16 miles

Table of Trigonometric Ratios

θ	sin	cos	tan	θ	sin	cos	tan
0	0.0000	1.0000	0.0000	45	0.7071	0.7071	1.0000
1	0.0175	0.9998	0.0175	46	0.7193	0.6947	1.0355
2	0.0349	0.9994	0.0349	47	0.7314	0.6820	1.0724
3	0.0523	0.9986	0.0524	48	0.7431	0.6691	1.1106
4	0.0698	0.9976	0.0699	49	0.7547	0.6561	1.1504
5	0.0872	0.9962	0.0875	50	0.7660	0.6428	1.1918
6	0.1045	0.9945	0.1051	51	0.7771	0.6293	1.2349
7	0.1219	0.9925	0.1228	52	0.7880	0.6157	1.2799
8	0.1392	0.9903	0.1405	53	0.7986	0.6018	1.3270
9	0.1564	0.9877	0.1584	54	0.8090	0.5878	1.3764
10	0.1736	0.9848	0.1763	55	0.8192	0.5736	1.4281
11	0.1908	0.9816	0.1944	56	0.8290	0.5592	1.4856
12	0.2079	0.9781	0.2126	57	0.8387	0.5446	1.5399
13	0.2250	0.9744	0.2309	58	0.8480	0.5299	1.6003
14	0.2419	0.9703	0.2493	59	0.8572	0.5150	1.6643
15	0.2588	0.9659	0.2679	60	0.8660	0.5000	1.7321
16	0.2756	0.9613	0.2867	61	0.8746	0.4848	1.8041
17	0.2924	0.9563	0.3057	62	0.8829	0.4695	1.8807
18	0.3090	0.9511	0.3249	63	0.8910	0.4540	1.9626
19	0.3256	0.9455	0.3443	64	0.8988	0.4384	2.0503
20	0.3420	0.9397	0.3640	65	0.9063	0.4226	2.1445
21	0.3584	0.9336	0.3839	66	0.9135	0.4067	2.2460
22	0.3746	0.9272	0.4040	67	0.9205	0.3907	2.3559
23	0.3907	0.9205	0.4245	68	0.9272	0.3746	2.4751
24	0.4067	0.9135	0.4452	69	0.9336	0.3584	2.6051
25	0.4226	0.9063	0.4663	70	0.9397	0.3420	2.7475
26	0.4384	0.8988	0.4877	71	0.9455	0.3256	2.9042
27	0.4540	0.8910	0.5095	72	0.9511	0.3090	3.0777
28	0.4695	0.8829	0.5317	73	0.9563	0.2924	3.2709
29	0.4848	0.8746	0.5543	74	0.9613	0.2756	3.4874
30	0.5000	0.8660	0.5774	75	0.9659	0.2588	3.7321
31	0.5150	0.8572	0.6009	76	0.9703	0.2419	4.0108
32	0.5299	0.8480	0.6249	77	0.9744	0.2250	4.3315
33	0.5446	0.8387	0.6494	78	0.9781	0.2079	4.7046
34	0.5592	0.8290	0.6745	79	0.9816	0.1908	5.1446
35	0.5736	0.8192	0.7002	80	0.9848	0.1736	5.6713
36	0.5878	0.8090	0.7265	81	0.9877	0.1564	6.3138
37	0.6018	0.7986	0.7536	82	0.9903	0.1392	7.1154
38	0.6157	0.7880	0.7813	83	0.9925	0.1219	8.1443
39	0.6293	0.7771	0.8098	84	0.9945	0.1045	9.5144
40	0.6428	0.7660	0.8391	85	0.9962	0.0872	11.4301
41	0.6561	0.7547	0.8693	86	0.9976	0.0698	14.301
42	0.6691	0.7431	0.9004	87	0.9986	0.0523	19.081
43	0.6820	0.7314	0.9325	88	0.9994	0.0349	28.636
44	0.6947	0.7193	0.9657	89	0.9998	0.0175	57.290
				90	1.0000		

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APPENDIX



Nest Constructions



APPENDIX

Nest Box Sizes and Information by Species

Place 10 cm of wood shavings, dried grass or other suitable material in the bottom of the box and if possible change annually.

Metric Conversions
1 inch = 2.5 cm
1 foot = 30 cm
1 acre = 0.4 hectare

SPECIES	Entrance Hole diameter (cm)	Height of Hole above floor (cm)	Inside Floor area (cm)	Height of Wall panels (cm)	Minimum Height above ground (m)	Maximum Number of Pairs per acre	Notes
Chickadee	3	15	9x9	20	2-5	1-2	place near shrubs in woods
Nuthatch	"	"	"	"	2	"	
Downy Woodpecker	"	"	"	"	3-5	"	
Bluebird	4	15	13x13	20	2-3	1	place on tree in open area
Tree Swallow	"	"	"	"	"	8	
House Sparrow	"	"	"	"	"	4	
House Wren	2.5-3	15-20	15x15	15-20	"	"	
Hairy Woodpecker	4	22-30	15x15	30-35	3-5	1	on trees in open area
Crested Flycatcher	5	15	"	20	"	1	
Starling	4	"	"	"	"	4	
Purple Martin	4	"	"	"	"	50	
Common Flicker	6	355	15x15	40	2-5	2	on tree near shrubs or open area
Saw-whet Owl	6.5	20-25	"	25-30	3.7-6	"	
American Kestrel	7.5	31	25x25	40	6-9	—	place on tree in open area
Pileated Woodpecker	oval		10x10	20	8	—	woodpecker in woods,
Hooded Merganser	"		"	"	"	—	wood duck on tree near
Wood Duck	"		"	"	"	—	shrubs in open area
Barn Owl	15	10	25x46	30-38	3.7-5.5	—	place nest in woods
Screech Owl	705	23-30	20x20	25-30	3-8	—	

Cavity Nesting Ducks

Wood ducks, goldeneye, hooded and common mergansers nest in holes in trees, often near water. Below are some things to keep in mind:

- Have the nest boxes ready by early March when the birds are looking for breeding sites.
- The entrance should be visible to the duck from the waterway.
- You can place the posts for nest boxes in the water during the winter by drilling through the ice and pounding in the pole.
- Each box should have 3 to 5 inches (7 to 13 cm) of wood shavings and be replaced every year.
- If you have a suitable habitat but no trees, make a wood duck nest box and adjust the entrance hole for other cavity-nesting ducks.

Nesting Shelves

Birds such as robins, phoebes and barn swallows will not nest in boxes, they will accept a nesting shelf tucked away under some building eaves.

Procedure

MATERIALS REQUIRED

- 2 cm (3/4") untreated softwood or other weather resistant wood
- 4 cm (1 1/2") coated flat-head screws

Follow the construction plan in the illustration below. Cut a roof, bottom, two sides, back and front for the nesting shelf. You can leave the nesting shelf unpainted or treated with waterproof varnish. If you decide to paint the nesting shelf, the best colours are brown, tan or gray.

Mount the nesting shelf underneath the eaves of a garage or house at least four to five meters away from a door.

Clean the shelf of any nests after the young have fledged. Robins will build a nest every year and often twice in the summer. By removing the nests, it will prevent the adults from building one on top of another.

Provide nesting materials by hanging from a tree a mesh onion bag stuffed with twigs, yarns, feathers and dried grasses.

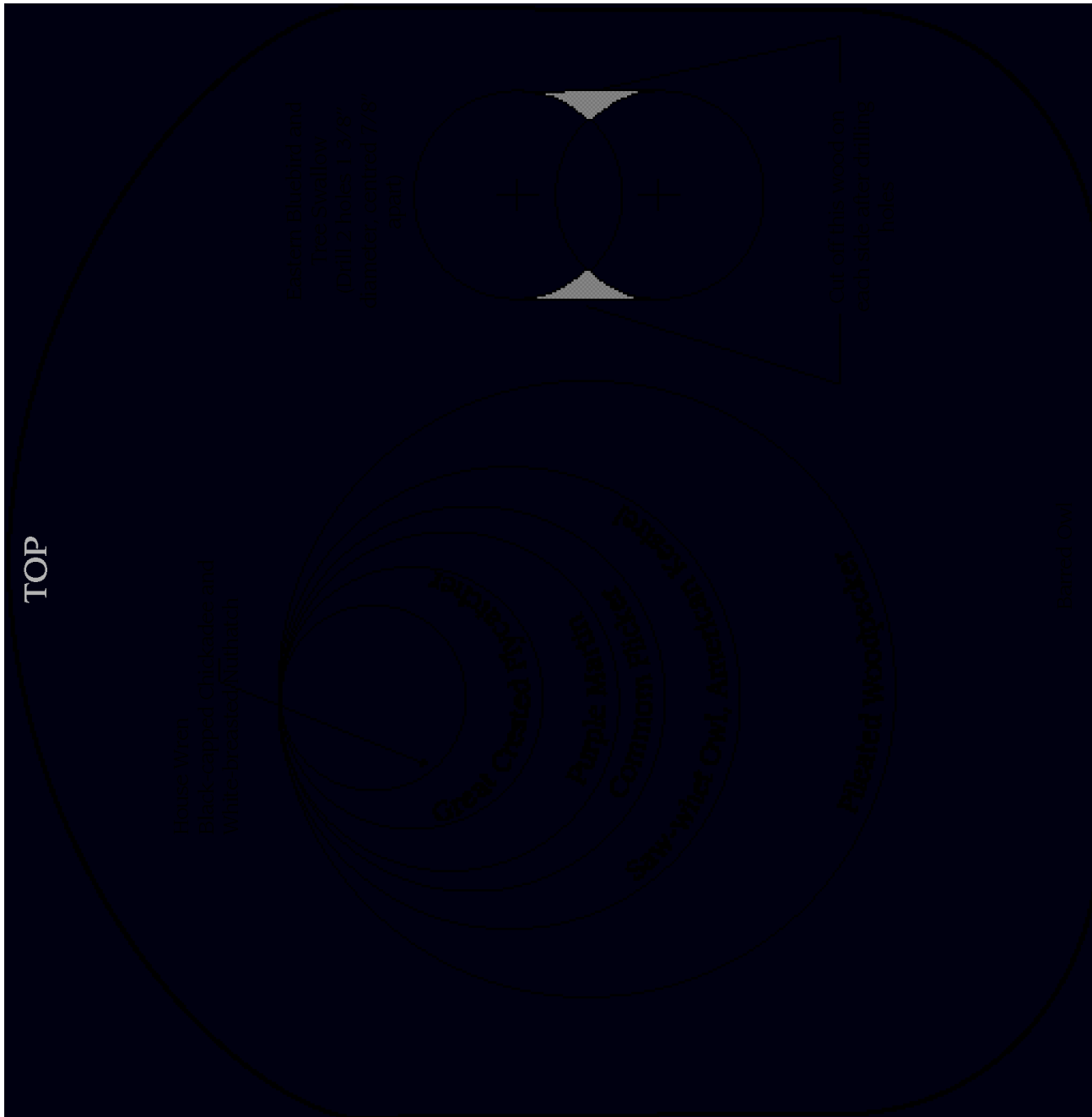
Annually check the nesting shelf to see if it is still in good repair and securely mounted.

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Entrance Hole Sizes for some birds that use Nest Boxes

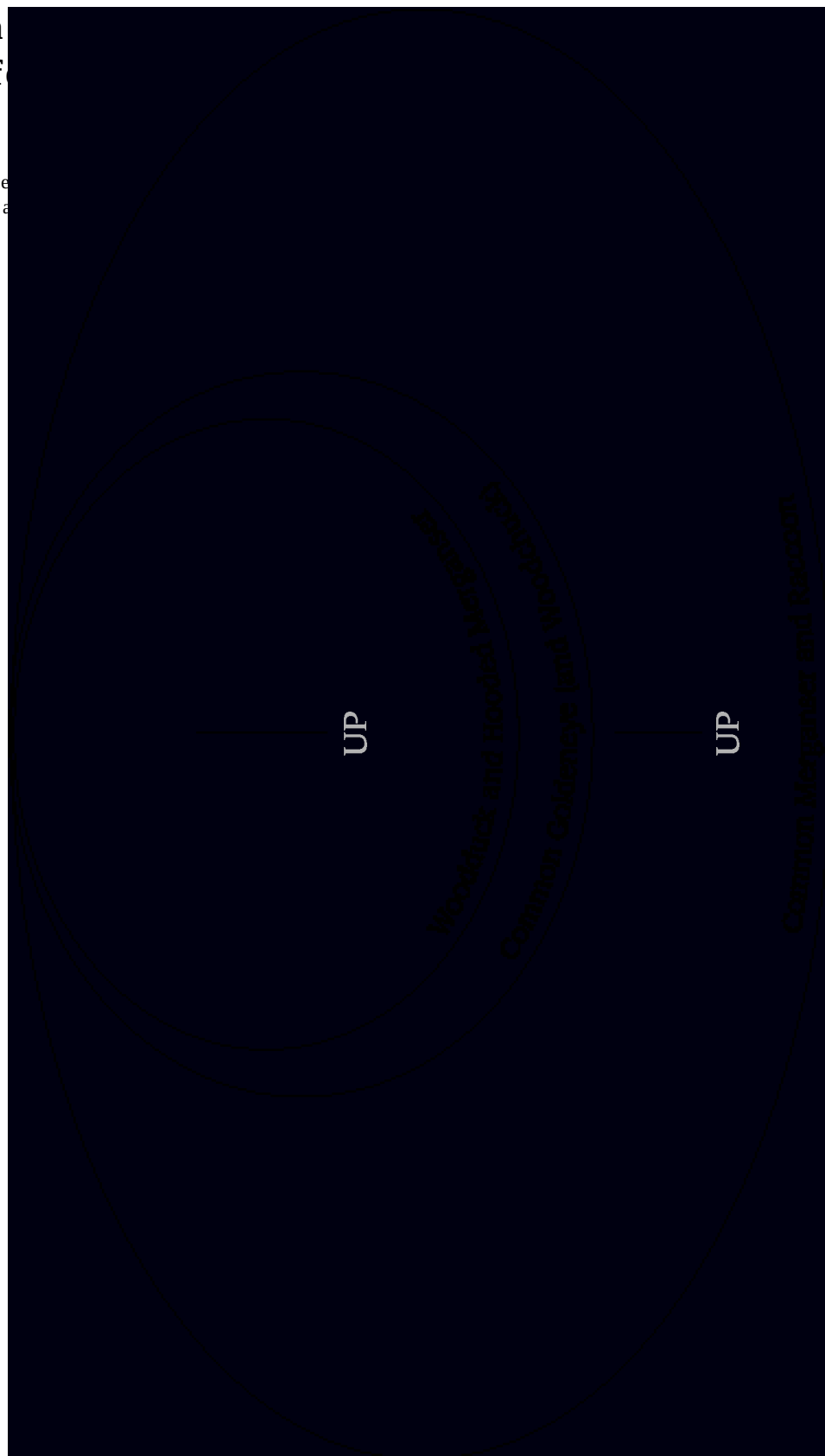
Trace onto wood using carbon paper

METRIC CONVERSION: 1 inch = 2.5 cm



Entrance Sizes for Boxes

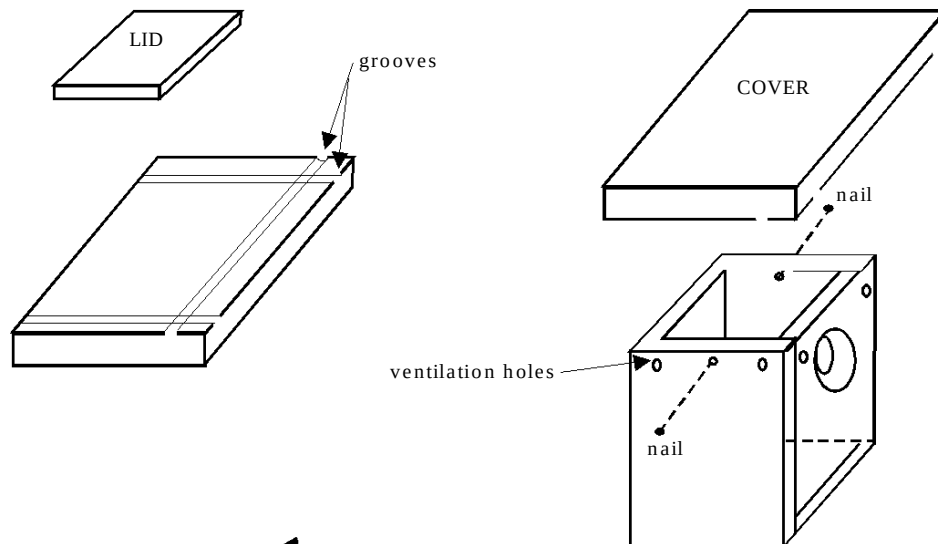
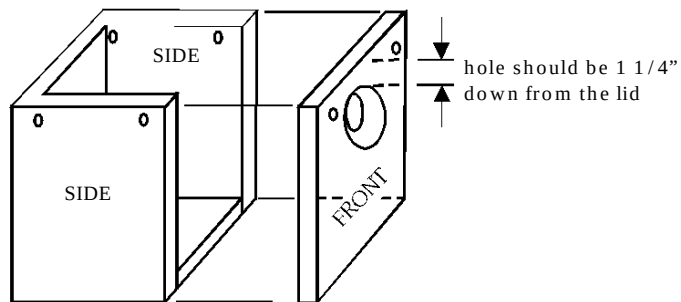
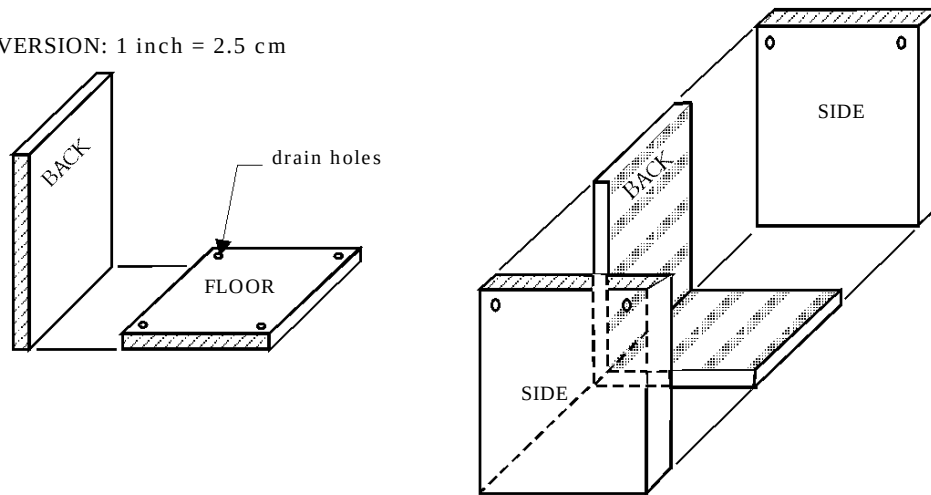
These can be
wood with ca



last updated: 06/99

Nest Box Construction

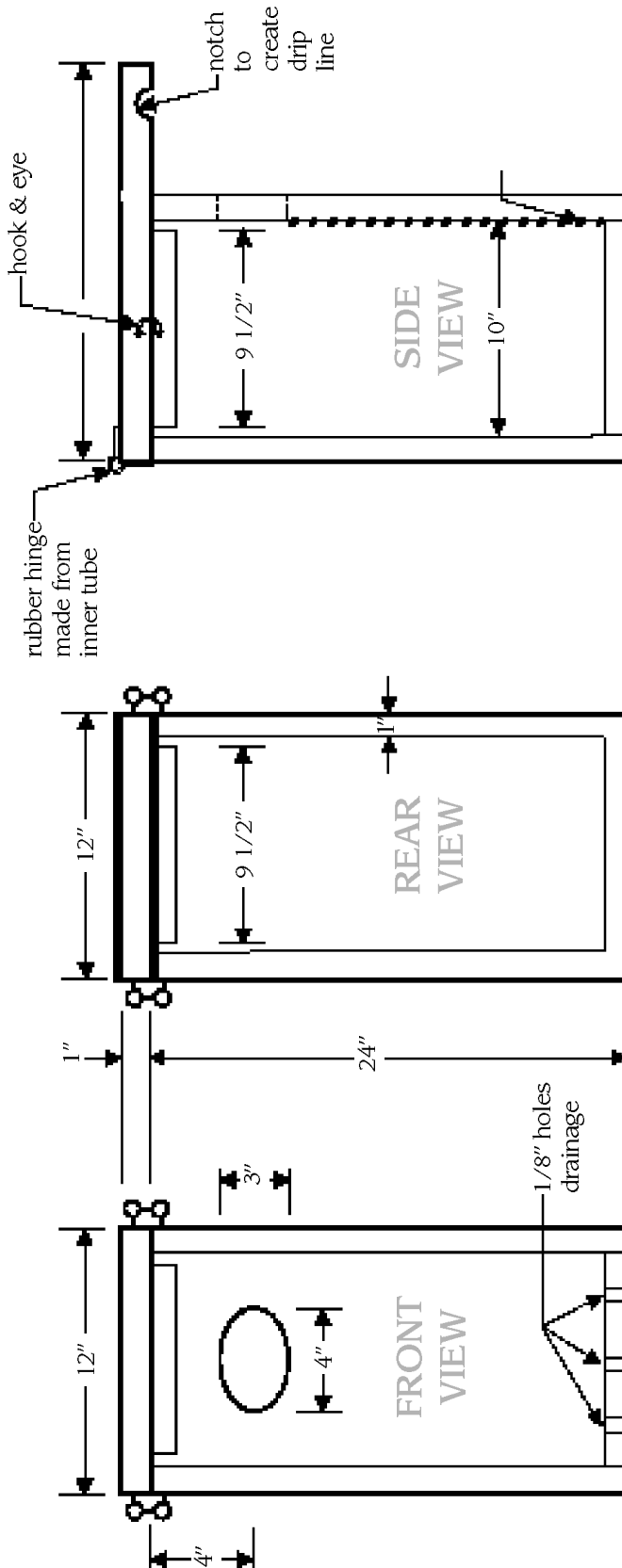
METRIC CONVERSION: 1 inch = 2.5 cm



Adventurers

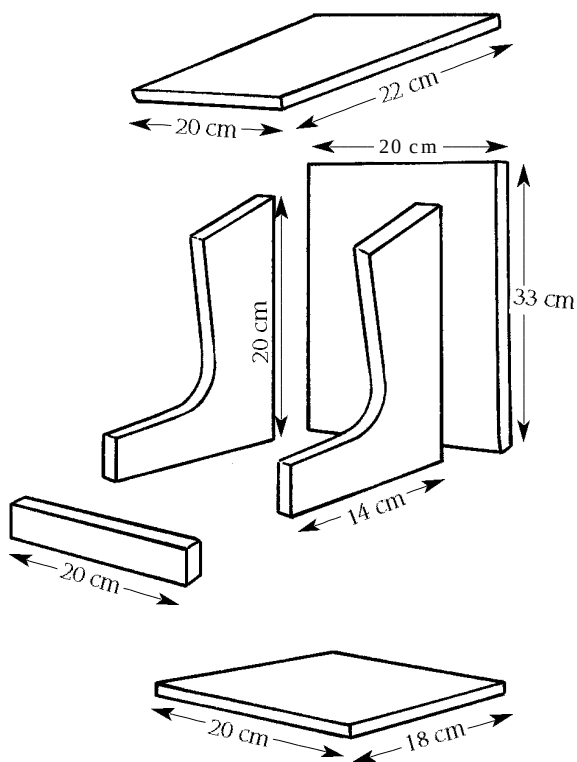
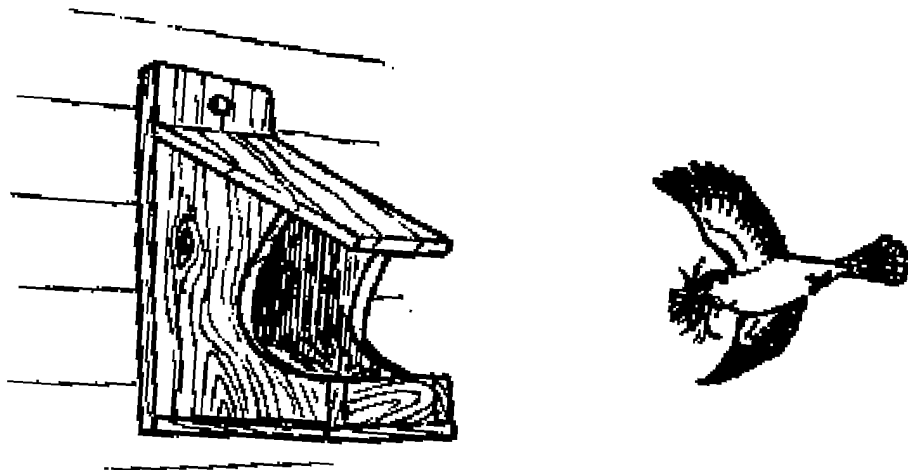
Woodduck Nesting Box

METRIC CONVERSION: 1
inch = 2.5 cm



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Nesting Shelf

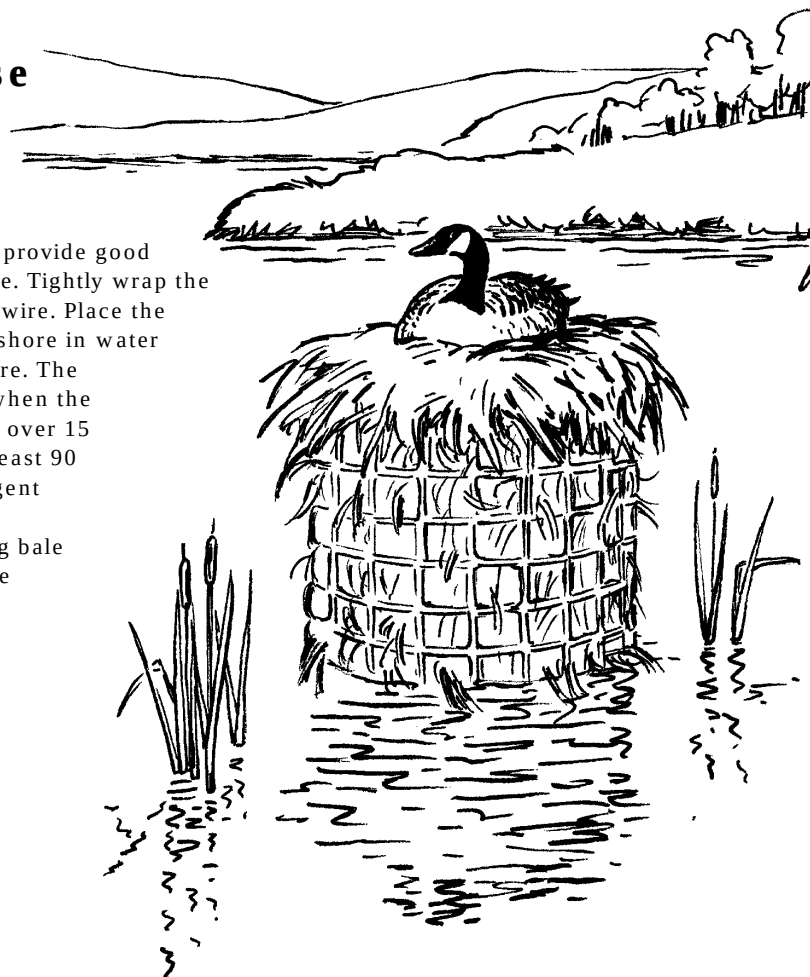


Small Mammal Nest Boxes

	Flying Squirrel	Red Squirrel
Entrance hole diameter (cm)	3	7.5
Height of hole above floor (cm)	15	50
Inside floor area (cm)	10 x 14	25 x 28
Height of wall panels (cm)	20	60
Minimum Height above ground (m)	2.5 - 4	6 - 9
Notes:		entrance hole on side

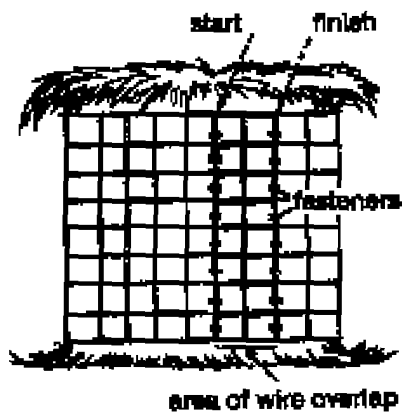
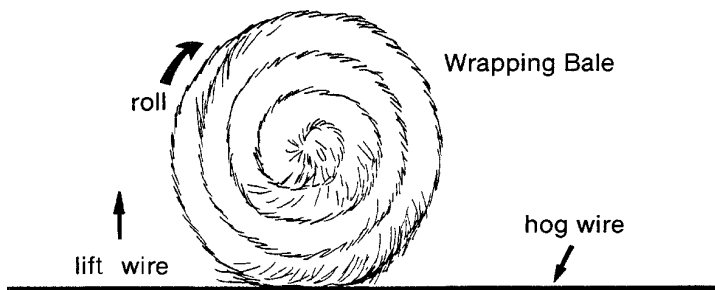
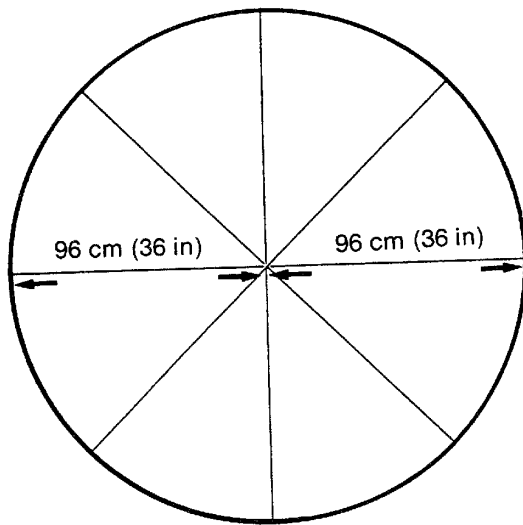
Canada Geese Nesting Bales

Round (1.5m) flax bales provide good nesting for Canada geese. Tightly wrap the bales with hog or paige wire. Place the bale 20 to 25 metres offshore in water no deeper than one metre. The minimum water depth when the water is open should be over 15 cm. Space the bales at least 90 metres apart with emergent vegetation or shoreline projections. Each nesting bale needs a minimum of one hectare of wetland.



last updated: 06/99

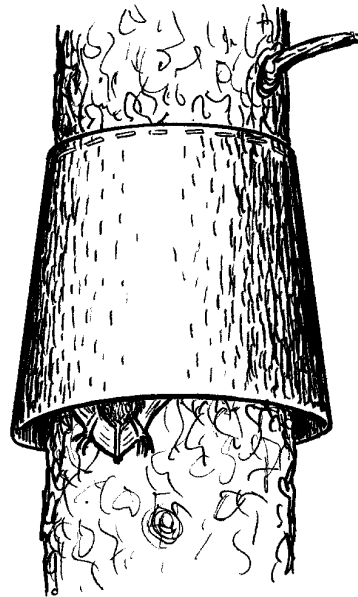
Construction of Nesting Bales



Make a Simple Bat Roost

Wrap a one metre piece of tar paper around a tree trunk, 2 to 5 metres above the ground. Staple or nail the tar paper snugly around the top edge to prevent water leaking down into the tar paper skirt. The bats enter from below. Check annually for damage.

Fact: A single brown bat can eat as many as 7,000 insects a night.

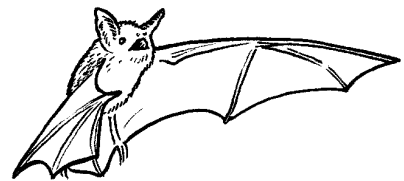
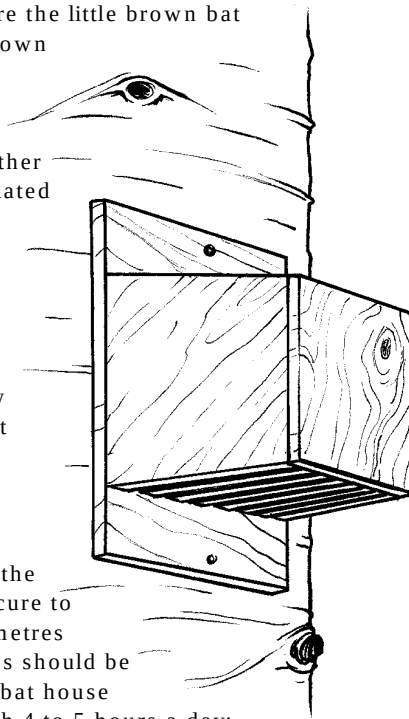


Build a Bat House

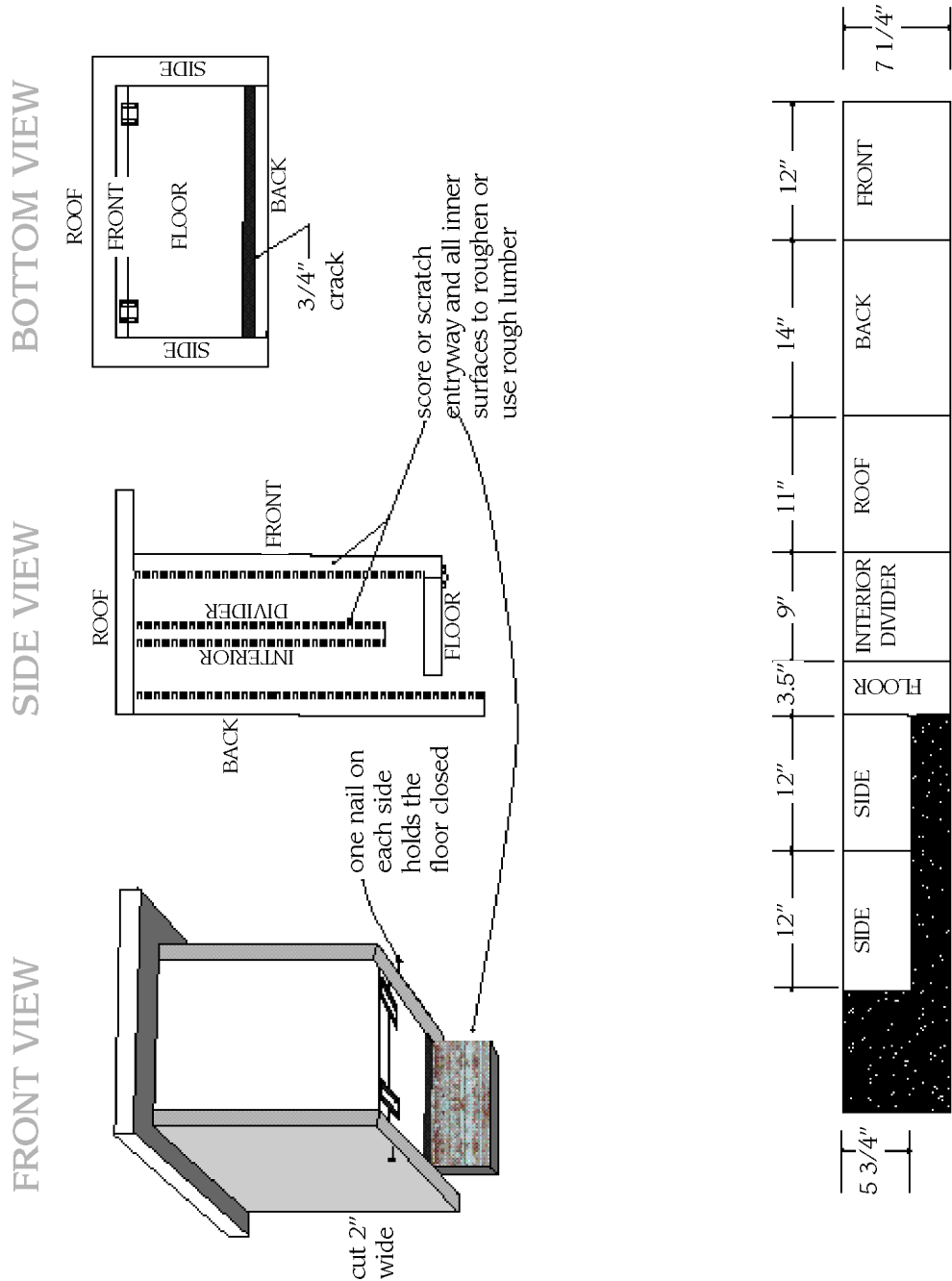
Two common bats in Alberta are the little brown bat and big brown bat. The little brown bat prefers to roost in hot, dry places like attics, church belfries and barn roofs. Big brown bats, on the other hand, prefer cooler, more ventilated sites like rock crevices, tree hollows and out-buildings.

Cut the wood according to the diagrams below. Place the bat house in an area that you know bats exist already. If you are not sure, give the bat house two years and then relocate.

Bats are particular, so here are some considerations regarding the placement of the bat house: secure to a building or tree trunk 4 to 5 metres above the ground; tree branches should be no closer than 1.5 metres; the bat house should receive the sun's warmth 4 to 5 hours a day; the nearest major obstacle should be 6 metres away; and place where there are lots of insects such as a forest edge, woodlot, meadow, marsh, river and pond.

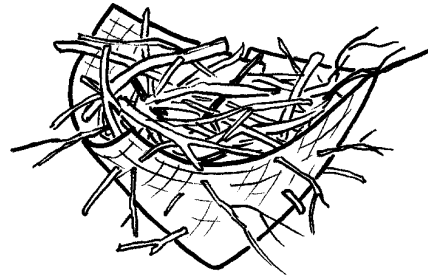
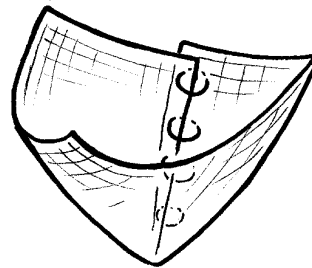
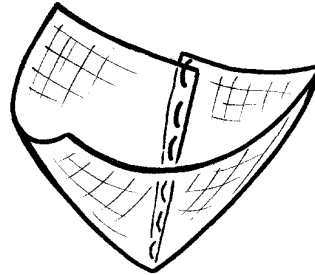
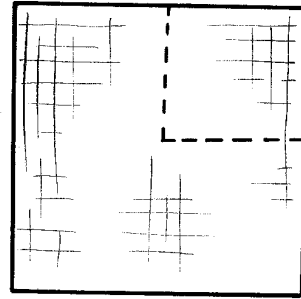
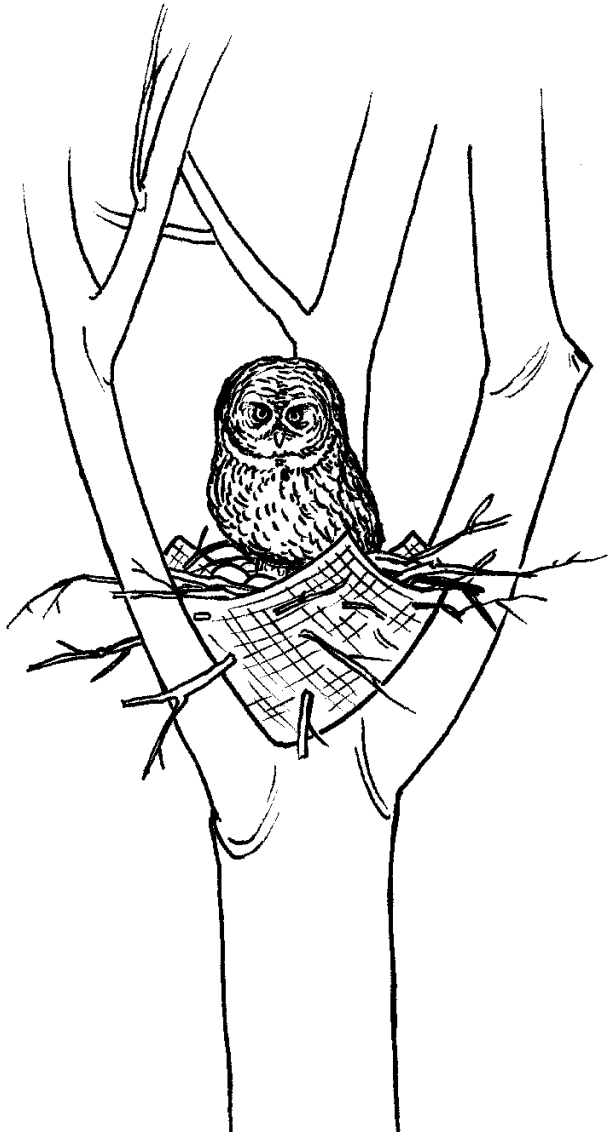


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MATERIALS REQUIRED

- 2 cm (3/4") wood not treated and not planed ((does not emit toxic fumes)
- 4 cm (1 1/5") flathead screws
- caulking (for lose fitting seams and joints)
- dark paint or stain or cover in tar paper



last updated: 06/99

APPENDIX



Helpful Guidelines



APPENDIX

Guidelines for Requesting Information

Be Specific

If you are specific about the materials you need or the issues you are interested in, your chance of obtaining useful information is greatly increased. A blanket statement like, "Send me everything you have." Is not economical or ecological.

Request Only What You Need

Read and use what you get and pass it on.

One Request For One Group

Streamline your requests for printed materials. Have the source send enough copies for the group instead of individuals requesting separately. If your group has different information needs from the same source, ask that they send all the materials in one package to one address.

Look Locally

Local sources, such as the community public library and your school library may have information on the topic you need. Regional agencies, organizations can also provide valuable information and assistance, particularly on local issues.

Pay the Postage

If you are requesting information from a non-profit or volunteer organization, send a self-addressed, stamped envelope. You will get a better response and it helps out those groups with limited budgets.

Plan Ahead

If you are requesting material that you need right now then you are asking too late! Allow time for offices to process the materials, and the mail system to work. Book videos and films approximately two to three weeks in advance.

Think Environmentally

Set an example and model the environmental concepts you are learning. Reuse envelopes and paper when requesting information. Show others how simple it is to do-by doing it!

Guidelines for Contacting Speakers

Request a Speaker Well in Advance

Since most speakers come to youth group meetings on volunteer time, they need some time to juggle other obligations and appointments. Be specific about the date and time of your event and book the speaker(s) three to four weeks in advance.

Introduce Yourself

Be proud of yourself and the group of Junior Forest Wardens that you represent. Be clear with your request and the event you are requesting the guest's presence at. Describe the audience, their age, how many there will be, and the setting of the presentation.

Document Everything

- The 5 Ws - Keep notes on whom you are speaking to, phone number, mailing address and what the person will be speaking about or helping with and any equipment or other needs they may have.
- Confirm - Telephone the speaker three to four days before the event or send a letter in advance to confirm your understanding of what the speaker will be doing and where.
- Thank You - Thank the speaker with a small gift after the presentation or mail a card of appreciation later.

Guidelines for a Presentation

Be Prepared

Know the information inside and out. Read everything you can on the topic. Remember, you know more than your audience-- that's why you are doing the presentation.

It's Like Telling a Story

Your presentation should have a beginning, a middle and an ending. Demonstrate a flow of ideas in your presentation by providing the information and facts together. By doing so the audience can easily develop an understanding of your presentation topic.

last updated: 06/99

Make Cue Cards

Use small file cards to write down key points to trigger your memory. You are using them to jog your memory not to read from, don't write everything down every word you plan to say. Number the cards in numerical order. If you drop the cards then you can quickly put them back in their order.

Use Props

You can make your presentation more effective by using artifacts, photographs, anything that your audience can see and/or handle. Many people are visual learners and by actually seeing something and handling it makes the information more meaningful for them.

Start on the Right Foot

Begin slowly. It usually takes an audience a few minutes to adjust themselves to listen to a speaker. Do not make the first two sentences contain the most important information, otherwise it is lost on deaf ears.

End With a Bang

Have a definite ending. Summarize the key points made in your presentation so the audience can do a mental check on their understandings of the presentation. End with a few statements to give the audience food for thought.

Say What You Think

Do not be afraid to state your opinion, that's what will make your presentation unique to you.

Oxygen Helps

Force yourself to take two to three slow, deep breaths before you start. You will be amazed and relieved how much this helps to calm jittery nerves.

Practice Makes Perfect

If you want to do the best presentation ever, practice in front of a mirror or use a tape recorder. As you play back the tape, listen for any word repetitions, a smooth flow of ideas, those nasty bits like ums and aws. Practice will help you say what you mean to say in the best way possible. The more you practice public speaking, the better you do at it and the more comfortable you feel.

Any Questions?

If you have the type of presentation where questions may be necessary, leave five to 10 minutes after your closing remarks. Thank the audience after the question and answer session.

Materials

Think about whether you want the group rustling papers during your presentation if you pass printed information out before you start. After the presentation, leave any brochures or handouts on a table which summarizes your session or lists sources for more information on the topic.

How to Publicize Your Event or Project

Getting Started

Someone in the club should be assigned the job of making a list of the contacts in the local radio, television and cable stations that will be contacted to help promote your event. Get the names and telephone numbers of the Program Directors. Keep the list updated for future events.

Write a Media Release

It's not as hard as it sounds. Remember the 5Ws: Who, What, Where, When, and How. Write a one-page, double spaced media release stating the name of your group, age, the number of people involved in the project or event and a description of the event. The most important information goes in the first paragraph. Add a contact name and phone number at the bottom of the page. The Media Release should be delivered to the editor of a local newspaper, and to radio and television station program directors. Follow up one week later with a telephone call.

Organize a Publicity Event

Hold a kickoff celebration to bring exposure to the project. For example, have the mayor or another dignitary plant a tree for wildlife to kick off a major tree planting project. Ask the media and other member of the community to attend and participate. If a photographer or TV camera crew is expected to show up, plan some visually stimulating activities.

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Write Your Own Story

Plan ahead by writing your own story just in case the media does not show up at your event. Submit a photograph and a story to the newspaper after the event. You may also consider writing a story before the event just to stimulate interest in the community before the big event.

Write a PSA - Public Service Announcement

This is a shorter version of a media release. This is written as an announcement so a radio host can read it on the radio or it can go as a small announcement in a newspaper column. In the top left corner of the page, write the contact name and phone number. In the top right corner of the page write the date when you would like the media to make the announcement and for how long, for example, Run: June 9-10, 1998.

Contact Person

Assign someone to be the contact person. The name will be on Media Releases and Public Service Announcements. This person should be someone who will not freeze up on camera or in front of a microphone. The person must be prepared to talk about the club, the project or event, its purpose and so on.

Network

You may decide to plan your event so that it is part of a larger public event such as Wildlife Week, Arbour Day or Environment Week. Your event may also be promoted in some already existing networks such as a school newsletter, club newsletter or small neighbourhood community newsletters. You may also ask for assistance, expertise or materials through those contacts.

Timing is Everything

Plan your event, if possible, between 9:30 and 11:00 a.m. This is the best time to attract media attention and will help ensure that your event is covered in the early evening newscast.

Remind Everyone

Two Weeks Before - Phone the media before the event and briefly tell them about your plans. Specify the date and the activity. Tell them you will follow up with a media release.

One Week Before - Deliver the media release by hand to the person spoken to on the telephone.

Day Before - Phone the media contacts to remind them of the event. However, for a Monday event call on Friday.

Follow Up

Send a thank you letter to editors, Program directors and all those who helped promote your event. Thank-you notes make everyone feel good about being involved.

APPENDIX

IV.



Tree Planting

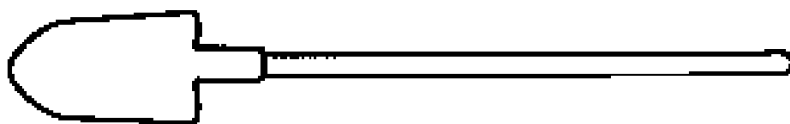


Adventurers
JUNIOR FOREST WARDENS

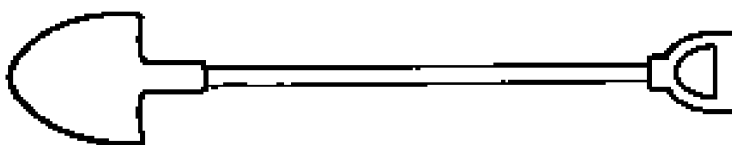
APPENDIX

Tree Planting Tools

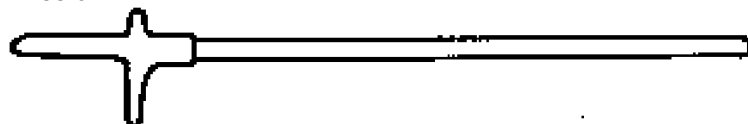
Planting Spade



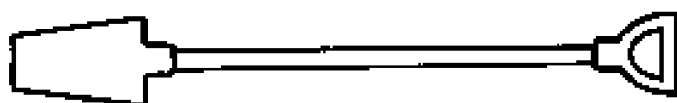
Spade



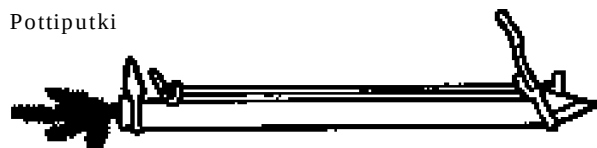
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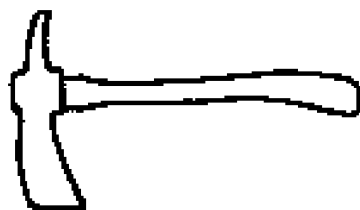
Planting bar



Pottiputki

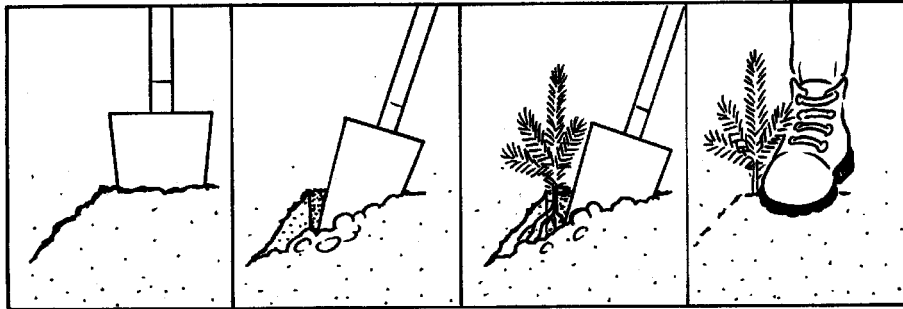


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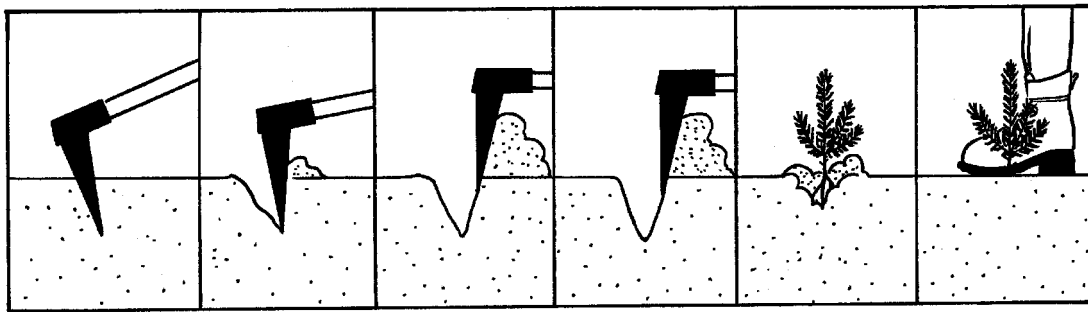


Tree Planting Methods

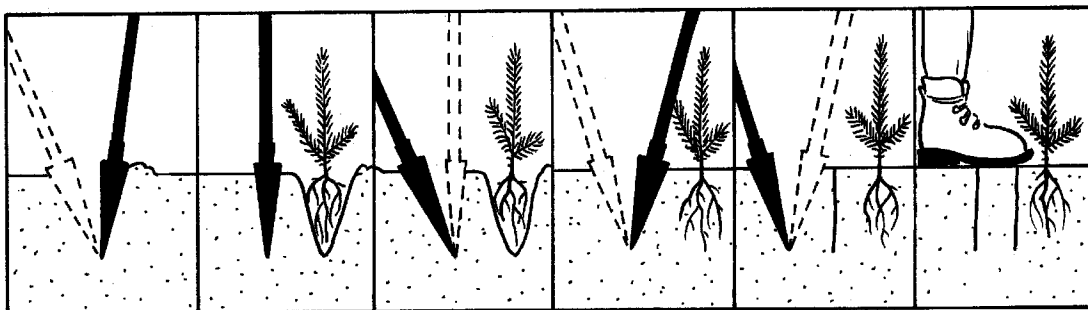
L- slit method



Mattock planting method

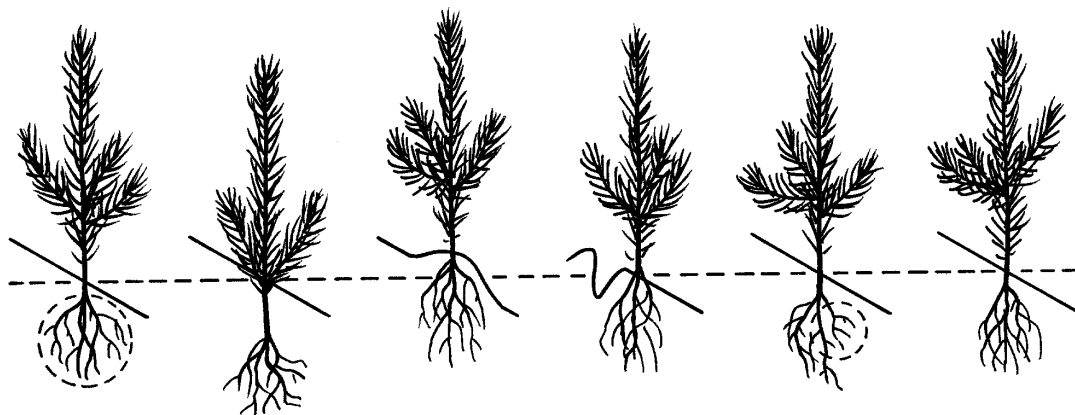
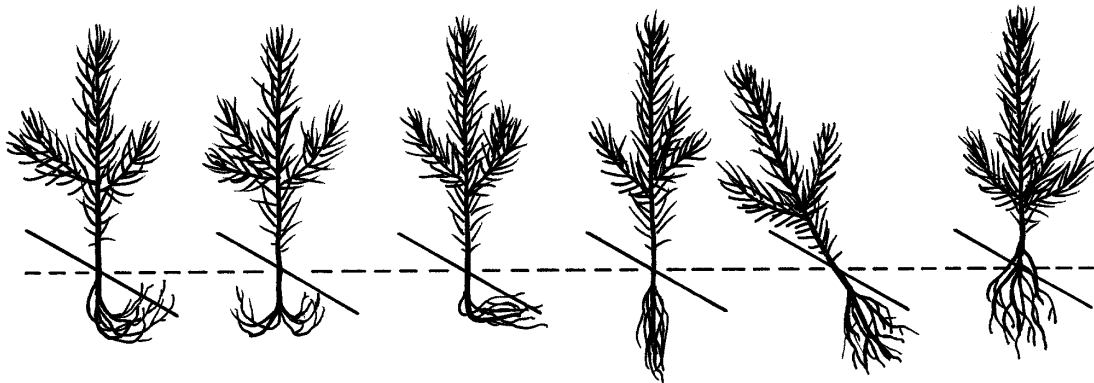
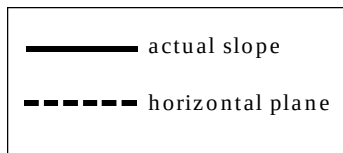


Planting bar method



last updated: 06/99

Common Planting Errors



Planted in Rotten Wood
Roots not in dam mineral soil

Too Deep
Needles buried, tree position poor

Planted on Mound
Roots apt to dry out

Inadequate Tamping
Roots drying likely due to depression left

Air Pocket
Showing improper tamping

A Satisfactorily Planted Tree

APPENDIX



Adventurers
JUNIOR FOREST WARDENS

Damage to Trees

APPENDIX

Tree Damage

BACKGROUND

A pest is an organism capable of causing material damage. In a forestry industry, a pest includes insects and diseases. Pests may damage forests to the extent that their functions are limited for recreation, wildlife habitat or commercial use. The biodiversity of forests also may be altered as a result of the impacts of such damage. The major insect pests (22 in all), five most important diseases, and weather-related damage such as frost, drought and windstorm damage have an enormous impact on forests.

Major Insects Pests in Canada

1. Eastern Spruce Budworm*
2. Western Spruce Budworm
3. Two-year-cycle Budworm
4. Jack Pine Budworm*
5. Blackheaded Budworm
6. Eastern Hemlock Looper
7. Western Hemlock Looper
8. Forest Tent Caterpillar*
9. Spruce Beetle
10. Larch Bark Beetle
11. Douglas-fir Beetle
12. Mountain Pine Beetle*
13. Douglas-fir Tussock Moth
14. Balsam Fir Sawfly
15. European Pine Sawfly
16. Redheaded Pine Sawfly
17. Swaine Jack Pine Sawfly
18. Introduced Pine Sawfly
19. Larch Sawfly
20. Yellowheaded Spruce Sawfly*
21. Pine False Webworm
22. Gypsy Moth*

Major Diseases in Canada

1. Dutch Elm Disease*
2. Lodgepole Pine Dwarf Mistletoe*
3. European Larch Canker
4. Sirococcus Shoot Blight
5. Scleroderris Canker
6. Elytroderma needle cast
7. Needle rusts of hard pines
8. Spruce cone rust
9. Yellow witches broom
10. Atropellis canker (Western Canada)
11. White pine blister rust
12. Stalactiform blister rust
13. Comandra blister rust
14. Sweet fern blister rust
15. Western gall rust
16. Armillaria root rot
17. Damping off of seedlings
18. Aspen leaf flight
19. Aspen leaf rust
20. Hypoxylon canker
21. Fire blight
22. Black knot of cherry
23. Stem decay

NOTE

- There are leaflets available from the Canadian Forestry Service for those with an asterisk* from the two lists above. Refer to Resources Section for more information.
- The common insect pests in Alberta are underlined in the list, Major Insect Pests in Canada above.



Activity

Make A Game of It!

Summary

Each warden will make a card with key information about an insect pest and then use the cards to play a game similar to 20 Questions.

Procedure

Have each Warden randomly choose an insect pest brochure. Have them silently read the brochure and summarize the information on the index card. Each index card should include the following information:

MATERIALS REQUIRED

- ☐ Index cards
- ☐ Forest Leaflet Series (insect pests)
- ☐ pens and pencils
- ☐ clothes pins

Warden:

Insect Pest:

Species of Tree it destroys:

Part(s) of Tree Affected:

Insect stage that is destructive:

Symptoms and Damage:

Prevention and Control:

Judge the knowledge level of your group; It may be easier for your group to list only three things: Name of Insect, Tree it Affects and Damage.

Introductions

Have each Warden present the information from the brochure to the whole group. You may present this part of the activity as a task where they have to introduce a new member of the community to the group. They may use the brochure to show a picture for others to look at as they introduce the insect. They should have no more than one minute for each introduction.

20 Questions

After the introductions, gather all the index cards. Shuffle them up and use a clothes pin to attach one index card to the back of each Warden. Now they have to put their listening and recall skills to work. Tell them they are to move around and ask another person a question that can be answered with a yes or no answer. A suitable question may be "Do I defoliate trees?", a yes or no will answer the question. The person who asked the question is allowed to look at the person's information on her/his back to be able to answer it. Remind Wardens that they are not to guess but to use their skills to find the insect pest by damage, tree species, and so on. Continue until everyone has succeeded. Ask them if they want to try again. Remind them that it will help them remember important information about insects.

Outdoor Activity

Wardens will visit a forest study plot and look for three insect and three disease pests.

Procedure

Take a walkabout through a woodlot with the Wardens. Look for trees that appear to be damaged. Use the booklet, A Field Guide to Animal Damage of Alberta's Native Trees and the following Key to Damage Caused by Forest Insects as guides to help you determine the cause of the damage.

MATERIALS REQUIRED

- A Field Guide to Animal Damage of Alberta's Native Trees booklet

Supporting Activity

Woodland Whodunit, Activity 3.3 Module # 3, Conditions Affecting Growth from the Focus on Forests program manual.

Key to Damage Caused by Forest Insects

Introduction

Use this key to determine what causes the appearance of the damage. Be aware that the insect(s) may not be present. This key may be difficult, especially with defoliators. Sometimes, for example, the bark beetle (which defoliates trees) may only leave sign like boring dust and the tree may still be green this year--but not next.

How To Use This Key

Make the best choice between two statements, for example A and AA, then # 1 or 2 and so on until you arrive at the best description and answer.

Tree Species and Section

A	Spruce	D	Tamarack
B	Pine	E	Poplar
C	Fir	F	Birch

Coniferous Species

SPRUCE

A

Needles eaten

1. Webbing or silk present
Terminals of tree reddish or brownish, often more pronounced toward the top; needles more or less webbed together.► **Spruce Budworm**
2. No webbing or silk
 - a. Needles eaten off, often leaving short stubs.► **Sawflies**
 - b. Needles not eaten off except at the end of branches. Tree appears cropped off at the top, usually on young trees.► **Animal Browsing**

AA

Needles not eaten

1. Tips of twigs swollen with hard green or brown cone-like galls.► **Spruce Gall Aphids**
2. Tips of twigs not swollen
 - a. Entire tree dying, crown yellow or reddish-brown colour. Boring dust around the base of the tree, tunnels on the inside of the bark.► **Bark Beetles**
 - b. Part of the tree dying. Leader dead, upper whorls of side branches dead, grubs and tunnels under the bark.► **Spruce Weevil**

PINE

B Needles eaten

1. Needles chewed off.
 - a. short needle stubs on the twigs► **Sawflies**
 - b. Needles not eaten off except at the end of the branches. Tree appears cropped off at the top, usually young trees (low trees)► **Animal Browsing**

BB Needles not eaten

1. Entire tree dying. Boring dust around the base of the tree.► **Bark Beetles**
2. Part of the tree dying.
 - a. Leader always affected. Leader dead, upper whorls of side branches dead. Grubs in tunnels in pith.► **Pine Terminal Weevil**
 - b. Leader not usually affected. Hollow pitchy masses at crotch of isolated dead branches.► **Pitch Nodule Maker**

FIR

C Needles eaten

1. Webbing or silk present
Terminals of tree reddish or brownish, often more pronounced toward top, needles more or less webbed together.► **Spruce Budworm**
2. No webbing or silk
 - a. Needles eaten off, often leaving short stubs► **Balsam Fir Sawfly**
 - b. Needles not eaten off except at the end of branches, usually on young trees.► **Animal Browsing**

CC Needles not eaten

1. Entire tree dying, crown reddish-brown. Boring dust around the base of the tree, tunnels on the inside of the bark► **Bark Beetles**

last updated: 06/99

TAMARACK

D Needles eaten

Tips of branches curled like a hook or question mark.► **Larch Sawfly**

Deciduous Species

POPLAR

E Leaves eaten

1. Some leaves rolled or tied together with silk. If damage severe, silk abundant► **Large Aspen Tortrix**
2. Leaves not rolled or tied with silk
 - a. Entire leaves eaten, large hairy caterpillars (white keyhole spots)► **Forest Tent Caterpillar**
 - b. Only upper or lower surfaces of many of the leaves eaten, black grubs may be present► **Poplar Leaf-eating Beetles**

EE Leaves not eaten

Injury to stems. Holes boring in main trunk, boring dust and gummy masses present.► **Poplar Borer**

BIRCH

F Tip of tree dying:

borer in galleries beneath bark.► **Bronze Birch Borer**

Background Information on Tree Diseases

Tree diseases spread slowly, over long periods of time. Sometimes there is no evidence of disease until the tree is cut down or dies. It is thought that diseases cause a higher tree mortality than fire and insects together.

Diseases can be broken down into two categories:

1. Abiotic (non-infectious)

Diseases caused by low or high temperatures, too much water or drought conditions, injury (mechanical or chemical) or air pollution.

2. Biotic (infectious)

Diseases caused by living organisms such as bacteria, fungi, viruses, nematodes (round or thread worms) or parasitic plants. Not all bacteria are harmful, certain ones fix nitrogen in trees. Most fungi are beneficial because they assist with decomposition, and some species help tree roots.

Fungi are associated with causing such diseases as, stem and root decays and stains, root diseases, stem cankers and rusts. Parasitic plants that harm trees are dwarf mistletoe (also called witches broom). Foliage and cone diseases include needle casts, needle rusts, and leaf spot diseases. Cone rust accounts for a large loss of seed in spruces.



A c t i v i t y

When diagnosing trees for various ailments, Wardens should examine all tree parts carefully from the root collar base to the buds, foliage. Note any signs of insects feeding, fungi, foliage discoloration and location, branch and twig kill, and recent growth patterns of buds, shoots and foliage.

Have Wardens make a chart to record their observations. The chart should record enough of their observation on site that they can look up the information from their charts to other sources, for example, at a library, find out what caused the disease.

last updated: 06/99

This table shows the most common symptoms and is the first step in identifying problems caused by insects and diseases.

Parts of Tree Affected

Cause	Foliage	Trunk	Other Parts
INSECTS	○ leaves turned red ○ leaves curled up ○ leaves discoloured ○ galls	○ holes and tunnels ○ resin secretion	○ Sticky substance on foliage ○ foamy, viscous liquid (like spittle) ○ withered leading shoot
DISEASES	○ leaves discoloured ○ leaves stained ○ leaves turned yellow or red ○ loss of leaves	○ fungi ○ resin secretion ○ cankers ○ rot	○ dead branches

The Most Common Pests and Damage to Prairie Tree Species

Tree Species	Insects	Diseases	Environmental Stress
WHITE SPRUCE	○ Spruce Beetle ○ Spruce Budworm ○ White Pine Weevil ○ Wood Borers ○ Woolly Aphid ○ Yellow headed Spruce Sawfly	○ Armillaria root rot ○ Spruce cone rust ○ Spruce needle rust	○ windthrow ○ drought
JACK PINE / LODGEPOLE PINE	○ Jack pine budworm ○ Lodgepole terminal weevil ○ Mountain pine beetle ○ Pitch blister moth ○ Warrens rootcollar ○ Weevil ○ Wood borers	○ Armillaria root rot ○ Dwarf Mistletoe ○ Pine stem rusts ○ Western gall rust	○ shade
TAMARACK	○ Bark beetle ○ Larch Sawfly ○ Wood borers		○ Low herbicide tolerance
BLACK SPRUCE	○ White-spotted sawyer beetle	○ Armillaria root rot ○ root & stem decays	○ flooding
BALSAM FIR	○ Spruce budworm ○ Wood borers	○ Armillaria root rot ○ root & stem decays	
TREMBLING ASPEN	○ Bruce spanworm ○ Poplar borer ○ Poplar leaf miner ○ Forest tent caterpillar ○ Large aspen tortrix	○ Armillaria root rot ○ Hypoxylon canker ○ False tinder cook ○ stem decays/stains	○ shade ○ drought
BALSAM POPLAR	○ Poplar leaf miner	○ Armillaria root rot ○ Hypoxylon canker ○ various stem decays	○ drought ○ flooding
WHITE BIRCH	○ Birch leaf miners ○ Bronze birch borer	○ Fungal conks ○ Silver leaf ○ root & stem decays	○ drought ○ soil temperature fluctuation

from Woodlot Management Guide For The Prairie Provinces Controlling Pests

Controlling Pests

BACKGROUND

The forest is full of hundreds, if not thousands, of different species. Most of the insects have little effect on trees. In some cases, insects are beneficial as pollinators, or predators of pests. There are, however, some very destructive insects to the trees, and they attack all parts of the tree in all stages of growth. Insect infestations may increase fire hazards, alter wildlife habitat and reduce recreational value.

A pest is an organism capable of causing material damage. In a forest this includes insects and diseases. Most insects that feed on the forest trees can breed rapidly, causing widespread damage. They are usually held in check by natural means such as by weather or are attacked by other organisms known as biological control agents.

Biological control agents play an important role in regulating the pests. Without them, many insects that feed on trees would occur in such numbers that would incur serious damage to the forest.

Biological control agents are divided into two categories because of how they attack the pest insect; predators or parasites.

Predators

These are organisms that catch and devour the insect pest. They include insect-eating birds, shrews, spiders, mites and larvae of ladybird beetles.

Parasites

These are organisms that live within a host, draining their nourishment and giving nothing in return to the host. Generally, the host dies, but some only weaken the host by slowing down its development. There are two main types of parasites.

○ Parasitic Insects (parasitoids)

These organisms lay their eggs on or in a host insect where they hatch and the larvae develop by consuming the host. Parasitoids are usually host-specific where they lay their eggs on or in specific pest insects. Examples, tiny wasps and flies.

○ Parasitic Microorganisms (pathogens)

Four types of pathogens are found in forestry: bacteria, viruses, fungi and protozoa. These enter the host by contaminated food, through the outer exoskeleton of the insect or the eggs are contaminated. Bacteria, viruses and fungi cause diseases fatal to the host. Protozoa weaken but don't kill the host by living in the host.

Symptoms can tell you the type of infection:

- Fungal infection - white cottony growth on the outside of a dead or dying insect.
- Virus infection - dead larvae with a dark and flaccid appearance.
- Bacterial infection - shriveled larva with an abnormally large head.

Biological Control

The introduction of biological controls is not a simple matter. There needs to be knowledge about how the pest develops and spreads and the exact way in which the control agent works. Research and development programs are underway in Canadian Forestry Service research centres across Canada.

Biological control agents are used on forest insects pests the following ways:

- Adjust the environment to help predators - provide nesting sites for insect-eating birds.
- Adjust environment to help parasitoids - plant vegetation which will support alternative hosts for parasitoids or provide adult parasitoids with a food source.
- Breed and release parasitoids and predators.
- Produce and apply pathogens.

SPRUCE SUCCESS STORY

The entire spruce tree population was threatened by the spruce sawfly (*Gilpinia hercyniae*) during the 1930s. This was a problem similar in magnitude to today's problems with the spruce budworm. In the Gaspé Peninsula, Quebec, where the infection was first detected, half of the marketable spruce was destroyed before the outbreak was controlled by the introduction of a virus and several parasites. Due to continued control by the parasites, the European spruce sawfly is no longer a problem in Canada.

What are the benefits and negative effects of biological control?

Benefits

- Biological controls do have the potential to regulate insects that cause damage to trees thus affecting the economy. Knowing their potential should reduce our dependence on chemical insecticides.
- Biological control agents tend to be host-specific whereas chemical insecticides kill a wide variety of insects.
- Some biological control agents are self-perpetuating. Once introduced, they maintain themselves and hold their hosts in check.

Negative Effects

- The effects of biological control agents are slower to appear than chemical insecticides.
- Further research is needed before many biological control agents are ready for practical use in the field.
- The cost is high and the production low since most biological control agents can only be produced in living hosts. As a result, biological control agents are not attractive in the manufacturing industry.

So Long Winter Moth

The Maritime province were hit by another European pest in the 1930s. The winter moth (*Operophtera brumata*) attacked red oak, red maple and white elm. Two parasitoids were introduced in the late 1950s and by the mid 60s, the winter moth had become one of the less commonly known defoliators of hardwoods in that region.

The control program cost \$500,000. The destruction to the red oak alone was more than \$7 million, unchecked it would have reached \$38 million in the dollar value of the time.



A c t i v i t i e s

1. Have Wardens discuss the impacts of having no controls for insects. Read the two success stories (Spruce Success Story, So Long Winter Moth) to the Wardens. Ask them to think about the impacts those two insects had on those regions. Include economic, social, environmental aspects.
2. Have Wardens randomly choose two or three brochures from the Forest Leaflet series. (Refer to Supporting Resources for ordering information)
 - Have the Wardens determine which methods are used to control the insect pests. For example, predator or parasite (parasitoids or pathogens [virus, fungus or bacteria])
 - Have Wardens determine and describe the type of damage the insect pest does to a tree. Which trees are damaged by each pest.

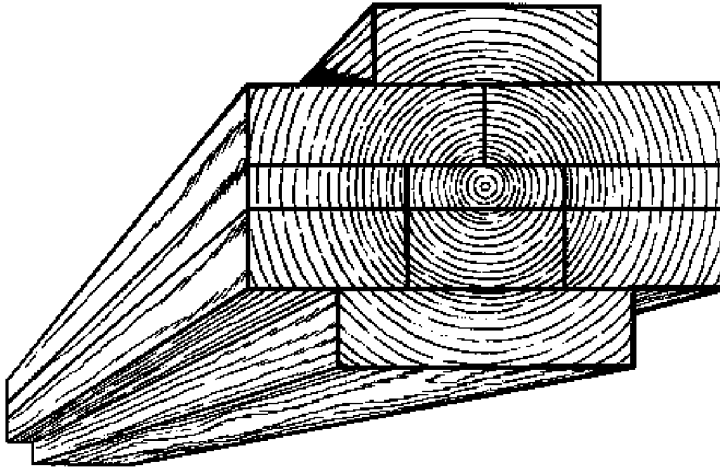
APPENDIX



Adventurers
JUNIOR FOREST WARDENS

VI Volume Tables

APPENDIX



Typical Yield of a Spruce Tree

average 50 ft. length (15
metres)

10 in. diameter (23 cm)

- 1 - (2x8") 16 ft - long
- 3 - (2x4") 16 ft - long
- 3 - (2x6") 16 ft - long
- 3 - (11x4") 16 ft - long

Construction lumber is sold
in North America in imperial
measurements using the
board foot - outside
North America it is sold by
cubic metre.

SINGLE TREE VOLUME TABLE – TOTAL VOLUME (m³)																		SPECIES: ASPEN		
DBH (cm)	Height (m)																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1.0	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0003	0.0004	0.0004	0.0004	0.0005	0.0005	0.0006	0.0006	0.0006	0.0007	0.0007	0.0008	0.0008	0.0009
2.0	0.0002	0.0004	0.0005	0.0007	0.0009	0.0010	0.0012	0.0014	0.0015	0.0017	0.0018	0.0020	0.0021	0.0023	0.0025	0.0026	0.0028	0.0029	0.0031	0.0032
3.0	0.0004	0.0008	0.0012	0.0015	0.0019	0.0022	0.0026	0.0029	0.0033	0.0036	0.0040	0.0043	0.0047	0.0050	0.0053	0.0057	0.0060	0.0063	0.0067	0.0070
4.0	0.0007	0.0014	0.0020	0.0026	0.0033	0.0039	0.0045	0.0051	0.0057	0.0063	0.0069	0.0075	0.0081	0.0087	0.0092	0.0098	0.0104	0.0110	0.0116	0.0121
5.0	0.0011	0.0021	0.0031	0.0041	0.0050	0.0060	0.0069	0.0078	0.0087	0.0097	0.0106	0.0115	0.0124	0.0133	0.0142	0.0151	0.0160	0.0168	0.0177	0.0186
6.0	0.0015	0.0030	0.0044	0.0057	0.0071	0.0084	0.0098	0.0111	0.0124	0.0137	0.0150	0.0163	0.0175	0.0188	0.0201	0.0214	0.0226	0.0239	0.0251	0.0264
7.0	0.0021	0.0040	0.0069	0.0077	0.0095	0.0113	0.0131	0.0149	0.0166	0.0184	0.0201	0.0219	0.0236	0.0253	0.0270	0.0287	0.0304	0.0321	0.0338	0.0354
8.0	0.0027	0.0052	0.0076	0.0100	0.0123	0.0146	0.0169	0.0192	0.0215	0.0237	0.0260	0.0282	0.0304	0.0327	0.0349	0.0371	0.0392	0.0414	0.0436	0.0458
9.0	0.0034	0.0065	0.0095	0.0125	0.0154	0.0183	0.0212	0.0241	0.0269	0.0298	0.0326	0.0354	0.0381	0.0409	0.0437	0.0464	0.0492	0.0519	0.0546	0.0574
10.0	0.0041	0.0079	0.0116	0.0153	0.0189	0.0224	0.0260	0.0295	0.0329	0.0364	0.0398	0.0433	0.0467	0.0501	0.0534	0.0568	0.0602	0.0635	0.0669	0.0702
11.0	0.0049	0.0095	0.0140	0.0183	0.0227	0.0269	0.0312	0.0354	0.0395	0.0437	0.0478	0.0519	0.0560	0.0601	0.0641	0.0682	0.0722	0.0762	0.0802	0.0842
12.0	0.0058	0.0112	0.0165	0.0217	0.0268	0.0318	0.0368	0.0418	0.0467	0.0516	0.0565	0.0613	0.0662	0.0710	0.0758	0.0806	0.0853	0.0901	0.0948	0.0995
13.0	0.0068	0.0131	0.0192	0.0253	0.0312	0.0371	0.0429	0.0487	0.0545	0.0602	0.0658	0.0715	0.0771	0.0827	0.0883	0.0939	0.0994	0.1050	0.1105	0.1160
14.0	0.0078	0.0151	0.0222	0.0291	0.0360	0.0427	0.0495	0.0561	0.0628	0.0693	0.0759	0.0824	0.0889	0.0954	0.1018	0.1082	0.1146	0.1210	0.1273	0.1337
15.0	0.0089	0.0172	0.0253	0.0332	0.0410	0.0488	0.0565	0.0641	0.0716	0.0791	0.0866	0.0940	0.1015	0.1088	0.1162	0.1235	0.1308	0.1381	0.1453	0.1526
16.0	0.0101	0.0195	0.0286	0.0376	0.0464	0.0552	0.0639	0.0725	0.0810	0.0895	0.0980	0.1064	0.1148	0.1231	0.1315	0.1398	0.1480	0.1562	0.1644	0.1726
17.0	0.0114	0.0219	0.0322	0.0422	0.0522	0.0620	0.0717	0.0814	0.0910	0.1006	0.1101	0.1195	0.1289	0.1383	0.1476	0.1570	0.1662	0.1755	0.1847	0.1939
18.0	0.0127	0.0244	0.0359	0.0471	0.0582	0.0692	0.0800	0.0908	0.1015	0.1122	0.1228	0.1334	0.1439	0.1543	0.1647	0.1751	0.1855	0.1958	0.2061	0.2163
19.0	0.0141	0.0271	0.0398	0.0523	0.0646	0.0767	0.0888	0.1007	0.1126	0.1244	0.1362	0.1479	0.1595	0.1711	0.1827	0.1942	0.2057	0.2171	0.2285	0.2399
20.0	0.0155	0.0299	0.0439	0.0576	0.0712	0.0846	0.0979	0.1111	0.1243	0.1373	0.1503	0.1632	0.1760	0.1888	0.2016	0.2143	0.2269	0.2395	0.2521	0.2647
21.0	0.0170	0.0328	0.0482	0.0633	0.0782	0.0929	0.1075	0.1220	0.1364	0.1507	0.1650	0.1791	0.1933	0.2073	0.2213	0.2352	0.2491	0.2630	0.2768	0.2906
22.0	0.0186	0.0359	0.0527	0.0692	0.0855	0.1016	0.1175	0.1334	0.1491	0.1648	0.1803	0.1958	0.2113	0.2266	0.2419	0.2572	0.2724	0.2875	0.3026	0.3177
23.0	0.0203	0.0391	0.0574	0.0753	0.0931	0.1106	0.1280	0.1452	0.1624	0.1794	0.1964	0.2132	0.2300	0.2468	0.2634	0.2800	0.2966	0.3131	0.3295	0.3459
24.0	0.0220	0.0424	0.0622	0.0817	0.1010	0.1200	0.1389	0.1576	0.1762	0.1947	0.2131	0.2313	0.2496	0.2677	0.2858	0.3038	0.3218	0.3396	0.3575	0.3753
25.0	0.0238	0.0458	0.0673	0.0884	0.1092	0.1298	0.1502	0.1704	0.1905	0.2105	0.2304	0.2502	0.2699	0.2895	0.3090	0.3285	0.3479	0.3673	0.3866	0.4058
26.0	0.0256	0.0494	0.0726	0.0953	0.1177	0.1399	0.1619	0.1837	0.2054	0.2269	0.2483	0.2697	0.2909	0.3121	0.3331	0.3541	0.3751	0.3959	0.4167	0.4375
27.0	0.0276	0.0531	0.0780	0.1024	0.1265	0.1504	0.1740	0.1975	0.2208	0.2439	0.2670	0.2899	0.3127	0.3355	0.3581	0.3807	0.4032	0.4256	0.4479	0.4702
28.0	0.0295	0.0570	0.0836	0.1098	0.1356	0.1612	0.1866	0.2117	0.2367	0.2615	0.2862	0.3108	0.3353	0.3596	0.3839	0.4081	0.4322	0.4563	0.4803	0.5042
29.0	0.0316	0.0609	0.0894	0.1174	0.1451	0.1724	0.1995	0.2264	0.2531	0.2797	0.3061	0.3324	0.3586	0.3846	0.4106	0.4365	0.4623	0.4880	0.5136	0.5392
30.0	0.0337	0.0650	0.0954	0.1253	0.1548	0.1840	0.2129	0.2416	0.2701	0.2985	0.3266	0.3547	0.3826	0.4105	0.4382	0.4658	0.4933	0.5207	0.5481	0.5754
31.0	0.0359	0.0692	0.1016	0.1334	0.1648	0.1959	0.2267	0.2573	0.2876	0.3178	0.3478	0.3777	0.4074	0.4371	0.4666	0.4960	0.5253	0.5545	0.5836	0.6127
32.0	0.0382	0.0736	0.1080	0.1418	0.1752	0.2082	0.2409	0.2734	0.3056	0.3377	0.3696	0.4014	0.4330	0.4645	0.4958	0.5271	0.5582	0.5893	0.6202	0.6511
33.0	0.0405	0.0780	0.1145	0.1504	0.1858	0.2208	0.2555	0.2900	0.3242	0.3582	0.3921	0.4257	0.4593	0.4926	0.5259	0.5591	0.5921	0.6250	0.6579	0.6908
34.0	0.0429	0.0826	0.1213	0.1593	0.1967	0.2338	0.2706	0.3070	0.3433	0.3793	0.4151	0.4508	0.4863	0.5216	0.5568	0.5919	0.6269	0.6618	0.6966	0.7312
35.0	0.0453	0.0873	0.1282	0.1684	0.2080	0.2472	0.2860	0.3246	0.3629	0.4009	0.4388	0.4765	0.5140	0.5514	0.5886	0.6257	0.6627	0.6996	0.7363	0.7730
36.0	0.0478	0.0922	0.1353	0.1777	0.2195	0.2609	0.3019	0.3426	0.3830	0.4232	0.4631	0.5029	0.5425	0.5820	0.6213	0.6604	0.6994	0.7384	0.7771	0.8158
37.0	0.0504	0.0971	0.1426	0.1873	0.2313	0.2749	0.3181	0.3610	0.4036	0.4460	0.4881	0.5300	0.5718	0.6133	0.6547	0.6960	0.7371	0.7781	0.8190	0.8598
38.0	0.0530	0.1022	0.1501	0.1971	0.2434	0.2893	0.3348	0.3799	0.4248	0.4693	0.5137	0.5578	0.6017	0.6455	0.6890	0.7325	0.7758	0.8189	0.8619	0.9048
39.0	0.0557	0.1074	0.1577	0.2071	0.2559	0.3041	0.3519	0.3993	0.4464	0.4933	0.5399	0.5862	0.6324	0.6784	0.7242	0.7698	0.8153	0.8607	0.9059	0.9510
40.0	0.0585	0.1128	0.1656	0.2174	0.2686	0.3192	0.3694	0.4192	0.4686	0.5178	0.5667	0.6154	0.6638	0.7121	0.7602	0.8081	0.8558	0.9034	0.9509	0.9982
50.0	0.0897	0.1729	0.2538	0.3333	0.4118	0.4894	0.5663	0.6426	0.7185	0.7939	0.8688	0.9435	1.0178	1.0918	1.1655	1.2389	1.3121	1.3851	1.4579	1.5305
60.0	0.1272	0.2452	0.3599	0.4726	0.5839	0.6939	0.8030	0.9112	1.0187	1.1256	1.2319	1.3377	1.4431	1.5480	1.6525	1.7567	1.8605	1.9639	2.0671	2.1700
70.0	0.1708	0.3294	0.4835	0.6350	0.7844	0.9322	1.0787	1.2241	1.3686	1.5121	1.6550	1.7971	1.9386	2.0796	2.2200	2.3599	2.4994	2.6384	2.7770	2.9152
80.0	0.2206	0.4253	0.6244	0.8200	1.0129	1.2038	1.3930	1.5808	1.7673	1.9528	2.1372	2.3208	2.5036	2.6856	2.8669	3.0476	3.2277	3.4072	3.5862	3.7652
90.0	0.2764	0.5330	0.7824	1.0275	1.2692	1.5084	1.7455	1.9808	2.2145	2.4469	2.6780	2.9081	3.1371	3.3651	3.5923	3.8187	4.0444	4.2694	4.4936	4.7178
100.0	0.3383	0.6521	0.9574	1.2572	1.5530	1.8457	2.1355	2.4237	2.7097	2.9940	3.2768	3.5582	3.8384	4.1175	4.3955	4.6725	4.9486	5.2239	5.4983	5.7730

Last updated: 06/99

SINGLE TREE VOLUME TABLE – TOTAL VOLUME (m³)

SPECIES: ASPEN

Height (m)

DBH
(cm)

1.0	0.0009	0.0009	0.0010	0.0010	0.0011	0.0011	0.0012	0.0012	0.0013	0.0013	0.0013	0.0014	0.0014	0.0014	0.0015	0.0015	0.0016	0.0016	0.0016	0.0016
2.0	0.0034	0.0035	0.0037	0.0038	0.0040	0.0041	0.0044	0.0044	0.0047	0.0047	0.0049	0.0052	0.0053	0.0055	0.0055	0.0058	0.0059	0.0061	0.0061	0.0062
3.0	0.0173	0.0177	0.0180	0.0183	0.0186	0.0189	0.0193	0.0196	0.0199	0.0201	0.0203	0.0206	0.0208	0.0210	0.0212	0.0215	0.0218	0.0220	0.0221	0.0222
4.0	0.0127	0.0133	0.0139	0.0144	0.0150	0.0156	0.0161	0.0167	0.0173	0.0178	0.0184	0.0189	0.0195	0.0201	0.0206	0.0212	0.0218	0.0223	0.0228	0.0234
5.0	0.0195	0.0204	0.0212	0.0221	0.0230	0.0239	0.0247	0.0256	0.0265	0.0273	0.0282	0.0290	0.0299	0.0308	0.0316	0.0325	0.0333	0.0342	0.0350	0.0359
6.0	0.0276	0.0289	0.0301	0.0314	0.0326	0.0338	0.0351	0.0363	0.0375	0.0387	0.0400	0.0412	0.0424	0.0436	0.0448	0.0460	0.0472	0.0485	0.0497	0.0509
7.0	0.0371	0.0388	0.0405	0.0421	0.0438	0.0454	0.0471	0.0487	0.0504	0.0520	0.0537	0.0553	0.0570	0.0586	0.0602	0.0618	0.0635	0.0651	0.0667	0.0683
8.0	0.0479	0.0501	0.0523	0.0544	0.0565	0.0587	0.0608	0.0630	0.0651	0.0672	0.0693	0.0714	0.0735	0.0757	0.0778	0.0799	0.0820	0.0841	0.0862	0.0882
9.0	0.0601	0.0628	0.0655	0.0682	0.0709	0.0735	0.0762	0.0789	0.0815	0.0842	0.0869	0.0895	0.0922	0.0948	0.0974	0.1001	0.1027	0.1053	0.1080	0.1106
10.0	0.0735	0.0768	0.0801	0.0834	0.0867	0.0900	0.0932	0.0965	0.0998	0.1030	0.1063	0.1095	0.1128	0.1160	0.1192	0.1225	0.1257	0.1289	0.1321	0.1353
11.0	0.0882	0.0922	0.0962	0.1001	0.1041	0.1080	0.1119	0.1158	0.1198	0.1237	0.1276	0.1315	0.1353	0.1392	0.1431	0.1470	0.1508	0.1547	0.1585	0.1624
12.0	0.1042	0.1089	0.1136	0.1183	0.1229	0.1276	0.1322	0.1368	0.1415	0.1461	0.1507	0.1553	0.1599	0.1645	0.1690	0.1736	0.1782	0.1827	0.1873	0.1918
13.0	0.1215	0.1269	0.1324	0.1379	0.1433	0.1487	0.1541	0.1595	0.1649	0.1703	0.1757	0.1810	0.1864	0.1917	0.1971	0.2024	0.2077	0.2130	0.2183	0.2236
14.0	0.1400	0.1463	0.1526	0.1589	0.1651	0.1714	0.1777	0.1838	0.1901	0.1963	0.2024	0.2086	0.2148	0.2210	0.2271	0.2332	0.2394	0.2455	0.2516	0.2577
15.0	0.1598	0.1670	0.1742	0.1813	0.1885	0.1956	0.2027	0.2098	0.2169	0.2240	0.2310	0.2381	0.2451	0.2522	0.2592	0.2662	0.2732	0.2802	0.2872	0.2941
16.0	0.1808	0.1889	0.1971	0.2052	0.2133	0.2213	0.2294	0.2374	0.2454	0.2534	0.2614	0.2694	0.2774	0.2853	0.2933	0.3012	0.3091	0.3170	0.3249	0.3328
17.0	0.2025	0.2122	0.2213	0.2304	0.2395	0.2486	0.2576	0.2666	0.2757	0.2846	0.2936	0.3026	0.3115	0.3205	0.3294	0.3383	0.3472	0.3561	0.3649	0.3738
18.0	0.2265	0.2367	0.2469	0.2571	0.2672	0.2773	0.2874	0.2975	0.3075	0.3176	0.3276	0.3376	0.3476	0.3575	0.3675	0.3774	0.3873	0.3973	0.4071	0.4170
19.0	0.2513	0.2626	0.2739	0.2851	0.2964	0.3076	0.3188	0.3299	0.3411	0.3522	0.3633	0.3744	0.3855	0.3965	0.4076	0.4186	0.4296	0.4406	0.4516	0.4625
20.0	0.2772	0.2897	0.3021	0.3146	0.3270	0.3393	0.3517	0.3640	0.3763	0.3886	0.4008	0.4131	0.4253	0.4375	0.4497	0.4618	0.4740	0.4861	0.4982	0.5103
21.0	0.3043	0.3181	0.3317	0.3454	0.3590	0.3726	0.3861	0.3997	0.4132	0.4266	0.4401	0.4535	0.4669	0.4803	0.4937	0.5070	0.5204	0.5337	0.5470	0.5602
22.0	0.3327	0.3477	0.3626	0.3776	0.3924	0.4073	0.4221	0.4369	0.4517	0.4664	0.4811	0.4958	0.5104	0.5251	0.5397	0.5543	0.5689	0.5834	0.5979	0.6124
23.0	0.3623	0.3786	0.3949	0.4111	0.4273	0.4435	0.4596	0.4757	0.4918	0.5078	0.5239	0.5398	0.5558	0.5717	0.5877	0.6035	0.6194	0.6352	0.6511	0.6669
24.0	0.3930	0.4107	0.4284	0.4460	0.4636	0.4811	0.4986	0.5161	0.5336	0.5510	0.5683	0.5857	0.6030	0.6203	0.6376	0.6548	0.6720	0.6892	0.7064	0.7235
25.0	0.4250	0.4441	0.4632	0.4823	0.5013	0.5203	0.5392	0.5581	0.5769	0.5958	0.6146	0.6333	0.6520	0.6707	0.6894	0.7080	0.7267	0.7452	0.7638	0.7823
26.0	0.4581	0.4788	0.4994	0.5199	0.5404	0.5608	0.5812	0.6016	0.6219	0.6422	0.6625	0.6827	0.7029	0.7231	0.7432	0.7633	0.7833	0.8034	0.8234	0.8434
27.0	0.4925	0.5147	0.5368	0.5589	0.5809	0.6029	0.6248	0.6467	0.6686	0.6904	0.7121	0.7339	0.7556	0.7772	0.7989	0.8205	0.8420	0.8636	0.8851	0.9066
28.0	0.5280	0.5518	0.5755	0.5992	0.6228	0.6464	0.6699	0.6934	0.7168	0.7402	0.7635	0.7868	0.8101	0.8333	0.8565	0.8797	0.9028	0.9259	0.9489	0.9720
29.0	0.5647	0.5901	0.6155	0.6408	0.6661	0.6913	0.7164	0.7416	0.7666	0.7916	0.8166	0.8415	0.8664	0.8912	0.9160	0.9408	0.9655	0.9902	1.0149	1.0395
30.0	0.6026	0.6297	0.6568	0.6838	0.7108	0.7377	0.7645	0.7913	0.8180	0.8447	0.8714	0.8980	0.9245	0.9510	0.9775	1.0039	1.0303	1.0567	1.0830	1.1093
31.0	0.6416	0.6705	0.6994	0.7281	0.7568	0.7855	0.8141	0.8426	0.8710	0.8995	0.9278	0.9562	0.9844	1.0127	1.0408	1.0690	1.0971	1.1251	1.1532	1.1811
32.0	0.6819	0.7126	0.7432	0.7738	0.8043	0.8347	0.8651	0.8954	0.9257	0.9559	0.9860	1.0161	1.0461	1.0761	1.1061	1.1360	1.1659	1.1957	1.2255	1.2552
33.0	0.7233	0.7558	0.7883	0.8208	0.8531	0.8854	0.9176	0.9498	0.9818	1.0139	1.0459	1.0778	1.1096	1.1415	1.1732	1.2050	1.2366	1.2683	1.2998	1.3314
34.0	0.7668	0.8003	0.8347	0.8690	0.9033	0.9375	0.9716	1.0056	1.0396	1.0735	1.1074	1.1412	1.1749	1.2086	1.2423	1.2759	1.3094	1.3429	1.3763	1.4097
35.0	0.8095	0.8460	0.8824	0.9186	0.9549	0.9910	1.0271	1.0630	1.0990	1.1348	1.1706	1.2063	1.2420	1.2776	1.3132	1.3487	1.3841	1.4195	1.4549	1.4902
36.0	0.8544	0.8929	0.9313	0.9696	1.0078	1.0459	1.0840	1.1220	1.1599	1.1977	1.2355	1.2732	1.3109	1.3484	1.3860	1.4234	1.4609	1.4982	1.5355	1.5728
37.0	0.9004	0.9410	0.9814	1.0218	1.0621	1.1023	1.1424	1.1824	1.2224	1.2622	1.3021	1.3418	1.3815	1.4211	1.4606	1.5001	1.5396	1.5789	1.6183	1.6575
38.0	0.9476	0.9903	1.0329	1.0753	1.1177	1.1600	1.2022	1.2444	1.2864	1.3284	1.3703	1.4121	1.4539	1.4955	1.5372	1.5787	1.6202	1.6617	1.7031	1.7444
39.0	0.9959	1.0408	1.0855	1.1302	1.1747	1.2192	1.2636	1.3078	1.3520	1.3961	1.4402	1.4841	1.5280	1.5718	1.6156	1.6593	1.7029	1.7464	1.7899	1.8334
40.0	1.0454	1.0925	1.1395	1.1863	1.2331	1.2798	1.3263	1.3728	1.4192	1.4655	1.5117	1.5579	1.6039	1.6499	1.6958	1.7417	1.7875	1.8332	1.8788	1.9244
50.0	1.6028	1.6750	1.7470	1.8189	1.8906	1.9621	2.0335	2.1048	2.1759	2.2469	2.3177	2.3885	2.4591	2.5296	2.6000	2.6703	2.7405	2.8106	2.8806	2.9505
60.0	2.2726	2.3750	2.4771	2.5790	2.6806	2.7821	2.8833	2.9843	3.0852	3.1858	3.2863	3.3866	3.4864	3.5867	3.6862	3.7852	3.8857	3.9857	4.0844	4.1835
70.0	3.0531	3.1906	3.3278	3.4646	3.6012	3.7375	3.8734	4.0092	4.1446	4.2799	4.4149	4.5496	4.6841	4.8184	4.9526	5.0865	5.2202	5.3537	5.4870	5.6202
80.0	3.9427	4.1203	4.2975	4.4742	4.6506	4.8266	5.0022	5.1775	5.3524	5.5270	5.7013	5.8754	6.0491	6.2225	6.3957	6.5687	6.7413	6.9137	7.0859	7.2579
90.0	4.9404	5.1629	5.3849	5.6063	5.8273	6.0478	6.2679	6.4875	6.7067	6.9255	7.1440	7.3620	7.5797	7.7971	8.0141	8.2307	8.4471	8.6632	8.8789	9.0944
100.0	6.0449	6.3172	6.5888	6.8598	7.1302	7.4000	7.6692	7.9380	8.2062	8.4739	8.7412	9.0080	9.2744	9.5403	9.8058	10.0709	10.3357	10.6000	10.8640	11.1276

SINGLE TREE VOLUME TABLE - TOTAL VOLUME (m³)

SINGLE TREE VOLUME TABLE - TOTAL VOLUME (m³)																				SPECIES: PINE	
DBH (cm)	Height (m)																			20	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19		
1.0	0.0001	0.0001	0.0002	0.0002	0.0003	0.0003	0.0004	0.0004	0.0005	0.0005	0.0006	0.0006	0.0007	0.0007	0.0008	0.0008	0.0009	0.0009	0.0009	0.0010	
2.0	0.0002	0.0004	0.0006	0.0008	0.0010	0.0011	0.0013	0.0015	0.0017	0.0019	0.0021	0.0022	0.0024	0.0026	0.0028	0.0030	0.0032	0.0033	0.0035	0.0037	
3.0	0.0004	0.0008	0.0012	0.0017	0.0021	0.0025	0.0029	0.0033	0.0037	0.0041	0.0044	0.0048	0.0052	0.0056	0.0060	0.0064	0.0068	0.0072	0.0076	0.0080	
4.0	0.0007	0.0014	0.0022	0.0028	0.0035	0.0042	0.0049	0.0056	0.0063	0.0070	0.0077	0.0083	0.0090	0.0097	0.0104	0.0111	0.0117	0.0124	0.0131	0.0138	
5.0	0.0011	0.0022	0.0033	0.0043	0.0054	0.0065	0.0075	0.0086	0.0096	0.0107	0.0117	0.0127	0.0138	0.0148	0.0158	0.0169	0.0179	0.0189	0.0200	0.0210	
6.0	0.0016	0.0031	0.0046	0.0061	0.0076	0.0091	0.0106	0.0121	0.0136	0.0150	0.0165	0.0180	0.0194	0.0209	0.0224	0.0238	0.0253	0.0267	0.0282	0.0296	
7.0	0.0021	0.0042	0.0062	0.0082	0.0102	0.0122	0.0142	0.0162	0.0182	0.0201	0.0221	0.0241	0.0260	0.0280	0.0300	0.0319	0.0339	0.0358	0.0377	0.0397	
8.0	0.0027	0.0054	0.0080	0.0106	0.0132	0.0157	0.0183	0.0208	0.0234	0.0259	0.0285	0.0310	0.0335	0.0360	0.0386	0.0411	0.0436	0.0461	0.0486	0.0511	
9.0	0.0034	0.0067	0.0100	0.0132	0.0164	0.0197	0.0229	0.0260	0.0292	0.0324	0.0356	0.0387	0.0419	0.0450	0.0482	0.0513	0.0545	0.0576	0.0607	0.0638	
10.0	0.0042	0.0082	0.0122	0.0161	0.0201	0.0240	0.0279	0.0318	0.0357	0.0396	0.0434	0.0473	0.0511	0.0550	0.0588	0.0627	0.0665	0.0703	0.0741	0.0779	
11.0	0.0050	0.0098	0.0146	0.0193	0.0240	0.0287	0.0334	0.0381	0.0427	0.0474	0.0520	0.0566	0.0612	0.0658	0.0704	0.0750	0.0796	0.0842	0.0888	0.0934	
12.0	0.0059	0.0116	0.0172	0.0228	0.0283	0.0339	0.0394	0.0449	0.0504	0.0559	0.0613	0.0668	0.0722	0.0776	0.0831	0.0885	0.0939	0.0993	0.1047	0.1101	
13.0	0.0068	0.0135	0.0200	0.0265	0.0330	0.0394	0.0458	0.0522	0.0586	0.0650	0.0713	0.0777	0.0840	0.0903	0.0966	0.1029	0.1092	0.1155	0.1218	0.1281	
14.0	0.0079	0.0155	0.0230	0.0305	0.0379	0.0454	0.0527	0.0601	0.0674	0.0748	0.0821	0.0894	0.0967	0.1039	0.1112	0.1184	0.1257	0.1329	0.1401	0.1473	
15.0	0.0090	0.0176	0.0262	0.0348	0.0432	0.0517	0.0601	0.0685	0.0769	0.0852	0.0935	0.1018	0.1101	0.1184	0.1267	0.1350	0.1432	0.1514	0.1597	0.1679	
16.0	0.0101	0.0199	0.0296	0.0393	0.0489	0.0584	0.0679	0.0774	0.0868	0.0963	0.1057	0.1151	0.1244	0.1338	0.1432	0.1525	0.1618	0.1711	0.1804	0.1897	
17.0	0.0113	0.0224	0.0332	0.0440	0.0548	0.0655	0.0762	0.0868	0.0974	0.1080	0.1185	0.1291	0.1396	0.1501	0.1606	0.1710	0.1815	0.1919	0.2023	0.2138	
18.0	0.0126	0.0249	0.0370	0.0491	0.0611	0.0730	0.0849	0.0967	0.1085	0.1203	0.1321	0.1438	0.1555	0.1672	0.1789	0.1906	0.2022	0.2138	0.2255	0.2371	
19.0	0.0140	0.0276	0.0410	0.0544	0.0676	0.0808	0.0940	0.1071	0.1202	0.1333	0.1463	0.1593	0.1723	0.1852	0.1982	0.2111	0.2240	0.2369	0.2497	0.2636	
20.0	0.0154	0.0304	0.0452	0.0599	0.0745	0.0891	0.1036	0.1180	0.1325	0.1468	0.1612	0.1755	0.1898	0.2041	0.2184	0.2326	0.2468	0.2610	0.2752	0.2894	
21.0	0.0169	0.0333	0.0496	0.0657	0.0817	0.0977	0.1136	0.1295	0.1453	0.1611	0.1768	0.1925	0.2082	0.2239	0.2395	0.2551	0.2707	0.2863	0.3018	0.3174	
22.0	0.0185	0.0364	0.0541	0.0717	0.0893	0.1067	0.1241	0.1414	0.1586	0.1759	0.1931	0.2102	0.2274	0.2445	0.2615	0.2786	0.2956	0.3126	0.3296	0.3466	
23.0	0.0201	0.0396	0.0589	0.0780	0.0971	0.1160	0.1349	0.1538	0.1726	0.1913	0.2100	0.2287	0.2473	0.2659	0.2845	0.3030	0.3215	0.3400	0.3585	0.3770	
24.0	0.0218	0.0429	0.0638	0.0846	0.1052	0.1258	0.1463	0.1667	0.1870	0.2074	0.2276	0.2479	0.2682	0.2884	0.3083	0.3284	0.3485	0.3686	0.3886	0.4086	
25.0	0.0235	0.0464	0.0690	0.0914	0.1137	0.1359	0.1580	0.1801	0.2021	0.2240	0.2459	0.2678	0.2896	0.3114	0.3331	0.3548	0.3765	0.3982	0.4198	0.4414	
26.0	0.0253	0.0499	0.0743	0.0984	0.1224	0.1464	0.1702	0.1939	0.2176	0.2413	0.2648	0.2884	0.3119	0.3353	0.3588	0.3822	0.4055	0.4288	0.4521	0.4752	
27.0	0.0272	0.0536	0.0798	0.1057	0.1315	0.1572	0.1828	0.2083	0.2337	0.2591	0.2845	0.3097	0.3350	0.3602	0.3853	0.4104	0.4355	0.4606	0.4856	0.5106	
28.0	0.0292	0.0575	0.0855	0.1132	0.1409	0.1684	0.1958	0.2231	0.2504	0.2776	0.3047	0.3318	0.3588	0.3858	0.4128	0.4397	0.4666	0.4934	0.5202	0.5470	
29.0	0.0312	0.0614	0.0913	0.1210	0.1505	0.1799	0.2092	0.2385	0.2676	0.2966	0.3256	0.3546	0.3835	0.4123	0.4411	0.4699	0.4986	0.5273	0.5559	0.5845	
30.0	0.0332	0.0655	0.0974	0.1290	0.1605	0.1919	0.2231	0.2542	0.2853	0.3163	0.3472	0.3781	0.4089	0.4396	0.4703	0.5010	0.5316	0.5622	0.5928	0.6233	
31.0	0.0354	0.0697	0.1036	0.1373	0.1708	0.2041	0.2374	0.2705	0.3036	0.3365	0.3694	0.4023	0.4351	0.4678	0.5005	0.5331	0.5657	0.5982	0.6307	0.6632	
32.0	0.0375	0.0740	0.1100	0.1458	0.1814	0.2168	0.2521	0.2873	0.3224	0.3574	0.3923	0.4272	0.4620	0.4967	0.5314	0.5661	0.6007	0.6352	0.6698	0.7042	
33.0	0.0398	0.0784	0.1166	0.1545	0.1922	0.2298	0.2672	0.3045	0.3417	0.3788	0.4158	0.4528	0.4897	0.5265	0.5633	0.6000	0.6367	0.6733	0.7099	0.7465	
34.0	0.0421	0.0830	0.1234	0.1635	0.2034	0.2431	0.2827	0.3222	0.3616	0.4008	0.4400	0.4791	0.5182	0.5571	0.5960	0.6349	0.6737	0.7125	0.7512	0.7898	
35.0	0.0445	0.0877	0.1303	0.1727	0.2149	0.2569	0.2987	0.3404	0.3819	0.4234	0.4648	0.5061	0.5474	0.5885	0.6297	0.6707	0.7117	0.7526	0.7935	0.8344	
36.0	0.0469	0.0925	0.1375	0.1822	0.2266	0.2709	0.3150	0.3590	0.4029	0.4466	0.4903	0.5338	0.5773	0.6208	0.6641	0.7074	0.7507	0.7938	0.8370	0.8801	
37.0	0.0494	0.0974	0.1448	0.1919	0.2387	0.2853	0.3318	0.3781	0.4243	0.4704	0.5164	0.5623	0.6081	0.6538	0.6995	0.7451	0.7906	0.8361	0.8815	0.9269	
38.0	0.0520	0.1024	0.1523	0.2018	0.2511	0.3001	0.3490	0.3977	0.4463	0.4947	0.5431	0.5914	0.6395	0.6876	0.7357	0.7836	0.8315	0.8794	0.9271	0.9749	
39.0	0.0546	0.1076	0.1600	0.2120	0.2637	0.3152	0.3665	0.4177	0.4687	0.5197	0.5705	0.6212	0.6718	0.7223	0.7727	0.8231	0.8734	0.9237	0.9739	1.0240	
40.0	0.0573	0.1129	0.1678	0.2224	0.2767	0.3307	0.3845	0.4382	0.4918	0.5452	0.5984	0.6516	0.7047	0.7577	0.8107	0.8635	0.9163	0.9690	1.0217	1.0742	
50.0	0.0874	0.1722	0.2560	0.3392	0.4220	0.5046	0.5866	0.6685	0.7501	0.8316	0.9129	0.9940	1.0750	1.1559	1.2366	1.3172	1.3977	1.4781	1.5584	1.6387	
60.0	0.1234	0.2431	0.3615	0.4790	0.5959	0.7123	0.8283	0.9439	1.0592	1.1742	1.2890	1.4036	1.5179	1.6321	1.7461	1.8599	1.9736	2.0871	2.2005	2.3138	
70.0	0.1651	0.3254	0.4839	0.6412	0.7977	0.9535	1.1088	1.2636	1.4179	1.5719	1.7256	1.8790	2.0321	2.1849	2.3375	2.4899	2.6421	2.7941	2.9459	3.0975	
80.0	0.2126	0.4190	0.6230	0.8256	1.0271	1.2277	1.4276	1.6268	1.8256	2.0238	2.2217	2.4191	2.6162	2.8130	3.0095	3.2057	3.4016	3.5973	3.7928	3.9880	
90.0	0.2657	0.5236	0.7786	1.0317	1.2835	1.5342	1.7840	2.0330	2.2814	2.5291	2.7764	3.0231	3.2695	3.5154	3.7609	4.0061	4.2509	4.4955	4.7397	4.9837	
100.0	0.3243	0.6391	0.9504	1.2594	1.5667	1.8727	2.1776	2.4816	2.7847	3.0872	3.3890	3.6902	3.9908	4.2910	4.5907	4.8900	5.1889	5.4874	5.7855	6.0832	

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SINGLE TREE VOLUME TABLE - TOTAL VOLUME (m³)																		SPECIES: PINE				
DBH (cm)	Height (m)																					
	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40		
1.0	0.0010	0.0011	0.0011	0.0012	0.0012	0.0013	0.0013	0.0014	0.0014	0.0015	0.0015	0.0016	0.0016	0.0017	0.0017	0.0018	0.0018	0.0019	0.0019	0.0020		
2.0	0.0039	0.0041	0.0043	0.0044	0.0046	0.0048	0.0050	0.0052	0.0053	0.0055	0.0057	0.0059	0.0061	0.0062	0.0064	0.0066	0.0068	0.0069	0.0071	0.0073		
3.0	0.0084	0.0088	0.0092	0.0095	0.0099	0.0103	0.0107	0.0111	0.0115	0.0119	0.0123	0.0126	0.0130	0.0134	0.0138	0.0142	0.0146	0.0150	0.0154	0.0157		
4.0	0.0144	0.0151	0.0158	0.0165	0.0171	0.0178	0.0185	0.0191	0.0198	0.0205	0.0211	0.0218	0.0225	0.0231	0.0238	0.0245	0.0251	0.0258	0.0265	0.0271		
5.0	0.0220	0.0230	0.0241	0.0251	0.0261	0.0271	0.0282	0.0292	0.0302	0.0312	0.0322	0.0333	0.0343	0.0353	0.0363	0.0373	0.0383	0.0393	0.0404	0.0414		
6.0	0.0311	0.0325	0.0340	0.0354	0.0369	0.0383	0.0398	0.0412	0.0426	0.0441	0.0455	0.0470	0.0484	0.0498	0.0513	0.0527	0.0541	0.0556	0.0570	0.0584		
7.0	0.0416	0.0436	0.0455	0.0474	0.0494	0.0513	0.0532	0.0552	0.0571	0.0590	0.0609	0.0629	0.0648	0.0667	0.0686	0.0705	0.0725	0.0744	0.0763	0.0782		
8.0	0.0536	0.0561	0.0586	0.0611	0.0636	0.0661	0.0685	0.0710	0.0735	0.0760	0.0785	0.0809	0.0834	0.0859	0.0884	0.0908	0.0933	0.0958	0.0982	0.1007		
9.0	0.0670	0.0701	0.0732	0.0763	0.0794	0.0825	0.0857	0.0888	0.0919	0.0950	0.0981	0.1011	0.1042	0.1073	0.1104	0.1135	0.1166	0.1197	0.1228	0.1258		
10.0	0.0818	0.0856	0.0894	0.0932	0.0970	0.1008	0.1046	0.1083	0.1121	0.1159	0.1197	0.1235	0.1272	0.1310	0.1348	0.1385	0.1423	0.1461	0.1498	0.1536		
11.0	0.0979	0.1025	0.1070	0.1116	0.1161	0.1207	0.1252	0.1298	0.1343	0.1388	0.1433	0.1479	0.1524	0.1569	0.1614	0.1659	0.1704	0.1749	0.1795	0.1840		
12.0	0.1154	0.1208	0.1262	0.1316	0.1369	0.1423	0.1476	0.1530	0.1583	0.1637	0.1690	0.1743	0.1797	0.1850	0.1903	0.1956	0.2009	0.2063	0.2116	0.2169		
13.0	0.1343	0.1406	0.1468	0.1531	0.1593	0.1655	0.1718	0.1780	0.1842	0.1904	0.1966	0.2028	0.2090	0.2152	0.2214	0.2276	0.2338	0.2400	0.2462	0.2523		
14.0	0.1545	0.1617	0.1689	0.1761	0.1833	0.1905	0.1976	0.2048	0.2119	0.2191	0.2262	0.2334	0.2405	0.2476	0.2548	0.2619	0.2690	0.2761	0.2832	0.2903		
15.0	0.1761	0.1843	0.1925	0.2007	0.2089	0.2170	0.2252	0.2334	0.2415	0.2497	0.2578	0.2659	0.2741	0.2822	0.2903	0.2984	0.3065	0.3146	0.3227	0.3308		
16.0	0.1990	0.2082	0.2175	0.2267	0.2360	0.2452	0.2545	0.2637	0.2729	0.2821	0.2913	0.3005	0.3097	0.3188	0.3280	0.3372	0.3463	0.3555	0.3647	0.3738		
17.0	0.2232	0.2336	0.2439	0.2543	0.2647	0.2750	0.2854	0.2957	0.3061	0.3164	0.3267	0.3370	0.3473	0.3576	0.3679	0.3782	0.3884	0.3987	0.4090	0.4192		
18.0	0.2487	0.2602	0.2718	0.2834	0.2949	0.3065	0.3180	0.3295	0.3410	0.3525	0.3640	0.3755	0.3870	0.3984	0.4099	0.4214	0.4328	0.4443	0.4557	0.4671		
19.0	0.2754	0.2883	0.3011	0.3139	0.3267	0.3395	0.3522	0.3650	0.3778	0.3905	0.4032	0.4159	0.4287	0.4414	0.4541	0.4668	0.4794	0.4921	0.5048	0.5175		
20.0	0.3035	0.3177	0.3318	0.3459	0.3600	0.3741	0.3881	0.4022	0.4163	0.4303	0.4443	0.4583	0.4724	0.4864	0.5004	0.5143	0.5283	0.5423	0.5562	0.5702		
21.0	0.3329	0.3484	0.3639	0.3793	0.3948	0.4102	0.4257	0.4411	0.4565	0.4719	0.4873	0.5027	0.5180	0.5334	0.5488	0.5641	0.5794	0.5947	0.6101	0.6254		
22.0	0.3635	0.3804	0.3974	0.4143	0.4311	0.4480	0.4649	0.4817	0.4985	0.5153	0.5321	0.5489	0.5657	0.5825	0.5993	0.6160	0.6327	0.6495	0.6662	0.6829		
23.0	0.3954	0.4138	0.4322	0.4506	0.4690	0.4873	0.5057	0.5240	0.5423	0.5606	0.5788	0.5971	0.6154	0.6336	0.6518	0.6701	0.6883	0.7065	0.7247	0.7428		
24.0	0.4286	0.4485	0.4685	0.4884	0.5083	0.5282	0.5481	0.5679	0.5878	0.6076	0.6274	0.6472	0.6670	0.6868	0.7065	0.7263	0.7460	0.7657	0.7854	0.8051		
25.0	0.4630	0.4846	0.5061	0.5276	0.5491	0.5706	0.5921	0.6135	0.6350	0.6564	0.6778	0.6992	0.7205	0.7419	0.7633	0.7846	0.8059	0.8272	0.8485	0.8698		
26.0	0.4987	0.5219	0.5451	0.5683	0.5914	0.6146	0.6377	0.6608	0.6839	0.7069	0.7298	0.7530	0.7761	0.7991	0.8221	0.8450	0.8680	0.8909	0.9139	0.9368		
27.0	0.5356	0.5605	0.5854	0.6103	0.6352	0.6601	0.6849	0.7097	0.7345	0.7593	0.7840	0.8088	0.8335	0.8582	0.8829	0.9076	0.9323	0.9569	0.9815	1.0062		
28.0	0.5737	0.6005	0.6271	0.6538	0.6805	0.7071	0.7337	0.7603	0.7868	0.8134	0.8399	0.8664	0.8929	0.9194	0.9458	0.9722	0.9987	1.0251	1.0515	1.0778		
29.0	0.6131	0.6417	0.6702	0.6987	0.7272	0.7556	0.7841	0.8125	0.8409	0.8692	0.8976	0.9259	0.9542	0.9825	1.0108	1.0390	1.0672	1.0955	1.1237	1.1518		
30.0	0.6537	0.6842	0.7146	0.7450	0.7754	0.8057	0.8360	0.8663	0.8966	0.9268	0.9570	0.9872	1.0174	1.0476	1.0777	1.1078	1.1379	1.1680	1.1981	1.2282		
31.0	0.6956	0.7280	0.7604	0.7927	0.8250	0.8573	0.8895	0.9218	0.9540	0.9861	1.0183	1.0504	1.0825	1.1146	1.1467	1.1788	1.2108	1.2428	1.2748	1.3068		
32.0	0.7387	0.7731	0.8074	0.8418	0.8761	0.9104	0.9446	0.9788	1.0130	1.0472	1.0814	1.1155	1.1496	1.1837	1.2177	1.2518	1.2858	1.3198	1.3537	1.3877		
33.0	0.7830	0.8194	0.8559	0.8923	0.9286	0.9650	1.0013	1.0375	1.0738	1.1100	1.1462	1.1824	1.2185	1.2546	1.2907	1.3268	1.3629	1.3989	1.4349	1.4709		
34.0	0.8285	0.8671	0.9056	0.9441	0.9826	1.0210	1.0594	1.0978	1.1362	1.1745	1.2128	1.2511	1.2893	1.3275	1.3657	1.4039	1.4421	1.4802	1.5183	1.5564		
35.0	0.8752	0.9159	0.9567	0.9973	1.0380	1.0786	1.1192	1.1597	1.2003	1.2407	1.2812	1.3216	1.3620	1.4024	1.4428	1.4831	1.5234	1.5637	1.6039	1.6442		
36.0	0.9231	0.9661	1.0090	1.0520	1.0948	1.1377	1.1805	1.2232	1.2660	1.3087	1.3513	1.3940	1.4366	1.4792	1.5218	1.5643	1.6068	1.6493	1.6917	1.7342		
37.0	0.9722	1.0175	1.0627	1.1079	1.1531	1.1982	1.2433	1.2883	1.3333	1.3783	1.4233	1.4682	1.5131	1.5579	1.6027	1.6475	1.6923	1.7370	1.7818	1.8265		
38.0	1.0225	1.0702	1.1178	1.1653	1.2128	1.2602	1.3076	1.3550	1.4024	1.4497	1.4969	1.5442	1.5914	1.6385	1.6857	1.7328	1.7799	1.8270	1.8740	1.9210		
39.0	1.0741	1.1241	1.1741	1.2240	1.2739	1.3237	1.3735	1.4233	1.4730	1.5227	1.5723	1.6220	1.6716	1.7211	1.7706	1.8201	1.8696	1.9190	1.9684	2.0178		
40.0	1.1268	1.1793	1.2317	1.2841	1.3364	1.3887	1.4409	1.4931	1.5453	1.5974	1.6495	1.7016	1.7536	1.8056	1.8575	1.9094	1.9613	2.0132	2.0650	2.1168		
50.0	1.7188	1.7989	1.8788	1.9587	2.0386	2.1183	2.1980	2.2777	2.3572	2.4367	2.5162	2.5956	2.6749	2.7542	2.8335	2.9127	2.9918	3.0709	3.1500	3.2290		
60.0	2.4270	2.5400	2.6529	2.7658	2.8785	2.9911	3.1036	3.2161	3.3284	3.4407	3.5529	3.6650	3.7770	3.8890	4.0009	4.1127	4.2245	4.3362	4.4478	4.5594		
70.0	3.2490	3.4003	3.5515	3.7025	3.8534	4.0042	4.1549	4.3054	4.4558	4.6061	4.7563	4.9064	5.0564	5.2063	5.3561	5.5058	5.6554	5.8049	5.9544	6.1037		
80.0	4.1830	4.3779	4.5725	4.7670	4.9612	5.1553	5.3493	5.5431	5.7368	5.9303	6.1236	6.3169	6.5100	6.7030	6.8958	7.0886	7.2812	7.4737	7.6661	7.8584		
90.0	5.2274	5.4709	5.7142	5.9572	6.1999	6.4425	6.6849	6.9271	7.1691	7.4109	7.6526	7.8941	8.1354	8.3766	8.6176	8.8584	9.0992	9.3398	9.5802	9.8205		
100.0	6.3809	6.6780	6.9749	7.2716	7.5679	7.8640	8.1599	8.4555	8.7509	9.0461	9.3411	9.6359	9.9304	10.2248	10.5190	10.8130	11.1069	11.4005	11.6940	11.9874		

SINGLE TREE VOLUME TABLE - TOTAL VOLUME (m³)																	SPECIES: WHITE SPRUCE			
DBH (cm)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1.0	0.0000	0.0001	0.0001	0.0002	0.0002	0.0003	0.0003	0.0004	0.0005	0.0005	0.0006	0.0006	0.0007	0.0007	0.0008	0.0009	0.0009	0.0010	0.0010	0.0011
2.0	0.0001	0.0003	0.0005	0.0007	0.0008	0.0010	0.0012	0.0014	0.0016	0.0018	0.0020	0.0022	0.0024	0.0026	0.0028	0.0030	0.0033	0.0035	0.0037	0.0039
3.0	0.0003	0.0006	0.0010	0.0014	0.0018	0.0022	0.0026	0.0030	0.0034	0.0038	0.0042	0.0047	0.0051	0.0055	0.0060	0.0064	0.0068	0.0073	0.0077	0.0082
4.0	0.0005	0.0011	0.0017	0.0023	0.0030	0.0037	0.0043	0.0050	0.0057	0.0065	0.0072	0.0079	0.0086	0.0094	0.0101	0.0109	0.0116	0.0124	0.0131	0.0138
5.0	0.0008	0.0016	0.0026	0.0035	0.0045	0.0055	0.0065	0.0076	0.0087	0.0097	0.0108	0.0119	0.0130	0.0141	0.0152	0.0164	0.0175	0.0186	0.0198	0.0210
6.0	0.0011	0.0023	0.0036	0.0049	0.0063	0.0077	0.0092	0.0106	0.0121	0.0136	0.0151	0.0166	0.0182	0.0197	0.0213	0.0229	0.0245	0.0261	0.0277	0.0293
7.0	0.0014	0.0030	0.0048	0.0065	0.0084	0.0102	0.0121	0.0141	0.0160	0.0180	0.0200	0.0221	0.0241	0.0262	0.0283	0.0304	0.0325	0.0346	0.0367	0.0389
8.0	0.0018	0.0039	0.0061	0.0084	0.0107	0.0131	0.0155	0.0180	0.0205	0.0230	0.0256	0.0282	0.0308	0.0335	0.0361	0.0388	0.0415	0.0442	0.0469	0.0497
9.0	0.0022	0.0048	0.0075	0.0104	0.0133	0.0162	0.0193	0.0223	0.0255	0.0286	0.0318	0.0350	0.0383	0.0415	0.0448	0.0482	0.0515	0.0549	0.0582	0.0617
10.0	0.0027	0.0058	0.0091	0.0126	0.0161	0.0197	0.0234	0.0271	0.0309	0.0347	0.0386	0.0425	0.0464	0.0504	0.0544	0.0584	0.0625	0.0666	0.0707	0.0748
11.0	0.0032	0.0070	0.0109	0.0150	0.0192	0.0235	0.0279	0.0323	0.0368	0.0414	0.0460	0.0506	0.0553	0.0600	0.0648	0.0696	0.0744	0.0793	0.0842	0.0891
12.0	0.0038	0.0082	0.0128	0.0176	0.0225	0.0276	0.0327	0.0379	0.0432	0.0485	0.0539	0.0594	0.0649	0.0704	0.0760	0.0817	0.0873	0.0930	0.0988	0.1046
13.0	0.0044	0.0095	0.0148	0.0204	0.0261	0.0319	0.0379	0.0439	0.0500	0.0562	0.0625	0.0688	0.0752	0.0816	0.0881	0.0946	0.1012	0.1078	0.1144	0.1211
14.0	0.0050	0.0108	0.0168	0.0233	0.0299	0.0366	0.0434	0.0503	0.0573	0.0644	0.0716	0.0788	0.0861	0.0935	0.1009	0.1084	0.1159	0.1235	0.1311	0.1388
15.0	0.0057	0.0123	0.0193	0.0265	0.0339	0.0415	0.0492	0.0571	0.0650	0.0731	0.0812	0.0895	0.0977	0.1061	0.1145	0.1230	0.1316	0.1402	0.1488	0.1575
16.0	0.0064	0.0138	0.0217	0.0298	0.0382	0.0467	0.0554	0.0643	0.0732	0.0823	0.0915	0.1007	0.1100	0.1195	0.1289	0.1385	0.1481	0.1578	0.1675	0.1773
17.0	0.0072	0.0155	0.0242	0.0333	0.0427	0.0522	0.0620	0.0718	0.0819	0.0920	0.1022	0.1126	0.1230	0.1335	0.1441	0.1548	0.1656	0.1764	0.1873	0.1982
18.0	0.0080	0.0172	0.0269	0.0370	0.0474	0.0580	0.0688	0.0798	0.0909	0.1022	0.1135	0.1250	0.1366	0.1483	0.1601	0.1719	0.1839	0.1959	0.2080	0.2202
19.0	0.0088	0.0190	0.0297	0.0409	0.0524	0.0641	0.0760	0.0881	0.1004	0.1128	0.1254	0.1381	0.1509	0.1638	0.1768	0.1899	0.2031	0.2164	0.2297	0.2430
20.0	0.0097	0.0209	0.0327	0.0449	0.0575	0.0704	0.0835	0.0968	0.1103	0.1240	0.1378	0.1517	0.1659	0.1800	0.1943	0.2086	0.2231	0.2377	0.2524	0.2671
21.0	0.0106	0.0228	0.0357	0.0491	0.0629	0.0770	0.0913	0.1059	0.1207	0.1356	0.1507	0.1659	0.1813	0.1968	0.2125	0.2282	0.2440	0.2600	0.2760	0.2922
22.0	0.0115	0.0248	0.0389	0.0535	0.0685	0.0839	0.0995	0.1153	0.1314	0.1477	0.1641	0.1807	0.1975	0.2144	0.2314	0.2486	0.2658	0.2832	0.3007	0.3182
23.0	0.0125	0.0270	0.0422	0.0581	0.0744	0.0910	0.1079	0.1252	0.1426	0.1602	0.1781	0.1961	0.2143	0.2326	0.2511	0.2697	0.2884	0.3073	0.3262	0.3453
24.0	0.0135	0.0291	0.0452	0.0628	0.0804	0.0984	0.1167	0.1353	0.1542	0.1733	0.1926	0.2120	0.2313	0.2515	0.2715	0.2916	0.3119	0.3322	0.3528	0.3734
25.0	0.0146	0.0314	0.0492	0.0677	0.0867	0.1061	0.1258	0.1459	0.1662	0.1868	0.2076	0.2286	0.2497	0.2711	0.2926	0.3143	0.3361	0.3581	0.3802	0.4024
26.0	0.0157	0.0338	0.0529	0.0727	0.0931	0.1140	0.1352	0.1568	0.1786	0.2007	0.2231	0.2456	0.2684	0.2913	0.3145	0.3378	0.3612	0.3849	0.4086	0.4325
27.0	0.0168	0.0362	0.0567	0.0780	0.0998	0.1222	0.1449	0.1680	0.1914	0.2151	0.2391	0.2632	0.2876	0.3123	0.3370	0.3620	0.3872	0.4125	0.4379	0.4635
28.0	0.0180	0.0387	0.0606	0.0834	0.1067	0.1306	0.1549	0.1796	0.2046	0.2300	0.2556	0.2814	0.3075	0.3338	0.3603	0.3870	0.4139	0.4410	0.4682	0.4955
29.0	0.0191	0.0413	0.0646	0.0889	0.1138	0.1393	0.1652	0.1916	0.2183	0.2453	0.2726	0.3002	0.3280	0.3560	0.3843	0.4128	0.4415	0.4703	0.4993	0.5285
30.0	0.0204	0.0439	0.0688	0.0946	0.1211	0.1482	0.1758	0.2039	0.2323	0.2610	0.2901	0.3194	0.3490	0.3789	0.4090	0.4393	0.4698	0.5005	0.5314	0.5625
31.0	0.0216	0.0466	0.0731	0.1005	0.1287	0.1574	0.1868	0.2165	0.2467	0.2772	0.3081	0.3393	0.3707	0.4024	0.4344	0.4666	0.4990	0.5316	0.5644	0.5974
32.0	0.0229	0.0494	0.0774	0.1065	0.1364	0.1669	0.1980	0.2295	0.2615	0.2939	0.3266	0.3596	0.3930	0.4266	0.4605	0.4946	0.5289	0.5635	0.5983	0.6332
33.0	0.0243	0.0523	0.0820	0.1127	0.1443	0.1766	0.2095	0.2429	0.2767	0.3109	0.3456	0.3805	0.4158	0.4514	0.4872	0.5233	0.5597	0.5962	0.6330	0.6700
34.0	0.0256	0.0552	0.0866	0.1191	0.1524	0.1865	0.2213	0.2565	0.2923	0.3285	0.3650	0.4020	0.4392	0.4768	0.5147	0.5528	0.5912	0.6298	0.6687	0.7078
35.0	0.0270	0.0583	0.0913	0.1256	0.1608	0.1967	0.2334	0.2706	0.3083	0.3464	0.3850	0.4239	0.4633	0.5029	0.5428	0.5830	0.6235	0.6643	0.7053	0.7465
36.0	0.0285	0.0614	0.0961	0.1322	0.1693	0.2072	0.2458	0.2849	0.3246	0.3648	0.4054	0.4465	0.4878	0.5296	0.5716	0.6140	0.6566	0.6995	0.7427	0.7861
37.0	0.0299	0.0645	0.1011	0.1391	0.1780	0.2179	0.2584	0.2996	0.3414	0.3836	0.4264	0.4695	0.5130	0.5569	0.6011	0.6457	0.6905	0.7356	0.7810	0.8267
38.0	0.0314	0.0678	0.1062	0.1460	0.1870	0.2288	0.2714	0.3147	0.3585	0.4029	0.4478	0.4931	0.5388	0.5849	0.6313	0.6781	0.7252	0.7726	0.8202	0.8682
39.0	0.0330	0.0711	0.1114	0.1532	0.1961	0.2400	0.2847	0.3300	0.3760	0.4226	0.4696	0.5171	0.5651	0.6134	0.6621	0.7112	0.7606	0.8103	0.8603	0.9106
40.0	0.0346	0.0745	0.1167	0.1605	0.2054	0.2514	0.2982	0.3458	0.3939	0.4427	0.4920	0.5418	0.5920	0.6426	0.6937	0.7450	0.7968	0.8489	0.9013	0.9539
50.0	0.0521	0.1122	0.1758	0.2417	0.3095	0.3787	0.4493	0.5209	0.5934	0.6669	0.7411	0.8161	0.8918	0.9681	1.0449	1.1224	1.2003	1.2788	1.3577	1.4371
60.0	0.0728	0.1568	0.2457	0.3378	0.4326	0.5293	0.6279	0.7280	0.8294	0.9321	1.0359	1.1407	1.2464	1.3530	1.4605	1.5687	1.6776	1.7873	1.8976	2.0085
70.0	0.0946	0.2081	0.3260	0.4484	0.5741	0.7025	0.8333	0.9662	1.1008	1.2371	1.3748	1.5139	1.6542	1.7957	1.9383	2.0820	2.2266	2.3721	2.5185	2.6657
80.0	0.1234	0.2659	0.4166	0.5730	0.7336	0.8978	1.0649	1.2347	1.4067	1.5808	1.7568	1.9346	2.1139	2.2947	2.4770	2.6605	2.8453	3.0312	3.2183	3.4054
90.0	0.1532	0.3301	0.5172	0.7113	0.9107	1.1145	1.3220	1.5308	1.7464	1.9625	2.1810	2.4017	2.6243	2.8488	3.0750	3.3029	3.5323	3.7631	3.9954	4.2289
100.0	0.1859	0.4006	0.6276	0.8631	1.1051	1.3524	1.6042	1.8599	2.1191	2.3814	2.6466	2.9143	3.1845	3.4569	3.7314	4.0079	4.2863	4.5664	4.8482	5.1306

Last updated: 06/99

SINGLE TREE VOLUME TABLE - TOTAL VOLUME (m³)

SPECIES: WHITE SPRUCE

Height (m)

DBH
(cm)

DBH (cm)	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
1.0	0.0012	0.0012	0.0013	0.0013	0.0014	0.0015	0.0015	0.0016	0.0016	0.0017	0.0018	0.0018	0.0019	0.0020	0.0020	0.0021	0.0022	0.0022	0.0023	0.0024
2.0	0.0041	0.0043	0.0045	0.0048	0.0050	0.0052	0.0054	0.0057	0.0059	0.0061	0.0063	0.0066	0.0068	0.0070	0.0072	0.0075	0.0077	0.0079	0.0082	0.0084
3.0	0.0087	0.0091	0.0096	0.0100	0.0105	0.0110	0.0114	0.0119	0.0124	0.0128	0.0133	0.0138	0.0143	0.0148	0.0152	0.0157	0.0162	0.0167	0.0172	0.0177
4.0	0.0147	0.0155	0.0162	0.0170	0.0178	0.0186	0.0194	0.0202	0.0210	0.0218	0.0226	0.0234	0.0242	0.0250	0.0258	0.0267	0.0275	0.0283	0.0291	0.0300
5.0	0.0221	0.0233	0.0245	0.0256	0.0268	0.0280	0.0292	0.0304	0.0316	0.0328	0.0340	0.0353	0.0365	0.0377	0.0389	0.0402	0.0414	0.0427	0.0439	0.0451
6.0	0.0309	0.0325	0.0342	0.0358	0.0375	0.0392	0.0408	0.0425	0.0442	0.0459	0.0476	0.0493	0.0510	0.0527	0.0544	0.0561	0.0579	0.0596	0.0614	0.0631
7.0	0.0410	0.0432	0.0454	0.0476	0.0498	0.0520	0.0542	0.0564	0.0586	0.0609	0.0631	0.0654	0.0677	0.0699	0.0722	0.0745	0.0768	0.0791	0.0814	0.0837
8.0	0.0524	0.0552	0.0580	0.0608	0.0636	0.0664	0.0692	0.0721	0.0749	0.0778	0.0807	0.0836	0.0865	0.0894	0.0923	0.0952	0.0982	0.1011	0.1041	0.1070
9.0	0.0651	0.0685	0.0720	0.0754	0.0789	0.0824	0.0860	0.0895	0.0930	0.0966	0.1002	0.1038	0.1074	0.1110	0.1146	0.1182	0.1219	0.1255	0.1292	0.1328
10.0	0.0790	0.0831	0.0873	0.0916	0.0958	0.1000	0.1043	0.1086	0.1129	0.1172	0.1216	0.1259	0.1303	0.1347	0.1390	0.1435	0.1479	0.1523	0.1567	0.1612
11.0	0.0941	0.0990	0.1040	0.1091	0.1141	0.1192	0.1243	0.1294	0.1345	0.1396	0.1448	0.1500	0.1552	0.1604	0.1656	0.1709	0.1762	0.1814	0.1867	0.1920
12.0	0.1104	0.1162	0.1221	0.1280	0.1339	0.1398	0.1458	0.1518	0.1578	0.1638	0.1699	0.1760	0.1821	0.1882	0.1943	0.2005	0.2067	0.2129	0.2191	0.2253
13.0	0.1278	0.1346	0.1414	0.1482	0.1551	0.1620	0.1689	0.1758	0.1828	0.1898	0.1968	0.2038	0.2109	0.2180	0.2251	0.2322	0.2394	0.2466	0.2538	0.2610
14.0	0.1465	0.1542	0.1620	0.1698	0.1777	0.1856	0.1935	0.2014	0.2094	0.2174	0.2255	0.2336	0.2416	0.2498	0.2579	0.2661	0.2743	0.2825	0.2908	0.2990
15.0	0.1663	0.1751	0.1839	0.1928	0.2017	0.2106	0.2195	0.2286	0.2377	0.2468	0.2559	0.2651	0.2743	0.2835	0.2928	0.3020	0.3113	0.3207	0.3300	0.3394
16.0	0.1872	0.1971	0.2070	0.2170	0.2271	0.2371	0.2473	0.2574	0.2676	0.2779	0.2881	0.2984	0.3088	0.3192	0.3296	0.3400	0.3505	0.3610	0.3716	0.3821
17.0	0.2092	0.2203	0.2314	0.2426	0.2538	0.2651	0.2764	0.2877	0.2991	0.3106	0.3221	0.3336	0.3452	0.3568	0.3684	0.3801	0.3918	0.4035	0.4153	0.4271
18.0	0.2324	0.2447	0.2570	0.2694	0.2819	0.2944	0.3070	0.3196	0.3322	0.3450	0.3577	0.3705	0.3834	0.3962	0.4092	0.4221	0.4351	0.4482	0.4613	0.4744
19.0	0.2566	0.2702	0.2838	0.2975	0.3113	0.3251	0.3390	0.3529	0.3669	0.3810	0.3950	0.4092	0.4234	0.4376	0.4519	0.4662	0.4806	0.4950	0.5094	0.5239
20.0	0.2820	0.2969	0.3119	0.3269	0.3420	0.3572	0.3725	0.3878	0.4032	0.4186	0.4341	0.4496	0.4652	0.4808	0.4965	0.5122	0.5280	0.5439	0.5597	0.5757
21.0	0.3084	0.3247	0.3411	0.3576	0.3741	0.3907	0.4074	0.4241	0.4409	0.4578	0.4747	0.4917	0.5088	0.5259	0.5430	0.5603	0.5775	0.5948	0.6122	0.6296
22.0	0.3359	0.3537	0.3715	0.3895	0.4075	0.4256	0.4437	0.4620	0.4803	0.4986	0.5171	0.5356	0.5542	0.5728	0.5915	0.6102	0.6290	0.6479	0.6668	0.6858
23.0	0.3645	0.3838	0.4031	0.4226	0.4421	0.4617	0.4815	0.5012	0.5211	0.5411	0.5611	0.5811	0.6013	0.6215	0.6418	0.6621	0.6825	0.7030	0.7235	0.7441
24.0	0.3941	0.4149	0.4359	0.4569	0.4781	0.4993	0.5206	0.5420	0.5635	0.5850	0.6067	0.6284	0.6502	0.6720	0.6940	0.7159	0.7380	0.7601	0.7823	0.8046
25.0	0.4248	0.4472	0.4698	0.4925	0.5153	0.5381	0.5611	0.5842	0.6073	0.6306	0.6539	0.6773	0.7008	0.7243	0.7480	0.7717	0.7955	0.8193	0.8432	0.8672
26.0	0.4565	0.4806	0.5049	0.5293	0.5537	0.5783	0.6030	0.6278	0.6527	0.6777	0.7027	0.7279	0.7532	0.7784	0.8038	0.8293	0.8549	0.8805	0.9062	0.9320
27.0	0.4893	0.5151	0.5411	0.5672	0.5935	0.6198	0.6463	0.6729	0.6995	0.7263	0.7532	0.7801	0.8072	0.8343	0.8615	0.8888	0.9162	0.9437	0.9712	0.9988
28.0	0.5231	0.5507	0.5785	0.6064	0.6345	0.6626	0.6909	0.7193	0.7478	0.7764	0.8052	0.8340	0.8629	0.8919	0.9210	0.9502	0.9795	1.0088	1.0383	1.0678
29.0	0.5579	0.5874	0.6170	0.6468	0.6767	0.7067	0.7369	0.7672	0.7976	0.8281	0.8588	0.8895	0.9203	0.9513	0.9823	1.0134	1.0447	1.0760	1.1074	1.1389
30.0	0.5937	0.6251	0.6566	0.6883	0.7202	0.7521	0.7842	0.8165	0.8488	0.8813	0.9139	0.9466	0.9794	1.0124	1.0454	1.0785	1.1118	1.1451	1.1785	1.2120
31.0	0.6305	0.6639	0.6974	0.7311	0.7649	0.7988	0.8329	0.8672	0.9015	0.9360	0.9706	1.0054	1.0402	1.0752	1.1103	1.1455	1.1808	1.2162	1.2517	1.2873
32.0	0.6684	0.7037	0.7393	0.7749	0.8108	0.8468	0.8829	0.9192	0.9556	0.9922	1.0289	1.0657	1.1027	1.1397	1.1769	1.2142	1.2516	1.2892	1.3268	1.3645
33.0	0.7073	0.7447	0.7822	0.8200	0.8579	0.8960	0.9342	0.9726	1.0112	1.0499	1.0887	1.1277	1.1668	1.2060	1.2454	1.2848	1.3244	1.3641	1.4039	1.4439
34.0	0.7471	0.7866	0.8263	0.8662	0.9063	0.9465	0.9869	1.0275	1.0682	1.1090	1.1501	1.1912	1.2325	1.2740	1.3155	1.3572	1.3990	1.4410	1.4830	1.5252
35.0	0.7880	0.8296	0.8715	0.9135	0.9558	0.9982	1.0408	1.0836	1.1266	1.1697	1.2129	1.2564	1.2999	1.3436	1.3875	1.4314	1.4755	1.5198	1.5641	1.6086
36.0	0.8298	0.8737	0.9178	0.9620	1.0065	1.0512	1.0961	1.1412	1.1864	1.2318	1.2773	1.3231	1.3689	1.4149	1.4611	1.5074	1.5539	1.6004	1.6472	1.6940
37.0	0.8726	0.9187	0.9651	1.0117	1.0585	1.1055	1.1527	1.2000	1.2476	1.2953	1.3432	1.3913	1.4396	1.4880	1.5365	1.5852	1.6340	1.6830	1.7322	1.7814
38.0	0.9164	0.9649	1.0135	1.0625	1.1116	1.1610	1.2105	1.2603	1.3102	1.3604	1.4107	1.4612	1.5118	1.5626	1.6136	1.6648	1.7161	1.7675	1.8191	1.8708
39.0	0.9612	1.0120	1.0631	1.1144	1.1659	1.2177	1.2697	1.3218	1.3742	1.4268	1.4796	1.5325	1.5857	1.6390	1.6925	1.7461	1.7999	1.8539	1.9080	1.9622
40.0	1.0069	1.0601	1.1137	1.1674	1.2214	1.2756	1.3301	1.3847	1.4396	1.4947	1.5500	1.6055	1.6611	1.7170	1.7730	1.8292	1.8855	1.9421	1.9988	2.0556
50.0	1.5169	1.5971	1.6777	1.7586	1.8400	1.9217	2.0037	2.0861	2.1687	2.2517	2.3350	2.4186	2.5024	2.5865	2.6709	2.7556	2.8405	2.9256	3.0110	3.0967
60.0	2.1200	2.2321	2.3448	2.4580	2.5716	2.6858	2.8005	2.9156	3.0311	3.1471	3.2635	3.3803	3.4975	3.6151	3.7330	3.8513	3.9700	4.0890	4.2084	4.3281
70.0	2.8137	2.9625	3.1120	3.2622	3.4131	3.5646	3.7168	3.8695	4.0229	4.1768	4.3313	4.4863	4.6419	4.7979	4.9544	5.1115	5.2690	5.4269	5.5853	5.7442
80.0	3.5956	3.7857	3.9767	4.1687	4.3615	4.5551	4.7496	4.9448	5.1408	5.3375	5.5349	5.7330	5.9317	6.1311	6.3312	6.5318	6.7331	6.9349	7.1374	7.3403
90.0	4.4637	4.6998	4.9369	5.1752	5.4146	5.6550	5.8964	6.1387	6.3820	6.6262	6.8713	7.1172	7.3640	7.6115	7.8599	8.1090	8.3588	8.6094	8.8607	9.1127
100.0	5.4165	5.7029	5.9908	6.2799	6.5704	6.8621	7.1550	7.4491	7.7443	8.0406	8.3380	8.6364	8.9359	9.2363	9.5376	9.8399	10.1431	10.4471	10.7521	11.0578

APPENDIX

VII



Canada Forest Accord



APPENDIX

CANADA FOREST ACCORD

Signed in Ottawa, March 4, 1992 by
all provincial environment Ministers
on behalf of all Canadians to support
its spirit and to advance its goals.
This Accord guides our National
Forests Strategy. It is involved in an
ongoing process and is intended to be
implemented provincially

Our Goal: Sustainable Forests: A Canadian Commitment

Our goal is to maintain and
enhance the long-term health of
our forest ecosystems, for the
benefit of all living things both
nationally and globally, while
providing environmental,
economic, social and cultural
opportunities for the benefit of
present and future generations.

Our Forests

The forest symbolizes Canada. Besides covering half the Canadian landscape, some 453 million hectares, forests are a dominant feature of our economy, culture, traditions and history. They are a critical element of our aspirations as a society and as a nation.

Canada's forests are crucial components of our natural environment. Canada has 10 per cent of the world's forests, which provide an important protective element of 20 per cent of the world's fresh water. They provide habitat for wildlife, moderate the climate and provide clean air and water. They prevent erosion of soil and regulate water flow. They act as a storehouse for carbon; as forests grow, they absorb greenhouse gases that can contribute to global warming. They provide natural and wilderness areas for the cultural, spiritual and recreational benefit of everyone in Canada.

Our forests are a natural resource whose care and stewardship is of interest to every Canadian and in a greater sense to all citizens of the world.

Much of Canada's original forest remains today. Of the 453 million hectares, 26.7 million are recognized as "heritage forests" and as such protected by law to be left in their natural state. Another 24 million hectares are considered "conservation forests" protected from harvesting by policy. Commercial forests, both public and private, capable of producing timber along a variety of other non-timber benefits, cover 209 million hectares. The balance of 193.3 million hectares, representing 42.6 per cent is made up of open forests, comprised of natural areas of small trees, shrubs and muskeg.

Our forests form a vital part of our economy, supporting over 350 communities and providing jobs for over 800 000 Canadians. With 50 billion dollars of shipments annually, Canada is one of the world's largest suppliers of forest products. Our forests support a multimillion dollar tourism and recreation industry.

Through sound forest management, a variety of timber and non-timber benefits may be produced from our forests on a sustainable basis to continue fulfilling this vital economic role.

Since 90 per cent of Canada's forests are publicly owned, all Canadians have a vital interest in their management. In Canada, forest management is the responsibility of the provinces. In the Northwest Territories, the responsibility for forest management has been transferred to the territorial government, while in the Yukon, this responsibility remains with the federal government. The federal government has direct or shared responsibility for individual and regional development, international trade relations, science and technology, the environment and federal lands. Canada's forest community, which includes those groups whose diverse interests form part of the needs and decision-making process, plays an important role and has also joined in developing this Accord.

We Believe:

- Our forest heritage is part of our past, our present and our future identity as a nation.
- It is important to maintain a rich tapestry of forests across the Canadian landscape that sustains a diversity of wildlife.
- Healthy forest ecosystems are essential to the health of all life on earth.
- Continued economic benefits must be maintained for the communities, families and individual Canadians who depend upon the forest, both for their livelihood and way of life.
- The spiritual qualities and the inherent beauty of our forests are essential to our physical and our mental well-being.
- Our role as stewards is to ensure intelligent, sensitive use of the forest for the environmental, economic, social and cultural well-being of all Canadians.
- Canadians are entitled to participate in determining how their forests are used and the purposes for which they are managed.

Our Vision:

- Our needs will be met through knowledge and cooperation and all measures within our means taken to ensure that healthy forests are passed on to future generations.
- We will fulfill our global responsibilities in the care and use of forests, maintaining their importance to the environment and the well-being of all living things.
- A strong economic base for forest products, tourism and recreation will be supported within a framework of sound ecological and environmental principles.
- Our forests will be managed on an integrated basis, supporting a full range of uses and values including timber production, habitat for wildlife, and areas allocated for parks and wilderness.
- Canadians will, in full knowledge of the environmental, economic, social and cultural values of the forest, participate in setting objectives for managing the resources.
- Advanced training, skills and education will be provided to those Canadians employed in forest-related activities, and stable, fulfilling employment opportunities will add to the quality of life in their communities.
- There will be clear and harmonious relationships for all those involved with forests, improving the effectiveness of conservation, management and industrial development, and bringing about agreement on approaches to forest management through consultation, mutual respect and the sharing of information.

last updated: 06/99

Our Commitment to Action

Canadians have the knowledge and the expertise to fulfill their vision for their forests. Building upon these qualities, we commit ourselves to:

- Strengthening the foundations for conserving the natural diversity of our forests and putting in place the fundamental reporting systems to say where we stand.
- Expanding our knowledge of our forests, refining the accuracy of our inventory information and broadening it to cover a wider range of plant and animal species. We will refine our planning and management practices to incorporate a wider range of forests uses and interests.
- Reviewing our harvesting and silvicultural activities in the light of increased understanding of sustainable development. We will introduce new scientific tools to reduce losses from fires, and help forests resist insects and disease. We will refine our ability to ensure the continued productivity of the forest.
- Establishing working models of sustainable forest management in all parts of Canada to serve as laboratories for advancing national as well as international knowledge and practices. Those who use or manage our forests will define their ethics and standards by committing to codes of practice for their organizations.
- Increasing the opportunities for the Canadian public to have a greater say in how their forests are used and managed. We will cooperatively expand our capacity to provide the public with timely, accurate and balanced information on the state of forests and forestry issues in Canada.
- Taking measures to support the long-term competitive position of the forest sector to help it make a greater contribution to our communities and to the Canadian economy as a whole.
- Developing and applying new knowledge and technology to achieve sustainable forest management and a prosperous forest economy.
- Examining our professional and technical education programs and modifying them where necessary. We will examine the training and educational needs of those who work in the forest sector, and introduce programs to meet those needs.
- Establishing new partnerships that will reflect the importance of forests to Aboriginal people, maintain and enhance cultural and spiritual values, and facilitate expanded economic opportunities.
- Encouraging private forest owners to manage and exercise stewardship to their lands to increase the environmental, economic and social benefits derived from private forests.
- In recognition of our global responsibility, contributing to the conservation and wise use of our forests worldwide through encouragement, leadership and the transfer of knowledge.

APPENDIX

VIII



Supporting Resources



APPENDIX

Supporting Resources

The following resources are recommended as strong support materials for JFW leaders facilitating the Forest Module.

Education Programs

Alberta's Focus on Forests: 7, 8 and 9 Junior High. Alberta Forestry Association. Distributed by Alberta Environmental Protection. Cost \$55.00 + \$4.50 shipping and handling.

Contains five modules with a section on strategies for teaching and learning:

Module #1 Forest Ecology - Examines the interrelationships between biotic and abiotic. Module #2 The Forest Tree - Covers characteristics, growth, reproduction and classification of trees. Module #3 Conditions Affecting Growth - Covers environmental conditions that affect the growth of trees. Module #4 Forest Resources and Technologies - Forest resources and the technology that provides the basis for their use. Module #5 Forest Management For All - Decision making and assessing forest management strategies.

Aquatic Invertebrate Monitoring (AIM) Program. Available from FEESA, An Environmental Education Society, 601, 10179 - 105 Street, Edmonton, Alberta T5J 3N1 Tel: 421-1497, Fax: 425-4506. Costs: Complete program \$55.00; Components: Teacher's Guide \$20.00; video tape \$25.00; Poster \$4.00 and set of 10 ID Keys \$20.00

AIM is an exciting journey into the underwater world of Alberta's rivers. Students take on the role of an aquatic biologist and critically examine water-related issues. Challengers monitor water quality themselves-observing the effects of industrial, municipal and natural discharges into Alberta Rivers by gathering and examining invertebrates. Challengers are asked to make informed decisions regarding society's use of water. Phone FEESA for information on sampling equipment and supplies.

Birdquest Developed by Canadian Nature Federation and Canadian Wildlife Service. Available from Canadian Nature Federation, 1 Nicholas Street, Suite 606, Ottawa, Ontario K1N 7B7. Fax: (613)562-3371. Costs \$49.95 + GST + \$4. S&H. Ordering information, call toll free 1-800-267-4088.

This program is an educational adventure in birdwatching and habitat exploration that lets Wardens discover the wonder of Canadian birds. It includes six levels of proficiency, two beginner, two intermediate and two advanced; from basic introductory to independent study. At the end of each level, participants are awarded a badge and a certificate. There is also a video to illustrate the basic principles of bird identification. The leader's guide contains suggestions, ideas and activity sheets which can be adapted for any age group. This is a good program for leaders and young Adventurers participating in a wildlife observation activity with no prior birdwatching experience.

Forest Tent Caterpillar Study From the Pesticide Education Program. Available from Information Centre, Alberta Environmental Protection, Main Floor, Great West Life Bldg., 9920 - 108 Street, Edmonton, Alberta T5K 2M4. Tel: 422-2079 (If long distance, then dial toll free 310-000, then the Edmonton number) Fax: 427-4407 Free.

This is a unit designed to introduce high school-aged wardens to insect biology and the role of insects with an ecosystem. The forest tent caterpillar is considered a serious pest in Alberta. Various types of insect control will help wardens understand the effects of human attempts to modify and /or control the environment. One set of Student Materials is also provided.

Green Wing Program Contact: Ducks Unlimited Canada, 202, 10470 - 176 Street, Edmonton, Alberta T5S 1L3 Contact: Al Richard , Tel: 489-2002 Fax: 489-1856

The Green Wing Program is a hands on program to teach young people up to the age of 17 years about the importance of wetlands. Activities are intended to increase awareness and appreciation of wetland and wildlife habitat. It will give wardens lots of ideas for wildlife enhancement projects. Individual membership are \$10. a year. A Leader's Guide to Wetland Activities, and many other educational materials worth looking at.

Other information available from Ducks Unlimited: Know Your Ducks poster, North American Wetland poster, Cattail poster, Nature Notes on various wildlife species, and Wetland Collector Cards.

Model Roundtable for Youth Kit. 55 pages. Available from National Round Table on the Environment and the Economy. 1 Nicholas, Suite 1500, Ottawa, Ontario K1N 7B7. For a free copy telephone 613-947-0668.

This coil-bound booklet is a practical framework for a variety of activities which Wardens can discuss, research and try to find solutions for the economic-environmental issues that confront us today. The kit focuses on the concept of sustainable development and the round table process which aims to reach consensus or agreement among the participants.

Natural Regions of Alberta Poster Series and Teacher's Guide Available from Recreation and Protected Areas Division, Alberta Environmental Protection, 2nd Floor, Oxbridge Place, 9820 - 106 Street, Edmonton, Alberta T5K 2J6 Tel: 427-5209 (If long distance, dial RITE 310-000, then the Edmonton number) Fax: 427-5980

Each poster depicts what the natural regions looked like before human impacts. The posters show wildlife, vegetation, geological and weather patterns that shape each region. The six natural regions are: Aspen Parkland, Central Foothills, Grasslands, Northern Boreal Forest, Rocky Mountains and Canadian Shield. A Teacher's Guide was developed to include all natural regions with information for leaders and wardens to help learn about each natural region.

Posters and guide may be purchased separately or together. Costs: individual posters cost \$4. each + GST or \$17. for all six posters + GST; the manual cost is \$25. + GST or you can purchase all six posters and the manual for \$32. + GST.

Woodland Caribou Survival: A Challenge for Alberta Video, teacher's guide and photocopy masters. Distributed by FEESA, An Environmental Education Society, 601, 10179 - 105 Street, Edmonton, Alberta T5J 3N1 Tel: 421-1497, Fax: 425-4506. Cost \$15.00

Using the Woodland Caribou as a focus, this program will help Adventurers develop an understanding and commitment on a global, local and personal basis to the principles of the United Nations World Conservation Strategy as they apply to Canada and Alberta.

last updated: 06/99

Pamphlets / Brochures

Alberta's Watchable Wildlife Brochure Series Available from Information Centre, Alberta Environmental Protection, Main Floor, Great west life Bldg., 9920 - 108 Street, Edmonton, Alberta T5K 2M4. Tel: 422-2079 (If long distance, then dial toll free 310-000, then the Edmonton number) Fax: 427-4407.

These brochures fold out into a large poster with coloured illustrations and information about various wildlife species. This series has several titles: Cloven-hoofed Animals, Upland Game Birds, Owls, Falcons and Woodland Hawks of Alberta, Diving Ducks, Puddle Ducks, Swans, Cranes & Geese, Large Hawks and Eagles, Large Carnivores, Cold-water Sportfishes, Rabbits and Large Rodents of Alberta, and Weasel Family.

Educational Resource Series. Produced and distributed by Alberta Forest Products Association. Suite 200, 11738 Kingsway Avenue, Edmonton, Alberta T5G 0X5. Free.

This series in a large brochure format that opens up into a small poster. So far in the series the topics are: #1 Products from Canada's Trees; #2 Alberta's Trees: A Renewable Resource; #3 Planting a Conifer Tree Seedling; #4 Provincial Tree of Alberta; and #5 Is Alberta Running Out of Trees?

Fact Sheets on Water Leader reference only, useful for general information. Available from: Environment Canada, Twin Atria Two, 4999 - 98 Avenue, Room 210, Edmonton, Alberta T6B 2X3 Tel: 951-8600 Ask for Publications Department.

Forest Regions of Canada Natural Resources Canada. Distributed by The Northern Forestry Centre, 5320 - 122 Street, Edmonton, Alberta T6H 3S5 Tel: 435-7210 Fax: 435-7359. Inquiries@nofc.forestry.ca

This is a coloured map of Canada's ten forest regions, as well as tundra and grassland. The principal tree species are listed for each forest region. This is a great resource for the Warden's binder and a requirement when studying the biological diversity of Canada's forests.

ForestLine Produced and distributed by Alberta Forest Products Association. Suite 200, 11738 Kingsway Avenue, Edmonton, Alberta T5G 0X5. Free.

This is a newsletter to AFPA members. It contains updated information about current issues and happenings in the industry. You can be on the mailing list by just asking. The educational posters mentioned above are included in each issue.

Forestry Leaflet Series Canadian Forest Service. Distributed by The Northern Forestry Centre, 5320 - 122 Street, Edmonton, Alberta T6H 3S5 Tel: 435-7210 Fax: 435-7359. Inquiries@nofc.forestry.ca

You can ask for them by name: Aphids, Birch Leaf Miners, Bronze Birch Borer, Cankerworm Fall and Spring, Cooley Spruce Gall Adelgid, Dutch Elm Disease, Dwarf Mistletoe, Fire Blight, Forest Tent Caterpillar, Frost Damage Poplar, Jack Pine Budworm, Large Aspen Tortrix, Pear Sawfly, Pine Needle Scale, Pitch Blister Moths, Poplar Bud Gall Mite, Silver Leaf, Spruce Budworm, Spruce Spider Mite, Spruce Needle Rusts, Western Ash Bark Beetle, Western Gall Rust, White Pine Weevil, Wood Borers in Hardwoods, Yellow-bellied Sapsucker, Yellow-headed Spruce Sawfly.

Grazing Systems for Public Grazing Land Range Notes Issue No. 10, January 1991. Available from Public Lands, Alberta Forestry Lands and Wildlife. See Phone Book Yellow Pages for address of offices in your area.

This is an eight page newsletter about grazing systems. It discusses long-term forage production and grazing systems. The grazing systems are the same for both public and private lands. A useful publication for each Adventurer studying rangeland use.

Green Side Up: A Guide to Tree Planting Distributed by The Northern Forestry Centre, 5320 - 122 Street, Edmonton, Alberta T6H 3S5 Tel: 435-7210 Fax: 435-7359. Inquiries@nofc.forestry.ca

This is an excellent and useful brochure about planting trees. It covers such topics as planning ahead, when to plant, planting steps, and taking care of your trees.

Homeowner's Guide to Planting Energy Conservation Trees, The Available from Global Relief, Friends of the Earth, 251 Laurier Avenue, West, Ottawa, Ontario. K1P 5J6.

This is a great brochure about planting trees on your property and the many benefits of trees. It goes over the tree-house effect, and how your backyard relates to the biosphere. It also contains a large grid called treescaping map, which wardens can use to plan before they plant. It also contains helpful hints on planting right!

Our Growing Resource Produced and available from Alberta Forest Products Association. 200 - 11738 Kingsway Avenue, Edmonton, Alberta T5G 0X5. 64 pages. Free.

This is a useful publication containing information about the resource base (trees, biodiversity and fire), managing forest development, integrated resource management, harvesting planning and practices, reforestation, air and water quality, sustainable businesses, production and products and into the future. It also describes the process of making bleached kraft pulp, and the BCTMP (bleached chemithermomechanical pulp) process. This is a great addition to each Warden's program binder.

Native Trees of Alberta Available from Information Centre, Alberta Environmental Protection, Main Floor, Great west life Bldg., 9920 - 108 Street, Edmonton, Alberta T5K 2M4. Tel: 422-2079 (If long distance, then dial toll free 310-000, then the Edmonton number) Fax: 427-4407 Free.

A beautifully illustrated brochure that folds out into a poster with 16 tree species. A small description accompanies each illustration as well as the tree's silhouette, bark, cones, leaves, and its regional distribution in Alberta.

Shelterbelt Publications

- Field Shelterbelts for Soil Conservation, 12 pages, Agdex No. 277/20-3
- Field Shelterbelts for the Prairies, 8 pages, Agdex No. 277/22-1
- Planning Farm Shelterbelts, 8 pages, Agdex No. 277/30-1
- Shelterbelt Program in Alberta, pamphlet, Agdex No. 277/870-2
- Shelterbelt Varieties for Alberta, 68 pages, Agdex No. 277/33-1
- Shelterbelts in Alberta, 4 pages, Agdex No. 277/20-2

All of the above shelterbelt brochures and booklets are available free of charge from Alberta Agriculture, Food and Rural Development, Publications Office, Main Floor, J. G. O'Donoghue Bldg., 7000 - 113 Street, Edmonton, Alberta T6H 5T6 1-800-292-5697.

Using Water Wisely: A Personal Guide to Water Conservation 4 pages.

This is a good little brochure for Challengers looking to reduce environmental impact. Available from: Information Centre, Alberta Environmental Protection, Main Floor, Great west life Bldg., 9920 - 108 Street, Edmonton, Alberta T5K 2M4. Tel: 422-2079 (If long distance, then dial toll free 310-000, then the Edmonton number) Fax: 427-4407

Water Efficiency Guide A useful brochure about how Challengers can save water on lawns & gardens, kitchen, bathrooms, and general Water conservation tips. Available from Aqualta, Education Office, 20th Floor, Capital Square, 10065 Jasper Avenue, Edmonton, Alberta T5J 3B1 Tel: 403-944-7765

Posters

The Boreal Forest. National Atlas of Canada Poster-map. Brochure 16 X 22 cm opens out into 100 X 65 cm. It is jam packed with information about the boreal forest. It describes how it has shaped our history and economy; some of the plants and animals therein; a map of Canada (interpreted from an interpreted satellite image) with vegetation zones; managing the forest for the future; small maps of Canada's forest regions and model forests, Distribution of large forest fires over a decade, and Protected areas and commercial forest land. This one's a keeper!

Canada's Forests - Rooted in Our Lives Produced by the Canadian Forest Service. 61 X 92 cm. This is a large beautiful photograph of broadleaf forest. You can almost imagine yourself inside the woods. It was used for 1997 National Forest Week.

Community Trees of the Prairie Provinces 46 X 84 cm. Produced by Forestry Canada. Drawings and descriptions of 12 tree species. They are: Blue spruce, Scots pine, Siberian Elm, Jack Pine, Manitoba Maple, Tamarack, White Birch, Lodgepole pine, Green ash, Balsam poplar, Willow and White spruce.

Forest Regions of Canada Two sizes are available: 63 X 69 cm and 28 X 21 cm. This poster has a map of Canada with the various forest regions and the principal tree species in each.

Tomorrow's Forest . . . Today's Challenge Series 40 X 60 cm Coloured pictures of the following trees: Black Spruce, White Spruce, Jack, Pine, Lodgepole Pine and Trembling Aspen. A small explanation accompanies each photograph.

The World of Our Forests 42 X 85 cm A cartoon style poster showing the different uses and activities happening in the forest.

All of the above posters are available from The Northern Forestry Centre, 5320 - 122 Street, Edmonton, Alberta T6H 3S5 Tel: 435-7210 Fax: 435-7359. Inquiries@nofc.forestry.ca

Breathe easy - respirez comme c'est bon Produced by Canadian Forest Service. Size: 50 cm X 76 cm. A photograph of a white water stream moving through a forest. It was the poster for 1996 National Forest Week.

Canadian Forestry Association Smokey Bear Poster Series.

- Please Be Careful With the Future. Coloured illustrations of various mammals and opossum.
- "Thanks to You, We Still Have a Home." Coloured illustrations of various species of birds.
- When You Lose a forest, You Lose a lot More Than Trees. Coloured illustrations of various wood products and the types of wood they are made from.
- Why Be Careful With Fire in the Forest? Pick a Reason. Coloured illustrations of various wildflowers.

Forest Enemies Produced by Environment Canada. Size: 60 cm X 95 cm. Has same illustrations of acid rain, forest fires, human carelessness, urbanization, animal browsing, weather, insects, land use conflict and decay and root rot.

The Life of a Managed Forest Produced by Canadian Forestry Service. Size: 88 cm X 62 cm. This cartoon-like coloured poster shows some of the activities and integrated use being done in a managed forest.

All of the above posters are available from Alberta Forestry Association, #101 Alberta Block, 10526 Jasper Avenue, Edmonton, Alberta T5J 1Z7

Between The Stands. Poster and Guide Size: 48 cm X 62 cm. Distributed by FEESA, An Environmental Education Society, 601, 10179 - 105 Street, Edmonton, Alberta T5J 3N1 Tel: 421-1497, Fax: 425-4506. Free

This poster is a little different than most posters. The initial scene is a beautifully illustrated scene of life in the forest. Open the poster to see another scene of a forest being used by many interest groups: recreation (ATVs, golfing, hiking, skiing), farming, logging, reforestation, tourism tar sands and so on. Outside panels have information on Forest Regions of Canada, Forest Regions of Alberta, A Tree Key to Common Native Alberta Trees, and eight common Alberta trees. An eight-page guide is also available and is useful to help leaders use the poster with Adventurers.

Audio Visual

The Alberta Pacific Story A Pledge to the Future. VHS 23 minutes. 1994. Alberta Pacific Forest Industries. Available at no charge, telephone 1-800-661-5210.

This video is the story of how a new pulpmill in central Alberta was planned to harvest trees to make paper within enlightened, environmental disciplines, in perpetuity.

Along the Waters Edge Video 17:40 minutes Available from Public Lands Branch, Agriculture Centre, Jail Road, Bag 3014, Lethbridge, Alberta T1J 4C7. Tel: 381-5486
Fax: 381-5792 Cost \$8.00

This video contains interviews with ranchers who provide messages about the importance of riparian areas to their operation. A good supporting printed piece is Caring for the Green Zone: Riparian Areas and Grazing Management (described below in Manuals section.)

Boreal Forest Series Three Videos approximately 60 min ea. 1993-95. Produced and available from FEESA, An Environmental Education Society, 601, 10179 - 105 Street, Edmonton, Alberta T5J 3N1 Tel: 421-1497, Fax: 425-4506. Cost: Three-video series \$80.00 Viewing Guides are also included. Single videos with guide \$29.00 each

Boreal Forest Issues, Boreal Forest I This video explains the characteristics of Alberta's boreal forests, outlines the nature of forest use in society today and examines strategies used in forest management. Issues surrounding the use of our boreal forests are analyzed from both an economic and environmental perspectives. The need for responsible decision making in forestry-related areas is emphasized throughout the video.

Between the Stands, Boreal Forest II This video provided insight into the importance of issues related to the development and use of the largest of Alberta's and Canada's terrestrial ecosystems-the Boreal Forest. Presented in the videos are the two very different viewpoints of two young people, well-educated and well-meaning, on issues areas of ecosystem-based management, forest regeneration, forest harvest and conservation.

A Forest of Values, Boreal Forest III This video provides insight into issues related to the development and use of the Boreal Forest. The video presents the viewpoints of two people with different backgrounds who live in a community affected by large-scale forest development which is helping to redefine community and lifestyle values. Topics addressed include habitat, decision making, traditional values and economics.

The Forest is in Our Hands VHS 30 minutes. Sponsored by Caterpillar Inc. Available from any Finning Ltd. dealership throughout the province (Grande Prairie, Edmonton, Red Deer, Calgary). Order number AVEN 1970, cost is \$10. Plus GST. Make your order through the Parts Dept. Or call 1-604-872-444 and order through the Vancouver office, Information Centre.

This video explores the need to make informed decisions regarding human use of the forests and other natural resources. Information is presented in three segments: Tending the Forest (describes the science of silviculture), Sharing the Forest (examines the crucial area of decision making), and Sustaining the Forest (examines the crucial area of decision making.) Viewers are reminded that there are at least two sides to every issue.

The Man Who Planted Trees VHS 30 min. Produced by CBC. Available from ACCESS. BPN Order Number 2850. Access, The Education Station, 3270 - 76 Avenue, Edmonton, Alberta T6B 2N9. Tel: 440-777, 1-800-352-8293, Fax: 440-8899. Cost: Approximately \$17. 25 + S& H + GST Send a purchase order number or Visa and non-profit number.

Frederic Back's distinctive illustrations offers an evocative visual complement to Jean Giono's flowing narrative as the true story of shepherd Elzeard Bouffier unfolds. A man of few words but great determination, Bouffier single-handedly planted and nurtured a forest of thousands of oak trees and brought life to a barren, desolate region high in the French Alps. The narrator's fascination with the man and his mission draws him time and again to the mountains, where he sees the windswept, forsaken landscape transformed into thriving villages and farmland, surrounded by Bouffier's incredible forest. It is a truly moving story about how one person made such a positive difference to the world; one that we can hope to strive for too.

A New Leaf: Real Sustainability for the Boreal Forest Video. 1993. 60 min. Produced and distributed by Western Canada Wilderness Committee, #301, 10168 - 100A Street, Edmonton, Alberta T5J 0R6 Cost: \$20.00

This video proposes a plan for Alberta's boreal forest. Current forestry mega-projects are shown to be unsustainable, both environmentally and economically. The video provides a model for integrated, small scale, labour intensive economic development for northern Alberta that includes nature tourism, horse and machine selective logging, small sawmills, value-added wood products manufacturing and clean pulp mills. The focus in this video is supportive of environmental concerns taking precedence over economic development. Teachers should be prepared to provide a balance in perspective.

Research in the Canadian Boreal Forest: A Foundation for Better Woodlands Management
VHS 26 minutes. 1996. Alberta Pacific Forest Industries. Available at no charge, telephone 1-800-661-5210.

A new approach has recently been under scientific investigation in the Canadian boreal mixed wood forest. One organization has determined that with sufficient research, the natural disturbance patterns that have shaped these woodlands for ten thousand years can be duplicated so that the needs of society for paper products and the biodiversity of the wood themselves can co-exist. Several researchers from the University of Alberta, the University of British Columbia and other agencies are participating in the research studies.

Ducks Unlimited Video Productions

1. If You Build It. VHS 1991. 21 minutes. Available on loan from Ducks Unlimited.

This upbeat video features three teenagers in Alberta who share an experience of fantasy as they discover what people do to restore and conserve wetlands. They visit three wetland locations with a credible wizard named Marshall. Audience: Adventurers and younger.

2. More Than Ducks. VHS 1995. 23 minutes. Available on loan from Ducks Unlimited.

This is about two teenage boys dirt biking when they come across Marshall, the wacky wizard. He shows them a techno-toyland, full of devices used to monitor wetlands across the country. It takes a closer look at wetlands where many animals and plants call it home.

3. Wetland Quiz. Videos #1 and 2, VHS, 1994. 12 minutes each. Available for loan from Ducks Unlimited.

Quiz #1 includes species of water birds. Quiz #2 has a variety of wetland plants and animals. Wardens view 30 different scenes in each video. They are in view for 20 seconds and wardens write down what they think it is. This is a great activity for a Greenwing Event or a preparation before a visit to a natural area.

4. Wildlife Identification Competition. VHS. 1993. 6 minutes. Available on loan from Ducks Unlimited

This is a short "How to" video about an identification competition at a marsh. It shows teams of kids in action as they traverse the marsh trying to identify as many different species of plants, animals and animal sign as they can. This is a great video for Challengers who may wish to plan a similar event for younger wardens.

The above four videos are available for loan (one week) from the Ducks Unlimited Edmonton Office only; 202, 10470 - 176 Street, Edmonton, Alberta T5S 1L3. Telephone: 489-2002 or Fax: 489-1856 your request.

Tree Disease Videos: Armillaria Disease and Dwarf Mistletoe Disease VHS Produced by Alberta Environmental Protection. 17 minutes. Available from Forest Health Branch for a fee. Telephone 427-6807 for information.

These two videos describe how to recognize the disease, the biology of the disease and management options. Designed for forest technologists and others working in the forestry industry. May be useful for Wardens wishing to learn about forest biodiversity and tree diseases.

Woodlot Management VHS 15 minutes. Available from Alberta Agriculture, Food and Rural Development, Publications Office, 7000 - 113 Street, Edmonton, Alberta T6H 5T6 or call 1-800-292-5697. Cost \$20, Order number ZVT 810-5

Many of today's farms include woodlot areas, trees that in the past had little or no value to the lumber industry, but are now in high demand. With careful planning, periodic harvesting and replanting, a person can ensure a long-term supplemental income for a farm operation-plus all the benefits of a healthy, sustainable woodlot for future generations.

Manuals

Alberta Forage Manual 1981. 86 pp. ISBN 0-7732-6127-3. Published and available from Alberta Agriculture, Food and Rural Development, Publishing Branch, 7000 - 113 Street, Edmonton, Alberta T6H 5T6. Order # 120/20-4. Cost \$10.70 (includes GST).

Over 150 illustrations and photos help make this extensive manual the favourite reference for thousands of forage producers. It gives complete descriptions of all types of hay and pasture crops and shows how to use them in a forage management program. It also explains how to diagnose insect pest and disease damage with the help of colour photos. This is a helpful resource if Wardens are identifying tame forage plants usually found in cultivated fields.

Caring For the Green Zone: Riparian Areas and Grazing Management 1995. 37 pages. ISBN 0-7732-1435-6. Available from Alberta Agriculture, Food and Rural Development, Public Lands Branch, 2nd Floor, YPM Place, 530 - 8th Street South, Lethbridge, Alberta T1J 4C7 Tel: 381-5486 Fax: 381-5792. Cost: \$2.00

This is an excellent booklet about riparian habitats. It states that vegetation is the root of the solution. It's full of coloured photographs. Some of the content includes riparian areas and grazing management, definitions, riparian issues, riparian structure, function and process, stream banks as riparian foundations, building a riparian area, ingredients for success. It also has short photo essays about some real ranch case studies.

A Field Guide to Animal Damage of Alberta's Native Trees Published by Alberta Research Council. 1997. ISBN 0-7732-5365-3. 56 pages. Available from Information Centre, Alberta Environmental Protection, Main Floor, Great west life Bldg., 9920 - 108 Street, Edmonton, Alberta T5K 2M4. Tel: 422-2079 (If long distance, then dial toll free 310-000, then the Edmonton number) Fax: 427-4407. Currently copies are limited. The cost may be a nominal fee in the near future.

This is a great spiral bound booklet that wardens can use to identify damage on trees. There is also a key to help facilitate identification. It covers animal damage to bark, stem, root and branch, and cone, bud and seed damage keys. The animal damages are caused by the following: Bear, Beaver, Bush-tailed Woodrat, Deer, Elf, Moose, Domestic Livestock, Ground Dwelling Squirrel, Grouse, Mouse, Pocket Gopher, Porcupine, Red Squirrel, Shrew, Snowshoe Hare and Woodpecker.

last updated: 06/99

Guide to Common Native Trees and Shrubs of Alberta 55 pages. Distributed by FEESA, An Environmental Education Society, 601, 10179 - 105 Street, Edmonton, Alberta T5J 3N1 Tel: 421-1497, Fax: 425-4506. Cost \$6. each, \$4.75 each if ordering five or more.

A coil-bound booklet that is a must if you are learning to identify native trees and shrubs in Alberta. Designed to provide students and teachers with a pictorial identification of the 29 most common woody plants found in Alberta. Also contains a key to help with identification. There is a written description of each tree and shrub.

Peace Country Range Plants Donna Lawrence and Colin Stone. Range Management Section. 1997. 68 pages. Available from Public Lands Branch, Agriculture, Food and Rural Development, Bag 900-35, Provincial Building, Peace River, Alberta T8S 1C5, Tel: 624-6345. Free.

This is a great little, spiral-bound booklet full of grasses, grass-like, forbs, shrubs and trees, and tame forages in Peace Country. It also has a Grass Key, Glossary and References. Every plant species has a clear black and white illustration. A very useful book if your Adventurers and Challengers are identifying range land plants.

Prairie Raptors: A Landowners Guide 1995 Available from Canadian Wildlife Service, Environment Canada, Prairie and Northern Region, Twin Atria Building, Room 200, 4999 - 98 Avenue, Edmonton, Alberta T6B 2X3. 48 pages.

This is a small comprehensive guide for landowners and other prairie dwellers to the identification and conservation of eagles, hawks, owls, falcons and other birds of prey. It's full of illustrations and coloured photographs. It explains how to build nest boxes and platforms and explains some of the problems associated with the declining populations of raptors. This is a great resource for JFW groups in southern Alberta and for wildlife project ideas.

A Working Guide to Planning An Event Distributed by Publications Office, Alberta Agriculture, Food and Rural Development, 7000 - 113 Street, Edmonton, Alberta T6H 9Z9. Tel: locally 422-3951 or toll free 1-800-292-5697. Ask for Homedex 1933-31-1. Free

This is a 24-page workbook designed to help organizations increase their effectiveness in planning a special event. It will help you determine what you wish to accomplish, how you are going to do it, and how will you know you have accomplished what you set out to do. It will also help you keep relevant information together for future reference. It may be useful for wardens developing responsibility and skills in planning and managing activities.

Books

Alberta Wildlife Viewing Guide. Lone Pine Publishing, Edmonton, Alberta. 1990. ISBN 0-919433-78-2 (pbk.) Cost: \$7.95

It covers over 60 provincially designated Watchable Wildlife sites. The book contains information on viewing sites throughout the province with full colour photographs, site and access maps, and details on facilities and programs.

Backyard Habitat for Canada's Wildlife Canadian Wildlife Federation. 1996. 189 pages. ISBN 1-55029-090-8. Only available from Canadian Wildlife Federation, 2740 Queensview Drive, Ottawa, Ontario K2B 1A2. Toll Free Ordering at 1-800-563-9453. Fax: 613-721-2286. Costs approximately \$26.80 including GST and S & H.

This is a useful book should your group decide to create and enhance habitat for wildlife. Topics in this book include creating backyard habitat, community action for wildlife, planting for wildlife, conserving species and special places, backyard projects and community projects.

Butterflies of Alberta by John Acorn. Lone Pine Publishing, Edmonton, Alberta, 1993. 143 pages. ISBN 1-55105-028-5. Cost: \$16.95

Every species of Alberta's butterflies are in this book. It contains beautiful coloured pictures, distinguishing features, flight periods, geographic ranges, behaviour and preferred food plants. This book encourages the low-impact joy of butterfly watching instead of butterfly collecting. This is an excellent resource if you are conducting a Butterfly Survey.

A Guide to Using Native Plants on Disturbed Lands Alberta Agriculture, Food and Rural Development. 250 pages. Available from Alberta Agriculture, Food and Rural Development, Publications Office, 700 - 113 Street, Edmonton, Alberta T6H 5T6 or call 1-800-292-5697. Cost \$30.00

This book provides useful and up-to-date information for the reclamation industry, seed producers and nurseries, land management agencies, municipalities, landscapers and gardeners. It lists the native plants suited to the various natural regions and site types across Alberta. It also provides detailed information about the ecology, reproduction, habitat and availability of 130 native grasses, 260 wildflowers, 80 shrubs and 13 tree species. Other features include tips on seeding rates, timing, and methods to help reduce costs and seeding failures. This is a useful resource for Challengers evaluating range land.

Nestboxes for Prairie Birds Myrna Pearman. 1992. 80 pages, illustrated and colour photographs. Available from Ellis Bird Farm Ltd., Box 2980, Lacombe, Alberta T0C 1S0. Cost approx. \$15.

This book contains information on 40 bird species of cavity dwellers. This is an excellent reference if you and your group of Wardens have decided to enhance habitat for cavity nesters. You may be able to borrow a copy from a school's library because at the time of publication, every school in Alberta received a free copy. You may purchase the book directly from the Ellis Bird Farm or a local bookstore.

Northern Bushcraft by Mors L. Kochanski. Lone Pine Publishing, Edmonton Alberta: 1987. ISBN 0-919433-51-0 Illustrations and colour photographs. 303 pages.

This is a comprehensive reference for anyone wanting to learn the practical skills and knowledge necessary for wilderness self-sufficiency. The book covers information on uses of the axe, the knife, shelter construction, fire technology, important flora and fauna, basic existence skills such as warmth, hygiene and nutrition.

last updated: 06/99

Plants of the Western Boreal Forest & Aspen ParklandDerek Johnson, Linda Kershaw, Andy MacKinnon and Jim Pojar. Lone Pine Publishing; Edmonton. 1995. ISBN 1-555105-058-7

This beautifully illustrated, easy-to-use field guide provides detailed information about plants in the region extending from Alaska to western Ontario. This is a good reference book for identifying native range land plants, grasses, trees, shrubs, flowers, lichen, ferns, aquatic plants and more. Contains over 800 colour photographs and 900 line drawings. Also has intriguing notes about edible plants, native uses of plants and origin of plant names.

Trees and Shrubs of AlbertaKathleen Wilkinson. Lone Pine Publishing; Edmonton. 1990. ISBN 0-919433-39-1

This book is a pictorial field guide to Alberta's native and naturalized trees and shrubs. It describes and illustrates such species as junipers, pines and spruces and reveals a wide range of Alberta's deciduous trees. It has 180 colour photographs, clear descriptions to aid identification, habitat keys and distribution maps and medicinal, Aboriginal and current uses.

Miscellaneous

Alberta's Watchable Wildlife Resource Materials Order Catalogue67 pages, August 1996. Available from Information Centre, Alberta Environmental Protection, Main Floor, Great west life Bldg., 9920 - 108 Street, Edmonton, Alberta T5K 2M4. Free. Tel: 422-2079 (If long distance, then dial toll free 310-000, then the Edmonton number) Fax: 427-4407

The Watchable Wildlife Program has produced a number of information booklets and signage that may help you develop your own community's Watchable Wildlife project. The catalogue is full of interpretative signs for numerous plants (trees, shrubs, flowers, forbs, grasses), insects, birds, reptiles and amphibians, fish, and mammals. Information is also available on how to construct stands for signs.

Developing Your Wildlife Viewing Site81 pages. Size 11" X 8.5" Available from Information Centre, 14745 - 122 Avenue, Edmonton, Alberta T5L 2W4. Tel: 422-1053, Fax: 422-0896. Cost \$6.50 plus handling.

This cerlox-bound book provides a detailed description of how you can develop a viewing site. It has excellent ideas for planning your site.

Glossary of Forestry TermsForestry Canada. Pacific and Yukon Region. Pacific Forestry Centre, 506 West Burnside Road, Victoria, B.C. V8Z 1M5. Free. A 62-page pocket-sized coil-bound booklet defining as simply as possible common forestry terms with some illustrations.

Greening Canada: A Guide to Community Tree Planting Prepared by Tree Plan Canada and the Conservation Council of Ontario. Available from Tree Canada Foundation. Suite 1550, 220 Laurier Avenue West, Ottawa, Ontario K1P 5Z9. Tel: 613-567-5545, Fax: 613-567-5270. Free but supplies are limited!

This is a 25 page manual to be used as a tool to turn enthusiasm for tree planting into hands-on action helping communities enhance their environment. Ideas for community and individual tree planting activities are described, along with some basic technical information for getting started. It contains a checklist for the vision, and delegation sheet for jobs to be done. Also ask for the Tree Maintenance Schedule.

Occupational Profiles Available from Information Centre, Alberta Environmental Protection, Main Floor, Great West Life Bldg., 9920 - 108 Street, Edmonton, Alberta T5K 2M4. Tel: 422-2079 (If long distance, then dial toll free 310-000, then the Edmonton number) Fax: 427-4407

Several occupational profiles are available for Wardens to preview related to working the field of forestry. Each profile is a three to four page summary. Relevant profiles include Forest Worker, Forest Technologist, and Forester/Forestry Scientist.

A Primer on Water: Questions and Answers 61 pages, a good reference for Adventurers. Available from: Environment Canada, Twin Atria Two, 4999 - 98 Avenue, Room 210, Edmonton, Alberta T6B 2X3 Tel: 951-8600 Ask for Publications

Ten Easy Steps to Planning and Delivering A Presentation 8 pages. Distributed by Publications Office, Alberta Agriculture, Food and Rural Development, 7000 - 113 Street, Edmonton, Alberta T6H 9Z9. Tel: locally 422-3951 or toll free 1-800-292-5697. Ask for Homedex 1931-30. Free

Treevia Available from Canadian Forest Service. 5320 - 122 Street, Edmonton, Alberta T6H 3S5. Free.

Treevia is a boxed set of question cards with three different questions and degrees of difficulty on each card. The questions convey current knowledge about the many social economic and environmental values of Canada's forests. The statistical information used was current at the time of publishing, March 1993.

APPENDIX

IX.

Phone Book Yellow Pages

Adventurers
JUNIOR FOREST WARDENS

APPENDIX

Phone Book Yellow Pages

Access, The Education Station
3270 - 76 Avenue
Edmonton, Alberta T6B 2N9
Tel: 440-777
1-800-352-8293 (outside Edmonton)
Fax 440-8899

**Alberta Agriculture,
Food and Rural Development**
Publications Office
7000 - 113 Street
Edmonton, Alberta T6H 9Z9

Tel: 427-0391
Toll Free: 1-800-292-5697

**Alberta Amphibian Monitoring
Program**
Alberta Environmental Protection
Wildlife Management Division
7th Floor, O. S. Longman Building
6909 - 116 Street
Edmonton, Alberta T6H 4P2

Tel: 422-9535
Dial 310-0000 first then government number
Web Site:
<http://www.gov.ca/~env/nrs/wildlife/amphib/index.html>

**Alberta Environment
Information Centre**
Main Floor, Great west life Bldg
9920 - 108 Street
Edmonton, Alberta T5K 2M4

Tel: 422-2079
(Dial 310-000 first for no charge)
Fax: 427-4407

Alberta Forest Products Association
Suite 200, 11738 Kingsway Avenue
Edmonton, Alberta
T5G 0X5

Tel: 452-2841
Fax: 455-0505

Alberta Forestry Association
101, 10526 Jasper Avenue
Edmonton, Alberta
T5J 1Z7

Tel: 427-0705

**Alberta Hunter Education
Instructors Association**
Conservation Education
WISE Foundation
9011 Sylvester Crest, SW
Calgary, Alberta

Tel: 252-8474
Fax: 252-3770

Alberta Native Plant Council
Garneau P. O. Box 52099
Edmonton, Alberta T6G 2T5

Alberta Trail Net
Rob Garner, Executive Director
11759 Groat Road
Edmonton, Alberta T5M 3K6

Tel: 527-2052 (Residence, Medicine Hat)
Fax: 526-6173

Aqualta
Education Office
20th Floor, Capital Square
10065 Jasper Avenue
Edmonton, Alberta T5J 3B1

Tel: 412-3650
Fax: 412-3013

Brooks Pheasant Hatchery
P. O. Box 1829
Brooks, Alberta T0J 0J0

Tel: 362-4122

Canadian Forest Service
Northern Forestry Centre
5320 - 122 Street
Edmonton, Alberta T6H 3S5

Tel: 435-7210
Fax: 435-7359
Inquiries@nafc.forestry.ca

Canadian Heritage Rivers System
Alberta Environmental Protection
Contact: Ted Dykstra
2nd Floor, Oxbridge Place
9820 - 106 Street
Edmonton, Alberta T5K 2J6

Tel: 427-9381
Dial 310-000

Canadian Nature Federation
Suite 606, 1 Nicholas Street
Ottawa, Ontario K1N 7B7

Tel: 613-562-3447, ext. 299
Toll Free: 1-800-267-4088
Fax: 613-562-3371
E-mail: epiccnf@web.net

Canadian Wildlife Federation
2740 Queensview Drive
Ottawa, Ontario K2B 1A2

Tel: 1-800-563-9453
Fax: 613-721-2902
E-mail: info@cwf-fcf.org

Canadian Wildlife Service
Environment Canada
Prairie and Northern Region
Twin Atria Building, Room 200
4999 - 98 Avenue
Edmonton, Alberta
T6B 2X3

Tel: 951-8700

Canfor
P.O. Box 49420 Bentall Postal Station
Vancouver, BC V7X 1B5

Tel: 604-661-5395
Fax: 604-661-5381

Cows and Fish Program
Lethbridge, Alberta

Tel: 381-5377
RITE 310-0000 then dial number above

Ducks Unlimited Canada
Contact: Al Richard
202, 10470 - 176 Street
Edmonton, Alberta T5S 1L3

Tel: 489-2002
Fax: 489-1856

Ellis Bird Farm
Box 2980
Lacombe, Alberta T0C 1S0

Tel: 346-2211

Environment Canada
Twin Atria Two, Room 210
4999 - 98 Avenue
Edmonton, Alberta T6B 2X3

Tel: 951-8600

Environmental Training Centre
1176 Switzer Drive
Hinton, Alberta T7V 1V3

Tel: 310-8200
Dial RITE 310-0000 first
then the number above

**FEESA, An Environmental Education
Society**
601, 10179 - 105 Street
Edmonton, Alberta T5J 3N1

Tel: 421-1497
Fax: 425-4506.
E-mail: feesa@telusplanet.net

Fire Hot Line
Tel: 427-FIRE
Cellular Tel: *FIRE

Forestry Canada
Pacific and Yukon Region
Pacific Forestry Centre
506 West Burnside Road
Victoria, BC V8Z 1M5

Tel: 250-363-0600

Map Town
Suite 100, 400 - 5th Avenue SW
Calgary, Alberta T2P 0L6

Tel: 266-2241
Fax: 266-2356

Map Town
10815 - 100 Avenue
Edmonton, Alberta T5J 4X4

Tel: 429-2600
Fax: 426-7573

Northwest Scientific Supply Ltd.
(for litmus paper)

Tel: 1-800-663-5890
Fax 1-800-797-5773

Operation Grassland
c/o Eastern Irrigation District
Contact: David Scobie
P. O. Bag 8
Brooks, Alberta T1R 1B2

Tel: 362-1400

Plantwatch
Contact: Elizabeth Beaubien
Devonian Botanic Garden
Research Assistant
University of Alberta
Edmonton, Alberta T6G 2E1

Tel: 987-5455/3054
Fax: 987-4141.
E-mail: ebeaubie@gpu.srv.ualberta.ca

Purple Loosestrife Report Line
Canadian Wildlife Federation

Tel: 403-422-4909 or
1-800-565-6305

Report A Poacher
1-800-642-3800

Telus Feather Care Program
Floor 6-E
10035 - 102 Avenue
Edmonton, Alberta T5J 0E5

Tel: 403-493-2822
Toll Free: 1-800-667-1125
(outside Edmonton)

Tree Canada Foundation
Suite 1550, 220 Laurier Avenue West
Ottawa, Ontario K1P 5Z9

Tel: 613-567-5545
Fax: 613-567-5270

Trout Unlimited Canada
Box 6270, Station D
Calgary, Alberta T2P 2C8

Tel: 403-221-8360
Toll Free: 1-800-909-6040
(outside Calgary)
Fax: 403-221-8368

Watchable Wildlife Program
Wildlife Management
4th Floor, Great west life Bldg.
9920 - 108 Street
Edmonton, Alberta T5K 2M4

Tel: 427-5185
Dial 310-000 then the government
number

**Western Canada Wilderness
Committee**
#301, 10168 - 100A Street
Edmonton, Alberta T5J 0R6

Tel: 420-1001
Fax: 420-1475

Yellow Fish Program
Drainage Branch
City of Edmonton
6th Floor, Century Place
9803 - 102A Avenue
Edmonton, Alberta T5J 3A3

Tel: 496-FISH
Fax: 496-5648.

FISH HATCHERIES AND BROOD STATIONS IN ALBERTA

Calgary

Sam Livingston Fish Hatchery
1440 - 17A Street SE
Calgary, Alberta T2G 4T9

Dial RITE 310-0000 first
Then dial 297-6561

Species Reared: Rainbow Trout, Brook Trout, Brown Trout and Cutthroat Trout.
Visiting Hours: 10:00 a.m. to 4:00 p.m.
Monday to Friday, 10:00 a.m. to 6:00 p.m.
Saturday and Sunday

Caroline

Raven Brood Trout Station
Box 160
Caroline, Alberta T0M 0M0

Dial RITE 310-0000 first
Then dial 722-2180.
Fax: 722-3784

Species Reared: Rainbow Trout.
Visiting hours: 10:00 a.m. to 4:00 p.m. daily
Location: 55 km west of Innisfail on Hwy 54,
then 4 km south on Hwy 22 and 1.2 km west.

Cold Lake

Cold Lake Fish Hatchery
Box 8159
Cold Lake, Alberta T0A 0V0

Dial RITE 310-0000 first
Then dial 639-4087
Fax: 639-3598

Species Reared: Walleye, Rainbow Trout, Lake Trout.
Visiting Hours: 10:00 a.m. to 3:30 p.m. daily
Location: 8 km west of the town of Cold Lake on Hwy 55, 14.5 km north on Primrose Lake Road, 2 km east.

WILDLIFE REHABILITATION CENTRES IN ALBERTA

Edmonton

Alberta Bird Rescue Association
Att'n: David & Kim Allen
51080 Range Road 223
Sherwood Park, Alberta T8C 1G9
Tel: 922-6103

Alberta Society for
Injured Birds of Prey
Att'n: Karl Grantmeyer
51562 Range Road 222
Sherwood Park, Alberta T8C 1H4
Tel: 922-3024

Delton Veterinary Clinic
Att'n: Dr. Mike Person
8203 - 127 Avenue
Edmonton, Alberta T5E 0A1
Tel: 475-9225

Lethbridge

Coaldale Rehabilitation Centre
Box 1494
Coaldale, Alberta T0K 0L0
Tel: 345-4262

Red Deer

Medicine River Rehabilitation Centre
Att'n: Carol Kelly
R. R. #1
Markerville, Alberta T0M 1M1
Tel: 345-4262

ALBERTA FOREST SEEDLING NURSERIES*

Notes:

* When approaching the nurseries listed below, ask them if they would do a short tour of their facility and explain how they care for tree seedlings. These nurseries are private businesses and may shy away from a direct question such as, "Do you conduct tours?"

** Smoky Lake Forest Nursery (formerly known as Pine Ridge) is the gem to see. Their facilities include seed extraction, seed cleaning, seed storage, bareroot seedlings, lagoons for irrigation and container seedlings.

Alberta Nurseries & Seeds Ltd.
Box 20
Bowden, Alberta T0M 0K0
Tel: 224-3544
Fax: 224-2455

Beaverlodge Nursery (P. R. T.)
Box 449
Beaverlodge, Alberta
T0H 0C0
Tel: 354-2288
Fax: 354-3090

Bonnyville Forest Nursery Inc.
5110 - 55 Avenue
Bonnyville, Alberta T9N 2M9
Tel: 826-6162
Fax: 826-4790

Chinook Greenhouses (1990) Ltd.
1431 Bridge Street, S. E.
Box 18, Route
Medicine Hat, Alberta T1A 3E6
Tel: 527-8942
Fax: 526-4289

Currey Reforestation Ltd.
P. O. Box 66
Sangudo, Alberta T0E 2A0
Tel: 785-2640
Fax: 785-2073

Eldorado Greenhouses Ltd.
Box 32
Bragg Creek, Alberta T0L 0K0
Tel: 949-2860
Fax: 949-2860

Goodrich Nursery/Lakeside Nursery
Box 434
St. Paul, Alberta T0A 3A0
Tel: 635-2535
Fax: 645-6651

High Q Greenhouses
R. R. #1
Morinville, Alberta T8R 1P4
Tel: 939-7490
Fax: 939-2010

K & C Silviculture Farms
P. O. Box 25019
Red Deer, Alberta T4R 2M2
Tel: 347-3002
Fax: 347-3899

Long Lake Forest Nursery Ltd.
P. O. Box 6218
Bonnyville, Alberta T9N 2G8
Tel: 826-5975
Fax: 826-2454

Ponting's Greenhouse
Box 397
Mannville, Alberta T0B 2W0
Tel: 763-3996
Fax: 763-2110

R & L Greenhouses
26 - 8 Street NW
P. O. Box 644
Redcliff, Alberta T0J 2P0
Tel: 548-3121
Fax: 548-3716

Red Rock Nursery Ltd.
463 Sprague Way S. E.
Medicine Hat, Alberta T1B 3Y7
Tel: 529-5055
Fax: 526-8740

Ross Lake Nursery
Box 59
Stettler, Alberta T0C 2L0
Tel: 742-4708
Fax: 742-5060

Smoky Lake Forest Nursery**
P. O. Box 220
Smoky Lake, Alberta T0A 3C0
Tel: 656-4130
Fax: 656-4132

Tremel Greenhouses
P. O. Box 744
Smoky Lake, Alberta T0A 3C0
Tel: 383-2237
Fax: 383-3948

Water Valley Forest Nursery Inc.
Box 159
Cremona, Alberta T0M 0R0
Tel: 637-3912
Fax: 637-3988

Willow Valley Forest Landscape Centre
Tel: 831-8787
Box 733
Grande Prairie, Alberta T8V 3R5
Tel: 831-8787

Woodmere Nursery Ltd.
Fairview Division
Box 498
Fairview, Alberta T0H 1L0
Tel: 835-5292
Fax: 835-5459

last updated: 06/99

RANGE MANAGEMENT INFORMATION

For information about the Range Management Program or to contact a Range Land Specialist, contact any of the following Public Land offices:

Note: The numbers listed below are of Government of Alberta offices. Call toll free, by dialing the RITE number 310-0000 first, then the number

Lethbridge

530 - 8 Street S
Lethbridge, Alberta T1J 4C7

Tel: 381-5486

Red Deer

Room 405, Parkland Square
4901 - 48 Street
Red Deer, Alberta T6N 6M4

Tel: 340-5451

Sherwood Park

182 Chippewa Road
Sherwood Park, Alberta T8A 4H5

Tel: 464-7955
Fax: 449-0718

St. Paul

Box 1959, Eldorado Bldg
St. Paul, Alberta T0A 3A0

Tel: 645-6336

Peace River

Box 35, Provincial Bldg.
Peace River, Alberta T0H 2X0

Tel: 624-6345

There are other Public Land Offices throughout the province in the following communities: Athabasca, Barrhead, Bonnyville, Drayton, Valley Evansburg, Fairview, Fort Vermilion, Grande Prairie, High Prairie, Lac La Biche, Medicine Hat, Ponoka, Rocky Mountain House, Spirit River, Valleyview and Wainwright. These offices have Agrologists who may be able to assist with plant identification and the species composition of local range land. Some offices may also have range specialists who may make a presentation to your club.

Lumber

Athabasca	Tara Forest Products Ltd.	675-3866
Athabasca	Wallach's Planing Mill	675-2563
Blairmore	Atlas Lumber (Alberta) Ltd.	563-3366/3617
Bonnyville	Alex Fersovitch	826-5504
Bonnyville	Henry Vasseur Custom Planing Ltd.	826-2472
Boyle	Millar Western Industries Ltd.	689-3030
Breyant	St. Jean Lumber (1984) Ltd.	771-2216/2106
Cochrane	Spray Lake Sawmills (1980) Ltd.	932-2234
Coleman	Natal Forest Products Ltd.	563-3555
Cowley	Cowley Forest Products Ltd.	628-3991
Cowley	Johnson Bros. Sawmills Ltd.	628-3991
Drayton Valley	Weyerhaeuser Canada Ltd.	542-8000
Eckville	Hansen Forest Products Ltd.	746-2275
Edson	Carter Mills Ltd.	723-3422
Edson	Sundance Forest Industries Ltd.	723-3977
Fort Assiniboine	O. K. Limber Ltd.	584-2232
Fort McMurray	Northland Forest Products Ltd.	743-3773
Fox Creek	Mostowich Lumber Ltd.	622-4296
Grande Cache	Weyerhaeuser Canada Ltd.	827-7200
Grande Prairie	Canadian Forest Products Ltd.	538-7748
Grande Prairie	Weyerhaeuser Canada Ltd.	539-8500
High Level	High Level Forest Products Ltd.	926-3781
High Prairie	Buchanan Lumber	523-4544
High Prairie	Shadow Creek Enterprises	523-2645
Hines Creek	Canadian Forest Products Ltd.	538-7749
Hines Creek	Zavisha Sawmills Ltd.	494-3761
Hinton	Hi-Atha Sawmill Division	865-8900
La Crete	Crestview Sawmills Ltd.	928-2415/2428
La Crete	Evergreen Lumber Inc.	928-3616
La Crete	La Crete Sawmill Ltd.	928-2292
Lac La Biche	Ed Bobocel Lumber (1993) Ltd.	623-7740
Lodgepole	Tall Pine Timber Co. Ltd.	894-2301
Manning	Manning Diversified Forest Products Ltd.	836-3111
Nampa	Boucher Bros. Limber Ltd.	322-3945/3947
Red Earth	Brewster Construction Ltd.	551-1203
Rocky Mountain House	Rocky Wood Preserves Ltd.	845-2212
Rocky Mountain House	Strachan Forest Products Ltd.	845-6760/6223
Slave Lake	Vanderwell Contractors (1971) Ltd.	849-3824
Slave Lake	Zeidler Forest Industries Ltd.	468-3311 (E'ton)
Spirit River	Johnson Mills	351-2370
Trout Lake	Carrier Lumber Ltd.	869-3878
Whitcourt	Blue Ridge Lumber (1981) Ltd.	648-6200
Whitcourt	Miller Western Industries Ltd.	778-2221

Secondary Manufacturing

Aldersyde	Crawford Industries Ltd.	652-4011
Barrhead	Barrhead Speciality Wood Products	674-3700
Blairmore	R & R Lumber Supplies (1989) Ltd.	562-2677
Calgary	Jager Millworks Ltd.	259-0700
Calgary	Nose Creek Forest Products Ltd.	276-9501
Calgary	Palliser Lumber Sales Ltd.	279-0800
Cochrane	All Span Speciality Wood Products	932-7878, 1-800-268-4078
Drayton Valley	Sawn Wood Products Ltd.	542-6708
Edmonton	Canfor Wood Products Marketing	604-264-6358
Edmonton	Canswe Wood Products Ltd.	465-6776
Edmonton	Clareco Industries	452-0909
Edmonton	Jasper Millworks Ltd.	453-2402
Edmonton	Moen Lumber	447-1014
Edmonton	Park County Lumber Manufacturing Ltd.	472-6988
Edmonton	Western Archrib	465-9771
Edson	Yellowhead Wood Products Inc.	723-3330
Fort MacLeod	Albicaulis Lumber Ltd.	553-3510
Spruce Grove	Alberta Wood Preservers Ltd.	962-9323
Spruce Grove	Grove Lumber & Manufacturing Ltd.	962-6266
Spruce Grove	Spruceland Millworks Inc.	962-6333
Spruce Grove	Treeline Wood Products	962-4262
Stony Plain	Westmark Products Ltd.	963-2477 / 2400
Westlock	Westway Lumber Ltd.	349-3261

Panelboard

Blue Ridge	West Fraser Mills Ltd.	413-8900
Drayton Valley	Weyerhaeuser Canada Ltd.	452-5395
Edmonton	Zeidler Forest Industries Ltd.	468-3311
Edson	Weyerhaeuser Canada Ltd.	723-6963
Grande Prairie	Ainsworth Lumber Co. Ltd.	831-2500
High Prairie	Tolko Industries Ltd.	523-2101
Slave Lake	Weyerhaeuser Canada Ltd.	849-4333

Pulp and Paper

Boyle	Alberta-Pacific Forest Industries Inc.	525-8000
Grande Prairie	Weyerhaeuser Canada Ltd.	539-8500
Hinton	Weldwood of Canada Limited	865-2251
Peace River	Daishowa-Marubeni International Ltd.	624-7083
Slave Lake	Slave Lake Pulp Corporation	849-7777
Whitecourt	Alberta Newsprint Company	778-7000
Whitecourt	Millar Western Pulp (Whitecourt) Ltd.	778-2221/2036

FOREST FIRE PROTECTION CONTACTS

Provincial Forest Fire Centre
10th Floor, 9920 - 108 Street
Edmonton, Alberta T5K 2M4

Tel: 422-8664
Fax: 422-7230

Environmental Training Centre
1176 Switzer Drive
Hinton, Alberta T7V 1V3

Tel: 310-8200
Dial RITE 310-0000 first

LAND & FOREST SERVICE OFFICE LOCATIONS:

Contact the Land and Forest Service office nearest you. Personnel will help find your group a suitable site to tour

1. Southern East Slope		845-8250
Crowsnest District		
Blairmore	District Office	562-3210
Turner Valley	Sub-Office	933-4381
Bow District		
Calgary	District Office	297-8800
Clearwater District		
Rocky Mountain House	District Office	845-8272
Sundre	Sub-Office	638-3805
Nordegg	Sub-Office	721-3965
Brazeau District		
Drayton Valley	District Office	542-6616
2. Northern East Slopes		778-7165
Foothills District		
Hinton	HQ	865-8267
Grande Cache		827-3626
Yellowhead District		
Edson	HQ	723-8265
Cold Lake (Nojack)		795-3940
Woodlands District		
Whitecourt	HQ	778-7153
Fox Creek		622-3921
Swan Hills		333-2811
3. Northwest Boreal		624-6221
Wapiti District		
Grande Prairie	Grande Prairie	538-8080
Mackenzie District		
Hines Creek Ranger Station	Manning	836-2881
Hines Creek Ranger Station		494-3600
Upper Hay District		
Rainbow Lake Ranger Station	High Level	926-5400
Rainbow Lake Ranger Station		956-3919
Fort Vermilion District	Fort Vermilion	927-3235
Marten Hills District	Slave Lake	849-3061

FOREST FIRE PROTECTION CONTACTS

Wabasca Ranger Station		891-2860
Red Earth Ranger Station		649-3785
East Peace District	Peace River	624-6456
Kinuso Ranger Station		775-3662
Lakeshore District	High Prairie	523-4481
Smoky River District	Valleyview	524-3567
4. Northeast Boreal		623-5240
Waterways District		
Fort McMurray		743-7120
Fort Chipewyan		697-3762
Lakeland District		
Beaver Lake		623-4133
La Corey		826-5608
Athabasca District		
Athabasca		675-8168
Wandering River		771-3747

PLACES TO VISIT IN ALBERTA TO LEARN MORE ABOUT THE FOREST AND TREES

Hinton

Cache Percotte Environmental Education Centre
Contact: Ask for Coordinator of Environmental Youth Programs
Box 6330
Hinton, Alberta T7V 1X6

Dial RITE 310-0000
Then dial 865-8200.

Located three hours west of Edmonton in Hinton. School groups and adults are offered a diverse program of activities ranging from native uses of plants to outdoor leadership programs. Tours and presentations are also available on the Foothills Model Forest Research program. Learn about their work of forestry, wildlife, fisheries, watersheds and socio-economics. The centre has log cabin accommodations for up to 120 people. Kitchen and dining facilities with catering are available at the Training Centre but self-prepared meals are the most common for guests at the Centre.

Kananaskis Country

Jumping Pound Demonstration Forest
Contact:
Alberta Land and Forest Service
8660 Bearspaw Dam Road N. W.
PO Box 70028
Bowness Postal Outlet
Calgary, Alberta T3B 5K3

Dial RITE 310-0000
Then dial 297-8800.

Located in Kananaskis Country, 50 kilometres west of Calgary. (Highway 68 and 18 kilometres south from TransCanada Highway.) Open daily from May to September. A 10 kilometre self-guiding auto discovery tour is available. There is also an interpretative centre, showing the history of the Demonstration Forest and the management practices that can be seen on the tour. Group visits are available during the off-season. Contact the number listed above.

Whitecourt

Eric S. Huestis Demonstration Forest
Contact: Woodlands Forest Office
4004 - 47 Street
Whitecourt, Alberta T7S 1M8

Dial RITE 310-0000
Then dial 778-7153.

This demonstration forest is located just outside of Whitecourt on Highway 32 north. The self-guided auto tour winds past 16 interpretative sites on a seven kilometre trail. Each site demonstrated a different management technique or stage in the life cycle of a forest and features informational signage. Call in advance for information on road conditions.

CONSERVATION EDUCATION CAMPS

Calgary

Crowsnest Portable Camp
1440 - 17A Street SE
Calgary, Alberta T2G 4T9
Fax: 297-2839

Dial RITE 310-0000 first
then dial 297-2838.

Caroline

Alford Lake Conservation Education Centre
Box 369
Caroline, Alberta T0M 0M0

Tel: 722-2423
Fax: 722-2423

Edmonton

Narrow Lake Conservation Education Centre
14515 - 122 Avenue
Edmonton, Alberta T5L 2W4

Dial RITE 310-0000 first
then dial 422-2606

Fax: 427-5695

JFW LAND AND FOREST SERVICE STAFF

Provincial Coordinator/Chief Warden
7th Floor, Great west life Building
9920 - 108 Street
Edmonton, Alberta T5K 2M4
Tel: 422-5172
Fax: 422-7230

The Four Regional Coordinators
Southern Region
8660 Bearspaw Dam Road N.W.
Box 70028 Bowness Postal Outlet
Calgary, Alberta T3B 5K3
Tel: 297-8851
Fax: 297-8865

Central Region
7th Floor, Great west life Building
9920 - 108 Street
Edmonton, Alberta T5K 2M4
Tel: 427-6233
Fax: 427-0292

Northeast Region
Provincial Building
4901 - 50 Street
Athabasca, Alberta T9S 1E2
Tel: 675-8168
Fax: 675-8165

Northwest Region
Bag 900
Peace River, Alberta T8S 1T4
Tel: 624-6567
Fax: 624-2218

Long Lake Outdoor Education Centre
Box 2340
Athabasca, Alberta T9S 2B8
Tel: 675-2276
Fax: 675-3571

WEBSITES WORTH SURFING

Alberta Agriculture, Food and Rural Development
<http://www.agric.gov.ab.ca>

Alberta Environmental Protection
<http://www.gov.ab.ca/~env/>

Alberta Forest and Building Products
<http://www.gov.ab.ca/dept/edt/expo/rt/forest.html>

Alberta Forest Products Association
<http://www.abforestprod.org>

Alberta TrailNet
<http://www.health-in-action.org/arpa/trailnet.html/trailnet.menu.html>

Amazon Interaction Ecotourism Game
<http://www.eduweb.com/ecotourism/eco1.html>

Amazing Environmental Organization Web Directory!
<http://www.webdirectory.com/>

Aqualta
<http://www.aqualta.com>

Canada's Energy Efficiency HomePage
<http://eeb-dee.nrcan.gc.ca/science>

Canadian Forests
<http://www.canadian-forests.com/>

Canadian Forest Service
<http://nrcan.gc.ca/cfs/index.html>

Canadian Nature Federation
<http://www.magma.ca/~cnfgen/>

Canadian Parks & Wilderness Society (CPAWS)
www.afternet.com/~tnr/cpaws/cpaws.html

Canadian Pulp and Paper Association
<http://www.open.doors.cppa.ca/>

Canadian Wildfire! Network
<http://www.denendeh.com/flycolor/wildfire/index.htm>

CIDA Forestry Advisers Network
<http://www.cfan-rcfa.org>

Crees and Trees
<http://www.gcc.ca/enviro/forestry/Fo/registry.html>

Dichotomous Key for Trees of the Pacific Northwest
<http://www.orst.edu/instruct/for241/>

EcoNet
<http://www.igc.org/igc/issues/forests/>

Environment Canada's Green Lane
<http://www.ec.gc.ca>

Federation of Alberta Naturalists (FAN)
<http://www.connect.ab.ca/~fan/fanhome.htm>

FEESA, an environmental education society
<http://www.telusplanet.net/public/feesa>

Forest Stewardship Activity Guide
<http://www.ces.ncsu.edu/nreos/forest/steward/pdf/brantoc.html>

Gaia Forest Conservation Archives
<http://forests.org/giai.html>

Geographic Information, GIS Systems
<http://info.er.usgs.gov/research/gis/title.html>

Global Rivers Environmental Education Network
<http://www.igc.apc.org/green/greeninfo.html>

Handbook for a Better Future
<http://www.mit.edu:8001/people/howes/environ.html>

Kew Gardens (about orchids)
<http://www.rbgekew.org.uk/herbarium/orchid/>

Mitsubishi Corporation
<http://mcweb.mitsubishi.co.jp/>

National Geographic - Explore the Fantastic Forest
<http://www.nationalgeographic.com/features/96/forest/>

National Wildlife Federation (USA)
<http://www.nwf.org/nwf>

Ontario Forestry Association
<http://www.oforest.on.ca>

Pencil Pages!
<http://www.pencils.com/>

Play Treevia
<http://nrcan.gc.ca/cfs/nfw/>

Provincial Forest Fire Centre
<http://www.gov.ab.ca/~env/lfs/fpd/fp.html>

Radarsat International
<http://www.rsi.ca>

Save What's Left
<http://www.Savewhatsleft.org>

Smokey the Bear
<http://www.smokeybear.com/>

Society and Culture: Environmental and Nature: Projects:
http://www.yahoo.com/Society_and_Culture/Environment_andNature/Projects/

Telesat (Canada's National Satellite Communications Company)
<http://www.telesat.ca>

Temperate Rainforest Foundation
<http://www.forestinfo.org/>

Trout Unlimited Canada
<http://www.cadvision.com/tuc>

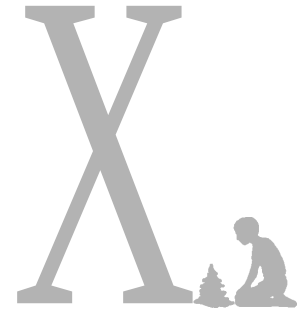
Virtual Forestry Library
<http://metla.fi/info/vlib/Forestry/>

Woodlinks
<http://www.woodlinks.com/>

World Wide Fund for Nature-International
<http://www.panda.org/tdda/forest/new/index.htm>

Yahoo Forestry Index
<http://www.yahoo.com/science/agriculture/forestry>

APPENDIX



Glossary of Terms



APPENDIX

Glossary of Terms

A **Abiotic** A non-living feature of an area such as rainfall or soil.

Agroforestry The practice of raising trees and agricultural products at the same time on a particular piece of land.

Annual Allowable Cut (AAC) The average volume of wood which is permitted to be harvested annually by a company from a particular area on a sustained yield basis. This is roughly equal to the amount of new growth produced by the forest each year. Allowances are made for the loss of timber due to natural causes such as fire, insects and disease. Expressed as cubic metres of wood.

Annual Operating Plan A plan prepared and submitted by the timber harvest operator that details how road construction, harvesting, reclamation and reforestation activities will be carried out. It also describes how other resource uses and users are integrated and considered during operations.

Audit A review and inspection of particular behaviours or patterns. An audit can be conducted with a simple checking or a thorough scrutiny.

B **Biodiversity** (biological diversity) The variety of life in an area, ranging from a drop of water to the whole biosphere. There are four main considerations: landscape diversity, ecosystem diversity, species diversity and genetic diversity. Biodiversity also involves the complex interactions between living things.

Biotic All kinds of organisms of an area from bacteria and fungi to plants and animals.

Bleached Kraft Pulp Wood fibres from which lignin and pitch have been removed by chemical processing and which then have been bleached to whiten the pulp.

Buffer Strip A strip of land including the undisturbed vegetation where disturbance is not allowed or is closely monitored to preserve or enhance particular qualities. Buffer strips are along roads, trails, watercourses and recreational sites.

C **Canopy** The top layer of a forest.

Carrying Capacity The number of organisms of a given species and quality that can survive in a given ecosystem without causing deterioration.

Chain A chain is a fifty metre nylon rope marked or knotted every metre. The first metre is marked every 10 cm.

Chemithermomechanical Pulp (CTMP) Wood fibres which have been separated and cleaned by a combination of chemicals, heat and mechanical action.

Chloride A compound in which chlorine is combined with another element.

Clearcut A designated cutblock where all or most of the trees have been harvested at the same time.

Climax vegetation The combination of plants which remains unchanging; the end product of succession.

Clinometer An instrument used to measure three heights and the steepness of slope.

Colonization The first stage of succession in which hardy organisms move into a barren area.

Community A collection of organisms of different species living together within a particular geographic ecosystem.

Coniferous Trees that have cones, and needles or scale-like needles, for example, pine, spruce, fir and also tamarack/larch. The wood produced is commercially known as softwood.

Cord A pile of roundwood (whole or split) the same length, stacked in the same direction, for example, 4'X4'X8'.

Corridor A band of habitat linking two similar habitat types; a route that allows movement of individuals or taxa from one region or place to another.

Cruise First-hand measurement and evaluation of timber in an area.

Cutblock An area with defined boundaries authorized for harvest.

D **dbh Diameter at Breast Height.** This is a standard measurement of the tree's diameter taken at 1.3 m to enable comparisons with other trees.

Deciduous Trees which lose their leaves in the fall. This includes broadleaf trees and also tamarack/larch. The wood is commercially known as hardwood.

Decreaser Plants These plants are plentiful in a climax range but are the first to decrease as grazing becomes too heavy. They are the plants best liked by livestock. The poorer the condition on the range, the fewer decreaser plants there will be.

Dimensional Lumber Dried, planed, graded wood in a variety of sizes used for construction.

Disposition A land use contract (lease, licence or permit) that gives specific rights to a land or resource user issued under the provisions of the Public Lands Act.

Duff The top layer of the forest floor made up of decomposing organic matter.

 **Eco-centric Education** Education where by the emphasis is switched away from a human perspective toward an ecological perspective.

Ecological footprint The land that would be required on this planet to support our current lifestyle forever.

Ecology The study of life; the combination of species co-existing and interacting in an area.

Ecosystem The basic functional unit in ecology defined as a self-sustaining interaction of abiotic (non-living) and biotic (living) factors. The biosphere is a large ecosystem where as relatively small landscapes are small ecosystems.

Ecosystem Diversity The variety of different natural systems (pond, forest, marsh, lake), found within a given area.

Ecosystem Stewardship The art and science of conserving natural landscape diversity, productivity and processes while providing a sustainable flow of products to meet society's needs and maintain the integrity of the ecosystem.

Ecosystem-based Management Managing uses of an ecosystem so that the diversity, productivity and structure of the ecosystem are maintained to benefit present and future biological communities, including humans.

Ecotourism A specialized and growing sector of the tourism industry in which various outdoor experiences are provided.

Edge The boundary zone between two ecosystems which is generally richer in species than either adjoining ecosystems.

Effluent A discharge from a sewage treatment plant or industrial source.

 **Fauna** All species of vertebrate and invertebrate animals.

Feller Buncher A harvesting machine that cuts and stacks trees.

Fire Suppression The activity of fighting fire to extinguish it.

Flora All species of vascular and non-vascular plants.

Forage Value This is determined for each plant species on the basis of palatability, nutritive content and dependability as a forage supply. This is a relative factor and may vary, depending on the kind of livestock, other plants present, the soil fertility and the season. Forages are classed as good, fair or poor.

Forbs Plants with broad leaves and annual stems (tops.) The veins are usually, but not always, netlike.

Forest A complex interaction of organisms in an area characterized by the presence of mature trees. Also defined as a plant community predominantly of one species growing more or less closely together with an associated animal community.

Forest Management The wise care and intelligent use of forests which tries to ensure both the protection and use of forests. It involves planning and administration, silviculture, forest protection, harvesting, research and development.

Forest Management Agreement (FMA) It is a renewable agreement between the government and a company that grants the company rights and obligations to manage, grow and harvest timber on a specific area on a sustained yield basis.

Fragmentation The degree to which movement by species between habitats in the landscape has been limited or prevented. It refers to the degree of separation of similar habitats and between habitats which are used at different times in a year or in the life cycle of a species. It has different effects on different species, for example, a secondary road is a barrier for small rodents but not necessarily for deer.

Free to Grow Young trees that are as high or higher than the competing brush vegetation with one metre of free-growing space surrounding their leaders. Judged to be free from competing vegetation.

 **Genetic Diversity** Refers to how each individual is different in some way from each other individual in its species.

Geographic Information

Systems (GIS) A computer-based mapping system which combines different types of resource information into a spatial display. It is used frequently to make forest management decisions.

Grasses Plants with hollow, jointed stems and leaves in two rows on the stems. Veins in the leaves are parallel.

Grass-like Plants Plants with solid stems with no joints. These are sedges and rushes.

Grazing Reserve (also called community pastures) public land managed for both grazing and other multiple uses such as fishing and hunting.

Green Area Forested public lands covering more than 50 per cent of Alberta and managed for forestry and multiple uses.

Ground Water Water found beneath the ground. When water seeps through the soil, past the roots of plants, it fills tiny spaces or pores between gravel and sand particles. Wells which are drilled, tap the under ground water source.

 **Habitat** The place where organisms live which has four components: space, food, water and shelter.

 **Increaser Plants** Plants that increase in number as grazing becomes heavy. They escape grazing because they are short or because they are less tasty to livestock. They replace decreaser plants that have been weakened by overgrazing. They are also plants of a climax range.

Increment Borer An instrument used to remove a small core from the tree to determine its age and growth rate.

Integrated Resource

Management The carefully planned management of two or more resources in the same area to optimize the benefits of the resources, taking into account all the values and resources which commonly includes water, soil, timber, range, fish, wildlife and recreation. It requires a cooperative and comprehensive approach to decision-making on resource use.

Intensive Forestry The practice of forestry so as to attain a high level of volume and quality of out-turn per unit of area, through the application of the best techniques of silviculture and management.

Invader Plants These plants replace the decreaser and increaser group plants as they are removed or seriously weakened by overgrazing. They are not present in climax vegetation or are there only in very small amounts. These plants are the danger signal of a deteriorating range.

 **Landscape Diversity** Variety of physical features of the land.

Leader The annual growth of the main vertical branch of a tree; the main shoot growing from the top of a tree with a single main trunk.

 **Management Plan** A general plan for the management of an area. Includes objectives, activities for management and standards to achieve goals.

Monoculture The cultivation on only one crop.

Multiple Use A practice where two or more interest groups or objectives are fulfilled in the same area of land.



Native Prairie An area of unbroken grassland or aspen parkland dominated by non-introduced species.

Native Species A species that originates in a particular place; not having been introduced from elsewhere.

Natural Regeneration The establishment of new trees from the seeds of trees in the forest, sometimes with help from people.

Niche The role played by an organism a biological community (such as producer, predator, prey, decomposer), as well as how the organism performs the function.

Nitrates Are used as fertilizers. When entering the human bloodstream, they compete with hemoglobin for oxygen.

Non-point Source Pollution

Pollution that is a result of circumstances in a broad area, such as urban run-off or acid rain.



Outdoor recreation The leisure activities that take place in a natural setting and provide a combination of physical, mental and spiritual benefits.



Pest An organism capable of causing material damage. In a forest this includes insects and diseases.

pH defines the number of free hydrogen ions in the water. It represents the negative logarithm of concentration of hydrogen ions. It is a measure of acidity based on a logarithmic scale of 0 to 14. A pH of 7 is neutral, an acid is a compound which releases hydrogen ions (H+), a base is a compound capable of accepting hydrogen ions. Because it is a logarithmic scale, a decrease in pH of one is actually a 10-fold increase in acidity, a decrease of two is a 100-fold increase and so on.

Point-source Pollution

Pollution that has a specific point of origin, such as liquids dumped from a pipe into a river or smoke rising from a smokestack.

Protected Area Areas that have some form of legal protection from industrial activities such as logging, mining, hydro-electric or oil and gas development.

Public Lands Lands of the Crown in Alberta administered by the government.

Pulp A soft, moist soupy mass of cellulose from which paper is made.

Pulpwood Wood cut and prepared and prepared for manufacture into wood pulp.



Quota A timber quota or agreement is a long-term right to harvest a percentage share of the annual allowable cut in a designated forest management unit.



Range Stewardship The art and science of optimizing the returns from rangelands in those combinations most desired by and suitable to society through the manipulation and conservation of range ecosystems.

Rangeland Lands supporting native or introduced plants which are a source of forage for domestic and native animals, and a source of other values derived from ecosystem functions. The native plant communities are predominately grasses, grass-like plants, forbs or shrubs.

Recreation Any leisure time activity.

Redd A shallow depression in the stream gravel into which the female fish of some species deposits her eggs.

Reforestation A commitment to return an area whose trees have been removed naturally by harvesting or fire to establishing forest cover by seeding, planting or natural regeneration.

Regeneration The process in which the forest is replaced and renewed. There are two kinds: Artificial Regeneration by seedlings or plantings. Natural Regeneration is from natural seedlings or suckering.

Regeneration Survey A survey conducted on all harvested areas to monitor reforestation efforts.

Resource Any part of the environment which society perceives as having value.

Riparian Zone The land area along the edge of streams and rivers which is affected by and also affects the body of water. This vegetation belt is often a transition zone between aquatic habitat and terrestrial habitat.

Rotation Period The length of time it takes to plant, grow, harvest and replant a crop on a given area of land.



Scarification A process of breaking up the soil surface in preparation for natural or artificial regeneration.

Secondary Wood Products The finished product that is constructed with or carved out of primary wood products.

Seed Tree Any tree which bears seed; specifically a tree left to provide the seed for natural reproduction. This is a method of harvesting forests where a few scattered trees are left on the site as a seed source for a new, even-aged stand.

Seedling A very young tree.

Selective Cutting A method of harvesting uneven-aged forests in which trees are marked and harvested individually or in small groups continuously, at relatively short intervals instead of all trees on a site. Other trees are left to grow to maturity or provide seed.

Shade-tolerant Trees that can grow under the shaded canopy of an aspen stand for a long period of time, for example the white spruce.

Silviculture The science and art of growing and tending a forest. It is also expresses as the theory and practice of managing forest establishment, composition and growth.

Slash Logging debris left on the ground after the trees are cut and removed.

Snag A standing dead tree from which the leaves and most of the branches have fallen.

Species Diversity The variety of species of living things within a given area.

Stand A community of trees sufficiently uniform in species, age, arrangement or condition to be distinguished as a group from the forest or other growth on the area.

Strip-cutting A method of harvesting forests in strip-like sections. The trees left standing are intended to provide seeds for growth of a new forest.

Study Plot An area of land specifically measured off where the study of flora and/or fauna is conducted with an inventory of the contents within that area.

Stumpage Fees paid by a forest company to the provincial government for every cubic metre of wood cut.

Succession The progressive change of plants and animals in an area beginning with colonization and ending with a stable climax

Suckering The generation of shoots from the underground stem of an aspen tree after it is cut. One parent aspen tree can produce several dozen suckers, and the resulting genetically identical trees are referred to as clones.

Surface Water Water found on the surface of the land, in river, irrigation canals, lakes, streams, dugouts and reservoirs.

Survey An examination of the living and organic components in a study plot.

Sustainable Development Development that meets the needs of the present without compromising the ability of future generations to meet their needs. (from Our Common Future, The Brundtland Report, 1987) This term is also used in reference to agriculture, i.e. sustainable agriculture.

Sustained Yield A method of forest management that requires a balance between net growth and the amount harvested. The yield that a forest can produce continuously at an intensity of management.

 **Tame Pasture** (tame grassland) Landscapes which have been converted from natural vegetative cover to forage species through cultivation and seedling.

Thinning Removing some trees from a site thereby reducing density which will stimulate growth and other desirable features.

Timber Cruising The collection of field data on forest commonly by the measurement and recording of information in sample plots. This also includes first-hand measurements and estimation of volumes of standing trees.

Topography Three dimensional features of a landscape, such as mountains and lakes, as represented on topographic maps.

 **Understory** The layers of plants that grow beneath the forest canopy.

Urban Forest The forested areas in cities. It also colourfully describes the huge volume of paper collected in cities and represents a major source of wood fibre for newsprint producers.

 **Vascular Plants** Plants which have a conducting system that includes xylem and phloem tissue.

Volume A measurement of the useable amount of wood. The metric measurement is cubic meters (m³) and in imperial is in board feet (fbm), cords or cunits (100 cubic feet.) Calculated by using dbh and tree height and is usually presented in a Volume Table. See Appendix V - Volume Tables.

 **Water Table** The horizontal plane beneath the surface of the land where the ground is fully saturated with water.

Watershed All the area that slopes downhill to a central body of water. Water moves downhill, so the slopes shed water.

Wetland An area where land meets water or where the ground is wet for the majority of or the entire year. There are five classes: bog, fens, swamps, marshes and shallow open water.

Whorl The arrangement of branches that grow in a circle around the circumference of the tree. You can roughly calculate the age of a coniferous tree by counting each whorl which represent one year's growth.

Wildlife All native species of plants, animals (including all invertebrates and vertebrates) fungi and some unicellular life forms.

Wood By-products Materials left from processing timber which can be used for packing materials, shavings for animal bedding, bark chips for soil, and sawdust and chips for value added products.

Wood Harvesting The cutting and removal of trees from a forested area.

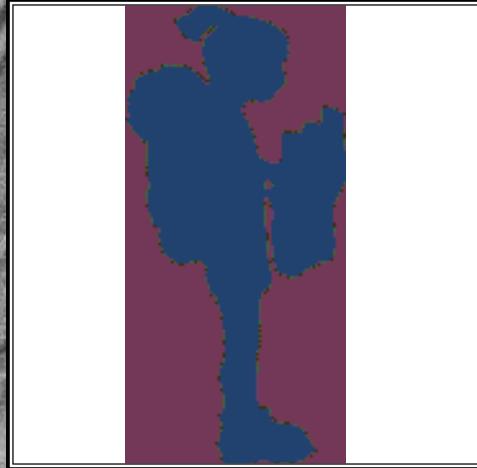
Wood Processing That segment of the forest industry that manufactures lumber, paper, plywood and other primary forest products.

Wood Products

- Primary - Trees processed and cut into dimensional lumber.
- Secondary - Finished products that are made or carved out of primary wood products.



Woodstravel



MODULE

*Supermarkets are all alright, but it's
much more fun to shop for food in
nature.*





Introduction

This manual provides basic information written to provide a conceptual understanding. The best teacher, however, is first hand experience. If you do not have the personal skills to teach the Wardens, have experts visit your club to demonstrate and teach skills and knowledge. Always provide Wardens with opportunities to practice and hone their skills.

Footnote

Woodstravel is different from the other three modules (Forestry, Leadership and Ecology.) This is the module that Wardens will probably have the most interest in. To some Wardens this module is the most fun because "Adventure awaits!" and because it works toward the Wardens being independent outdoors.

Woodstravel provides opportunities for Wardens to develop and hone their outdoor skills, acquire knowledge that will help them play safe outdoors, and provide opportunities for Wardens to be together in fellowship with other Wardens.

There are many books written on the topics such as survival, campcraft skills and fire building. This Woodstravel module was written to give you some background information and suggestions for activities you can do with Adventurers. There is so much material out there that this module is not intended to re-write the already published material, but rather provide a guide for program development and presentation.

To teach the skills in Woodstravel, Leaders have to be able to perform the same skills required from the Wardens. It takes practice to light a fire in the rain, practice to know all the wild edibles and practice to build a comfortable shelter in the bush. It takes some skill to repair ski poles, snowshoe downhill and hike up a steep path. Leaders may use resource people to help teach some of the difficult skills, but developing and practicing skills prior to teaching them is a must.

The knowledge and skills in Woodstravel will give Adventurers confidence to learn and enjoy nature to the fullest. Since the Silver Tree program takes three years to complete, JFW clubs should ideally integrate Woodstravel skills and knowledge with the Forestry, Leadership and Ecology modules of your program.





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Framework

I. First Aide

First aid is a basic skill for all Junior Forest Wardens and leaders. Each club should ensure that all wardens and leaders have current training and practice first aid on a regular basis.

- Complete a St. John Ambulance or Red Cross emergency first aid course
- Demonstrate how to manage an accident and how to get help
- Construct and demonstrate how to use a first aid kit

II. Fire Lighting Techniques

Fire lighting are part of the survival techniques taught in the JFW program. Knowledge of fire safety and fire suppression are critical to protecting people, wildlife and our forests.

- Explain the needs of a fire while building a fire.
- Prepare a three-course meal over an open fire.
- Build and maintain a warming fire.
- Build, use and put out a no trace cooking fire.
- Demonstrate how to make three types of fires, at least one in winter or during wet, windy conditions

III. Outdoor Clothing

Risk of hypothermia is a factor in all Junior Forest Warden activities. By teaching wardens how to dress appropriately for the activity and the weather, wardens and leaders practice prevention, and accept responsibility for their own personal safety

- Demonstrate how to use outdoor clothing to manage thermoregulation.
- Describe three types of clothing fabrics and the qualities of each page 41
- Give a 10-minute outdoor clothing lecture at school or to a Pathfinder group.



IV. Shelter

In an outdoor survival situation, the ability to find or make a shelter can mean the difference between comfort and discomfort, or surviving and not surviving.

- Construct and use a lean-to.
- Construct and use three types of snow shelters and/or shelters from natural products combined with plastic and nylon.
- Demonstrate two techniques for low-impact emergency shelters for use in natural areas.
- Demonstrate the proper location of shelters.
- Explain qualities and desirable features of tents

V. Navigation

The ability to use a compass and read a map accurately is an important skill in travelling in the woods.

- Identify the features on topographical maps and plot a course.
- Demonstrate orienting a map to the terrain.
- Demonstrate orienting a map with a compass
- Demonstrate techniques for setting a bearing and proper pacing.
- Demonstrate the use of a map and a compass on a trip in order to prove proficiency in staying found.

VI. Outdoor Safety

It is critical for outdoor safety to learn the potential hazards, how to prevent them and how to treat them.

- Demonstrate how to cope with two of the following in a camping and survival situation: sunburn, frostbite, hypothermia, dehydration, and wildlife problems.
- Describe emergency techniques to acquire water during a simulated survival situation.
- Describe six natural indicators of a storm and demonstrate the actions that should be taken.

VII. Responsible Hiking and Camping

As part of the Junior Forest Warden program, wardens and leaders are expected to use the out-of-doors responsibly. This role includes taking responsibility for personal safety and health.

- Demonstrate food packaging techniques. Describe how the packaging considers spoilage, food preservation and protection from wildlife
- Develop a cost-effective menu (not freeze-dried items) to feed a group of six for a week-long ski or backpack trip.
- Discuss the philosophy of leave no trace camping and demonstrate leave no trace camping in the following skill and knowledge areas: food preparation and cooking, fire building and fuel selection, shelter, and waste disposal.
- List ways you are responsible to and for others while planning a trip, during a trip and after a trip.



VIII. Knots and Lashings

Learning common knots and lashings and determining when to use them are skills that will aid in shelter construction, survival techniques, first aid and outdoor recreation activities.

- Make a shelter or an outdoor tool using cords and demonstrate the proper use of three knots and two lashings.
- Construct a knot display board which includes the name and use for at least eight knots.
- Make cordage out of natural materials.

IX. Survival

Making and learning how and when to use a survival kit is taught through the aid of survival situations.

- Describe factors affecting survival
- Describe the priorities of survival
- Practice a pattern for staying alive for one full day. Demonstrate proficiency in the use of map and compass, shelter, fire, selection of food sources, natural navigation aids, emergency first aid, signals, and dealing with boredom.

X. Search and Rescue

From searching for a lost article to participating in a search and rescue simulation, wardens learn an invaluable skill.

- Conduct a mock preliminary search for a person lost at camp.
- Conduct a mock secondary search using the containment and confinement methods.

XI. Outdoor Equipment

Learning the proper use of camping equipment contributes to a safe campout.

- Demonstrate how to light a camp stove.
- Demonstrate how to make a candle lamp or light a lantern.
- On a campout, describe the advantages and disadvantages of using stoves and fires.
- Describe how to select two of the following: daypack, backpack, sleeping bag, tent and canoe paddle.

XII. Daytrips and Campouts

Through participating, planning and leading a variety of daytrips and campouts, wardens have the opportunity to practice the skills they have learned in real-life situations

- Participate in nine daytrips.
- Participate in six campouts.
- Demonstrate an intermediate level of skill in two and a beginner level in one of the following: hiking, canoeing, cross-country skiing, or snowshoeing..





FIRST AID ●

First aid is a basic skill for all Junior Forest Wardens and leaders. Each club should ensure that all wardens and leaders have current training and practice first aid on a regular basis.

date completed





Complete a St. John Ambulance or Red Cross emergency first aid course

page 3



Demonstrate how to manage an accident and how to get help

page 5



Construct and demonstrate how to use a first aid kit

page 8

I. First Aid

1. Complete a St. John Ambulance or Red Cross emergency first aid course.

Research indicates that once individuals take a First Aid course, the incidence of injury decreases by 40 percent.

St. John Ambulance

The volunteers from St. John Ambulance Brigade provide first aid services to groups and organizations upon request. The St. John Ambulance mission is to enable Canadians to improve their health, safety and quality of life by providing training and community service.

Registration

Course prices include materials, registration and instructional fees. Course prices are subject to change without notice. Refer to the Yellow Pages section of this program for the St. John Ambulance branch locations.

Program Summary

Emergency First Aid (includes Level A CPR)	6.5 hours
Emergency First Aid (Level B CPR)	10 hours
Standard First Aid(includes Level A CPR)	13 hours
Standard First Aid with Basic Rescuer CPR (Level C)	16 hours
Extended First Aid (includes Level C CPR)	20 hours
Standard First Aid Re-certification	6.5 hours
Standard First Aid with Basic Rescuer CPR Re-certification	8 hours
First Aid in the Wilderness	16 hours

There are more programs in areas of CPR, advanced first aid skills, children, and in the workplace. Contact a St. John Ambulance office for more information.



CPR

All cardiopulmonary resuscitation (CPR) modules and courses are taught to St. John Ambulance national standards which are in accordance with those set by the Heart and Stroke Foundation of Canada.

Certification

All First Aid courses are certified for three years. It is recommended that CPR be re-evaluated annually.

Red Cross

The Canadian Red Cross teaches people of all ages that they can do something to help in an emergency.

Program Summary

Emergency First Aid	.6-8 hours
Standard First Aid	.15-18 hours
Heartsaver	.3-4 hours
Heartsaver Plus	.4-6 hours

Refer to the **Phone Book Yellow Pages** in this program for contact information for the Red Cross and St. John Ambulance.



2. Demonstration how to manage an accident and how to get help.

Background

Each accident will be a different situation. The key to responding to an emergency is to remain calm, assess the situation carefully before acting and continue to reassess.

The basic approach for handling an emergency is:

1. Assess the situation - Determine the extent of the emergency and what response is required. Do you have to administer first aid or coordinate a search for a lost person?
2. Develop a response plan to suit the emergency. For example, give first aid or initiate a search or send someone for help.
3. Assume leadership or select someone to be the leader who will delegate responsibilities. Group members cooperate with delegated duties.
4. Take care of the victim. Make comfortable and protect from weather conditions.
5. Keep a trained first aid person with the victim at all times to monitor wounds.
6. Give group members something to do to keep their mind off the situation. For example, have a fire made, make some hot drinks, get more wood and so on.
7. Check all group members. Is anyone suffering from shock or emotionally distraught. Maintain group morale.

Getting Help

When you send a person for help, follow a mutually agreed upon plan. The plan may differ depending upon where you are when the accident happens.

In the Urban Jungle

- Choose someone to go and telephone 911. It will be a free call on any pay phone.
- Give the person a brief summary of details which they must tell the 911 operator. For example, "There was a bike and car collision. We have an unconscious male, approximately 15 years old, with a green stick fracture and extensive bleeding. Please send an ambulance to the corner of Hit Avenue and Run Street."
- Have the person repeat everything you told them to say and do.
- Tell the person to report back to you when finished. Tell



them to say it, "I will come back here and tell you what I did."

- Wait a reasonable time (10 to 20 minutes) for the person to return. Consider sending another person to telephone 911. Follow the same procedure.
- Wait for emergency response and professional help to arrive at the accident scene.

In the Wilderness

- Determine where you go for help. Pre-trip planning should already provide a location for you to go for help. It may be a ranger station, cottage house or road but keep in mind there may be no phone or car.
- Someone must stay behind. This person must be briefed as to what is expected, for example, stay put-do not move your location or move to a shelter or road. If the group moves unexpectedly, a note must be left with the following information: planned route, destination, time departed and estimated time of arrival.
- Ask for Help. There may be other groups or travellers in the area who may be able to assist with first aid. Be clear with instructions to new people coming into the situation, for example, will they take over first aid treatment?
- Leaving for help. If anyone has to leave, it should be three people. They must have the skills and knowledge to leave safely. Follow this procedure:
 1. Use a map to determine the best route to get help.
 2. Pack only necessary equipment (map, compass, directions, food, water, clothing) and be prepared to bivouac.
 3. Determine what the group staying behind will do if help does not arrive by a certain time.
 4. Travel quickly and efficiently. Do not become another victim by getting hurt.
 5. The three going for help should never be split up.
 6. Conserve strength because you may need to lead the rescue party back.
 7. Contact authorities and arrange for a rescue. What will you do, stay or go back with rescue party.



- Have information for medical assistance to help with evacuation. Include name and age of victim(s), initial condition of victim, when and how accident occurred, first aid administered, location of group (on map), first aid equipment at site, type of rescue or help needed.

If You Are Alone

If an accident happens and there is just you and the victim, follow this procedure:

- Assist the victim with the necessary first aid.
- Make the victim comfortable. If possible and if necessary, move the victim away from the accident site if it poses further danger to a safer place.
- Tell the victim if conscious, that you are going for help and will return.
- Procedure as above depending on your location, in the wilderness or in the city.



A c t i v i t y I d e a s

- On a daytrip, set up a scenario where Adventurers must assess an accident scene, administer first aid, go for help and delegate duties. This is an opportunity for Wardens to use map and compass skills, first aid, fire lighting and leadership skills.
- Set up a fictitious accident at meeting time. Have the group assess the situation and send someone for help.



3. Construct and demonstrate how to use a first aid kit.

A first aid kit can be custom-made for the activity. For example, a first aid kit for a car and home can be quite extensive. One for a backpacking trip may include only the necessities such as moleskin for blister and hot spots on the feet and it may include insect repellent.

A first aid kit should be compact in size and have the most important contents ready for any situation. Below are some items that may be included for various situations:

Hiking First Aid Kit

- tweezers
- Wound management: butterfly closures (2), antibiotic cream, antiseptic towelets, moleskin
- Medications: antihistamines, sting relief swabs
- Bandage materials: 3" X 3" sterile dressings (4), roller gauze bandage, elastic bandage, tape, Q-tips, strip and knuckle bandages
- Infection control: latex gloves, anti-microbial hand wipes, biohazard waste bags (for soiled dressings)
- safety pins
- Other: band-aids, hay fever and headache medication
- mirror

Family First Aid Kit

- Basic medical instruments: thermometer, bandage scissors, tweezers
- Wound management: butterfly closures (4), antibiotic cream (Neosporin), antiseptic towelets, moleskin, instant cold pack, Tincture of Benzoin (prepares skin for application of adhesive)
- Medications: ipecac syrup (induces vomiting), acetaminophen chewable tablets (for sore throats), Extra Strength Tylenol (for headaches, fever, muscle aches), hydrocortisone itch cream (5% steroid ointment for severe skin reactions), A and D ointment (for sunburn), antihistamines (Benadryl, for allergic reactions), soothing sting relief swabs, cough suppressant



- Bandage materials: 3' X 4" sterile dressings (6), non-adherent 3" X 4" dressings (4), roller gauze bandage (2), 1" adhesive tape, strip and knuckle bandage, Q-tips
- Infection control: latex surgical gloves, anti-microbial hand wipes, bio-hazard waste bags
- safety pins, plastic bag
- mirror

Knowledge of the appropriate treatment and the effects of drugs is necessary when dealing with pain killers, antibiotics and other related substances. If you are planning an extensive kit, consult a medical professional.

- analgesic tablets (aspirin, Tylenol)
- caladryl lotion (a calamine and Benadryl lotion to relieve minor skin irritation)
- motion sickness drug (Gravol, Marezine)
- diarrhea medication (Immodium-AD)
- antacid (Maalox, Pepto Bismol, for stomach indigestion)
- stimulant
- pain medication
- muscle relaxant
- sting soother
- oil of cloves (toothaches)
- sunscreen cream, zinc oxide ointment
- assorted bandage compresses
- triangular bandage
- elastic bandage
- thermometer
- scissors
- single sided razor blade
- tweezers

Miscellaneous

- insect repellent
- parachute cord
- heavy duty aluminum foil
- safety pins



- petroleum jelly (Vaseline), can be used for lip balm and as lotion
- duct or heavy plastic tape
- dental floss
- mosquito head net
- notebook and pencil
- travellers cheques
- identification
- coins for telephones and emergency phone numbers
- pocket-sized survival manual
- military-type can opener (very small)
- space blanket
- waterproof matches
- mirror



A c t i v i t y I d e a s

- Have Wardens make a First Aid kit to fit a sandwich sized zip-lock bag or a pencil case.
- Have Wardens make a first aid kit for various situations and places such as: club meetings, their homes, a car, a personal kit, a group kit, an overnight hike, a week long backpack trip, a canoe trip, an overnight trip during the winter, a bicycle, a day long cross country ski trip.
- Have Wardens bring in the first aid kits from home, cars and so on and evaluate their contents. Do materials need to be replenished? What else could be added. Discuss and evaluate all the kits.
- Visit various sites (school, church, camp) and ask to evaluate their first aid kits. Evaluate the kits' contents and if necessary, make recommendations to the site for improvements.
- Visit a drug store and calculate the cost for materials that make up a basic first aid kit.
- Compare the contents and cost of an already assembled basic first aid to a first aid that Wardens can purchase and assemble themselves.
- Have Wardens review all the items in a basic first aid kit and discuss how each item can be used in emergency situations.



- Have Wardens review how to complete an accident report form. If you do not have access to this form, decide what a report should include (the 5 Ws and How.)
- Have Wardens practice planning and delivering a presentation by teaching younger Wardens about first aid kits.



FIRE LIGHTING TECHNIQUES

Fire lighting is one of the survival techniques taught in the JFN program. Knowledge of fire safety and fire suppression are critical to protecting people, wildlife and our forests.

<i>date completed</i>	✓		
_____	☐	Explain and demonstrate the steps in starting a successful fire.	page 15
_____	☐	Prepare a three-course meal over an open fire.	page 19
_____	☐	Build and maintain a warming fire.	page 26
_____	☐	Build, use and put out a no trace cooking fire.	page 27
_____	☐	Demonstrate how to make three types of fires, at least one in winter or during wet, windy conditions	page 29

II. Fire Lighting Techniques

1. Explain and demonstrate the steps in starting a successful fire.

Stages in Fire Lighting

There are four basic stages in fire lighting:

1. Ignition - The most common way to start a fire is with matches. Others are the flint and steel and the bow drill.
2. Establishment - This stage involves using the most effective method to light the required type of fire with the fuel available. Fine and coarse kindlings are ignited, which in turn ignite sufficient fuel of the right quality so the fire will continue to burn even in wind or rain. Establishment is a critical aspect of firelighting under adverse conditions as there are often many problems to overcome.
3. Application - Fire arrangements vary depending on the application and fuel available. There are fires for cooking, warming, drying, repelling insects, signal fires and so on.
4. Maintenance and Moderation - A fire can be made to burn at a desired output with a minimum of smoke. Knowledgeable maintenance will allow you long periods between adjustments or stockings.

Kindling

Kindling is any material that will light easily with the application of a flame. Kindling is not the same as tinder. Tinder is a material that will glow when a spark lands on it, specifically by a flint and steel or rock. The tinder is combined with a fine kindling to produce a flame with a breath or the wind.

If the kindling is too close together the mass of the material in the kindling absorbs too much of the match's heat before it can be effective and it physically obstructs oxygen access. The oxygen-combustion vapour mixture is then too lean to catch fire and produces only smoke. If the convective heat is not allowed up through the kindling because it is a dense mass, its drying and pre-heating action is less efficient.

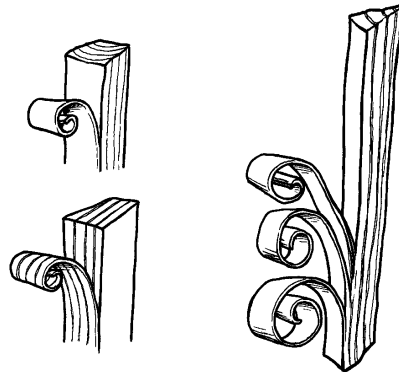
It is also helpful to light your kindling well off the ground. The coolest, dampest air is near the ground and there is also more obstruction to the flow of needed air to the site of combustion.



The best fuels are the ones that are high in carbon and hydrogen content. The most common elements in all living things are carbon, hydrogen, oxygen and nitrogen. Oxygen is not a fuel but it supports combustion. Nitrogen is not a fuel and it does not support combustion, in fact, it tends to interfere with oxygen. Combustion ceases when the oxygen level drops below 15 percent.

Types of Kindling

- Pine Needles - When pine needles are at least partly red, they can burn as well as birch bark. Use a compact but not tight bundle of needles.
- Birch Bark - This is the best kindling in the boreal forest. The bark contains an oily substance that makes the bark impervious to moisture and causes the bark to burn with considerable intensity. Finely or coarsely shredded bark is easy to ignite in any weather.
- Inner Bark of Black Poplar - This is an excellent rare kindling when dry. It is found on trees cut down by beavers in winter and early spring. The inner bark of aspen is also good but of a poorer quality than black poplar.
- Dry Grasses - This is a good kindling and is readily available in winter and scarce in summer. Dry grass is the best kindling for the flint and steel method of firelighting.
- Old Man's Beard - This is not a good kindling in wet weather, it absorbs moisture. It is fairly good to use in winter and can be easily dried when placed inside a shirt for a couple of hours. In dry weather it burns like gasoline. It is good enough to use with bow drill and the flint and steel methods.
- Feather Stick - Use a thumb-sized piece of knot free wood. Support the bottom of the stick on the ground or a log and cut with the grain. Shave the edges down as thinly as possible. A minimum of six feather sticks will start a good fire.
- Wood Scraping - These are small pieces of wood scraped off instead of





shaved off a piece of wood. Willow can be scraped into a fluffy mass of material that will ignite from an ember.

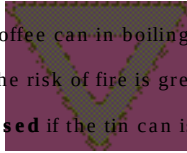
- Dead Pine Branches - Dead lower pine branches, if snapped off near the trunk of the tree, are often saturated with resin. The brittle resinous wood can be chipped and made in into fine feathers.

Manufactured Kindlings

Caution:

When heating paraffin wax, use a tin coffee can in boiling water

The risk of fire is greatly **increased** if the tin can is directly on the fire or element.



- Fire Kisses I - Take a fl inch square of paraffin wax and wrap in brown paper like a candy kiss. Dip the whole thing in paraffin wax.
- Fire Kisses II - Cut a strip (about one inch wide) from a heavy brown grocery bag. Tie in a knot and dip in paraffin wax.
- Super Match - Use a large wooden match that will strike anywhere. Wrap thin string or heavy thread (embroidery thread will work) around the match stem halfway up. Dip the whole match into paraffin wax to waterproof and hold the string in place.
- Tentest Fire Tinder - Use a two inch square of tentest approximately inch thick. Soak the tentest in liquid paraffin wax and place in survival kit. When needed, shave off pieces and use the shavings as kindling.
- Egg Carton Fire Starter - Use the egg cartons made of paper pulp instead of the foamed plastic ones. Fill each egg holder with dryer lint or cotton balls and fill with melted paraffin wax. When cooled, break apart and place one in a survival kit.
- Tuna and Cardboard Candle - Use a cleaned, empty tuna can. Cut strips of corrugated cardboard the width that the tuna can is deep. Coil the cardboard strip(s) around a wick. Keep coiling and place snugly but not too tight into the can. Fill with melted paraffin wax. Can use as a candle to start a fire.
- Electric Fire Starter - Use any sized battery from a flashlight, a 9-volt radio, or a car battery. Place steel wool between the + and - terminals, the steel wool will heat up and start to burn.
- Flint and Steel Kits - Use dryer lint or cotton balls and flint and steel. Place both in a film container or pill bottle.



Kinds of Wood for Fuel

- Willow - Very tolerable smoke, good coals, easy to gather but comes in small pieces.
- Aspen - Comes in bigger pieces but is a little smokier than willow.
- Alder- the smoke is pleasant, may even relieve headaches, can be broken into stove wood lengths but burns fast.
- Black Poplar Outer Bark - exceptionally good coals but burns up quickly.
- Pine, Black & White Spruce - Smoke induces headache, wood is sparky (especially black spruce)
- Tamarack (Larch) - Produces the most heat of all woods but is not common.
- Birch - Seldom found dry, it's either green or rotten and like aspen must be burned in the green state when other fuel is scarce.
- Driftwood - regardless of origin, tends to burn fairly hot and fast. Sodden (dripping wet) driftwood is very hot once ignited.

Fires are like humans, they thrive on attention.

Common Errors With Fires

- Fire is too small.
- Wood is too thick.
- Not enough fine materials to start fire.
- Wood is packed too closely together.
- Wood is too widely spread apart to produce effective inter-reflective action.
- Allowing a cavity to develop under long logs as they burn.

Tips

- The cure for a smoky fire is to add more good fuel.
- If you want an irritating smoky fire for signal or insect control, use green pine, spruce or punky wet wood.
- A good fire thrives on attention, adjust frequently.



Activity Ideas

- Set up a hot plate and melt paraffin wax in a double boiler. Have a night of making super matches and Fire Survival Kits (one fire kiss, one super match, both in an empty plastic film container)
- Have the club collect and save dryer lint for several months. Find some paper egg cartons and make egg carton fire starters.
- Make a variety of manufactured kindlings. Test and compare the effectiveness of these. Discuss the best application for each

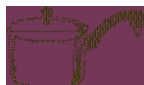
2. Prepare a three-course meal over an open fire.

Building a Cooking Fire

A cooking fire can be a small or as large as the number of pots required to feed the group. Pots can be supported over the flame with grills, rocks or by suspension from lashed sticks.

Clean Pots

If you rub liquid



dish detergent over the outside of your pots, soot from the fire will adhere to the pot but it will easily wash off with minimal scrubbing.

Suspending Pots

An ideal suspension system must be safe and easy to raise and lower a pot to control heat. Most quick rigs consist of three components: the suspension, the pivot and the anchor.

The anchor secures the far end of a suspension pole. The anchor must be secure so that it will not release accidentally. The pivot can be adjusted according to the situation. The suspension holds the pot or a pot hook over the fire. It should have a notch for the pot handle. If a suspension pole is too close to the fire, it will burn up. A tripod is useful as a pivot when the ground is frozen or rocky.

Three Course Meal

A three course meal may consist of soup, entree or main course and dessert. There are many books on the topic of outdoor cooking. Keep a record of your favourite recipes, how they were cooked, length of time and how many the recipe fed.



Dutch Oven Cooking

A Dutch Oven is a black cast iron pot with a cover. The pots come in a variety of sizes and are very heavy. Cast iron requires a certain amount of care. Most types of cast iron pots must be seasoned. Seasoning is a way of protecting the pot for many years of service. First, scrub the inside of the pot with steel wool and a bit of soap. Continue until the water is clear. Wipe and dry then apply a thin layer of cooking oil to the inside and outside of the pot. Place in an oven set at 250° for two to three hours. It's ready to use. After each use, clean the pot and apply a thin layer of oil to the inside to prevent rusting. Never soak your Dutch Oven in detergent as it will remove all the seasoning.

Cooking with a Dutch Oven

When you start to cook with Dutch Oven, experiment with various types of recipes, for example, try cooking vegetables, a cake, or a chicken. A good size is a 10" or 12" diameter.

The principle when cooking with a Dutch Oven is to maintain a constant heat with coals. If you are at camp, use Matchlight™ Briquettes. They light easily with a match. Move them around the pot when they are gray. The coals or briquettes should never be put under a Dutch Oven, you will burn the food. The coals are placed around and on top of the Dutch Oven. Cooking time is approximately the same as with your oven at home.

Coal Cooking

The fire for coal cooking must provide coals from the wood. Hope you are not in a hurry--it takes time to cook with coals. Some of the best coals are from the black poplar, two to three cm thick. Finger-thick willow or aspen sticks also produce coals.

Use coals to cook food in Dutch Ovens or wrap food in tin foil and place on top of coals. Use two layers of light-weight or one layer of heavy-duty aluminum foil. The foil should be large enough to go around the food and allow for crimping the edges in a tight seal.

When the tin foil is folded, make a double fold over on all seams so the juices will not leak out of the foil package. This is known as the drugstore wrap



Some Recipes

Bannock

1 cup flour
2 tsp baking powder
1/8 tsp salt
1/2 cup cold water or milk
1 Tbsp butter or margarine

Mix all ingredients to make a stiff dough for cooking on a stick to a runny dough for frying. Add oil to pan before frying. Serves two people.

Bannock is baking powder bread.

- Recipe from Bush Craft by Mors Kochanski.

Bannock

4 cups flour
6 Tbsp sugar
1 tsp salt
4 tsp baking soda

1/3 cup oil
milk or water

Mix the dry ingredients. Cut in 1/3 cup oil or butter with a fork, adding small amounts of water or milk until the dough gathers into a ball. Flatten into a pancake, not more than one inch thick. Fry until golden brown.

Bannock

4 cups flour
1/4 cup powdered milk
2 Tbsp shortening
1 1/3 cups warm water

1 tsp salt
1 Tbsp yeast
1 tsp sugar
Seasonings (optional)

Combine all dry ingredients. Add anything you like such as raisins, dried fruit or cinnamon. Cut in shortening, add water and mix to form a dough. Fry in a pan or make a sausage on a stick and cook slowly over an open fire. Delicious spread with jam.

- Phyllis McBride author of Cactus Cooking
member of AJFW Alumni



Dutch Oven Peach Cobbler

1-1 1/2 quarts fresh peaches, peeled and sliced	1 Tbsp margarine
1/2 cup water	3/4 cup white sugar
1/4 cup brown sugar	1/2 tsp salt
1/4 tsp cinnamon	2 Tbsp instant tapioca
2 cups biscuit mix, plus 1/2 cup	2 Tbsp dry milk powder
1/4 cup shortening	2/3 cup water

Place sliced peaches in Dutch Oven and dot with margarine. Add water. Add sugars, salt and cinnamon to peaches and toss to coat peaches. Sprinkle tapioca over fruit. In a small bowl mix milk powder, 2 Tbsp sugar and shortening to biscuit mix. Add water and stir until mixture holds together. Spread the 1/2 cup of biscuit mixture on tin foil and add rest of biscuit mixture. Knead dough working in the dry mix. Pat the dough into a circle big enough to fit onto the fruit in the Dutch Oven. Cut some slits on the crust to allow steam to escape.

Place Dutch Oven with coals or briquettes around and on the cover. Cook for 15-20 minutes. The time will vary depending on weather and wind conditions. The crust should be brown on top. Let it cool, serve and enjoy.

- Recipe from Camp Cooking by Bill and Jo McMorris

Foil Breakfast

sausage
egg
hash brown potatoes
salt, pepper, spices to taste

Place potatoes, egg, sausage patty and spices in foil. Wrap securely. Place on coals for 15 minutes.

Foil Dinner

potato slices	dab of butter
hamburger patty	salt, pepper
onion slices	
carrot slices	

Lay potatoes, onion, carrots on a sheet of heavy-duty foil then place the hamburger patty on top. Cover with slices of vegetables again. Season with butter, salt and pepper. Cook 20 to 30 minutes over hot coals, turning twice during cooking.



Meat Loaf in a Dutch Oven

2 lbs ground beef

a small can evaporated milk or 1/2 cup milk

2 packages dried onion soup mix

Mix all ingredients together and form a loaf in the Dutch Oven. Bake approximately 50 to 60 minutes.

Cinnamon Raisin Roll-Ups in a Dutch Oven

2 cups Bisquick mix

2 Tbsp margarine

1/2 cup raisins

1/4 cup chopped nuts

1/2 cup sour cream

1/2 tsp ground cinnamon

3 Tbsp milk

2 Tbsp melted margarine

1/4 cup packed brown sugar granulated sugar

Spray Pam or oil inside of Dutch Oven. Mix baking mix, raisins, sour cream and milk, beat 20 strokes. Smooth into ball on floured tin foil or wax paper. Knead 10 times. Roll into a rectangular, about 12" X 10". Spread with softened margarine. Mix brown sugar, nuts and cinnamon and sprinkle over dough. Roll up tightly. Pinch end of roll. Cut into 12 slices. Place slices, cut side down, on piece of tin foil. Brush melted margarine over tops and sprinkle with granulated sugar.

Prepare Dutch Oven by crushing up tin foil into three or 4 balls and place on bottom of Dutch Oven. Place Tin foil sheet with slices on top of tin foil balls. This will prevent the rolls from being burned because the air space under them distributes the heat more evenly. Bake until golden, about 13 minutes.

You can use aluminum pie pans on top of your single burner stove. The two pie pans are secured together with clothespins.



Clothes Pin Biscuit Ring or Pie Pan Oven

1 1/2 cups Bisquick

1/3 cup cold water

two 8" aluminum pie pans

3 to 4 wooden clothespins, soaked in water

5-6 Tbsp shortening

In a small pot, mix the Bisquick and water with a fork until the combination is well blended and sticky. Put 2 to 3 tablespoons of vegetable shortening in one of the pans and place on the stove to melt. Grease the other pie pan thoroughly. Spread the dough around the edge of the pan of melted fat, leaving the centre clear. Put the other pan on top of the dough. Line up the edges of the pans together and fasten together with clothespins. Establish a steady, low flame on the stove, put the pans on the burner to bake. Bake the bread about four minutes on one side, then invert the pan oven and cook the second side for another 4 to 5 minutes. Continue to bake another 6 to 8 minutes, alternating the sides every 3 to 3 minutes. Take the pan off the stove to check for doneness. Cut into wedges and serve with honey or jam.

Blueberry Bread

one 17 oz pkg Blueberry muffin mix

4 Tbsp dry milk powder

1/2 cup cold water

4 to 6 Tbsp shortening

Follow the same method as for Clothes Pin Biscuit Ring or Pie Pan Oven.



Try This at Home

Beef Jerky

1 lb. (454 g) sirloin or tip round steak, 2.5 cm thick

1/2 cup (125 ml) water

1 1/2 oz. (42 g) envelope of dry onion soup mix

1 tsp (5 ml) liquid smoke

1/4 tsp (1 ml) garlic powder

1/4 tsp (1 ml) salt

1/8 tsp (0.5 ml) pepper

1 plastic zip lock bag

Cut off all the visible fat from the meat. Cut the meat into long strips about 1/8 inch (3 mm) thick. This is easier to do if you partially freeze the meat first. Put the strips into the plastic bag.

Measure the remaining six ingredients into a small bowl and pour them into the bag and onto the meat. Remove as much air as you can from the bag. Seal with a twist tie. Squeeze to get all the beef wet with the marinade. Place the bag in your refrigerator for at least six hours, turning occasionally. Heat the oven to 150° F (65° C). Remove the beef from the marinade. Blot with some paper towels. Place the wire rack in the cookie sheet. Put the meat strips on the rack. Dry the strips on the centre rack in the oven for four hours. Turn the beef strips over with a tong. Put the strips back into the oven for three to four more hours until the strips begin to get brittle. Take them out and cool completely. Store in the refrigerator or freezer.



3. Build and maintain a warming fire.

Warming Fire

The wall back fire, formerly known as the reflector and re-emitter fire, is a fire for warmth. A fire in an open area emits radiant energy in all directions. With a wall back or log wall a considerable portion of this radiant energy can be redirected in a more useful direction, thereby using the fuel more efficiently.

The wall back fire described below was evolved through Mors Kochanski's considerable use and experience. Built properly, it is like a large fireplace radiating heat and light.

If it is not very cold, the wall back is built of green logs so that it lasts longer. A commonly available slow burning green wood is black poplar (*Populus balsamifera*).

Logs 25 to 30 cm in diameter should last at least one night for any condition above -20° C. The colder the weather the more massive the reflector should be. If the weather is very cold, then the wall back can be built of dry logs, which become a source of fuel themselves; their burning surfaces tend to radiate more intensely than green wood. This type of fire may have to be rebuilt or readjusted as well as being stocked every four to six hours.

If very large logs, 40 cm, are used then a wall three logs high is adequate. With smaller logs, four logs high is more satisfactory in performance. Ideally the wall back should be about as high as the waist of the user.

A simple measure for the length of a log used is the distance from fingertip to fingertip. For more stability, the logs can be hewn flat, on the top and bottom, an operation more conveniently done before the logs are cut into sections. With the three log wall back fire, a brace can be used to hold the stacked logs in place by its weight, or logs may be piled behind the reflector for added support.

The wall is usually built vertically. If the log wall is leaned toward the fire so that if it collapses, it will fall on the fire, and a few stoking sessions in the night may be avoided.

The wall back fire must be built parallel to the wind. The wind direction may vary 15° or so either way, but it must blow across the front of the log wall to properly carry away the smoke and sparks. It is not the heated air that keeps you warm in this instance. It is the radiant energy that you



intercept that warms you, much like the warmth you receive from the sun. It should be noted that the fire must be built against the face of the wall for maximum effect.

4. **Build, use and put out a no trace cooking fire.**

Background

We can have fires where there is no visible trace left. The following methods are traditionally used to leave no trace:

- Never use rocks to ring a fire unless there is a fire ring already existing. A fire will permanently blacken rocks.
- Dig up the top sod and put aside. Dig down approximately 15 to 20 cm to the mineral soil. Put the mineral soil to the side.
- Burn fire down to an ash. Soak with water.
- Replace organic soil. Place sod back on top. Scatter with organic debris such as cones and twigs to disguise the spot.

The disadvantages though are that a fire will kill microorganisms in organic soil that are responsible for breaking down organic matter. The upper part of the pit dug down to the mineral soil will be sterilized and roots and other organic material on the sides of the pit may smolder after the fire is out and buried.

Mound Fire

A mound fire can be built anywhere, on top of the ground or on top of a camp's makeshift kitchen counter. All you need is a trowel or shovel, a large stuff sack and a round cloth which is optional.

- Locate a good source of mineral soil. Collect soil from an already disturbed area, for example, a stream bed, beneath tree roots or sandy areas.
- Fill the stuff sac with the mineral soil.
- Carry the soil to the fire site.
- Lay the ground cloth down and create a circular, flat-topped mound with the mineral soil about 15 to 20 cm thick. The mound's circumference should be larger than



the planned fire size. The ground cloth is not essential but helps with cleanup after the fire is out. The soil mound insulates the ground from the heat of the fire.

- Build the fires on top of the mound. The heat may kill the grass underneath but it will not sterilize the soil.
- Let the fire burn down to a white ash before dousing with water. When the fire is out, all the wood should be burned completely. Do not put your hands into the ash after it has been doused with water. Ash and water make caustic lye which can give you chemical burns.
- Scatter as much ash as possible and return the mineral soil back to its original location.

Fire Pan

A fire pan is a metal pan that is placed on the ground upon which a fire is built. When finished, bury or scatter the ashes.

Fire Stoves

A simple wood burning stove is more effective than an open fire. There are a number of commercially produced fire stoves ranging from simple, collapsible boxes to units with battery-powered fans, and petroleum-fueled stoves. If wood is scarce, use petroleum.



5. **Demonstrate how to make three types of fires, at least one in winter or during wet, windy conditions.**

Background

When starting a fire in cold weather, the pile of finger or wrist thick sticks piled on top of the burning bundle should be at least knee high. This will produce enough heat and coals to start the fire properly so that when any fuel is added it starts to burn immediately with a minimum of smoke. Starting a fire properly is particularly important when only poor fuel is available. A common error is using too large pieces too soon.

Fires are much like humans, they thrive on attention. Frequent adjustment of a fire will keep it going at its best. The adjustments usually consist of:

- moving together pieces of fuel that are too far apart
- parting the pieces that are too close together
- filling voids under the fire
- putting fuel into the thermal column early enough for pre-drying and pre-heating.

Often, the cure for a smoky fire is simply proper adjustment. A spread-out fire with inferior fuel always smokes.

Trench Fire

A trench fire is good in times of drought, windy weather or where the ground is strewn with dry leaves or pine needles. Dig a trench in line with the prevailing wind to create a good draft. The windward side should be wider and deeper and sloped upwards on the far end. Place rocks on sides as they will retain heat and also bolster the walls which have a tendency to crumble when the earth dries due to the heat. A small chimney of flat stones or sod on the leeward side will improve the fire.

Teepee Fire

A teepee fire is made by forming a teepee of kindling around the tinder bed. In windy weather, the teepee can be put against a log on the lee side. Larger fuel pieces are added to



the teepee to maintain its shape. As the fuel underneath burns down, fuel is added underneath. The teepee fire needs goes regular adjustment.

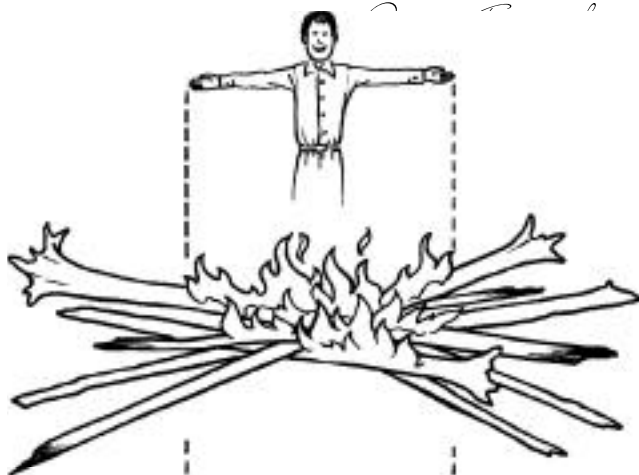
Log Cabin Fire

The log cabin gets its name because the larger fuel is laid like the alternating pattern of logs of a log house. The size of the log cabin pattern can be large at the bottom and become increasingly smaller as the fuel gets higher. As the fire burns down, fuel is added in the overlapping log cabin pattern.

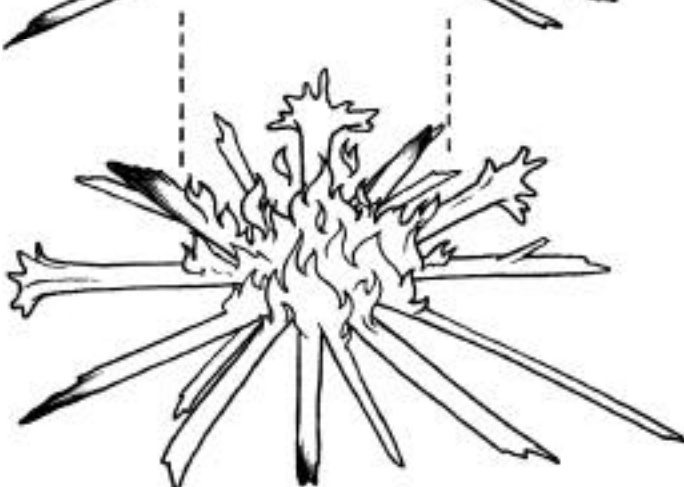
Other kinds of fires that are covered in other areas of this program include: Cooking Fire, page 19; Warming Fire, page 26; No Trace Fire, page 27; and Signal Fire, page 116.

Fire on Top of Deep Snow

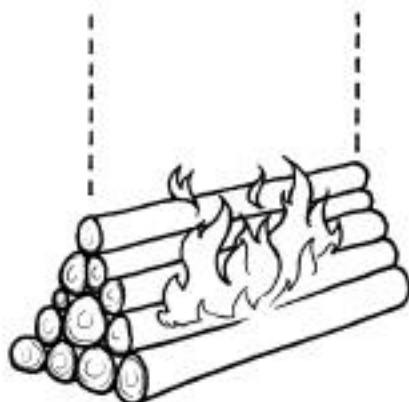
In winter, pile of fuel should be at least knee high. Start by building a platform made from green logs on the snow. The platform can have two layers, each layer laid in opposite directions. The fire is made on top of the platform. The best fire for winter is the parallel log fire. It should be hot enough so that you have to take one step back.



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when is made easy by pushing
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leaving your sleeping bag.



Fire

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III OUTDOOR CLOTHING ●

Risk of hypothermia is a factor in all Junior Forest Warden activities. By teaching wardens how to dress appropriately for the activity and the weather, wardens and leaders practice prevention, and accept responsibility for their own personal safety.

date completed



_____	☐	Demonstrate how to use outdoor clothing to manage thermoregulation.	page 35
_____	☐	Describe three types of clothing fabrics and the qualities of each.	page 41
_____	☐	Give a 10-minute outdoor clothing lecture at school or to a Pathfinder group.	page 44

III. Outdoor Clothing

1. Demonstrate how to use outdoor clothing to manage thermoregulation.

Background

Heat leaves the body in a variety of ways:

- Conductive Heat Loss occurs when contact is made between your body and a cooler surface. It can be minimized by not sitting on the cold ground, especially on snow or rock. Conduction occurs 25 times faster with wet clothing than with dry.
- Convective Heat Loss occurs when body heat warms the air (if submerged, the water) adjacent to the body; that air then rises and moves away from the body and fresh colder air replaces it. Wind increases the speed of heat loss through convection. The impact of heat loss from convection is measured by the windchill factor, see Windchill Chart in Appendix I. An important element in dressing for the backcountry is trapping the air around the body.
- Radiant Heat Loss is caused by the escape of infrared radiation from the body. It is minimized by wearing insulative fabrics or with fabric that reflects the heat back to the body.
- Evaporative Heat Loss occurs when perspiration (water) on the skin evaporates, drawing heat from the body. Minimizing the amount of sweating is important in reducing evaporative heat loss. In hot weather, on the other hand, evaporation is essential in cooling the body to prevent heat illnesses.

- From The Backpackers Field Manual by Rick Curtis.

Thermoregulation is balancing the heat a body loses to the environment with the heat generated from exercise. An example of proper thermoregulation is when heat production and heat retention are greater than the cold environment. If the environment is greater than heat production and heat retention then a person is susceptible to hypothermia or frostbite.

Heat can be produced in the body by exercise and by shivering. Some of the heat retention factors include:

- body size and shape (the surface-to-volume ratio affects how quickly heat is lost)



- insulation (type of clothes and layering affects heat retention)
- body fat (the amount of body fat affects how quickly heat is lost)
- core body response (The body has a natural response to protect the vital organs in the torso and head by cutting off blood flow to the extremities. That response is not a medical problem but is a symptom that the body is under stress.)

The human body has a number of ways to maintain the core temperature of 37° C (98.6° F)

- Increase of the blood to the surface which increases heat loss.
- Decrease of blood flow to the arms and legs which decreases heat loss.
- Sweating cools the body by moisture evaporation.
- Shivering generates heat by increasing activity in the muscles. Exercise is better than shivering for heating the body.
- Changes in activity levels will either increase or decrease heat production.
- Putting on or taking off clothes helps to regulate the body's temperature.

Layering

Dressing in layers instead of wearing one bulky garment, can help prevent uncomfortable and potentially dangerous situations. Layering is a simple procedure that allows a person to adjust to a wide variety of environmental conditions.

The still air around the body is like a micro-climate. This micro-climate can easily change by physical activity, wind temperature and moisture. Wearing a series of thin layers allows a person to fine tune the micro-climate by shedding layers before the body gets too hot and adding layers before it gets too cold. By combining different fabrics in several layers, a comfortable body temperature can be maintained without excessive sweating which can lead to heat loss.



If the removal of a clothing layer is too much, re-establish parts of the sequence, for example, cover the ears, neck, replace mittens after the outer shell is taken off.

Follow the sequence below to vent excessive body heat:

1. uncover ears
2. uncover neck
3. uncover one hand
4. uncover second hand
5. open clothing at neck
6. open clothing at wrists
7. remove all head gear
8. remove layers of clothing

The Seven Clothing Layers

1. Inner Layer

This underwear layer keeps the skin dry. The best fabric to wear is a hydrophobic synthetic fabric such as polyester, or polypropylene. It will move perspiration away from the skin.

2. Middle Layer

This layer gives some insulation and protection from the elements, and should continue to transport the moisture from the inner layer. Clothing such as a zip-front turtleneck or button shirt (made from middle weight polypropylene or lightweight wool or fleece) allow for ventilation. Extra layers may be added as the temperature gets cooler and activity level changes.

3. Outer Layer

This is another insulation layer used when activity level is low. The best garment for the torso is a wool sweater, fleece jacket or vest. Wool absorbs up to 30 percent of its own weight in water so it gets very heavy. Fleece or wool pants may be added to protect the legs.

4. Shell Layer

The shell protects the micro-climate from the elements. The shell is an outer jacket and pants layer that blocks the wind, rain and snow. A windbreaker shell minimizes heat loss and keeps the air trapped by the layers underneath. A waterproof shell that is not breathable also traps the moisture from perspiration. If so, the shell should have armpit and full front zippers. The best shell should be waterproof and breathable so it can provide protection from wind and water and not encourage perspiration.



5. Head Layer

A hat will provide protection from the sun and rain and reduces heat loss. In cold weather: Up to 70 percent of the body's heat can be lost through radiation and convection from the head in cold weather. Because the head has no fat for insulation, the head acts like a radiator, letting heat escape. A hat conserves heat and allows the body to send more blood to the extremities (hands, legs, feet.) A good wool or fleece hat will slow heat loss, also in harsh conditions wear full-face balaclavas and neck gaiters. In hot weather: A wide-brimmed hat will protect the body in downpours and protect from the sun and helps to prevent overheating.

6. Hand Layers

In cold weather the hands can be insulated with loosely fitting mitten and gloves. The best combination is a polypropylene glove liner and wool mittens. Mittens are better than gloves because they have a greater surface area for radiating heat between the fingers. A layering system with a thin layer wool or synthetic glove for moisture transport and an insulating mitten and a non-insulating shell mitten for outer protection will cover a wide range of temperature control and still offer manual dexterity. Gloves are good to have for tying knots and other tasks requiring the use of your fingers.

7. Feet Layers

Wear two to three pairs of socks inside boots. A lightweight liner sock helps to pass moisture away from the foot. The second and third layers should be medium to lightweight wool or wool blend. Wearing more than one layer of socks allows the socks to slide against each other instead of against the skin. Cotton socks are not recommended because they will absorb and retain moisture from the feet.

Water is the single greatest threat to personal comfort. Rain and snow are not the only water sources. The human body produces moisture in the form of perspiration. At rest, a body gives off about 57 ml of water vapour every hour. Heavy exertion causes a body to give off up to one litre in sweat over the same period.

Water conducts heat away from the body more than 30 times faster than air. A person outdoors must, therefore, manage the body's moisture effectively and get it away from the body as quickly as possible. The water vapour must get from the inside to the outside. And this can be accomplished by

The body gets cold from the following negative factors:

- ☐ temperature
- ☐ body wetness (from rain, sweat and water)
- ☐ wind



venting (opening the neck area), removing some clothing layers, and wearing appropriate clothing.

Windchill is a major factor in increasing heat lost through convection. As the body heats air, it is replaced with a cooler air pushed by the wind, and over time, the heat lost will be more than the heat produced by the body.

Staying Warm at Camp

When you first get up in the morning and at the end of the day, your activity level will be low and so will the air temperature. You will need to have many, if not all your clothing layers on until you become more active, for example, after breakfast.

Good Morning

As your activity level increases you will need to shed some layers since you will begin generating heat. A good rule of thumb is to strip down until you feel cool, not chilled, just before you are ready to hike. If you begin with too many layers, you will be removing clothes after just 10 minutes. If you stop for more than a few minutes, you may need to add a layer to prevent getting chilled.

Good Night

At the end of the day, as activity decreases and temperature drops, more layers will need to be added. Once you start to cool down, it takes a lot of the body's calories to heat up again, so layer up as quickly as possible before you get chilled. Put on more than you think you need because it will get colder. If you are too warm, open up the layers and ventilate to reach a comfortable temperature.



To prevent cold injuries

- Stay Warm
Wear several layers of loose-fitting clothing, preferably wool and keep the head and neck covered.
- Stay Dry
Avoid getting wet, even by sweating.
- Eat Well
Eat high energy foods at regular intervals.
- Stay Safe
Limit the time spent in the cold. Stay with a partner so you can check each other for signs of cold injuries.
- Avoid use of Tobacco and Alcohol
These contribute to cold injuries by decreasing blood circulation.



Activity Idea

- Go through with the Wardens What Would You Do activity sheet. Wardens have a copy in their own manuals on page 34. Answers: A-2, B-4, C-1, D-6, E-3, and F-5.



What Would You Do?

Listed below are dangerous situations that could result in cold injuries. Match each situation with a safety practice that could prevent cold injury.

Dangerous Situation	Safety Practices
A. Poor nourishment	1. Wear warm clothing and protect your head, hands and feet.
B. Weakened condition	2. Eat foods such as chocolate, nuts or raisins frequently when you are in the cold.
C. Poor clothing	3. Carry an extra pair of woolen socks so you can keep your feet dry.
D. Long exposure	4. Avoid over-tiredness.
E. Wet clothing	5. Use the “buddy system” to ensure safety in the cold.
F. No partner	6. Stay outside for only short periods of time when the temperature is very low.

2. Describe three types of clothing fabrics and the qualities of each.

Background

The most important information a Warden should know when venturing outdoors is how to dress properly. (Some would argue, however, that the second most important information is knowing how to light a fire in any weather condition should be the most important.)

○ Wool

Wool traps air and absorbs water. It is extremely effective as an insulator because of its fibre. Depending on the wool, as much as 80 percent of its bulk can be air. Even when wool is wet, the dead air spaces still insulate. Wool releases moisture slowly thereby minimizing the chilling



effect however, wool absorbs a lot of water and the garment can get quite heavy. It also takes a long time for wool to dry.

- **Cotton**

Cotton is hydrophilic-it absorbs and retains. Once it is wet, it loses heat 25 times faster than dry clothing. The worst thing to wear on outdoor trips is blue jeans. When they get wet at the bottom, the pant legs are like wicks and suck all the moisture up the leg. Cotton is comfortable when its dry but loses all its insulating qualities when wet. Wet cotton can be a significant factor in hypothermia. It is also difficult to dry.

- **Polyester or polypropylene**

These are synthetic fabrics. As outer wear, a plastic fabric like arctic fleece stays warm when it's wet and dries quickly. Fleece has the same insulation qualities as wool and has poor wind resistance. Some synthetic fabrics designed for the inner layer (underwear) are hydrophobic ("water hating") and pull the water from the body outward. These are very effective.

- **Gore-Tex™**

Gore-Tex, introduced in 1976, is a waterproof fabric that is functionally breathable as well as windproof. The Gore-Tex membrane has nine billion microscopic pores per inch. These pores are 20,000 times smaller than a single droplet of water but 700 times larger than a molecule of water. This allows water vapour from perspiration to easily pass through the membrane while keeping water from the outside at bay. Is Gore-Tex the stuff of dreams? A windproof garment can keep a person 20 percent warmer because wind cannot displace the warm dead air trapped by insulating clothing layers.

Other fabric types include:

- **Cotton/nylon and cotton/polyester**

Blends of cotton and nylon, and cotton and polyester, are more wind-resistant than 100 percent cotton, but still should be avoided by serious outdoors people because of their absorbent nature.

- **Wool blends**

Blends are less warm than 100 percent wool but may be more durable and less expensive.

- **Nylon**

Compared to cotton, nylon is lighter and more durable.



- **Uncoated nylon**

This fabric is wind-resistant and breathable but not waterproof.

- **Ripstop nylon**

A grid of threads strengthens garments made from ripstop nylon making them more durable.

- **Nylon Taffeta**

Moderately water-resistant, this material is strong and often used in the manufacture of tents.

- **Cordura**

A heavy, coarsely woven nylon material, abrasion-resistant and strong. Coatings improve water resistance, but they don't bond as well to Cordura as they do to other materials.

- **Neoprene**

Neoprene is strong, but weighty. It is typically used in clothes made for paddle sports.

- **Urethane or Polymer**

These are added for water resistance as a coating on nylon or polyester, but are heavy and not breathable.



Activity Ideas

- Have Wardens work in small groups and bring in samples of outdoor clothing made of wool, cotton, polyester/polypropylene, and/or Gore-Tex. Give a short presentation to another group on the pros and cons of the fabrics.
- Have small groups of Wardens choose one fabric type. Have them make a short presentation to the rest of the group about the fabric type. Have them bring in various samples of clothing. They must use a fan (wind) or water (rain) as part of their presentation.



3. Give a 10-minute outdoor clothing lecture at school or to a Pathfinder group.



Activity Ideas

- Have a Pathfinder volunteer to be Exhibit A: The body. Have the Adventurers bring samples of clothing layers and dress Exhibit A (who is fully clothed) in the seven layers of clothing (inner, middle, outer, shell, head, hands, feet). This will be a great laugh because Exhibit A will look funny in big clothes and will get hot. Suggestion: Exhibit the clothing layers on the floor and discuss the importance of each layer before Exhibit A is dressed.
- Have Wardens bring in samples of clothing that do not provide insulation for outdoor activities. For example, cotton socks, thin cotton shirts, and so on.
- Demonstrate the wick action of blue jeans. Place a bucket of water on the floor. Put the leg bottoms of the blue jeans into the water. After the presentation, observe how far the water has soaked up the pant legs. Have another similar demonstration with a pair of sweat pants. Compare the differences/similarities between the fabric types. This demonstration will leave a lasting impression on Pathfinders.



IV SHELTER●

In an outdoor survival situation, the ability to find or make a shelter can mean the difference between comfort and discomfort, or surviving and not surviving.

<i>date completed</i>	✓		
_____	☐	Construct and use a lean-to.	page 47
_____	☐	Construct and use three types of snow shelters and/or shelters from natural products combined with plastic and nylon.	page 54
_____	☐	Demonstrate two techniques for low-impact emergency shelters for use in natural areas.	page 59
_____	☐	Demonstrate the proper location of shelters.	page 61
_____	☐	Explain qualities and desirable features of tents.	page 62

IV. Planning

1. **Construct and use a lean-to.**

Background

The whole topic of bush shelters is extensive and complex. There are shelters that will specifically ward off rain, snow, wind, and insects, with some fulfilling one role well and others standing up to all the impositions of the environment all at once. Some shelters require a fire in front to keep occupants warm while others are kept warm by occupants themselves. Shelters may be built above the ground, on the ground, partially in the ground, or completely in the ground. The form a shelter takes may depend on the building materials, tools available and the expertise and experience of the builder.

The Principles of the Lean-to

In essence, the shelters first function is to prevent any air movement through the back and the two ends. Its second function is to intercept any rain or snow from overhead.

Good sites can generally be found near the bases of tall spruces and large overhanging boughs. The ground near the base of the spruce is often spongy, drier in the rain, or more free of snow in the winter, as the tree tends to offer considerable protection from above. Overhead protection as well as a bough bed are often unnecessary when a good spruce can be found. You may only need protection from the wind.

A familiar form of boreal forest survival shelter is the lean-to or matchegin. The lean-to is often maligned by those who have not taken the time to understand it. It is one of the many shelters available to the expert survivalist and it could be the first type of shelter to be mastered by the novice because of its ease of construction and wide range of applicability.

The lean-to has certain advantages and disadvantages. Its main advantage is that it can be built readily anywhere there are trees. It is an easy shelter to build with the most readily available materials, such as spruce boughs, and if necessary, can be built without any tools. A person trained in the use of a good Mora knife should easily be able to cut down green trees with it as thick as the wrist for the rafter poles faster than most people can cut them down with a hatchet. The ridge pole, which should be at least 10 cm in diameter, can be cut down with a knife and baton in about five minutes.

Its main disadvantage is the large fire that has to be maintained in front of it to keep you warm. Gathering adequate amounts of fuel is exhausting. The amount of fuel



needed during the night would keep a 12-person teepee with a stove warm for a week or more. Another disadvantage may be the amount of materials and time required to build a cozy, functional shelter if either resource is scarce.

The Simple Open-fronted Lean-to

In conjunction with the re-emitter fire, the simple, open-fronted lean-to is one of the more tried and favoured shelters. Both the lean-to and the re-emitter are oriented parallel to the wind. A variance of up to 15° from either angle can be tolerated before you begin to experience problems with smoke. The ridge pole of the shelter is placed about one small pace from the face of the reflector fire when it is very cold, a long pace in moderately cold weather, and two paces away when the temperature is above 0°C.

Securing the Ridge Pole

The ridge pole of the lean-to should be sturdy and sound so as to easily bear (without bending) the weight of the poles, boughs, and banked snow used in building the shelter. If the butt end can barely be circled with the four fingers of both hands, it should be adequate. A sound ridge pole is seldom found lying on the ground and should be made from a standing tree.

The ridge pole can be supported between two standing trees, two tripods, or a tree and a tripod. The latter is the recommended method because the tree provides stability and the tripod provides for ease in rearranging the shelter, should there be any wind shift after the shelter is built. The two standing trees have to be used when the shelter is built of poles or split logs because of the great weight that has to be supported by the ridge pole. Tripods are notoriously unstable if there is a heavy lateral force applied to the ridge they are supporting.

For ease of handling and for providing a convenient height to work and live, the ridge pole is erected shoulder high from the ground. Sound poles are selected to make the tripod. To determine the point at which the lashing should be placed, one of the poles is stood upright and grasped head high. The legs

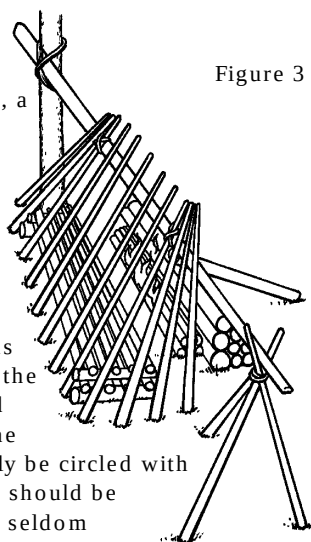


Figure 3



of the tripod are spread wide enough apart so that the ridge pole placed on it comes down to shoulder height. If possible, make the ridge pole long enough so that the tripod supporting the end is excluded from the main body of the shelter; it tends to get in the way when building the bough thatch. See figure 3. The other end of the ridge pole can be lashed or propped up with a stick. In either case, the ridge pole is on the same side of the tree as the back of the shelter. If no lashing material is available in winter, serviceable cord can be twisted from the grass found near the bases of smaller spruces. In the summer, roots from almost any tree, especially spruce, can be used.

Occasionally there is a tendency to shift parallel to the ridge pole causing a collapse of the shelter. This is prevented by lashing the ridge pole firmly at the tree support end.

Installing Rafter Poles

Dry rafter poles for the back of the lean-to can be gathered without the use of the axe. The poles can be burned off to the required length. They are limbed by being run back and forth between two closely spaced trees. When using boughs, the poles are roughly spaced a hand span apart or narrower. The ends are closed to block the wind, especially on the windward side.

(Pole Lean Angles)

The poles are leaned against the ridge pole at the shallowest angle possible that still provides adequate over-hand protection. The deeper the shelter, the colder the opposite side of the body may be. The closer the shelter-back is to the

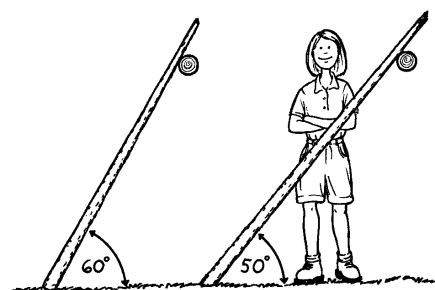


Figure 2

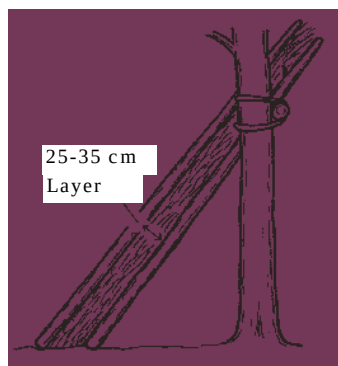
fire, the greater the chance is for it to warm up, and in turn, for it to be better able to warm the shelter's occupant.

The effect of the radiant energy is the inverse of the square of the distance. That is, if the back is one metre away, the effect could be $\frac{1}{1^2} = 1$, at two metres $\frac{1}{2^2} = \frac{1}{4}$ and at 3 metres $\frac{1}{3^2} = \frac{1}{9}$.

That is, doubling the distance away from the fire gives you one-quarter the effect. Tripling the distance gives you one-ninth of the effect. If the shelter has to deflect rain, then the steepness of the rafter poles has to be increased to the point where the boughs will shed the rain. In severe rain storms,



Chinking With Moss



When it is very cold and there is no snow available, one of the most effective shelters is made of two layers of closely fitting poles chinked with moss.

the back of the shelter may be almost straight up and down and may have to be higher than shoulder height to provide adequate coverage. The rafter poles used in the back of the shelter should not be excessively long as they may catch the rain and drip into the interior of the shelter.

Weather proofing your shelter

Boughs are now placed on the back of the shelter. The best boughs are of balsam or alpine fir, with white spruce being second in quality. Any material including the needle-less lower branches of spruce, leafy alder tips or handfuls of densely packed swamp birch, to name a few.

A layer of about 25 to 30 cm is required. In winter the layer of boughs has to support the snow banked on it and at the same time be thick enough so that the heat of the fire will not penetrate through and melt the snow. The snow is usually banked up high enough to be half metre higher than the top of the bed in the shelter. This assures a still-air space inside the shelter. It is very annoying and disruptive to your sleep to have to frequently turn over to warm up that side which is away from the fire. It bears repeating that this is one of the most essential points in making a comfortable lean-to. The boughs have to be packed as densely as possible and perhaps compressed with logs at the back of the shelter. If the boughs are to deflect all rain, depending on the severity of the storm, they have to be piled on quite thick. The first layer of boughs is composed of the biggest boughs available. They are set down, stem first, top side out. These boughs provide a foundation for the smaller boughs that are laid on next. The remaining boughs are placed stems up and under sides up, as experience has shown that this provides the maximum shedding effect. After the first layer is applied, the stems of the boughs are jammed into it to produce a neat shingled effect. The first layer of boughs can be laid on at a slight sideways angle to help keep the stems of the boughs from reaching into the shelter between the rafter poles.

The roof of the shelter can be made of a great variety of materials, especially in the summer. Two or three layers of straight poles are quite effective. Sheets of bark from dead birch and black poplar trees are good. Green white poplar splits very easily when frozen and the split halves can be very effectively used to make lean-to. In summer, any leafy branches can take the place of boughs. Clover, as found on many river banks, is quite effective. Grass thatching may also be tried.

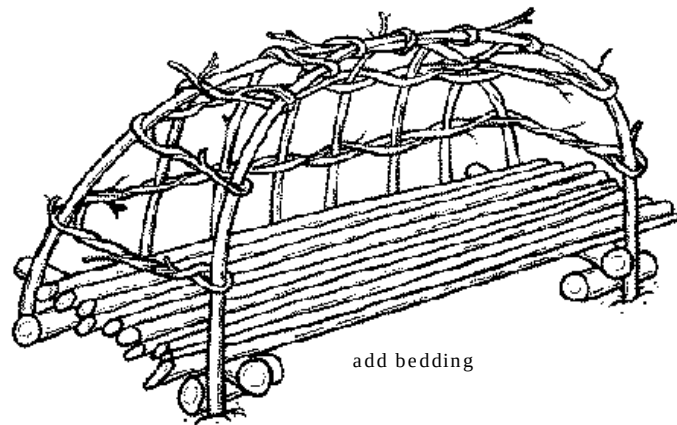


Variations

Flexible Open Fronted Lean-to

On occasion, though poles are not readily obtainable, thinner flexible materials are. The ridge pole and its supports are replaced by two arches paralleling each other about 30 cm apart, spanning slightly longer than one's height. The two arches are brought together at the top and bound together to provide stability. Instead of rafter poles, arches a hand span apart, make up the back of the shelter. The shelter can now be roofed with any of the materials mentioned earlier, especially grass.

The front arch is directly over the front edge of the bed.



Flexible Open-fronted Lean-To



Options for accommodating more than one person

With one person, the lean-to is made large enough to accommodate that person. Two people increase the length of the bed about one-third longer and sleep with heads at opposite ends, overlapping heels to hips. With one-third the effort, a second person is accommodated. A third person replaces the re-emitter fire with a second one person lean-to and a fire is maintained between the shelters. Four people use two of the longer shelters with a fire in between. Five or more people may be better off using a brush teepee which in actuality is a lean-to in a circle with a smaller fire in the middle.

From **Northern Bushcraft** by Mors Kochanski.



Wind Direction Relative to Shelter Back

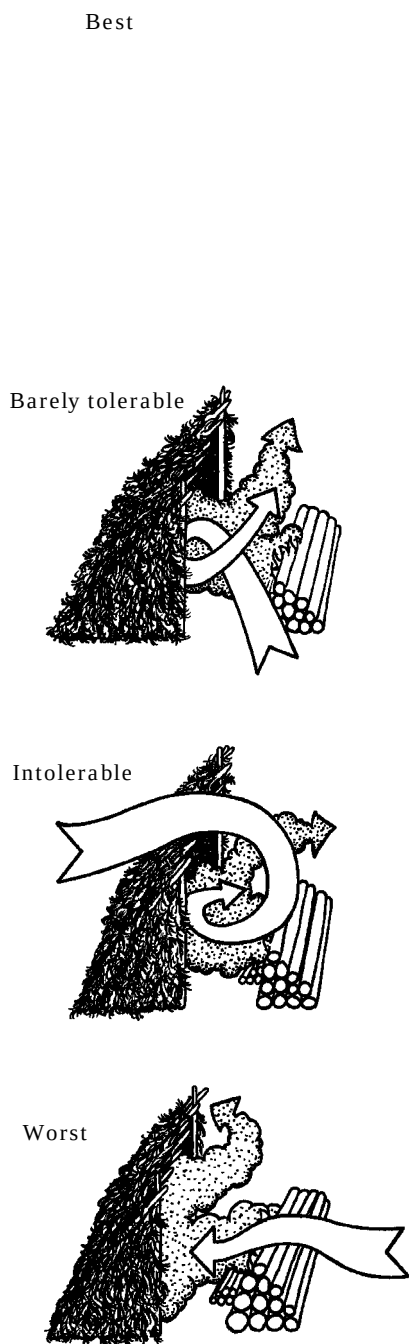


Figure 1

The Cross Section of a Winter Lean-to

1. Make the shelter under a tree that provides some overhead protection.
2. Face the shelter towards the sun.
3. The ridge pole is substantial enough to hold up the weight of the boughs and snow cover. The ridge pole is parallel to the wind. It is about shoulder high off the ground providing room to sit and work under the shelter roof.
4. Rafter poles must be leaned (see figure 1 page 48) against the ridge pole with the shallowest angle possible.
5. The back of the shelter is as close to the fire as possible.
6. Boughs are thick enough to prevent heat penetration from melting the banked up snow.
7. Snow is banked up to prevent infiltration of cold air. If possible, bank up the whole roof with snow.
8. The core of the bed is made of snow. It is about chair seat high. The snow is retained between logs which keep the snow from melting out from under the bed. With an elevated bed the ground can be uneven.
9. The snow is cleared between the fire and edge of the bed.
10. The bough bed is at least four fingers thick when compressed.
11. Wall backed fire is waist high. Fire is one good step away from the edge of the bed. Fire is made hot enough to force you to stay one step away.
12. A clear expanse of snow in front of the shelter provides more warming effect from the sun.



2. Construct and use three types of snow shelters and/or shelters from natural products combined with plastic and nylon.

Snow Shelters

1. **The Quinzhee**

The quinzhee is a simple snow shelter and the most valuable because it can be made from virtually any kind of snow, from powder to wind blown slab.

The theory behind a quinzhee is simple; snow hardens when mixed and compacted. Undisturbed snow, lying on the ground exists in various stages of metamorphosis or change. The snow is stratified into layers that are the result of factors such as the temperature-gradient within the snowpack and the conditions during which the snow originally fell. When this snowpack is disturbed by mixing and compacting, a great deal of re-crystallization occurs. The snow pile hardens.

Once the pile of disturbed snow has been allowed to harden, it can be hollowed out to make the snow shelter called the quinzhee.

Here's How

1. Use shovels, pots, pans, anything that will clear a two to three metre diameter circle to the ground if in shallow snow, or to a hard snow layer.
2. Shovel all the snow back into the circle and all available loose snow into a huge pile. Make sure all the snow gets mixed up. Break up slabs or blocks to a fine powder and avoid icy crust layers. Jump up and down on the pile to occasionally mix and compact the snow. Take care to ensure that the pile is dome shaped with no flat spots.
3. Stick branches, ski poles or glacier wands into the pile about 35 cm down at regular intervals. Leave them in the snow (they will be used as snow wall depth guides.)
4. Allow one to three hours for the snow to consolidate or harden. Take this time to rest or do another activity.
5. Cut a low entrance tunnel perpendicular to the prevailing wind and begin to excavate the inside to form a dome shaped room. Use the sticks or poles as



A burning wooden match has 1 BTU. A standard candle gives off 300 BTUs. Two burning candles will replace two people's body heat in a shelter

- guides to tell you when you are getting close to the limit of the wall.
6. When the structure is almost hollowed out, use the remaining snow from the ceiling to build up the height of the floor.
7. Smooth the walls to prevent drip points.
8. Light a candle inside and allow its heat to help consolidate the walls and floor.

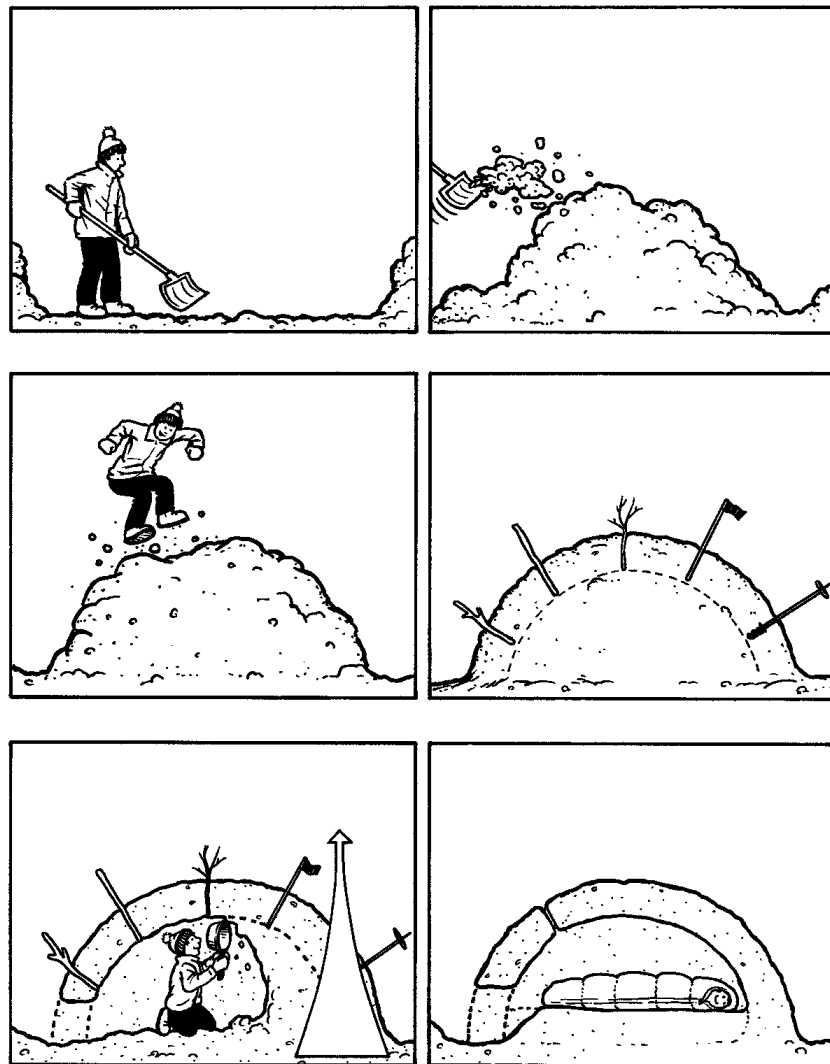


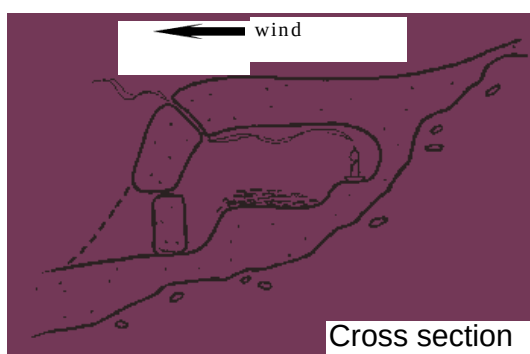
Figure 4



2. Snow Drift Cave

A snow cave requires a snowbank of fairly large dimensions. Trying to excavate a snow cave out of a drift through a small, low entrance tunnel is wet, cold and frustrating work. If you start with a large entrance which can later close back in, you will be able to work faster and remain dry.

Drifts can be found on the lee sides of wind exposed ridges, rocks and low clumps of trees and shrubs.



Snow Knife and Saw

The essential tools for winter survival are the snow saw or snow knife. They are easy to make as they do not require any tempering which would make them brittle for fine honing.

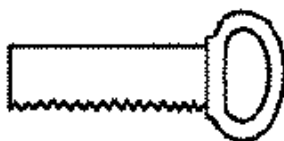
Snow Knife

A knife with a 50 cm long and 5 cm wide blade, and a two-hands handle. The thick two hands provides a good grip while wearing a pair of heavy mittens.

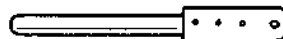
Snow Saw

The blade is 50 cm long and 9 cm wide. The handle is made for two hands and is designed so that one saws vertically.

Snow Saw



Snow Knife



Constructing a Snow Drift cave

1. Dig a 1 meter high hole into the drift. The hole can be dug with a shovel, a wooden board, hands, a snow saw or snow knife.
2. Dig a horizontal rectangle at shoulder height keeping the snow blocks that are removed.
3. Dig upwards into the drift. The objective is to make a platform for a sleeping area above the entrance opening. You may also create three levels inside: your candle on the highest, sleep on the centre one and the lower level which will trap the cold.
4. Cover the triangular opening with the snow blocks from the original digging. Fill cracks with snow.
5. Make a small ventilation hole in the roof of the shelter
6. Use a block of snow as a door and keep it loose fitting and on the INSIDE so that it will not freeze up and jam. If it does, a block on the inside will be much easier to free than one on the outside.



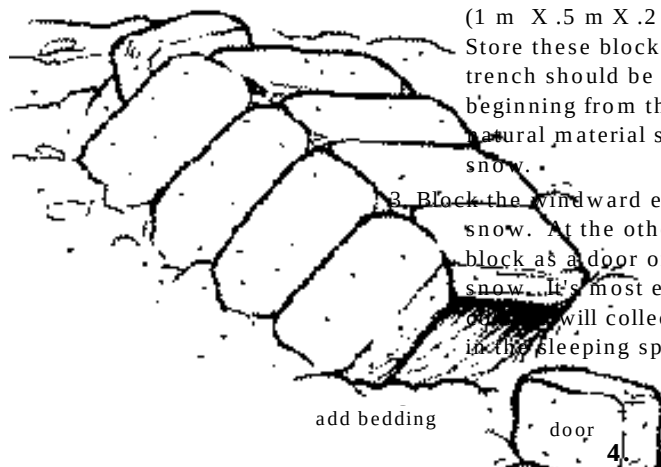


3. Trench Shelter

The trench shelter is the most efficient snow structure in terms of shelter space created with a minimum movement of snow. The trench shelter can be built into a drift or whatever when there is more than one metre of consolidated snow. This shelter is suitable for only one person and for short-term use.

Here's How

1. To start, either dig a pit into the snow pack or flatten the lee face of a drift.
2. Using a snow saw, start excavating large blocks (1 m X .5 m X .2 m) out of a deep parallel sided trench. Store these blocks on either side of the trench. The trench should be 60 cms deep and about 2 metres long beginning from the start of the pit. Line the floor with natural material so you are not sleeping directly on the snow.
3. Block the windward end with another block or piles of snow. At the other end (downwind) have a removable block as a door or dig an entrance. Fill any gaps with snow. It's most effective if built on a slight slope, the cold air will collect in the entrance leaving warmer air in the sleeping space.



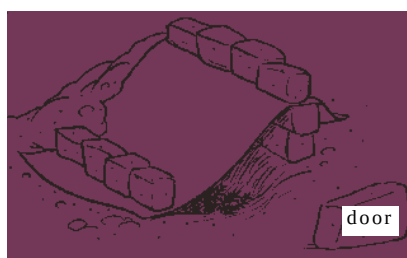
4. The Tree Well

Spaces underneath the spreading boughs of conifer can offer shelter. A medium-sized tree may have a space around the trunk. A large tree may have pockets in the snow beneath a branch. Dig under the tree where the branches are spreading on the lee side.



5. Shelter Combination

Soft snow can be built into a wind break. Anchor a ground sheet or poncho along the top with packed snow or snow blocks. Use more snow to close the sides.





3. Demonstrate two techniques for low-impact emergency shelters for use in natural areas.

Background

The type of shelter you build depends upon the local conditions, the material available and how long you expect you'll need it. Rig up a makeshift shelter to protect yourself from the elements. If no materials are available for constructing a shelter, make use of the cover that is available. Use landscape features such as cliffs and overhangs which can protect you from rain and wind. If you are in the open grasslands, sit with your back to the wind and pile any equipment behind you as a windbreak.

Bough Shelter

Make use of branches that sweep down to the ground or boughs that have partly broken from the tree to give basic protection from the wind. With conifers you can weave in twigs to make the cover more dense. Another similar shelter can be made by lashing a broken off bough to the base of another branch where it forks from the trunk.

Root Shelter

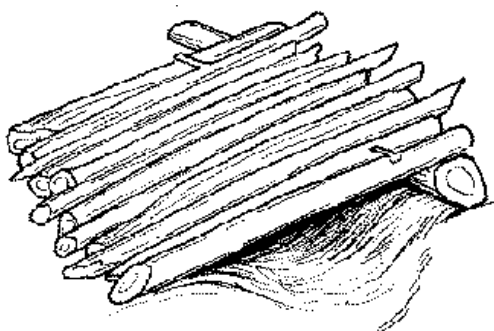
The spreading roots and trapped earth at the base of a fallen tree make good wind and storm barriers if the wind. The extended shelter





Natural Hollows

A shallow depression in the ground will provide some protection from wind and can reduce the effort in making a shelter. If it's wet, take measures to deflect the downhill flow of water around it. Make a roof to keep rain off and warmth in. Place some branches across the hollow. Another layer may be added and consolidated with turf, twigs or leaves.



Fallen Trees

A log or fallen tree trunk makes a useful windbreak on its own if it is at the right angle to the wind. With a small trunk, scoop out a hollow in the ground on the leeward side. A log can make an excellent support for a lean-to roof of boughs.





4. Demonstrate the proper location of shelters.

Background

A shelter is what gives you cover and comfort away from home. It will shade, repel wind and rain and keep in warmth. Sleep and rest are essential while outdoors and the time and effort you put into making a shelter comfortable, will pay off in terms of the way you feel and how you react to your surroundings.

Whenever you use a tarp, tent or natural shelter, think carefully about site placement. Consider leaving no trace. A tent on grass for more than a day will crush and make the grass turn yellow, leaving a direct sign of your presence. Stakes can also damage fragile soils. Guylines may also damage trees.

For a long term camp, find a secure site with convenient access to your major needs such as water, fuel and shelter.

Where's the Lee Side?

The lee side is the side away from the direction from which the wind blows. It's the side sheltered from the wind.

Guidelines

- Find a resilient or impacted location that is relatively flat. A hollowed out area will pool water in a storm.
- Look for shelter from the wind, on rising ground that has no risk of flooding.
- Identify the prevailing wind direction and set up your shelter so the openings do not face the oncoming wind.
- If you are on high exposed ground, go lower down to find a sheltered spot. If you are on low, wet ground, you need to go higher to find someplace dry.
- Check for signs of previous flooding. Look for high water.
- Find a spot safe from rock falls and avalanches.
- Ideally, you should be near water with a plentiful supply of firewood.
- Pitching too close to water may lead to trouble with insects. Running water can hide other noises that might alert you to danger or the a search and rescue party.
- Look overhead for bees' or hornets' nests and dead branches which could come crashing down in a high wind or storm.
- Stay away from game trails of any kind, especially one leading to a watering hole.



5. Explain qualities and desirable features of tents.

Background

Manufactured tents can provide you with shelter in a very short time for emergency situations such as hypothermia. Tents are easy to set up after a long day of hiking or canoeing when you are dog tired. Tents have many benefits and their use depends on your philosophy of camping, how much you want to live off the land and the kind of impact you leave.

The tent is one of the more essential and expensive items needed for sleeping outdoors. A lightweight tent that can be carried on your back is a great thing; however, a tent perfect for one use may not be the best for another activity.

Qualities

Three-season tents can be used in the moderate weather of spring, summer and fall while a four-season tent is designed to stand up to the worst possible conditions. They have stronger poles, additional waterproofing and a sturdier design.

The majority of tents have a breathable inner canopy and a separate waterproof fly. This two-walled construction is beneficial in two ways:

1. It moderates the temperature because of the insulating air space between the two walls; and
2. It allows ventilation of body vapour. During the night a person can lose up to a half a litre of water so ventilation is important. If the moisture is not allowed to escape, it will condense inside the tent and get the sleeper and gear wet.

Many tents are free-standing which means they come to life without being pegged down. This is an advantage because the tent can be assembled anywhere and then plopped down in the best site.

Desirable Features

Some of the things to look for in a tent will vary depending on:

- where and how it will be used,
- how many people should it hold,
- weight, and
- cost



Some of a tents features include:

○ **tent body**

The tent floor should be tough and waterproof and extend up to 15 cm on the tent walls. The tent body should be made of non-waterproof fabric (taffeta or ripstop nylon.) Seam construction can be in two types: bound or lap felled. Good quality tents have lap felled seams where the two pieces of fabric are placed on top of each other, folded and stitched. Bound seams are weaker and are made by stitching through a layer of material that is folded over the two pieces being joined.

○ **poles**

Most tent poles have shock cord running down the centre and attached at both ends. This makes the poles easier to assemble and keep together. Three materials used to make tent poles are: fibreglass, carbon fibre/composite and aluminum. Aluminum is the most common and comes in a variety of qualities made from different alloys: strongest is 7000 series, followed by 6000 and 2000 series. Carbon fibre/composite is expensive, light and strong. Fibreglass is cheap, heavy and prone to breaking.

○ **fly**

The fly is the part of the tent most exposed to the elements. The fly must be made of waterproof material.

○ **vestibule**

This is a separate extension added to the tent like a porch. Vestibules are useful for storing gear and taking off dirty boots outside of the sleeping area.

○ **stakes/pegs**

Aluminum stakes are light and about 23 cm (9 inches) long. Carry separately in a stuff sack to protect the tent from punctures.

○ **zippers**

This is usually the first thing to go on a tent. Look for a nylon coil zipper, its light and less likely to stick than a metal zipper.

○ **windows**

Windows should have zip closed flaps and bug netting to let the air circulate.



Buying a tent

Before you buy a tent, set it up. Take it down and re-assemble if it is already up on the store's floor. This is the best way to judge how easy or difficult it is to pitch. Could you do it in the dark? Could you do it in the park? Could you do it here or there? Could you do it anywhere?

Also look for any tight or difficult zippers that could break later. Lay down inside. Imagine how many people can be comfortable sleeping. Short ones, tall ones, skinny ones, and big ones.

Look at the outside of the tent to determine how strong it is. Push on the walls from different angles and directions to make sure it won't collapse or bend too easily. The canopy and fly should be taut, otherwise breathability, water repellency and stability are compromised.

Bad Places to Camp

- Hilltops exposed to wind (move down and look for shelter on the lee side.)
- Valley bottoms and deep hollows can get damp and frost during the night.
- Hillside terrace where the ground holds moisture.



V

NAVIGATION●

The ability to use a compass and read a map accurately is an important skill in travelling in the woods.

date completed



_____	☐	Identify the features on topographical maps and plot a course.	page 67
_____	☐	Demonstrate orienting a map to the terrain.	page 72
_____	☐	Demonstrate orienting a map with a compass	page 73
_____	☐	Demonstrate techniques for setting a bearing and proper pacing.	page 74
_____	☐	Demonstrate the use of a map and a compass on a trip in order to prove proficiency in staying found.	page 78

V. Navigation

1. Identify the features on topographical maps and plot a course.

Background

A map is a two-dimensional representation of our three-dimensional world. All maps have in common the same basic features in common. The most useful map for backpacking, canoeing and other wilderness trips is a topographical map.

Maps have scale marked either in the margin or legend of the map. A scale of 1:250,000 means that one unit on the map is equal to 250,000 units in the real world.

Map Scale	1 cm Equals
1:5,000	50 m
1:10,000	100 m
1:12,500	125 m
1:20,000	200 m
1:25,000	250 m
1:250,000	2,500 m

Map Colours	What They Mean
Black	Features such as roads and buildings
Blue	Water, lakes rivers, streams
Brown	Contour lines
Green	Vegetation (forest, scrub)
White	Little or no vegetation; also for glaciers and permanent snowfields
Red	Major highways, boundaries of public land areas
Purple	Features added to the map since the original survey (based on aerial photo and have not been checked)

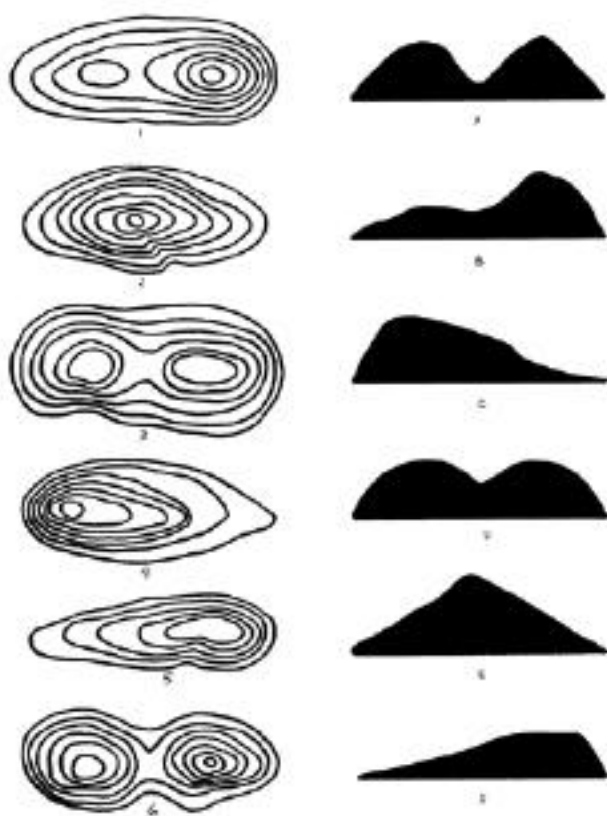
Map Legend

The map legend contains a great deal of important information. Some of the major features are found on topographical maps listed on the next page.



- map name
- year of production and revision
- general location
- next adjacent map
- map scale
- distance scale
- contour interval
- magnetic declination
- altitude and longitude
- symbols and what they represent

Contour Lines



Sample - Contour Map

Contour lines represent the three-dimensional character of the terrain on a two-dimensional surface. Contour lines drawn on a map represent equal points of height above sea level.

Contour lines can tell you a lot about the terrain.

- Moderate slopes - contours are evenly spaced
- Steep slopes - contours are closely spaced
- Gentle slopes - contours are widely spaced
- Valleys - contours form a V shape pointing up the hill; these Vs are always an indication of a drainage path that can also be a stream or river.
- Ridges - contours form a V shape pointing down a hill
- Summits - contours form a circle
- Depressions - contours are circular with line radiating to the centre



Measuring Distance

There are a couple of ways to accurately measure distance on a map.

1. Use a piece of string to trace the route planned. Measure the string on the scale line in the legend.
2. Mark a stick to a narrow distance on the map scale, for example .5 km. Walk off the route with the marked stick. Add 5 to 10 percent to account for a route with switchbacks which might not be on the map. It is better to anticipate a longer route than a shorter route.

Choosing a Route

- Where is the destination?
- What is your starting point? What type of road access is there to the trailhead?
- Be sensitive about travelling on private land. Ask permission if possible, and keep in mind that hiking through is usually permitted but overnight camping is not.
- Do not camp in a restricted area. The area is restricted for a reason.
- Consider the abilities of group members.
- Is everyone travelling to the trailhead together? Or meeting there separately?
- Is there a loop route to bring you back to your original starting point? Is it a one-way route?
- Do you need to be picked up?

Estimate Travel Time

Travel times will vary depending on the gear being carried, trail difficulty, and different ages and physical abilities of group members. On the average, a person hikes 3.2 km an hour. Add one hour for every 305 metres of ascent.

Plan the Day

Planning a route also includes how much time is required for getting organized. For example, ability of group members, time to break camp, special sites to be visited, time for rest breaks and meals, obstacles to cross such as river crossings or bushwhacking, and number of daylight hours.



At the end of a day you have to make sure you have a place to set up camp so trip planning is done from one campsite to another. Topographical maps do not always have the information you need to choose a good campsite. For example, the contours in one area was flat which would be a good place to camp except in reality it is thick with underbrush with no open spaces.

Activity Ideas



- Have Wardens draw the contours for the hills on page 68. Refer to Match the Contours answers below.
- After Wardens have had some idea of what contours look like, make a copy of Match the Contours, page ____ and have Wardens complete. Answers: 1-B, 2-E, 3-D, 4-C, 5-F and 6-A.
- Help Wardens become familiar with map symbols. Make a copy of page ____, Map Symbol Quiz for each Warden. It's a simple fill in the blanks exercise. Answers: 1-road (improved dirt), 2-contour lines for a hill, 3-cemetery, 4-single railroad track, 5-spring, 6-well, 7-buildings, 8-bench mark (monumented), 9-marsh, 10-trail, 11-bridge (river, road), 12-triangulation station, 13-river and streams, 14-road (unimproved dirt), 15-sand dunes, 16-church, and 17 school.

Variations to Map Symbol Quiz.

1. Have Wardens looking at all the symbols used on topographical maps. Break the Wardens up into two groups. Give each group half the symbols on a map. Give each group a pile of index cards. On one side of each card they are to draw the symbol, on the reverse the text for the symbol. Use a flash cards to learn all the symbols.
2. Have Wardens invent a game similar to the card game Concentration to help them learn the map symbols. Have two cards for each symbol: one with text identifying the symbol and the other with a picture of the symbol. Randomly, place them all face down and take turns turning the cards over until two cards match, for example, the word Railroad to picture of a railroad. Take another turn when a pair is matched. The team or player with the most pairs wins.
 - ▶ Play Map World - Real World. Copy the pages entitled with the same names and have Wardens match how it



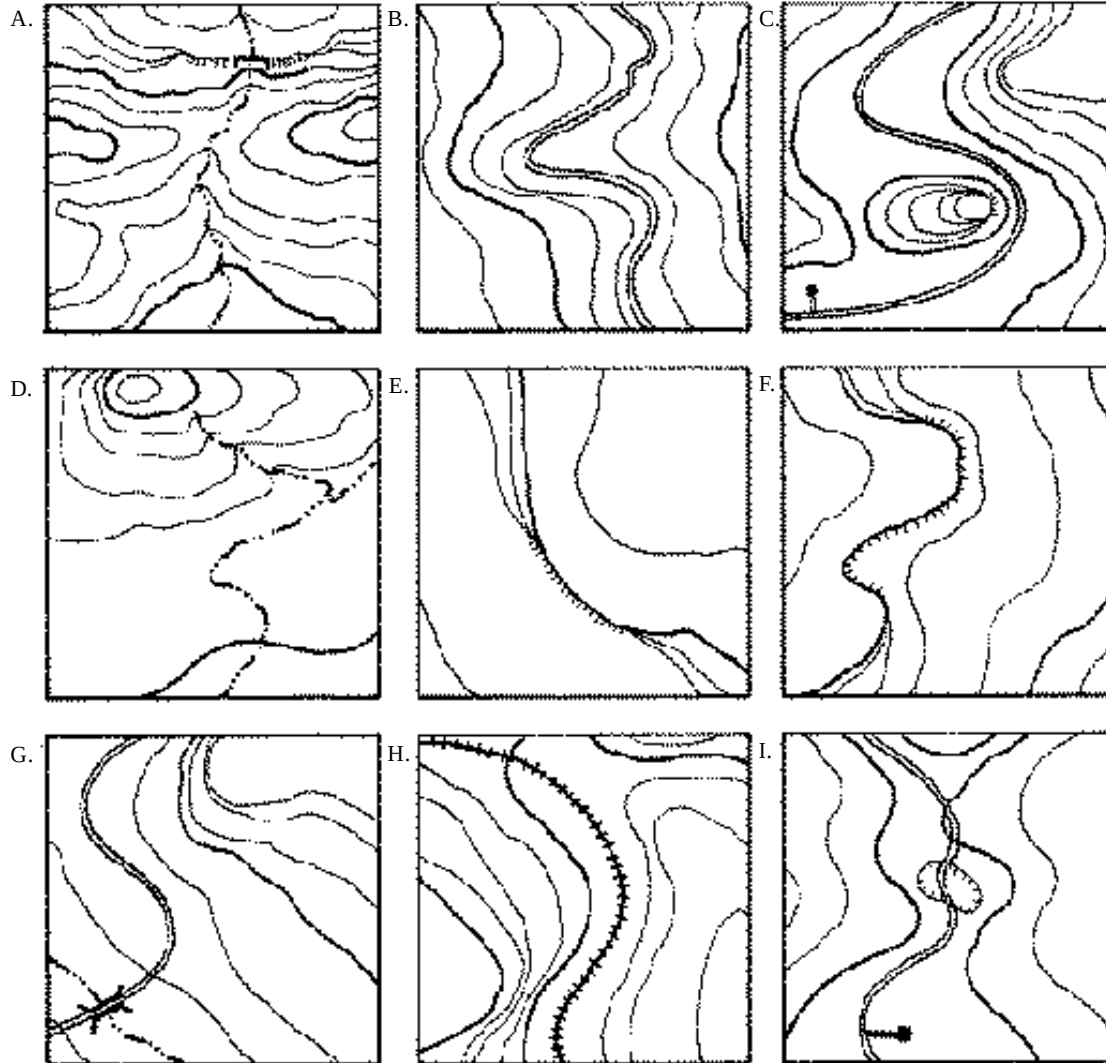
would look on the map and how it really looks in person. Answers: 1-D, 2-H, 3-E, 4-I, 5-B, 6-A, 7-F, 8-C and 9-G.

- ▶ Have Wardens plot a course and determine how long it will take to hike or canoe.
- ▶ Have Wardens plan an overnight trip with a topographical map. Choose the campsite for the night. Determine the travelling time.
- ▶ Have each Warden choose 10 items from the legend and quiz another Warden on what they mean.

Draw contours for the hills below.



Map World



LEGEND



bridge



cliff



depression



house/
sm. building



railroad



river



road



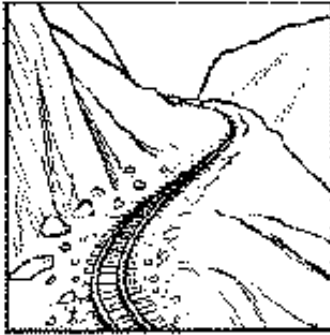
waterfall

Real World

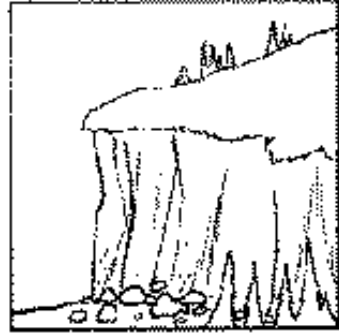
1



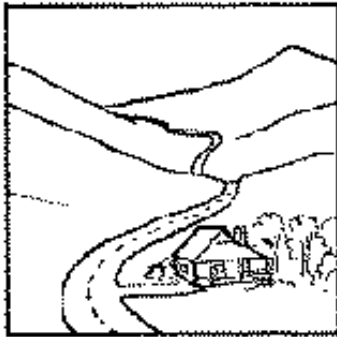
2



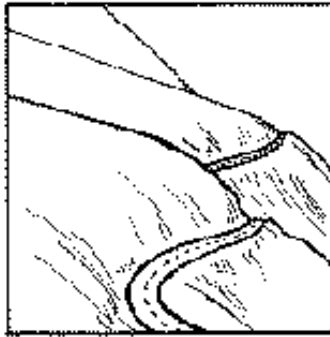
3



4



5



6



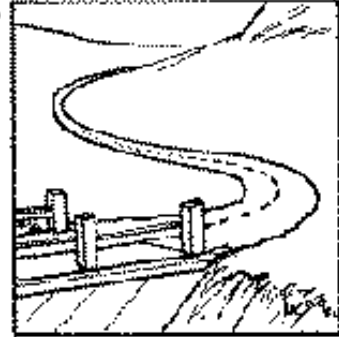
7



8



9





2. Demonstrate orienting a map to the terrain.

Background

Orienting a map to the landscape is easier than reading a road map which is often read upside down. When a map is oriented to the landscape, however, the map and the features line up.

Use Land Features

Lay the map on the ground and hold it horizontally. Find two prominent features in the landscape. Rotate the map until features on the ground are in line with the same features on the map. This is an effective method for scouting but not for real navigation.

Activity Ideas

- Have Wardens orient city or town map, a area or road map and a provincial map.
- Have Wardens use a trail map of a local area and orient the map to the surroundings.
- Have Wardens orient a topographic map to the landscape.





3. Demonstrate orienting a map with a compass.

Background

Orienting a Map with a Compass

1. Place the compass on the map so that the edge of the base plate lies parallel to the east or west edge of the map, with the direction of travel arrow pointing to the north edge of the map.
2. Hold the compass on the map and "box the needle." That means rotate the map with the compass together until the north end of the magnetic needle points to N on the compass housing. The map is oriented to magnetic north. This means the compass needle direction north is the same as true north on the map. Another option is to place the compass on the map so that the edge of the base plate lies along the magnetic north indicator line on the map legend at the bottom and then rotate the map.
3. Do a visual check by looking around for surrounding landmarks which should match what is on the map. For example, if you look east, the hills match with the map, look northwest to see the valley, and so on.

Compensating for Declination

Compensate for declination if you plan to travel using the map and compass.

1. Determine the declination on the map. If the declination is east of true north, add the declination to 0 degrees, if the declination is west of true north, subtract the declination from 360 degrees.
2. Compensate for the declination by setting the compass at the correct declination bearing.

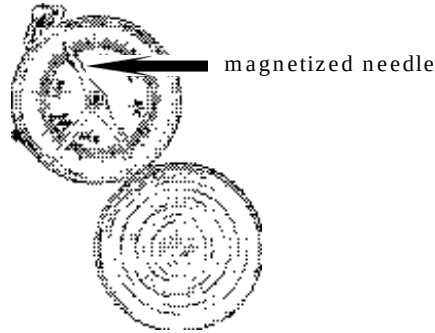


4. Demonstrate techniques for setting a bearing and proper pacing.

Compass

A compass is a magnetized needle that aligns itself with the earth's magnetic field which runs north to south. A compass is a navigation instrument with two important uses:

1. To maintain a constant direction of travel
2. To pinpoint a location on a map.



Magnetic Compass

Basic Rules for Using a Compass

To maximize accuracy with a compass, remember these rules:

- Directly face the object to which you are measuring the bearing.
- Keep the compass level which is level to the ground. If the compass is tilted the needle will not swing freely.
- Hold the compass directly in front, not at an angle.
- Align the magnetic needle and orienting arrow by holding the compass close enough that you are able to look down (not sideways) on the face of the compass. The needle should lie exactly straight over the orienting arrow with their points lined up.



Setting a Bearing

Become familiar with the basic uses of a compass by turning the moveable housing until the N lines up with the index line which may be labeled "Read bearing here." A bearing of north is the same as 0 degrees or 360 degrees. Turn your body and compass as one unit until the north seeking end of the needle lines up over the pointed end of the orienteering arrow. That's a bearing toward magnetic north. Follow the bearing by moving in the direction of the direction-of-travel arrow.

Have Wardens choose another bearing (a direction towards something) of 140 degrees. Turn the housing until 140 lines up with the index line. Have Wardens turn their body and compass as one unit until the north-seeking end of the needle lines up over the pointed end of the orienting arrow. The direction-of-travel arrow shows you which way to go for the 140° bearing.



Holding a compass



Tip

Call the direction-of-travel arrow the nose arrow. This will help wardens remember their the nose and the direction-of-travel arrow on the compass point in the same direction.

Setting a Compass Bearing

A basic skill in compass skills is to measure a bearing (direction) to a landmark you are looking at.

1. Face the landmark. Point the compass's direction-of-travel arrow at the landmark.
2. Bring the compass closer so you are able to get a closer reading making sure the travel arrow still points at the landmark.
3. Turn the housing until the pointed end of the orienting arrow lies under the north-seeking end of the needle.
4. Read the bearing at the index line. This provides the exact direction (expressed in degrees) of the landmark

Test Your Wardens' Skills

- Have each Warden drop a tin disc (from the top of a tin can or frozen juice container) in the grass. Tell them to choose any bearing and walk along it for 100 paces. Tell them to note the back bearing. Return on a reciprocal course. They have to watch their compass to return to their disc. How close did they get to their start after 100 paces?
- Have them walk a 60° bearing and walk 100 paces. Add 120° ($60^\circ + 120^\circ = 180^\circ$) and walk another 100 paces. Add another 120° ($180^\circ + 120^\circ = 300^\circ$) and walk another 100 paces. Did they end up where they started?
- Have each Adventurer design a course in the shape of a square for another Warden. The number of paces may vary and their initial bearing. (Tip: They have to add 90° at each corner.)

Pacing

Successful navigation includes the precise method of methodical pacing. Travelling on foot can sometimes feel like 10 km, when in reality it is only 4 km. It is worth the effort to count paces to know precisely where you are and be comfortable with the certainty of the distance travelled.

An adult with average height will pace about one kilometre in 625 paces (one mile in 1,000 paces.) An average adult has a step of 76 cm (30") but a pace of 1.6m.



Measure Your Pace

A pace is the measurement of a double step. Every time your foot (left or right) touches the ground, count a pace. Everyone's pace is slightly different because of leg length. Work in partners and lay out a measured course. Have one put their heels at zero and begin to walk. To calculate the length of a pace, count the number of paces and divide into the distance walked. Do two or three times and take an average of three measurements and that will be that individual's pace measurement. The average adult pace is 1.6 metres.

To keep track of the number of paces, count every time the right foot hits the ground. Count to 100 paces. To add the counted paces, transfer pebbles from one pocket to the other pocket at each 100 paces.

Walk a pre-measured distance while maintaining a normal pace and counting footsteps. Divide the distance in metres by the number of paces. If you have stopped growing that is your pace for life.

The average pace may change because of slopes (longer going down a slope, shorter going up a slope), wind (a tail wind will lengthen pace), terrain (a rough terrain surface will shorten pace), weather (snow, rain and ice will shorten pace), clothing (excessive clothing and boots will shorten pace), and visibility (reduced visibility will shorten pace due to uncertainty).

fast walking	road	6.0	10
comfortable walk	cutline	4.0	15
comfortable walk	broken, wooden	3.5	18
comfortable walk	mountain forest	3.5	25
snowshoeing	average snow	3.5	18
skiing	average snow	6.0	10
jogging	road	8-10	6
jogging/ walking 50 paces	road	7.0	8



5. Demonstrate the use of a map and a compass on a trip in order to prove proficiency in staying found.

Map and Compass Together

A map and compass can only work together if you know where you are in relation to magnetic north. If you think of a map as an artist's rendition of the world, you can understand that it displays true north but not the magnetic fields like the real world.

Declination

Declination is the angular difference between magnetic north which a compass points to and true north which is the geographic north that is on maps. It is marked in degrees on the map. When a compass is used this difference (which varies depending on where you are on the planet and the year) must be accounted for. The magnetic field lines of the earth are constantly changing, moving slowly westward 1/2 to 1 degree every five years. Because of this, it is important to use the most recent map.

Some compasses can be used to preset the declination which may reduce calculation errors.

Remember this rule: To compensate for declination, the map bearing and the magnetic bearing must be equal. If they are not equal, corrections are made to bearing by adding or subtracting the declination. There are four ways to do this:

West Declination

If the declination is west, then magnetic north is less than true north and the map bearing is less than the magnetic bearing. To make the two bearings equal, add or subtract the declination.

1. West Declination - Going from map bearing to magnetic bearing

A map bearing is taking a bearing from one point on the map to another point on the map in respect to true north. To get the magnetic bearing, add the declination to map bearing.



Map Bearing + Declination = Magnetic Bearing

2. West Declination - Going from magnetic bearing to map bearing.

A magnetic bearing is when a bearing is taken from the landscape. To determine the position on the map, subtract the declination from the magnetic compass bearing to get the proper map bearing.

Magnetic Bearing - Declination = Map Bearing

East Declination

If the declination is east, then magnetic north is greater than true north and the map bearing is greater than the magnetic bearing. To make the two bearings equal, add or subtract the declination.

3. East Declination - Going from map bearing to magnetic bearing

A map bearing is taking a bearing from one point on the map to another point on the map in respect to true north. To get the magnetic bearing, subtract the declination from the map bearing.

Map Bearing - Declination = Magnetic Bearing

4. East Declination - Going from magnetic bearing to map bearing

A magnetic bearing is when a bearing is taken from the landscape. To determine the position on the map, add the declination to the magnetic compass bearing to get the proper map bearing.

Magnetic Bearing + Declination = Map Bearing

How to Remember

There is a lot to remember and to make matters worse, the rules all sound the same. It's easy though if you if you remember the two rules for declination.

WEST declination: Add map to compass, subtract from compass to map.

EAST declination: Add from compass to map, subtract from map to compass.



Shortcut:

Declination East, compass least.

Declination West, compass best.

Shorter still is, East is least, West is best.

This means that when there is an east declination, the map reading is greater (best) by declination and the compass reading smaller (least)-by the amount of declination. With a west declination, the compass reading is best and the map least by the amount of declination. In each case you add or subtract the declination.

Here's a jump start for the memory. Think of Empty sea, add water. Empty sea becomes MTC (Map To Compass), add Water becomes add W (West) MTC.

The world is full of 45 degree bearings, but only one of them will connect you and your goal.

When converting a bearing from a map to compass, add west declination. Remember, declination west, compass best. From this you can figure out that you have to subtract east declination. Declination east, compass least. Or from compass (C) to (T) map (M) you subtract west and add east.

If this is all too much, write down the declination for your area and glue it to the back of your compass!



A c t i v i t y I d e a s

- Break Wardens up into small travelling groups. Give each a topographical map of the area with the camp site marked. Have the groups determine the best route, best route to travel and explain why, calculate the distance, how long it should take (add 5 to 10% more time), and the bearing.



VI

OUTDOOR SAFETY●

It is critical for outdoor safety to learn the potential hazards, how to prevent them and how to treat them.

date completed



Demonstrate how to cope with two of the following in a camping and survival situation: sunburn, frostbite, hypothermia, dehydration, and wildlife problems.

page 83



Describe emergency techniques to acquire water during a simulated survival situation.

page 85



Describe six natural indicators of a storm and demonstrate the actions that should be taken.

page 91

VI. Outdoor Safety

1. **Demonstrate how to cope with two of the following in a camping and survival situation: sunburn, frostbite, hypothermia, dehydration, and wildlife problems.**

Sunburn

For minor sunburn, place the person in the shade and apply cool water or cloths soaked in cool water. A commercial ointment or cream may be applied for some relief. (A severe sunburn may result in swelling and blisters and must be treated as a severe burn. Treatment: immerse burned area in cold water at once. Do not break blisters.)

Frostbite

Frostbite is the freezing of deeper body tissues from exposure to cold. Frostbite may be associated with hypothermia. Signs and symptoms are: a white, waxy appearance which may be pliable in superficial frostbite or hard and solid to the touch in deep frostbite; joints stiffen and there is a loss of sensation. (Note: Frost-nip is superficial freezing of a small area such as nose, cheek or toes. Treatment is steady pressure with a warm hand on the area.)

Treatment of frostbite: Take the person into a shelter. Do NOT apply snow or rub the frozen part. Thawing is painful and should be done under medical supervision. If you must thaw, use a container of warm water (42°C, comfortable when tested by elbow) and immerse the frozen part. Warm until the area is flushed red with blood.

Hypothermia

Hypothermia results when the body loses heat. Some symptoms are shivering, slurred speech, stumbling and drowsiness. It can occur at relatively warm temperatures because both water and wind can deprive the body of heat. To prevent hypothermia keep warm, dry, rested, well-fed and hydrated.



To treat hypothermia the person must be warmed up as soon as possible. Move the casualty to a shelter. Remove wet clothes and wrap in warm covers and a sleeping bag. Give a warm, sweet drink to help warm up.

If the person is unconscious or semi-conscious they must be treated with the utmost of care. Cooled blood in the arms and legs must be prevented from suddenly returning to the body core and thus causing afterdrop. Afterdrop is the sudden further cooling of the heart caused by accelerated circulation in persons severely affected by hypothermia.

To avoid afterdrop:

- The victim should not be handled roughly. Great care must be taken in handling and transporting the victim. Be very gentle when doing this.
- Do not force the victim to stand up or walk around. In this situation even mild exercise can kill the victim.
- Do not rub the arms or legs to try and warm them. This also speeds circulation.
- Do not elevate legs or arms as you would when treating a victim for shock.
- Do not apply heat to the extremities. Apply heat to the critical areas (groin, neck and head, chest, sides of trunk.) Direct mouth-to-mouth resuscitation may help to provide warmth to the lungs and core.

Most hypothermia fatalities occur during the re-warming process.

Dehydration

Dehydration occurs when the body's water level drops. To stay hydrated you will need to drink as the very minimum three to four litres a day when exerting yourself in the elements. Add an extra litre in the winter. It's easier to prevent than to treat. Dehydration can cause heat stroke, hypothermia, frostbite, mountain sickness and death. Wardens should keep track of their urine output. They should urinate at least three times a day and the liquid should be clear, light-coloured-clear and abundant. Dark yellow to orange is a sign of dehydration.

Treatment: For severe dehydration, add 1/2 teaspoon of salt and 1/2 teaspoon of baking soda per litre of water which replaces fluid and salt.

Note:

Thirst is a late response to fluid depletion, urine is the best indicator of dehydration.



Wildlife Problems

The number of people hurt by animals is relatively small compared to those injured by getting lost, cold or dehydrated. The best way to avoid large toothed animals is to let them know you are around. Wear a bear bell, talk loudly, or sing songs. Stay away from major game trails and watering holes. Hang your food and fragrant items such as soap and toothpaste in a tree. Cook away from the area where you are sleeping.

Leeches and Ticks

Once a leech or tick has taken hold, any attempt to dislodge them will force them to do more harm than good. Apply either a lighted match, burning cigarette, common table salt, a drop of kerosene or turpentine to its body. The leech or tick will release its hold and drop off. Ticks embedded in the skin should not be pulled off since the head may remain in the skin and become infected.

In both cases, cleanse the area with rubbing alcohol. Relieve irritation with a weak solution of water and baking soda or ammonia. Apply a clean, dry dressing.

2. Describe emergency techniques to acquire water during a simulated survival situation.

Background

Water is the key ingredient to survival. The body has 75 percent water by weight. The water lost by sweat, evaporation or by body functions has to be replaced. Sweating can be controlled by wearing layers of clothing. A 2.5 L (2.5% of body weight) loss of body fluid reduces the body's efficiency by 25 percent. A fluid loss of 25 percent of body weight is usually fatal.



Ways to Retain Fluids

To keep fluid loss to a minimum, take the following precautions:

- Avoid exertion. Just rest.
- Don't smoke.
- Keep cool. Stay in the shade. If there is none, erect a cover for shade.
- Do not lie on hot ground or heated surfaces.
- Don't eat, or eat as little as possible. If there is no water available, the fluid will be taken from vital organs to digest food, thereby increasing dehydration. Fat is the most difficult to digest and takes a lot of water to break down.
- Never drink alcohol. This also takes fluid from the vital organs to break it down.
- Don't talk. Breathe through the nose, not through the mouth.

Dehydration can cause heat stroke, hypothermia, frostbite, mountain sickness and death. In the summer, a person needs at least three to four litres a day. In cold weather, metabolism speeds up to generate more heat, so an extra litre must be added. Wardens should keep track of their urine output. They should urinate at least three times a day and the liquid should be clear, light-coloured. Dark yellow to orange coloured urine means that the body is low on water and is trying to conserve its supply by hoarding fluid which makes the urine become more concentrated and darker.

Symptoms of dehydration appear within 24 to 72 hours.

Water Quality

The quality of the water is your second priority (second to finding water). Gastrointestinal infection from contaminated water is common and you can suffer from diarrhea and vomiting. Assume all water is contaminated until you can boil or purify it.

Giardia is a common water-borne parasite that exists in two forms: as a dormant cyst and the disease-causing form called a trophozoite. It is transmitted from the feces of humans and animals. It causes diarrhea (explosive and watery), excess gas (smells like sulfur), abdominal cramping, weight loss, and loss of appetite. It is commonly called Beaver Fever. Boiling, chemical treatment and commercial water-filtration systems when used properly, eradicate the parasite.



A protozoa that also causes unwelcome symptoms is cryptosporidium. It's symptoms are profound fatigue, loss of appetite and intermittent diarrhea. It is highly resistant to iodine and chlorine but is large enough to be filtered out by a standard water filter.

Finding Water

Observation, awareness and common sense are the keys to finding water in the wilderness. Water flows downhill so find where the water collects. Survey the landscape and look for depressions, ravines or troughs that help water on its way to a final collection site. The surroundings may also give you clues to the location of a water source if you are observant.

- Dew and water condense on cold surfaces. You can lick surfaces like leaves and rocks. Dew usually evaporates by noon.
- Dry meandering stream beds may have water deposits just below the surface at outside bends. Dig in the bends for water.
- Dig a shallow well when you see damp sand or find plant growth.
- Small pools may be found in gullies behind large rocks or under cliffs. The water remains because the water collects on nonporous bedrock or a clay soil protected from the sun.
- Damp spots on the ground may mean a high water table.
- Look for soaks. These are places where plants and trees that need a lot of water live, for example, cattails, bulrushes and reeds, willows, poplars and cottonwood. Their growth means there is a high water table. Dig down 30 to 60 cm and after a while water will accumulate in the hole. Allow dirt to settle and filter.
- Look for natural depressions in rocks, hollow tree stumps.

Retrieving Water

- Water from Snow

Snow can provide water. It can be discouraging since very little water is obtained from melting snow, for example, 25 cm of snow equals 2.5 cm of water. Ice, on the other hand has a 1:1 yield of ice to water. If you melt snow, constantly poke the snow with a stick or a hole will burn in the pot.



○ Water from Soil

In a muddy or damp area, dig a hole .3 to .6 m deep. Allow water to seep into the hole. Wet sand can be put in a piece of cloth which is then pressed or wrung to force the water out. The water will be cloudy and should be filtered through a fine cloth.

○ Water from Plants

Condensation - Dig a shallow hole next to a plant that has a lot of leaves. Place a plastic bag over the plant and put the sides of the bag to the lowest point in the hole. Tie or tighten the opening of the bag around the base of the plant. Water will given off by the plant will condense on the inside of the bag and will slowly flow towards the lowest part of the hole. The plant will continue collecting water with its root system. This will work for a few days as long as the plant is not too exposed or killed by overheating in the bag.

Thistle - The most common species of North America thistle, the bull thistle, can provide water. Peel the thorns off young stems and leaves and chew the watery plant. It is good for quenching a burning hot thirst since their supply of water is meager. It will hold you over until a water supply is found.

Dew - Collecting dew is the simplest and safest way to collect water. Use a cloth to wipe up the moisture and wring the water into a container or right into your mouth. Dew doesn't stay around very long so you have to get up early and work hard.

○ Solar Still

This is a method to extract water from the soil. Dig a hole in humid ground and set up the still. First place a cup or pail in the centre of the hole to catch water. Cover the hole with a large piece of plastic sheeting. Use dirt to weigh down the edge of the plastic sheet around the hole. Place a rock in the centre of the plastic sheet to form a concave shape. The air under the plastic heats up from the sun's warmth. The warm air becomes saturated from the humidity in the soil. The saturated air touches the cool plastic and the water condenses as droplets on the plastic. The droplets collect and flow down the plastic to fall into the cup.



Collecting Water

1. Use a balloon or a heavy extra large “zip lock” type baggie

When using a balloon or baggie, put it in a sock and use it to transport water. The sock acts as a retainer when the balloon or baggie is enlarged with water. A balloon or a baggie can hold several litres of water. Tip: Keep a balloon or a heavy extra large “zip lock” type baggie in a survival kit for transporting water.

2. Make Something

Use birch bark to make a vessel to carry water.

Purifying Water

Most outdoor water sources contain microorganisms that can make you sick. Ingesting just one microorganism may cause illness. Wilderness medicine experts always advise treating water to protect against waterborne microorganisms.

Beware of these three types of microorganisms:

Viruses

Most wilderness medicine professionals now recommend treating water for viruses as well as bacteria and protozoa. Viruses must be eliminated through a purification system or boiling because they are small enough to pass through a filter, for example, Hepatitis A, Polio, Norwalk Virus.

Bacteria

Bacteria are becoming a significant threat in untreated water. Microfilters remove most bacteria but smaller bacteria like Cholera, Campylobacter, E. Coli and Salmonella require a very small micron size microfilter or a purifier.

Protozoa

Protozoa are the most common microorganisms in untreated water. Their relatively large size makes them easy to filter, but their protective shell resists iodine and chlorine treatment, for example, Giardia and Cryptosporidium.

○ Distillation

Water that you suspect is not of drinking quality can be boiled. The vapour goes into a second vessel where it condenses back into pure water.



○ **Filtering**

1. Commercial water filters

Most water filters are light weight and easy to use when removing debris and microorganisms from water. Good filters have screens rated to at least 0.2 microns which removes bacteria and pathogens. A filter designed to screen only large microorganisms such as giardia, need only screen to 1.0 microns. Viruses are smaller than the smallest filter so the water must be treated with iodine.

2. Hand made filter

Wet sand or muddy water can be strained through layers of cloth and a layer of charcoal to filter any bad taste and odour. It is collected in a basin below the filtering system.

○ **Boiling**

Water should be boiled at a rolling boil for at least 2 minutes, preferably 10 minutes. For every 305 metres (1,000 feet) above sea level add one minute. At 1,524 metres (5,000 feet) the water should be boiled two minutes for the basic treatment plus five minutes for altitude compensation. The total boiling time is a minimum of seven to a maximum of 15 minutes.

○ **Chemical Purification**

The effectiveness of all chemical treatment of water is related to temperature, pH level, and clarity of the water. Cloudy water often requires a higher concentration of the chemical to disinfect. There are two types of chemical treatments: those using iodine and those using chlorine. Halazone tablets, iodine tablets, tincture of iodine and bleach can all effectively purify water. The organisms that cause dysentery can take a cyst form. Remember that water temperature, sediment level, and contact time are all elements in killing microorganisms in the water.

Tincture of Iodine 2% liquid Add 5 drops per quart when the water is clear. Add 10 drops per quart when the water is cloudy. If viruses are a concern, the water should be treated with iodine.

Halazone is an example of a chlorine tablet. It can be used for people with iodine allergies and other medical restrictions, for example, pregnant women, those allergic to shellfish are often allergic to iodine, people with thyroid problems, women over 50 years, or those on lithium. Always remember to follow instructions on the package's label.



Drinking Water Safety Guide

Microbiological Micron rating	Microorganisms Eliminated
.004	eliminates all microorganisms: viruses, bacteria, giardia
0.2 - 1.0	eliminates giardia and most bacteria but not viruses
1.0 - 4.0	eliminates giardia and other larger protozoa

3. Describe six natural indicators of a storm and demonstrate the actions that should be taken.

Being caught in bad weather can prove fatal. Before setting out, take note of the weather. Observe wind and pressure changes. Keep a record of the weather and the conditions which precede it and what they develop into.

- Animals are sensitive to atmospheric pressure and are good for short-term weather predictions. Insect-eating birds feed higher in good weather and lower when a storm is approaching. Humans can sometimes sense a change in the weather. Curly-haired people find their hair becomes tight and unmanageable as bad weather approaches. Those with rheumatism, corns or similar ailments suffer discomfort in wet weather.
- If camp fire smoke rises steadily, the weather is likely to remain fine. If it starts swirling or is beaten down after rising a short way, a storm shower is coming.
- Sounds carry further when wet weather is on the way and the smell of vegetation becomes more distinctive before the arrival of rain.
- A corona, a coloured circle visible around the sun or moon will enlarge if fair weather lies ahead and shrink if rain is likely. A rainbow in the late afternoon is another sign of good weather.



- Migrating geese maintain their altitude by sensing air pressure, the more the pressure, the higher they fly. Low-flying geese mean a falling barometer, an omen of bad weather.

Cloud Reading

It is difficult but not impossible to accurately make short-term weather predictions. Start learning to predict weather by watching clouds. You need to identify the cloud patterns in the sky, determine if the clouds are getting more or less numerous and are the clouds getting lower or higher in the sky.

Cloud Reading can be useful in understanding how weather systems work. There are three main types of clouds to keep an eye on:

1. Cumulus (puffy)

Puffy white clouds indicate good weather but they can sometimes turn into darker clouds which mean thunder and lightning are coming. When these become anvil-shaped they are called thunderheads and foretell impending bad weather. Cumulus clouds fed by warm updrafts of a cold front develop a towering form warning of an approaching storm.

2. Stratus (layered)

These thin layered clouds are prevalent on hazy days. They may become thicker and dense enough to block the sun and a light rain may ensue. If they turn dark and get lower then a heavier rain is on the way.

3. Cirrus (wispy)

Cirrus clouds have turned up ends that give them the nickname mare's tails and are formed before a warm front hits. They are the most elusive of clouds and can keep you guessing what they will do. Next comes cirrostratus, then mackerel sky, then rain.

Winds of Change

Wind is created when hot air rises and cold air falls. When you combine wind direction and clouds types then you can guess fairly well the coming weather. When clouds are moving fairly quickly across the sky, conditions can change rapidly. If the temperature gets cooler as clouds are getting darker, there is a good chance that foul weather will follow. If cumulus clouds appear in the distance and temperatures are on the rise, count on fair weather.



Familiar Sayings - What They Mean

Red sky at night, Sailor's delight.
Red sky at morning, sailor's take warning.

A red sunset is caused by the sun's rays filtering through dust particles and pollution. Since the weather in the west will likely reach you the next day, and a red sky indicates dry conditions in the west, the weather should be good the next day. A grey or yellowish glow indicates wet weather is on the way. A red sky in morning shows the sun lighting up high cirrus clouds, which may lower later on meaning wet weather will follow.

Mackerel skies and mares' tails
Make tall ships carry low sails

Skies filled with mares' tails (cirrus clouds) indicate that a storm may be on the way. Scattered, high altitude cirrus clouds usually indicate good weather unless their wisps or mare's tails point up or down which may mean rain.

Sound travelling far and wide
A stormy day does betide.

If voices seem louder or the clank of pots and pans seem more shrill, this may foretell of an approaching storm. As clouds lower in the sky, sound waves hit them and bounce back faster than usual. Once the clouds have lifted, sounds return to normal.

The moon with a circle brings water in her beak.

A halo around the sun or moon tells of approaching rain. The halo is the refraction of light off ice crystals in cirrus clouds. When cirrus clouds lower in the sky, rain may follow.

Rainbow in morning, sailors take warning;
Rainbow toward night, sailor's delight.

Rainbows seen from the east in the morning where the sun rises and shines on moisture in the west which indicate the approach of wet weather. By the same token, an evening rainbow seen in the east is being illuminated by the sun setting in the west which suggest that the wet weather has already passed.

Crickets Chirp Out the Heat

The hotter the day, the more a cricket chirps. You can actually determine the temperature by counting the number of chirps you hear in 15 seconds. Divide the number by 2 and add 6 and the answer will be in degrees Celsius. Now, that's heat with a beat!



Lightning from the west or northwest will reach you,
Lightning from the south or southeast will pass you by

Storm clouds and thunderheads come from the west or northwest and move east. If you see lightning in the south, the storm system has missed you; there is little likelihood that the storm will travel north to your location.

If smoke goes high, no rain comes by;
If smoke hangs low, watch out for a blow

Smoke rising from a campfire in a thin, vertical spiral reveals a high pressure system, therefore good weather. Smoke will stay close to the ground in the presence of a low pressure system, which may mean rain.

Test your weather knowledge. True or False.

- ☐ If rain is on the way, many flowers fold up their leaves or petals.
True Clover folds its leaves and dandelions and tulips fold their petals.
- ☐ Spiders sometimes haul in their webs before the rain starts.
True
- ☐ Some trees turn over their leaves before the rain to keep the tops dry.
True Red and silver maples and poplars do this.
- ☐ Ants travel in lines before a rainstorm and scatter in dry weather.
False
- ☐ Cows gather and bed down in the pasture before a storm.
True
- ☐ Bees fly in circles before a rainstorm.
False, but they do stay closer to the hive.
- ☐ If a house fly pesters you, rain is coming.
True
- ☐ Dogs sniff the air more often before a rainstorm.
True
- ☐ Noises are clearer and smells are stronger before it rains.
True
- ☐ A rooster crowing at night means rain in the morning.
False



How Far Away is the Lightning?

Count the number of seconds between the sound of thunder and the sighting of lightning and divide by three. That will give you an estimate in kilometers the lightning is away. When you hear thunder and see lightning at the same time-look out, the storm is overhead!

Weather Summary

There are five weather factors that should be watched for changes in weather patterns.

1. Cloud Formations

- ▶ What types of clouds are there?
- ▶ What direction are they moving?
- ▶ How have the clouds changed throughout the day?

2. Wind Direction and Strength

Winds occur when the earth is heated unequally by the sun. Warm air rises and is known as a rising air current. Cold air descends and is known as a falling air current. This leads to high and low pressure areas. The air in the high pressure areas will move to the low pressure air to try and equalize the pressures. This horizontal movement of air can vary from a light breeze to a heavy wind.

- ▶ What direction was the wind blowing?
- ▶ What strength?
- ▶ Has the direction changed?

3. Temperature

- ▶ Has the temperature fluctuated beyond normal?

4. Humidity

- ▶ Has humidity changed, up or down? The warmer the air, the more moisture or water vapour it can hold. When air rises it cools. When the temperature of moist air drops to a point where the water vapour can change into droplets, clouds are formed.

5. Barometric Pressure

- ▶ Has the pressure changed (beyond altitude changes)? Changes in air pressure are caused by the circulation of hot and cold air, and the resulting rising and falling of air.



Forecasting Tips

Wind Direction	Barometric Pressure	General Forecast
SW to NW	30.10 to 30.20	Fair, with little temperature change for 1 to 2 days
SW to NW	30.10 to 30.20 rising rapidly	Fair, with warmer weather and rain within 2 days.
SW to NW	30.20 or above, barometer steady	Remaining fair with little temperature change.
SW to NW	30.20 or above, falling steadily	Fair and slowly rising temperatures for about 2 days.
S to SE	30.10 to 30.20, falling slowly	Rain within 24 hours.
S to SE	30.10 to 30.20, falling rapidly	Rain within 24 hours, wind will rise
SE to NE	30.10 to 30.20, falling slowly	Rain within 12 to 18 hours; wind will rise
SE to NE	30.10 to 30.20, falling rapidly	Rain within 12 hours; wind will rise
SE to NE	30.00 or below, falling slowly	Rain will continue one or more days.
SE to NE	30.00 or below, falling rapidly	Rain with high winds in a few hours. Clearing within 36 hours, colder in winter.
E to NE	30.10 or above, falling slowly	Summer: Light winds, rain for 2 to 4 days. Winter: Rain or snow within 12 hours.
SE to NE	30.10 or above, falling rapidly	Summer: Probable rain in 12 to 24 hours. Winter: Rain or snow within 12 hours.
S to SW	30.00 or below, rising slowly	Clearing within a few hours, then fair for several days.
S to E	29.80 or below, falling rapidly	Severe storm within a few hours, then clearing within 24 hours, colder in winter.
E to N cold	29.80 or below, falling rapidly	Severe storm in a few hours. Heavy rains or snow storms, followed by wave in winter.
Swinging to W	29.80 or below, rising rapidly	End of storm, clearing and colder.



More Forecasting Tips When:

Look For:	Clouds	Temperature	Winds	Air Pressure	Humidity
Weather to stay fair	Move high and decrease in numbers when morning fog disappears	Average for the season	West to northwest and gentle	Remains steady or goes up slowly	Stays low
Weather to get worse	Become thicker, lower and darker to the west	Above or below average for the season	Shift between east and south	Falls steadily or rapidly	Goes up
Rain or snow	Change from cirrus to lower types or rain or snow clouds	Goes up	Increase in speed, usually from the east	Falls, the faster it falls the sooner rain or snow	Goes up
Thunder Storm	Change from cumulus to cumulonimbus		Increase in speed rapidly	Falls	
Weather to Clear	Rise and break up	Rises after warm front. Drops after cold front	Swing from east through south to west	Rises	Goes down
Colder Weather		Goes down	From north or northwest	Rises	
Warmer Weather		Goes up	From the south	Falls	

Weather Signs

Look for cloudy unsettled weather when:

- the barometer is falling;
- the temperature at night is higher than usual;
- the clouds move in different directions at different levels;
- high thin clouds (cirrus) increase. A large ring may appear around the sun or moon and remain there until overcast clouds thicken and obscure it; and
- clouds darken on a summer afternoon.

Look for steady precipitation when there:

- have been signs of unsettled weather;
- the wind is south or southeast, with pressure falling. If the pressure falls slowly, rain or snow will occur within a day; if it falls rapidly, it will rain soon, with increasing wind speed;
- the wind is southeast to northeast, with pressure falling it will rain or snow soon; and
- thunderclouds are developing against a south or southeast wind.



Look for showers when:

- thunderclouds develop in a westerly wind; and
- cumulus clouds develop rapidly in the spring or summer during early afternoon.

Look for clearing weather:

- the barometer rises;
- the wind shifts into the west or northwest; and
- the temperature falls fairly rapidly, especially during the afternoon.

Look for continued bright weather when:

- you can look directly at the setting sun and it looks like a ball of fire;
- the barometer is steady or slowly rising;
- cloudiness decreases after 3 p.m. or 4 p.m.;
- morning fog breaks within two hours after sunrise;
- a light breeze blows from the west or northwest; and
- a red sunset occurs.

Look for higher temperatures when:

- the barometer is falling (in summer a falling barometer may indicate cloudy weather which will be cooler than clear weather);
- the wind swings away from the north or west into the southwest or south; and
- the morning sky is clear, except when the barometer is high or is rising in wintertime, or if the wind is strong from the north or west.

Look for lower temperatures when:

- the wind swings from the southwest into the west, or from the west into the northwest or north;
- skies are clearing (clearing skies in the morning will likely mean warmer weather by afternoon, particularly skies in the summer);
- the barometer rises in the winter;
- snow flurries occur with a wet or north wind; and
- the barometer is low and falling rapidly, wind east or northeast and backing slowly into north (the fall in temperature will be gradual.)



Taking Cover

When rain and high winds hit, and they will at some point, you want to be dry and secure within your tent and comfortable from the battering winds and rain. Here are a few tips to consider when finding and making shelter.

- Calculate the speed of an approaching storm by measuring the time between lightning flash and the thunderclap. Lightning takes three seconds to travel one kilometer (five seconds a mile.)
- Avoid being in a boat on a lake during a storm.
- Canyons are dangerous because there can be a flash flood caused by a storm. Because of the thunder you will not be able to hear the noise of the water descending down the canyon.
- Take cover in the lowest, driest place around.
- Lightning seeks the tallest object around so do not go under isolated trees.
- Lightning is attracted to metal, so remove metal framed backpacks and store them away from you.
- If you have no cover at all, sit on your pack and put your back to the wind and rain. Huddle to keep warm.



A c t i v i t y I d e a s

- Have wardens arrange a trip to a local weather station. Ask around. There may be one at the airport, a government office, a local station cared for by a citizen.
- Make arrangements for a speaker to visit your club. Ask the speaker to bring slides, pictures and exhibits to help teach wardens about weather.
- Invite an experienced outdoor leader to talk about the weather encountered on various trips, how to better predict weather and be safe while on outtrips.



RESPONSIBLE HIKING AND CAMPING

As part of the Junior Forest Warden program, wardens and leaders are expected to use the out-of-doors responsibly. This role includes taking responsibility for personal safety and health.

date completed



Demonstrate food packaging techniques.
Describe how the packaging considers spoilage,
food preservation and protection from wildlife

page 103



Develop a cost-effective menu (not freeze-dried
items) to feed a group of six for a week-long ski or
backpack trip.

page 109



Discuss the philosophy of leave no trace camping
and demonstrate leave no trace camping in the
following skill and knowledge areas: food
preparation and cooking, fire building and fuel
selection, shelter, and waste disposal.

page 116



List ways you are responsible to and for others
while planning a trip, during a trip and after a trip.

page 120

VII. Responsible Hiking and Camping

1. **Demonstrate food packaging techniques. Describe how the packaging considers spoilage, food preservation and protection from wildlife.**

Food Packaging

If you are using prepackaged foods from the outdoor store, you do not have to do any repackaging at home. Most of the packaging, however, you will want to discard (cardboard, foil) to repackage into your own packing system. The goal of packing food is to decrease the weight and the amount of garbage.

There are many packaging systems. One is using different sizes of sturdy re-sealable plastic bags such as Ziploc. There are other kinds of open-once bags that can be used such as tough baby bottle bags sold by the roll and boilable bags sold with a home bag sealing machine such as Seal-a-Meal or Meals-in-Minutes. These bags can be filled and sealed to any size desirable. Household bags can also be reused but check to see that there are no leaks. Clear bags are the most useful because you can see what is there. Add labels with freezer paper (which adheres well in damp conditions) or use permanent markers.

Pack each meal separately except for lunches. Lunch food for a several day trip are usually put into two large ziploc bags with a variety of food in each. The lunch bags contain food that will be used for every lunch like peanut butter, crackers, jam, nutella and so on.

All bags should be labeled with the contents and instructions in the simplest form. For example,

- lemon pudding add 1 1/2 c. water
- jello + 2 c water
- drink, add 4 cups

The jello and the drink will look the same through the ziploc but everything is labeled for clarity. Powdered foods that will be opened only once can be sealed in baby bottle bags.

Trimmed baby bottle bags are the perfect size to hold drink mix and other foods in small quantities and are tougher than sandwich baggies. They can be sealed with a home bag sealer. (To guard against leaks, make two seals, .5 cm apart.)



For foods that you will dip more than once into the bag (like trail mix, candy, Russian Tea Mix) ziploc bags work well. When they are empty, they can be reused or compressed and packed out.

Bowl in a Bag

Foods that need mixing can be pre-packaged at home in one-quart or one-litre plastic ziploc bags that can double as collapsible bowls. No spoon or pot needed and no clean-up. Some of these foods are pudding mix and dry milk, biscuit/dumpling mix, pancake batter, sour cream and dry milk. Add required water and oil, push out most of the air, and shake vigorously. Wardens may stand in line for shaking privileges.

There are other uses for resealable bags, here are some examples: Add water to dried fruit and set aside to rehydrate and to save leftovers. All ingredients of a dish go together into a bag and all components of the meal (main dish, beverage, dessert) are grouped together in a larger bag. A meal is never stalled because one person has half the main dish and the sauce is in another pack or do a meal in a bag. Before you go, pack the oatmeal, raisin and banana chips, salt, sugar and dry milk all together in a ziploc bag and label: oatmeal, cook 1 min in 3 c water. Put smoked salmon in a double baggie, push all air out and wrap with freezer tape. Package juice for the meal and label, juice, 1 litre. Put the amount of Mexican Mocha needed for the group in a sealed bag and label: Mex. Mocha, + 4 c hot water. All the four bags go into a larger bag labeled: Breakfast Day 1 (or whatever day it will be eaten.)

Here's an example of how this system works.

Breakfast Oatmeal with raisins and banana chips Smoked salmon Grapefruit juice Mexican mocha

All the meals are prepared in the same way. Dividing up the meal load is just as easy. There are many combinations and variations depending on the number of people, the number of meals and the length of the trip. Below are some ideas for carrying the meal load:

- Have the early risers carry the breakfasts
- Have a different person carry the meals for each day. For example, Alex has Day 1 meals, Earl has Day 2, Joanne has Day 3, Taylor has Day 4 and so on. Give the days alphabetically to Wardens.
- Spread the load over the trip length. If it's a long trip, the alphabetical suggestion above would have some Wardens carrying meals until the last days. For a 10 day trip, an alternative is to have Alex carry Day 1 and Day 10, Earl Day 2 and Day 9, Joanne Day 3 and Day 8 and so on. You can also split up the day's meals. For example, lunches for



odd-numbered Days 1, 3, 5, 7, 9 are packed together. Lunch for even -numbered days 2, 4, 6, 8, and 10 are packed together. This works the same for breakfasts and dinners. This method will have all the meals being used alternatively and evenly from all the packs.

Tips/Suggestions

- Clip instruction from boxes and tuck into the smaller bags.
- Gather all the granola for one week and put into one ziploc bag.
- Have each person pack their own snacks.
- Plan the meals on paper first. Calculate the approximate number of bags needed and the sizes. When ready to re-package foods and organize meals, spread out on the kitchen table. Do the breakfasts first, then the lunches and then dinners. Decide on how the meals will be carried and by whom. Once decided, they can be packaged accordingly.

Some Ways to Figure Out Quantities

- **Eyeballing** - One handful of raisins looks about right for a one person snack. Measure and you'll discover it's 1/8 cup. One cup, therefore, is enough raisins for eight people.
- **Experience and Record Keeping** - Note how much you brought on the trip and record as to whether it was 50 % too much, just right, half as much needed, and so on. Keep notes. Your measurements will get better with experience.
- **Calorie Counting** - Determine how many calories per person, per day are required and calculate how that translates into food.
- **Cookbooks** - Many cookbooks will tell you how much rice per person constitutes a serving. Increase the suggested serving for outdoor activities.
- **Home Experimenting** - Invite hungry friends to try your recipes. If there isn't enough, treat them to a pizza and increase the recipe for the trip.
- **Package Directions** - If the package says, serves four, it doesn't really. It only serves four if there is another two or three food items on each of the four plates. Keep this in mind when planning a meal.



Use the 3 Rs When Packaging Food

Reduce the amount of packaging by buying in bulk. Choose items that are bulk packaged rather than individually wrapped. This will also help to reduce cost.

Recycle all cardboard, glass when re-packing food.

Reuse the plastic bags after a trip that have no holes. They can be washed out and reused. Even plastic peanut butter jars can be washed out and reused for another trip.

Food Preservation

Dehydration removes the moisture from the food so bacteria, yeast and molds can't grow. Drying also slows down the action of enzymes which cause food to ripen and eventually spoil. Drying food is a method of food preservation that is simple, safe and easy to learn.

Drying food is a slow process. All that is needed is a heat source. You can use an oven or a commercial food dehydrator. The temperature should be constant 95 to 105° F and adequate circulation to carry the moisture away. Drying time varies from 8 to 10 hours to three days. Fruits, vegetables and meat can be dried.

Doneness test are different for each food. The following are doneness tests:

- Food can crush to a powder: peas, carrot, mushrooms, zucchini chips, corn, whole berries and most other vegetables.
- Large fruit are leathery and pliable: pears, banana fingers (lengthwise cut), prunes, apples, apricots, peaches and pineapple chunks.
- Food is crisp and brittle: banana chips, tomato slices.

Have Wardens make fruit leather at home and wrap in plastic food wrap for a trip. Dry it, you will like it!

Make Fruit Leather

1. Use very ripe fruit. Try a combination like berry/apple or banana/berry.
2. Use a blender to make the fruit into a pulp. Add liquid (juice, cider, water) just so you are able to blend.
3. The puree should be thick like applesauce. If thickening is needed, add apple which is high in pectin.



4. Pour puree onto plastic (like bread bag) and place on a cookie sheet on an oven rack
5. Dry at about 110° F until you can peel the sheet of fruit off the plastic cleanly. Don't over dry, it should be chewy but not stiff.
6. Store rolled in plastic food wrap and label. Pear and apple look the same, so does plum and cranberry.

Food Spoilage

On outdoor trips, long or short, hot weather will cause fresh foods and meats to spoil. Below are some guidelines for the length of time some foods will keep:

Fruits - Fresh hard apples, oranges and tangerines can be taken on the trail. Their time staying fresh will vary.

Cheese and Dairy - Only a few cheese are good for multi-day trips. Grated Parmesan and Romano (moisture content 34% or less) does not need refrigeration. Hard cheese like Cheddar, Colby and Swiss can go up to a week without refrigeration. Take powdered milk to conserve weight.

Meats - Hard salami, Pepperoni, smoked meats and jerky last for weeks without refrigeration. Canned meats and fish can last for a long time.

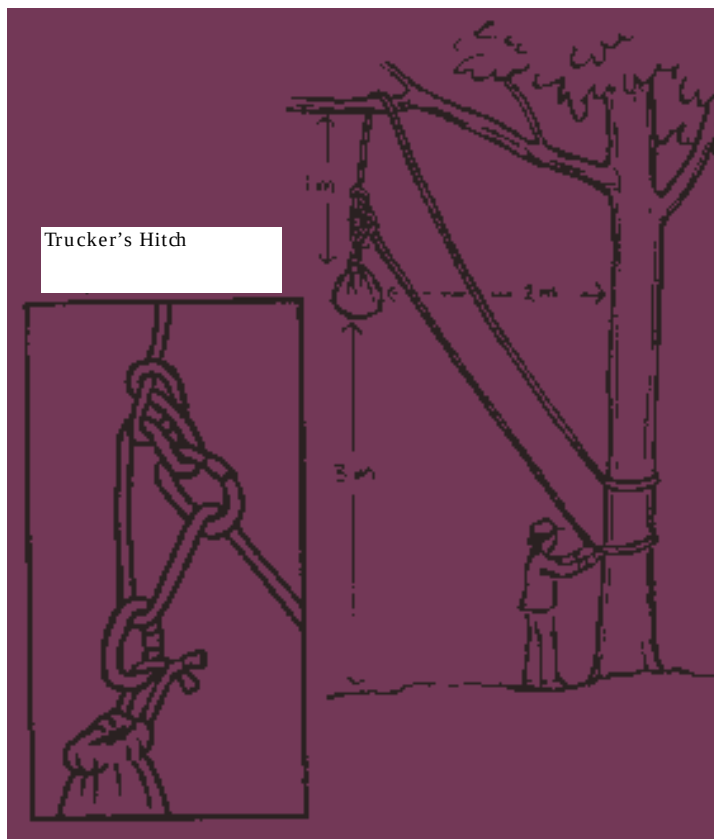
Eggs - Eggs can be carried for 2 to 3 days not refrigerated if they are cracked open and stored in a sealed jar (the eggs must be covered with water to remove the air.)

Tricks of the Food Trade

- Precook and freeze meals in plastic containers. The food will slowly thaw and be fresh on the second or third day.
- Cook food before you go. Fresh bread, biscuits, muffins, bean salad or humus are a nice treat along the trail.

Food Protected from Wildlife

In bear country, hang your food. You will need 30 metres of line and a sturdy stuff sack. Choose a tree at least 100 metres away from camp and hang the bag at least three metres above the ground, two metres away from the tree trunk and one metre below a branch. The smell of food can bring unwelcome visitors, so the camp kitchen should be about 100 metres downwind of the sleeping area.



Bears are not the only kind of animals interested in human food; insects and small mammals like mice and voles as well as wolverines will seek food. If your group has the luxury of space and carrying weight, pack food in a wooden box or plastic tub.

A food cache can also be rolled up in two or three layers of polyethylene. The plastic will mask any food odours. A food cache can also be buried under ground with a big rock covering the spot.

Improperly packaged and stored food may be suitable to dampness, mildew and rodent damage due to saltiness, freezing and cans rusting.

The cold water of streams and creeks may be used to keep food cold. Surround the food containers with rocks so they will not be swept downstream.



2. Develop a cost-effective menu (not freeze-dried items) to feed a group of six for a week-long ski or backpack trip.

Background

Proper nutrition is as important in the outdoors as it is at home. The amount of energy the body takes in from food is measured in units called calories. When planning a menu, the foods should be high in calories to meet your energy output in the outdoors. People have different metabolisms depending on how they eat and what they do.

Activity	Calorie Requirement	Food per day* (weight)
couch potato sedentary	1,500 - 2,000	varies
backpacking moderate exercise	2,500 - 3,000	.9 kg
cold weather hiking strenuous exercise	3,500 - 4,000	.0 to 1 kg
winter hiking/skiing very strenuous exercise	4,500 - 6,000	1.1+ kg

* Food weight required will vary because of the weight of hydrated foods.

Food Sources

1. Carbohydrates (4 calories/gram, energy released quickly)

Carbohydrates normally make up half of a person's daily caloric intake, however, for outdoor activities such as skiing and hiking, carbohydrates should make up 70% of daily caloric intake. Sugars break down quickly and give quick energy; starches release energy more slowly.

2. Fats (9 calories/gram, energy released slowly)

In the outdoors, fats should make up 25% of daily intake. During the winter this increases to 40% of daily caloric intake.

3. Proteins (4 calories/gram, energy released slowly)

Proteins are the essential building blocks of body tissue. A



protein is made up of 22 amino acids; 14 are made in the body, the other eight (known as essential amino acids) are not. Meat, poultry, fish eggs and milk are complete proteins (have eight essential amino acids). Foods such as beans, lentils, peanuts, cereals, vegetables and fruits are incomplete proteins (do not have eight essential amino acids). Complete proteins are made with combinations of food groups. Below are some food combinations for complete proteins.

Dairy + Grains - macaroni and cheese, cheese and crackers, pasta and Parmesan cheese, milk and cereal.

Grains + Legumes - rice and beans, refried bean and flour tortillas, peanut butter and bread, rice/bread and tofu.

Legumes + Seeds - peanuts and sunflower seeds in trail mix.

Canada's Food Guide

Canada's Food Guide says eat a variety of foods from each food group every day. Energy needs vary with age, gender and activity. Foods selected according to the guide can supply 1,000 to 11,400 calories. For additional energy, increase the number and size of servings from the various food groups or add other foods. The Canada Food Guide gives a minimum and maximum number of servings for each food group. Most people choose servings somewhere in between. Use the Canada Food Guide to assist with meal planning.

Food Group	Size of Serving	Food	# of Servings a Day (Recommended)
Grain Products	125 - 175 ml 125 - 175 ml 1 slice	cereal rice, pasta bread	5 - 12
Fruits & Vegetables	125 ml 1	juice, vegetable fruit	5 - 10 (2 are vegetables)
Milk and Milk Products	250 ml 175 ml 45 g	milk yogurt cheddar cheese	adolescents 3 - 4 adults 2 - 4
Meat & protein substitutes	60 - 90 g 250 ml 2	meat, poultry, fish legumes eggs	2 - 3



GORP
Stands for Good Ol' Raisins and Peanuts. Make some by combining equal amounts of raisins, peanuts, Smarties, coconut, walnuts, carob chips, dates, dried apricots and sunflower seeds. It's good for you.

Benefits of Good Meal Planning

- Reduce garbage.
- Reduced weight of food you are carrying resulting in less fatigue.
- Reduced dependence upon campfires for cooking.

Cost Effective Tips

- Buy in bulk and package into individual meals.
- Package your own meals instead of buying convenient freeze-dried meals.

Typical Menu Items

Breakfast

granola	Grapenuts
Cracklin'Oat Bran	oatmeal
Cream of Rice	Cream of Wheat
7 Grain	dried fruit
cracked millet	rice pudding
scones	dried hash browns
canned sliced bacon	Pop Tarts
Note: Pack cereals that won't crush.	

Lunch and Trail Food

dried fruit	granola bars
nuts and seeds	peanut butter, jelly, honey
cheese	tuna
fruit	trail mix
energy bars	jerky
fresh fruit	crackers
fresh carrots	
bagels, pita bread, tortillas, English muffins	
candy (hard candies, sesame snaps, caramels, jelly beans, malt balls)	



Dinner

Cup of Soup	Risotto
Ramen noodles	pasta
instant rice	Uncle Ben's Quick Brown Rice
falafel	couscous
beans	instant potatoes
dehydrated vegetables	bulgar
pepperoni for pita pizzas	cheese

Note: Make one-pot meals and add other things to make a bigger meal.

Dessert

brownie mix	Bisquick
instant gingerbread mix	corn bread mix
cheesecake mix	pudding
Jell-O	cobbler
cookies	

Condiments

sugar (white, brown, raw)	drink crystals (lemonade,
honey or maple syrup	iced tea, Tang)
tea (black, herbal), coffee	margarine (squeeze Parkay)
(instant, ground)	oil
cocoa	spice kit (pepper, salt, chili
powdered milk	powder, garlic powder, etc)
vanilla	soy sauce (backpacker's
Worcestershire sauce	ketchup)
cinnamon sugar	Tabasco sauce
instant gravy	bouillon cubes
bacon bits	Crisco (better than butter
dried spaghetti mix	and oil)
popcorn	Miso

Planning the Menu

There are two methods Wardens can use to plan the menu on paper: Ration Method, and Meal-by-Meal Method. Wardens can repeat meals, for example, breakfast for days 1 and 5 can be granola. Both are explained in the Warden's Manual.



One Pot Possibilities

It's easy to create your own recipe for a one pot meal. Select one item from each column and combine them in quantities enough for the number of people. Use your imagination and your personal taste buds to determine what items will taste good together.

Meat or Meat Substitute	Pasta, Grains & other bases				
Fresh meat in cool weather	Noodles (egg, spinach, whole wheat)	Freeze-dried	Cheese sauce (add milk powder)	Salt, pepper	Sunflower seeds
Canned meats (chicken, turkey, luncheon meat, beef and gravy)	Macaroni (egg, whole wheat)	Commerically dried	Sour Cream sauce (add milk powder)	Herbs (sage, oregano, basil, etc.)	Nuts (chopped, slivered)
Smoked fish	Dried potatoes (instant, diced, shredded, sliced)	Onions in various forms	Stroganoff sauce (add milk powder or sour cream to most)	Bouillon (cubed or powder)	Shredded coconut
Canned fish (tuna, salmon, clams, sardines)	Rice (quick brown or white, parboiled)	Mushrooms	Paprika	Garlic (minced, powdered, fresh)	Cheese (cubed, sliced, pore-grated)
Jerky (beef or fowl, chopped)	Bulgar (parboiled cracked wheat)	Sweet pepper flakes	Spaghetti sauce	Margarine	Sesame seeds
Hard salami	Japanese instant noodles	Celery flakes	Powdered soup mixes	Parsley (dried)	Wheat germ
Sausage (Thuringer, Landjager)		Mixed vegetable flakes	Gravy mix	Chives (dried)	Roasted soybeans
Pepperoni		Some fresh ones that travel well: carrots, cucumbers, onions	Teriyaki sauce	Curry powder	Bacon bits
Bacon or meat bar	Boxed mixes (Noodles Almondine, Macaroni and Cheese, Rice-a-Roni)		Curry sauce	Onion salt	Onion flakes
Freeze-dried ham, chicken, beef, shrimp			Sweet and sour sauce	Celery salt	
TVP (textured vegetable protein in granular or chunks in beef, chicken, ham flavors)	Hamburger Helper or similar one pot mixes (minus the package)			Garlic salt	
				Soy sauce	



Ration Method Menu Plan

Breakfast

Food Items	Quantity/person/day	X Number of Days	= Trip Quantity

Trail Foods

Food Items	Quantity/person/day	X Number of Days	= Trip Quantity

Lunch

Food Items	Quantity/person/day	X Number of Days	= Trip Quantity

Dinner

Food Items	Quantity/person/day	X Number of Days	= Trip Quantity

Desserts

Food Items	Quantity/person/day	X Number of Days	= Trip Quantity



Meal-by-Meal Menu Plan

Breakfast

Trip Day	Food Items	X Quantity - 1 person	= Your Quantity
Day 1			
Day 2			
Day 3			

Lunch

Trip Day	Food Items	X Quantity - 1 person	= Your Quantity
Day 1			
Day 2			
Day 3			

Snacks

Dinner

Trip Day	Food Items	X Quantity - 1 person	= Your Quantity
Day 1			
Day 2			
Day 3			



3. **Discuss the philosophy of leave no trace camping and demonstrate leave no trace camping in the following skill and knowledge areas: food preparation and cooking, fire building and fuel selection, shelter, and waste disposal.**

Background

Leave No Trace (LNT) is the name of an American program developed by the U. S. Forest Service and the National Outdoor Leadership School and other agencies in the United States. It is a national awareness campaign to help people travel in different ecosystems without disturbing the environment. In Canada, the program is called Tread Lightly. Whatever the name, the program philosophies are basically the same, minimum impact camping. Backcountry awareness means understanding how you can fit into the environment and leave no trace of your visit.

The way we choose to behave in the outdoors is influenced by our understanding of how people affect other living things. When we camp in an alpine meadow we affect the plants and animals which depend upon each other for survival. Understanding these interrelationships helps us feel a personal connection to the land, it gives us a reason for caring. We care by loving beauty, enjoying plants and animals, having an interest in nature, feeling a oneness with nature, being excited by discoveries and even by testing our strength and endurance in the wild.

Treading Lightly means:

TTravel only on designated routes.

Respect the rights of others.

Educate yourself.

Avoid stream banks, meadows, wildlife.

Drive and travel responsibly to protect the environment and preserve opportunities to enjoy outdoor recreation on public lands.



The principles of leaving no trace are guidelines, not rules.
Keep in mind the following when going into the backcountry:

- plan ahead and prepare
- concentrate impacts in high use areas or designated sites
- spread camp out where impact is unavoidable in pristine areas
- avoid places where impact is just beginning to be noticed
- pack it in, pack it out
- properly dispose of what you cannot pack out
- leave what you find
- use fire responsibly

A thing is right when it tends to preserve the
integrity, stability and beauty of the biotic community
It is wrong when it tends otherwise.

Aldo Leopold, A Sand County Almanac. 1949

Trip Planning

- Groups of 10 or less are ideal. It will reduce compaction of soil and minimize damage to vegetation.
- Know the regulations pertinent to the area you plan to travel through.
- Obtain a map and study the topographical features of your route. Find any fragile areas and possible campsites.

Trail Travel

- Stay on designated trails. Do not create switchbacks or new paths around puddles or boggy sections. Short cuts result in erosion and gullying and create unwanted parallel trails.
- If you are hiking off trail, stay away from sensitive areas like alpine meadows and water courses.
- Avoid stepping on plants by walking on rocks or compacted soil.
- Where trails do not exist, use a map and compass for navigation.
- Do not mark vegetation with axes to mark your route.
- When travelling in an alpine environment where trails do not exist, have your group spread out instead of walking single file.



- Do not drop litter along a trail or waterway, carry along a plastic bag for this purpose.
- When taking a rest break, move off the trail to a durable place such as a rock outcrop, sandy area or a non-vegetated area.
- Do not approach or harass wildlife.

The Campsite

- Use designated campsites whenever possible or camp well off the trail
- Avoid camping too close to natural beauty spots and open water since these already suffer from overuse.
- Choose a campsite at least 60 metres from water sources, trails and scenic spots.
- Set up the camp thoughtfully in terms of traffic patterns. The cooking area should be well separated from the sleeping area, food hanging site, hand washing area, latrines, and where the water source is. Minimize the traffic patterns.
- Lug-soled hiking boots do damage to vegetation and soil. Sneakers are good around the campsite.
- Use a tent with a waterproof floor. Avoid scarring campsites from the construction of lean-to shelters and bough beds.
- If you are in the back country, use a camp stove. It leaves no scars on the environment.
- Try not to spend more than a few days at any one campsite unless it is an established campsite of sacrificed area.
- Leave the area as you found it or better. If you have cleared the ground of pine cones, scatter them back before you leave.
- Pack everything that you brought in.

Waste Disposal

- Dispose of human waste (feces) at least 100 metres away from water sources or trails.
- A cathole is a small pit toilet for personal use. Dig a hole 10 to 15 cm diameter and 15 to 20 cm deep. Remove the sod intact. Bury the feces and cover the site with natural materials to disguise it.



- A latrine is a larger pit toilet for group use. A latrine is the same size as a cathole except it is deeper. Remove the sod intact. Each person covers the feces with a layer of dirt. Fill in the hole, scatter the extra dirt and cover with natural materials before leaving the campsite.
- Toilet paper may be burned or buried.
- Depending on the location of the trip (cave), feces and urine may have to be packed out.
- A sumphole may be dug to dispose of waste water instead of being dumped on to the ground. A sumphole is dug 25 to 30 cm deep. It can be located near the cooking area but at least 60 metres from open water. Use biodegradable soap (without phosphates) to prevent contamination.
- Pack out all food garbage. Do not bury food wastes because wildlife can find it and dig out garbage pits, even in winter. Hang food garbage, the same method for food storage.
- Medical waste such as soiled bandages and needles must be stored separately in special bags for this purpose.

The Campfire

If your camp stove doesn't work or an emergency necessitates the use of a fire, follow the techniques below:

- Use an existing firepit to avoid creating a new fire scar.
- Never build a fire on top of dead logs, tree roots or mossy areas.
- Select a site on level ground, sheltered from high winds and away from overhanging branches and heavy brush.
- Never leave a fire unattended.
- Have a convenient source of water nearby to extinguish the fire.
- Dig up a square piece of sod about 50 X 60 cm keeping it intact and lay to one side.
- Use only dead wood found lying on the ground. Do not break off branches or use saws and axes. They all leave unnecessary scars.
- Build a small fire instead of a big one.
- Don't ring the fire with rocks because the rocks will be scarred.
- After breaking camp, make sure the fire is out by feeling the ashes with your bare hand. Take the ashes into the



woods and scatter them so they won't be visible or alter the soil's chemistry. Finally, return the soil to fire pit, replace the sod and fill in the edges with soil.

Water

- Camp and defecate at least 60 metres from a water source.
- Avoid using soap with phosphates.
- Wash hands and dishes in a basin and dispose of water with soap into a sumphole. If you was washing hands in a creek, use sand or gravel for an abrasive.

4. List ways you are responsible to and for others while planning a trip, on a trip and after a trip.

Planning a Trip

Albertans are lucky enough to be close to hundreds of parks and wilderness areas and can get there fairly easily. Being there for most people involves a fair amount of planning, especially if this is your first time out for the year. You need basically the same equipment for a weekend trip as you would for a week-long trip. The only variable is food, the longer the trip, the more food you will need.

Plan of Action

- Pick a departure date and decide on the length of the trip.
- Delegate someone in charge of transportation. The group has to get to the trailhead or the campsite.
- Decide who the group leader is. The trip will provide a Warden with an opportunity to practice planning skills. Different members of the group can be in charge of different things, for example, a person with paddling strengths can be in charge of that part of the trip.



Booking Sites

In some of the more popular locations, it may be difficult to get a reservation for a campsite. If you can't go in during the off-season, be sure to book your campsite as far in advance as possible. Some parks have four-month waiting lists for campsites. On long weekends, you may need to reserve a site six or seven months ahead of time. Some campsites even have lotteries for much-in-demand campsites. The West Coast Trail on Vancouver Island has a two year wait and that's just to hike the trail. Plan as far ahead as possible.

Trip Registry

Leave a written trip itinerary with friends and family (people who care about you.) In some cases, consider leaving the trip plan with RCMP if you are embarking on a long canoeing trip or with Park officials if you are going into the backcountry. Highlight the route on a copy of the map. Include:

- the name and emergency phone numbers for group members
- description and location of vehicle(s)
- departure and expected return times
- route and likely campsites
- alternate route and circumstances under which you would use them
- list of visually distinctive equipment
- who to contact if you are overdue and how long to wait before calling for rescue.

Should you run into trouble, leaving an itinerary can save crucial hours or days. If you are lost, feeling assured that someone knows where to look and will soon be searching for you can keep panic in check.



Weather

Check out weather advisories before heading off. A weekend postponed is a weekend gained another time. As with any kind of outdoor event, plan for contingencies and agree on a rain check date for another trip.

Gauge Abilities

If some Wardens are new to the trip and the skills involved, ensure there is some instruction and practice before the actual trip. Everyone should be comfortable with the activity being undertaken, whether it is hiking or canoeing. Try and plan outdoor adventurers with a partner or a group, never alone.

During the Trip

Safety

When a group is inexperienced, the leader should not take unnecessary risks. All group members should feel comfortable with the challenges presented during the trip. Good planning will ensure, for example, that the class of rapids on the river during a canoeing trip is suited to the skills and abilities of the group. Presenting challenges above and beyond the group's abilities is foolhardy!

Expect the Unexpected

Your trip may be ruined by downpours or a plummeting temperature. The best thing you can do is to be prepared and not to get mad when these things happened. Anticipate the worst by including bad weather gear in your pack. Pack a book and read it while the rain pitter-patters against the tent fly.

After the Trip

When you return, be sure to check in so your friend or officials with whom you left the trip itinerary with know that you are back!

If you have left an itinerary with wilderness authorities and you have not returned when you said you would, officials usually wait until you are one or two days late before sending out a search party to find you. Be sure to inform officials when you have finished your trip. When you exit some trails, there may be a box to deposit a card indicating that you have returned. This is important, you may be billed for search and rescue costs if you neglect to inform authorities.



Activity Ideas



- Have Wardens brainstorm factors they should consider so they are responsible to all members of the group while planning a trip.
- Have Wardens prepare a list of things to do before the trip to ensure group safety.
- Have Wardens practice writing out trip itineraries. Even if you are all going out for a weekend at a regional camp with your own family, write out an itinerary and leave it with a relative. Wardens can also prepare an itinerary that can be left with their own families if they are going on a hiking trip. Have a short meeting prior to the distribution of the itinerary to verify that all the information is correct.



VIII

KNOTS AND LASHINGS●

Learning common knots and lashings and determining when to use them are skills that will aid in shelter construction, survival techniques, first aid and outdoor recreation activities.

date completed





Make a shelter or an outdoor tool using cords and demonstrate the proper use of three knots and two lashings.

page 127



Construct a knot display board which includes the name and use for at least eight knots.

page 130



Make cordage out of natural materials.

page 131

VIII. Knots and Lashings

1. **Make a shelter or an outdoor tool using cords and demonstrate the proper use of three knots and two lashings.**

Background

There is a knot for every job and it is important to know which knots will do the job. Wardens should know how to tie knots well enough to tie them in the dark and behind their backs. Practice. Practice. Practice. They should also be able to untie them. Knots must be done well enough so they do not come undone, but are able to be untied at crucial times.

Lashings

The method of lashing depends on the position of the components. Lashings tie down or attach objects together so they will not move. Knowing how to lash is valuable for making shelters, rafts and other structures.



Activity Ideas

- Have Wardens do the activity sheet, What Knot Would You Use? Wardens have a copy in their own manuals.
Answers: 1-taut line hitch, 2-two half hitches, 3-sheepshank, 4-bowline, 5-clove hitch, 6-clove hitch, 7-timber hitch, 8-square knot, 9-sheepshank, 10-sheet bend, and 11- Jam Knot.
- Have Wardens demonstrate the knots that are the correct answers for What Knot Would You Use?
- Have Wardens demonstrate at least one knot from each category (simple knots, joining knots, loop-making knots, hitches, shortening ropes and securing loads)
- Have Wardens in the group demonstrate three knots and their practical applications.
- Have Wardens make a lean-to using three knots and lashings.

Refer to Appendix II - Knots, Lashes and Splices for descriptions and drawings.



What Knot?

Warden

Put a check mark ✓ by the knot you think will do the job and demonstrate the knot to another Warden.

1. What knot would you use for adjusting tension on a tent guy line?
 - ▶ bowline
 - ▶ timber hitch
 - ▶ taut line hitch
 - ▶ figure -of-eight
2. What knot would you use around a post and through a ring or grommet?
 - ▶ timber hitch
 - ▶ figure-of-eight
 - ▶ two half hitches
 - ▶ square knot
3. What knot can be used to bypass a damaged section of rope?
 - ▶ sheepshank
 - ▶ two half hitches
 - ▶ square knot
 - ▶ taut line hitch
4. What knot is used to make a loop that will not close?
 - ▶ two half hitches
 - ▶ bowline
 - ▶ clove hitch
 - ▶ figure-of-eight
5. What knot is good when the standing part of the rope is pulled straight out from a pole or post?
 - ▶ bowline
 - ▶ clove hitch
 - ▶ taut line hitch
 - ▶ two half hitches
6. What knot is good for tying a boat to a dock?



- bowline
 - clove hitch
 - timber hitch
 - two half hitches
7. What knot would you use when you want to use a rope to drag a log?
- clove hitch
 - square knot
 - bowline
 - timber hitch
8. What knot would be good for tying packages and bandages?
- clove hitch
 - taut line hitch
 - square knot
 - bowline
9. What would you use to shorten a rope?
- figure-of-eight
 - taut line hitch
 - timber hitch
 - sheepshank
10. What would you use to tie together two ropes especially if they are of different thicknesses?
- square knot
 - sheet bend
 - bowline
 - timber hitch
11. What knot can be used instead of lashing?
- bowline
 - timber hitch
 - jam knot
 - square knot



2. Construct a knot display board which includes the name and use for at least eight knots.

Wardens will make a simple display using a firm backing and two colours of rope. You may see a knot display board inside a fish restaurant. They are large, about one by two metres, on a nice piece of finished wood, varnished, and with a variety of knots made with thick white nylon cord. The Wardens do the same sort of display, however, it is costly. Wardens can make a nice display on coloured matte board used by picture framers. Their knot display does not have to be large, somewhere around 40 cm X 50 cm.

Refer to Appendix II -

Knots, Lashes and Splices for pictures and instructions on the various knots Wardens can choose from.

Materials Required

- two colours of the same kind of rope
- white glue (dries clear)
- markers, labels
- plywood, thick matte board (comes in a variety of colours)
- reference materials
- adhesive hooks for hanging

Procedure

1. Encourage the Wardens to make their display board as professional looking as possible. Be tidy, neat and make it so that you will be proud of it in five years. Remind them that they will also use it when they need to brush up on their knots. They can hang the display board in their room.
2. Have Wardens decide on the knots they will each have on their own display boards.
3. One Warden may do the labels on a computer in various fonts and sizes.
4. Have Wardens prepare a shopping list. Wardens may decide to purchase one matte board and divide it up amongst themselves. For example, a matte board can be purchased 32" X 40" (approximately 80 cm X 100 cm) for about \$20.00. Four Wardens agreeing on the same colour of matte board can cut the matte board into four pieces, each measuring 40 X 50 cm for their display boards.



5. Choose an appropriate rope that is thick enough to show the twists and turns in the knots. Use two different colors so Wardens are able to determine the method of tying the knot.
6. Cut the knot leaving two to three cm of ends. Have wardens apply heat or glue to the ends of the rope to prevent fraying. The ends of the ropes may also be whipped or wound neatly with tape.
7. Before gluing the knot onto the display board, have Wardens draft where each knot will go so there is even spacing between the knots and labels. A book or some pressure may be applied so the knot lies flat and adheres properly to the board. Glue on a label identifying each knot or make a legend and glue it on the back.
8. Make a border around the edge. Braid rope or use a thick rope to frame the knots. Glue to the board.
9. Centre the adhesive hook on the back of the matte board so Wardens are able to proudly hang their knot display at home.

3. Make cordage out of natural materials.

Background

Vines, grasses, rushes, barks and animal hairs can be used to make rope or cordage. Cordage is a generic term for all cords, lines or ropes. The stems of stinging nettle make a first class cord. The stronger the fibre, the stronger the rope. Some stiff fibres can be made flexible by soaking, steaming or warming.

Sources of Fibres

○ Stinging Nettle (*Urtica dioica*)

This is an excellent fibre but it requires a lot of preparation. Choose the oldest plants and ones with the longest stems. They can grow up to 2 metres (7 feet) high. Soak them for 24 hours, lay them on the ground and pound them with a smooth stone. The pounding sheds the outer surface exposing the fibrous centre. Tease and comb to remove the fleshy matter called pith. Hang to dry. When dry, remove and discard the outer layer. Work the fibres into long threads, plaiting and twisting together to make a strong rope. Wear gloves when working with stinging nettle!



○ Bark

Willow bark produces a good fibre. The new growth from young trees is best. The dead inner bark of fallen branches can be used. It is best for strength if it looks like it has decayed too much.

○ Roots

The surface roots of many trees make good lashings. They run under, or even on the surface. They are often pliable and strong. The roots of the spruce are very good.

○ Rushes, Sedges, Grasses

Use when still green and the longest stems.

Testing Fibres

Tie two lengths together using an overhand knot. Using a reasonable amount of strength, try pulling them apart. If it snaps, the fibres are too brittle. If it is too smooth, it will slip apart. A good fibre will "bite" and hold together.

Plaiting Rope

This is an easy method for making rope. It is best for inexperienced. Make three equal lengths of fibre, which can be plaited together to make a thicker, stronger rope. When lengthening the strands in the plait, stagger the places which feed in the new fibres. Take a bundle of fibres, tie the ends together and anchor it firmly. Split it into three separate strands and braid (bring the left strand into the centre and then the right into the centre and so on.) Keep twisting the strands and keep plaiting as tight and even as possible.

Stinging Nettle





Spinning a Rope

Twist fibres together clockwise (more importantly, always in the same direction). Feed in lengths of new fibres as you go so that their ends are staggered.

When there are three lengths of fibres, anchor all three at one end and continue to twist each of them until quite tight. Draw all three strands together and twist all 3 counter-clockwise, the opposite direction.

Continue to add and twist until you have produced the amount of rope required. Secure a completed section to keep it tight as twisting continues. Wrap the rope around a tree trunk to keep the working length short.

A thicker rope can be made by repeating the process with three ropes that were just made. Or plait three simple ropes together.

Supporting Reference

Northern Bush Craft. Mors L. Kochanski. Lone Pine Publishing. Edmonton, Alberta. 1987. 287 pages and a color photo supplement.

Mors has a whole chapter in his book entitled, Bindcraft, Chapter 5, pages 145 to 156. He covers cordage techniques, different cordage materials and their uses, and the binding tie.



IX SURVIVAL●

Making and learning how and when to use a survival kit is taught through the aid of survival situations.

<i>date completed</i>	✓		
_____	☐	Describe factors affecting survival	page 137
_____	☐	Describe the priorities of survival	page 139
_____	☐	Practice a pattern for staying alive for one full day. Demonstrate proficiency in the use of map and compass, shelter, fire, selection of food sources, natural navigation aids, emergency first aid, signals, and dealing with boredom.	page 141

IX. Survival

1. Describe factors affecting survival.

Background

Mors Kochanski says that the less you know about the wilderness, the more you may have to bring on an outing. The difficulties you may expect in a survival situation are cold, pain, hunger, thirst, insects and loneliness. Forethought and experience may allow you to accept the realities and prepare you for the inevitable psychological reaction. How strong is your will to live?

Pain, cold, thirst, hunger, fatigue, boredom and loneliness, every one has experienced these, but few have known them to the extent that they have threatened survival. In the survival situation, the feelings of pain, cold, etc. are no different from those experienced elsewhere, however they are more severe and more dangerous. As with anything, the more you know about them and their effects on you, the better you will be able to control them, rather than letting them control you.

Factors affecting Survival

1. Fear

Should you become lost or confused, your immediate problem is fear. Fear is a normal response for anyone faced with an emergency. Fear influences your behaviour and your chances for survival. There is no advantage in trying to avoid fear by denying the existence of danger. It is important to realize that your fear should be accepted as a perfectly normal reaction rather than a shameful one. How you react to fear depends more on yourself than on the situation.

2. Pain

Pain is nature's way of making you pay attention to something that is wrong with you. But nature also has ways of holding off pain if you are too busy doing something else to pay attention to the injury at that moment. Pain may go unnoticed if your mind is occupied with plans for survival. On the other hand, once given in to, pain will weaken the drive to survive. Pain can get the best of you if you let it, even if it isn't serious or prolonged. A special effort must be made to keep hopes up and to keep working.



3. Cold

Cold is a much greater threat to survival than it sounds. It not only lowers your ability to think, is also tends to lower your will to do anything but get warm again. Cold is an insidious enemy. At the same time that it numbs the mind and body, it numbs the will. When it is hard to move and you want to sleep, do not forget your goal...to survive.

4. Thirst

Thirst is another factor in survival. Even when thirst is not extreme, it can dull your mind. As with pain and cold, thirst can be almost forgotten if the will to survive is strong enough. It is also important to remember not to deprive oneself unnecessarily of water. Serious dehydration may occur in a survival situation even when there is plenty of water.

5. Hunger

Hunger is dangerous because of the effects it can have on the mind, primarily in lessening the person's ability for rational thought. Both thirst and hunger increase a person's susceptibility to the weakening effects of cold, pain and fear.

6. Fatigue

Even a very moderate amount of fatigue can substantially reduce mental ability. Fatigue can make you careless. It becomes increasingly easy to adopt the feeling of just not caring. This is one of the biggest dangers in survival. The misguided notion that fatigue and energy expenditure are directly related may be responsible for many deaths in survival situations. Certainly, there is a real danger of over-exertion, fatigue, frustration, or boredom. Fatigue may represent an escape from a situation which has become too difficult. If you recognize the dangers of a situation, you can often summon the strength to go on.

7. Boredom and Loneliness

Boredom and loneliness are two of the toughest enemies of survival. They are bad mainly because they are unexpected. When nothing happens, when something is expected and doesn't come off, when you must stay still, quiet and alone, these feelings creep up on you.



2. Describe the priorities of survival.

Background

A pure survival situation is one where there is an immediate or long term threat to life, where the only feasible plan of action is to stay alive as long as possible, with the hope of being rescued.

The essence of survival is to be able to sleep comfortably when you need to and drink enough water to maintain the bodily functions at an optimum level. Outside of life threatening injury, an immediate concern is maintaining a comfortable body temperature. In cold conditions this is accomplished by dressing adequately, knowing how to preserve or maintain the insulative integrity of your clothing and supplementing any inadequacy with fire and shelter.

Priorities of Survival

1. Accept that you are in trouble.

The bush is neutral. It is neither for nor against you. The bush is not out to help or harm you. Your greatest success depends on a calm and collected attitude backed up with the resolve to do the best you can under the circumstances. It is mentally and physically exhausting when one strikes out at inanimate objects. Things become more difficult if you are unable to develop a positive attitude. Review your emergency plan.

2. Apply first aid.

If anyone is injured, apply first aid right away.

3. Build a fire.

A Warden should be able to build a fire under any circumstances. In the cold it makes sense to light a fire immediately to keep warm, rather than building one later to thaw one's self out. Once a fire is established, the next concern is collecting an adequate stock pile of fuel to last until the next day. If it is not raining or snowing there may not be any immediate need for a shelter. It may be enough to sleep between the fire and fuel supply.

4. Build a shelter.

Weather conditions may require the construction of a shelter to provide an improved micro-environment wherein one may comfortably work, rest and sleep. The most



universally useful shelter is the open lean-to with a fire in front of it. It must block any movement of air on the three sides away from the fire, and it must be close enough to absorb at least some of the radiant energy from the fire to create a warmed micro-environment.

5. Find water.

Dehydration is a life-threatening condition. Thirst is a poor indicator of bodily needs, and one should use additional means to ensure an adequate intake. Drink enough to pass at least one litre a day. The urine should be virtually colourless. Drinking will avert headaches, strong hunger pangs and fatigue.

6. Keep yourself warm.

If you cannot touch your little finger to your thumb on the same hand, you should immediately build a fire and seek shelter.

7. Set up signals.

Wardens should know how to signal with a mirror, how to build signal fires and the standard ground to air signals. The standard signals are:

- ▶ the big "X" means "I am not able to proceed."
- ▶ 3 shots, 3 honks or 3 blasts on a whistle means help
- ▶ two of anything means "Please respond."

8. Conserve Energy

Do not rush things. Do tasks properly the first time so that you do not have to find the energy to do them right the second time. Rest often. If you are lost, stay put and conserve energy. Take time to allow your body and mind adjust to your current predicament. Choose to live by the Rule of Four's:

- ▶ If you have no water, by knowing how to apply conservative measures you should live longer by four days.
- ▶ If you have no fire but you are adequately dressed for temperatures below -40° C you should be able to survive at least four days.
- ▶ Without adequate protection you can reach an irreversible state of hypothermia in less than four hours.
- ▶ If you have no food, you should get by at least 40 days (in summer) with no permanent damage to your health.
- ▶ Allow yourself and your rescuers at least four days before you embark on any significant decision such as walking out.
- ▶ Think over anything you plan to do at least four times from four different angles if possible.



3. Practice a pattern for staying alive for one full day. Demonstrate proficiency in the use of map and compass, shelter, fire, selection of food sources, natural navigation aids, emergency first aid, signals, and dealing with boredom.

Wild Edibles

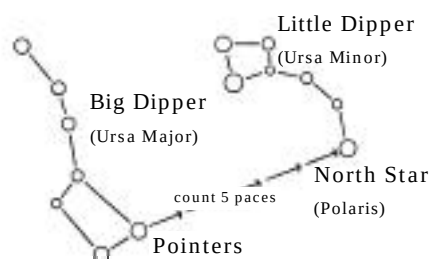
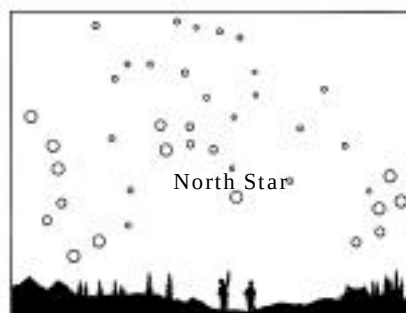
See Appendix III - Wild Edibles

Natural Navigation Aids

The North Star Will Help You Find Your Way

Identifying the North Star, also known as Stella Polaris or just Polaris, is a good way to figure out which way is north. Its bearing will never be more than two degrees from true north (unless you are in the Arctic.)

One way to find Polaris is to locate the big Dipper. The Big Dipper has seven stars in the northern part of the sky. Trace an imaginary line between the two stars that form its front lip and extend this line five times its own length to Polaris! Polaris is the top star on the handle of the Little Dipper which is pouring into the Big Dipper.





Sun or Moon

Insert a short stick in the ground and mark where the tip of its shadow falls. One hour later, mark again. The line between these marks is roughly east-west. The stick will be on the south side of the line.

Old-fashion Watch

Insert a twig into level ground. Place the watch with the hour hand pointing toward the twig, aligned with its shadow. If the watch is set to standard time, halfway between hour hand and 12 o'clock is south.

Improvised Compass

A piece of ferrous metal wire, a sewing needle is ideal, stroked repeatedly in one direction against silk will become magnetized and can be suspended so that it points north. The magnetism will not be strong and will need regular topping up. Suspend the needle in a loop of thread so that it does not affect the balance. Any kinks in or twisting of the thread must be avoided.

Stroking with a magnet, should you have one, will be much more efficient than using silk. Stroke the metal smoothly from one end to the other in one direction only.

Plant Pointers

Plants can help you find north and south. They tend to grow towards the sun so their flowers and most abundant growth will be south in the Northern Hemisphere.

On tree trunks moss will tend to be greener and more profuse on the south side. The north side will be yellowish to brown. Trees with a grainy bark will also display a tighter grain on the south side of the tree.

Wind Direction

If the wind direction of the prevailing wind is known it can be used for maintaining direction. There are consistent patterns throughout the world but they are not always the same the whole year round.

Birds and spiders will usually build their nests and webs in the lee side of cover.



Signals

All major distress signals are in units of three: three gun blasts, three whistle blasts, three car honks, three smoke puffs, three blazes on a tree and so on. Two of anything means please respond. Signals are transmitted in four ways: sight, sound, light and radio transmission.

1. **Sight** - Where a message is seen, for example, use blazes, hand signals, ground signals, smoky signal fires.
2. **Sound** - Using the voice, whistles, gun, or horn.
3. **Light** - Use flares, lights, mirrors or fires.
4. **Radio transmission** - Use an amateur radio transmission, citizen band or GPS (Global Positioning System.)

Signal Fires

A signal fire may be the only means of attracting attention in some circumstances. A good signal fire should fulfill the following requirements:

- it should produce a large volume of intense smoke
- the smoke should reach the tree tops within three minutes even in wind
- the fire should be easy to light.

There are various types of signal fires. Some are simple, quickly built and burn for a relatively short period of time. At the other extreme, a signal fire may take considerable effort to build and the end result may be quite spectacular.



Site of Signal Fire

Pick terrain that is apt to be checked first by searchers, such as edges of lakes or rivers. Clearings are better than thick stands of trees. Avoid any monotonous type of setting. Other ideal requirements of a site are:

- The signal fire should be close to camp so that it can be lit at a moments notice.
- The site should provide an abundance of boughs for the signal fire.
- The signal fire should be built near water. If the fire hazard is high, build the fire on sandy or rocky ground.
- Build the signal fire downwind and at least 50 metres away from your gear. Sleeping bags, clothing (especially nylon) and other equipment could be damaged by the burning needles that the signal fire will produce.

25-30 cm circumference of twigs



Twig length



Bend ends towards centre of bundle



Twig bundle



Simple Signal Fire

The simple signal fire requires no tools and takes only minutes to build. This type of signal may be held in a reserve while the proper signal fire is being built. Also. If one is travelling or is expected to be caught away from camp, it may be worthwhile to carry the bundle of twigs so as to be able to make the signal fire where ever you are.

Kindling

Gather a large bundle about the size of a hug of fine, dry twigs, preferably, but not necessarily, spruce. The branches used should range from elbow-to-finger tip to armpit-to-finger tip in length. Have all the but ends at one end of the bundle. When compressed the bundle should be at least 25 cm in circumference. Bind the bundle with spruce roots, grass cord or willow withes. The fine ends of the bundle are folded inward into to concentrate the dispersed tips so that they will ignite more readily when a flame is applied.

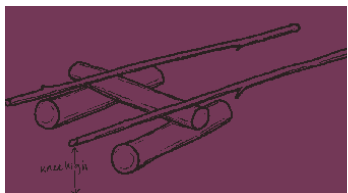


The Simple Signal Fire

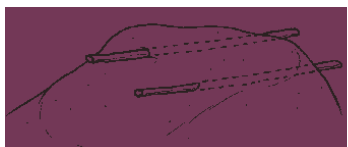


The Standard Signal Fire

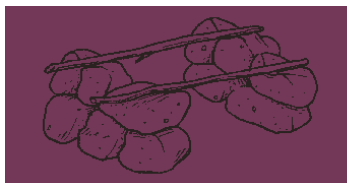
The standard signal fire produces a maximum of effect with a minimum of effort. If necessary this signal can be built without an axe or knife, because spruce boughs are easily broken off with the hands.



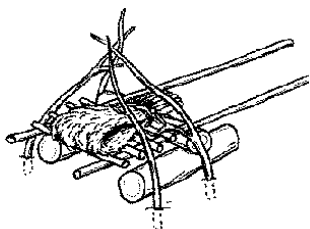
Common Support



Method of Making Fuel Support
in Winter



Using Rocks and Poles to Make
the Fuel Support



The Framework to be used with
bundles or feather sticks

Building the Signal Fire

Lay down the bundle, fine ends to the wind. Pile a few sticks, thumb-to-broom handle thick in a teepee fashion over the bundle. Cover this with 10-15cm of spruce boughs, or leafy green branches, teepee fashion, with the butt ends down. If boughs are not available use moss or grass or the organic material on the forest floor. The fine ends of the bundle should be uncovered, or left uncovered, to provide easy access for lighting the signal fire.

The Standard Signal Fire Fuel Support

Select two dry or green poles that are approximately 5 cm in diameter in their thin ends. Set up the poles about 25 to 30 cm apart and roughly parallel to the ground at knee height. The poles should extend beyond their supports the length of the finger tip to the elbow. This can be done in a number of different ways. This fuel support arrangement provides an easy access for lighting the kindling and allows for an unrestricted oxygen supply.

Kindling and Fuel

The kindling can be a bundle of twigs as is used in the simple signal fire. If this type of kindling is used, a grate is made by laying four or five sticks of thumb thickness across the pole ends. This keeps the bundle from falling through as it burns. If a knife and axe are available, the bundle can be replaced with 15 to 20 feather sticks. The feather sticks can be stacked in log cabin fashion with the feathers to the inside. To help sustain the fire, thumb stick fuel is loosely stacked behind the feather sticks or bundle.

The Framework

To support the boughs over the feather sticks and to keep the signal fire from falling over as it burns, a framework is made with four larger boughs that are stood up teepee fashion with the stems pressed into the ground. If larger boughs are not available, saplings or any straight poles can be used. Bend or snap any tips of the boughs projecting out of place so that they will lie down.

The Cover

The bough cover is now placed onto the framework. The boughs are placed stem upward with the underside of the bough to the outside as in shelter building. This protects the fire from rain. About 75 boughs are required. The front of the cover generally does not extend below the kindling and the fuel. The cover should be about 15 to 20 cm thick with a cap to help keep the kindling and fuel dry in case of rain.



Tactics

If time and energy permits, a number of signal fires may be built and kept in reserve. If the first signal is missed, another aircraft may pass overhead before you have built a new signal fire. On clear days you can light a signal fire in the mid-afternoon, to attract a fire tower or forestry personnel. If no one is aware of your plight, you may have to light three signal fires in a triangular pattern or mark an "X" which means "I am not able to proceed." near your signal fire or camp, otherwise your signal fire can be mistaken for a large campfire.



From **Woodstravel Guide** by Mors Kochanski

Using a Mirror

Use the sun and a reflector to flash light signals. Any shiny object will work. Polish a lid from a tin can, use glasses, or a piece of aluminum foil, a mirror is best. Long flashes can mean dashes and short flashes mean dots in Morse code, SOS, — — — • • • — — —. Random flashes will also work. A flash can be seen from a great distance. Even if there is no specific contact to aim at, the flash may attract someone's attention. It's worth sweeping the horizon during the day. If a plane approaches closely, make intermittent flashes and when you are certain that you have been seen stop signalling, you may be dazzling the pilot with flashes.

Using a Heliograph

A heliograph is a double-sided reflector with a hole through it. Sight the plane (or what you want to contact, a ship or person) through the hole in the heliograph in the general direction of the sun so that the sun will shine through the hole. You will see a spot of light or it will be on your face. Angle the mirror such that the dot of light on your face disappear back through the hole in the mirror while still sighting your contact.

If the sun is at an angle where this maneuver does not work, bring the mirror close to your eyes and line up you hand between the contact and you. Angle the mirror so you flash your hand and then move the hand away.



Note:

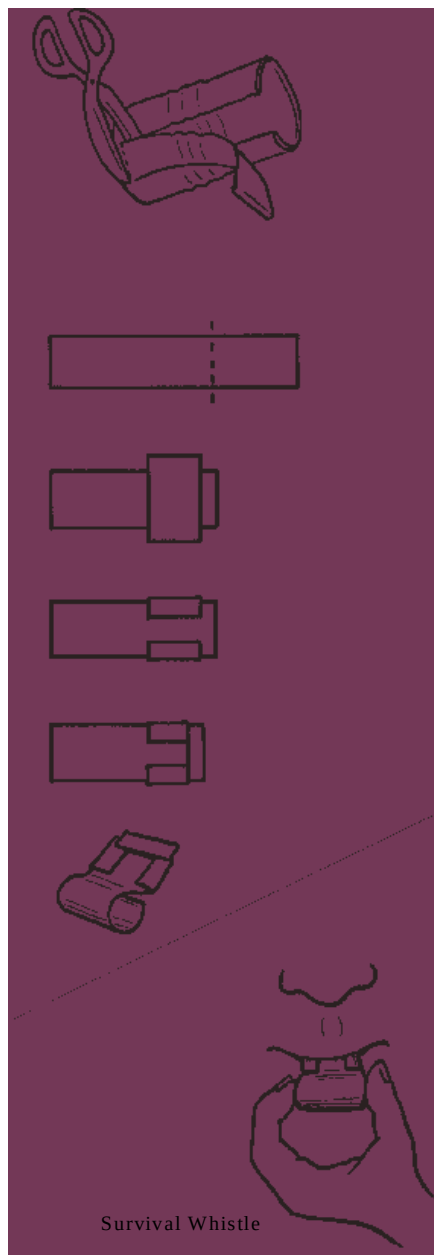
Do not practice this signal at an actual aircraft unless you are in trouble.

Make a Survival Whistle

1. Cut a 2 cm wide strip from an aluminum or tin can about 9 cm long.
2. Flatten the strip and cut it into 2 pieces: 3 cm long and 6 cm long.
3. Form a cross with the strips with 0.5 cm extended over the top. Be careful of the sharp edges.
4. Fold the ends of the shorter strip to the back. Not too tightly, there needs to be a space to whistle through. Fold the top 0.5 cm part over to the back.
5. Use a twig or your finger and curl the long end around the circumference. Now you have a curled end that does not quite meet the folded section.
6. Place your thumb and index finger at each open side of the curl to form the barrel of the whistle. Place the folded part in your mouth and blow over the curls opening.

Dealing With Boredom - Use your imagination and improvise.

- Dismiss worry and focus your energy on the things that count: a good fire, a good shelter, a good bed and lots of drinking water.
- Keep your mind busy and plan for survival. Recognizing the signs of fear and panic will help you overcome their devastating effect. Develop a plan for the next few days. This will raise your morale.
- Make sure that your doorway faces east towards the rising sun. Get up as soon as it is light and get busy.
- Improvise to improve the situation. This will give you more control and raise your morale.
- Remember your goal is to get out alive. Raising your morale by dreaming of the time after you get out alive. This will help you value your life now.
- Conserve your health and strength. Illness or injury will greatly reduce your chance of survival.
- Hunger, cold and fatigue lower your efficiency and stamina and will make you careless. You will realize that your low spirits are the result of your physical condition and not danger.
- Improvising to survive may include eating insects and other unusual foods.



Survival Whistle





X

SEARCH AND RESCUE●

From searching for a lost article to participating in a search and rescue simulation, wardens learn an invaluable skill.

<i>date completed</i>			
		Conduct a mock preliminary search for a person lost at camp.	page 153
		Conduct a mock secondary search using the containment and confinement methods.	page 159

X. Search and Rescue

The following search and rescue information is used with permission from Skip Stoffel at the Emergency Response Institute, Inc., in Olympia, Washington with the following advisory.

Attention JFW Leaders Teaching Search and Rescue (SAR)

Please be aware that the knowledge and skill level of Junior Forest Wardens in SAR is limited. Becoming aware and learning some SAR techniques should by no means give them the skills to conduct an actual SAR, it may in fact, give them false confidence that SAR is within their abilities. This information is included to provide insight into the scope of knowledge and skills required for effective SAR as well as provide some real incentive for Wardens to always take precautions to stay found.

1. **Conduct a mock preliminary search for a lost person at camp.**

Background

When you make camp, have Wardens look around and make careful mental notes (or write them down) of their home base. Search for landmarks to identify your location. This habitual precaution will make Wardens more aware of their surroundings and better equipped to stay found..

Awareness of search procedures may show Wardens how important it is to register a route plans.

If Someone Gets Lost

Before embarking on a trip, review the following procedures should any of the Wardens get lost.

- Don't Panic. Stay calm. Attitude is the most important factor in reducing the accident potential.
- Stay where you are. Sooner or later someone in the group will realize that you are missing and they will begin search procedures.
- Look and listen for signals from rescuers and be prepared to make your signal. Remember, three of anything (whistles, shouts, flashes from a flashlight) means help.
- If you have to move because of lightning, rockfalls or avalanche, don't go very far. Leave a note indicating where you went.
- Take stock of your resources such as water, food and equipment.



- Conserve your body heat and energy. Be careful of hypothermia. Put on all your layers of clothes before you begin to get cold.
- When it gets dark, sit down and rest. Build a safe fire which will keep you warm and also be a signal for rescuers.

Precautions

Taking precautions before and during the trip will cut down on the chances of anyone getting lost. Have a group discussion before departing.

1. Be prepared for the possibility of losing a member of the group. Make a list of the equipment required to conduct a search.
2. Survey the trip area carefully. Make group members familiar with its features.
3. Keep a log of the groups activity. Record information on destination, estimated time of arrival, weather patterns and so on.
4. Consult local authorities to determine if there are restrictions in the area you are visiting. For example, river fluctuations due to dam flooding. Advise authorities of your intentions, trip route and length.
5. Allow a margin of safety in calculating traveling time. Consider all the abilities of group members. The slowest members set the group's pace.
6. Take the roll call or a head count frequently. No one should wander from the group.
7. Check all equipment before departing. Advise the group of the possibility of getting lost and your precautions to prevent this happening.

Develop a Search and Rescue Plan

When developing a Search and Rescue Plan, calculate a time-frame for survival. Below are some variables to carefully think about before implementing a search:

- Think about the known behaviour of the lost victim.
- Determine the person's physical condition at the time reported lost.
- Assess the victim's experience and knowledge of the surroundings.



- Consider a possible weather pattern, the difficulty of the terrain, the remaining hours of daylight.

Consider Before Starting

Name - A lost person may be nervous and emotionally upset and may avoid the approach of a rescuer. Call the person's name, it's essential for overcoming the mental block.

Age - Young children stand up to the trials of being lost surprisingly well. Their abilities are generally underestimated by adults, such as the distance they can cover before tiring.

Gender - The difference between females and males makes little difference compared to other more important factors. Generally, females will stand the rigors of being lost better than males.

Physical Fitness - This certainly influences a search, sometimes to the disadvantage of the searchers since the fit person can cover more ground than one who tires quickly. The fit victim, however, has a better chance at survival.

Equipment - Psychologically, an experienced woodsperson will more easily and successfully cope with the difficulties of being lost. She or he will be less gripped by fear of the unknown and be familiar with the technicalities of survival.

Physical Handicap - Any physical handicap will mitigate against the survival of a lost person and may make the search task more difficult.

Terrain - Both searcher and victim will be impeded by rough terrain and thick heavy ground cover. Sounds, sights and movements are reduced and any signs of the victims' travel are almost eliminated.

Training - If any one factor can be said to be the most important, it is probably training. A victim knowing what to do and how to do it will have the best chance of sustaining life, finding the way back or being found.

Carefully search the proposed search area. Where possible, use maps. If there are no maps, identify prominent land features and use them as points of reference in the search. Clearly identify your present location, the proposed search route, the final reconnaissance location and the expected time of arrival. To determine the search area, establish known boundaries, indicate recognizable landmarks identified by searchers, point out the natural barriers that could inhibit the victim's movements, for example, a mountain, a river, a cliff.



Effective communication throughout the search is extremely important. Record all search activity. Throughout the search, establish reconnaissance points and the estimated time of arrival at each. Use a map and watch for orientation throughout the search. Consider the various means of communication and determine which is best suited to your needs. Radio communication is the most effective means but other alternatives such as whistles, flares and shouting can be just as good.

Whistles	Meaning
One whistle blast	I'm OK and proceeding
Two whistle blasts	I'm moving to your position, wait for me.
Three whistle blasts	Help!
Coloured Flares	Meaning
White flare	I'm OK and proceeding.
Green flare	I'm moving to your position, wait for me.
Red flare	Help!

Search Procedures

Assign someone to be the search leader. The search leader defines search boundaries and sends search members to block-off possible exits or trail-crossings within the search area. This inhibits the victim's movements. Additional searchers should proceed from these exits towards the established reconnaissance point.

While proceeding to reconnaissance point, talking should be kept to a minimum and searchers should stop periodically and call out to the victim using the person's name. The searchers should stop and listen for a possible reply from the victim. Start the search from the last known or assumed location of the victim.

Investigate all visible tracks and follow any noticeable deviations from the normal trails. Investigate natural or hand made shelters (fallen trees, hollow logs, culverts, old cabins, etc.) The victim could be looking for some sort of shelter. Look for clues, for example, candy wrappers, cigarette butts, clothing, etc. and mark the location of clues found using toilet paper, crepe paper, or brightly coloured flagging tape. Plastic markers, however, if left, do not disintegrate if left.



Where possible, use a vehicle to patrol any adjacent roads or trails within the search area. Use a car or ski-do for patrolling. This procedure serves two purposes: the noise could attract a lost person's attention and give them some sense of direction and in case of darkness, the vehicle's lights may be sighted from some distance by the victim. Often a road patrol may pick-up a victim who has wandered out to the road.

On arrival at your final reconnaissance point await reports from all members of the search. Should this initial search prove unsuccessful, formulate plans for a "sweep search" which is a more intricate means of searching and should be coordinated under the direction of a professional search team.

Night Searches

Contrary to popular belief, night-searching usually has a higher rate of success than day-time searching and is based on the following theory:

- Victims are generally immobile at night, therefore, possible contact is easier.
- Moisture content in the air at night allows noise to carry further and also preserves footprints and tracks.
- Generally, a night-time temperature drop and the result usually hardens the snowpack and therefore, permits easier travel on snow.
- In darkness, signaling by any form of light will be viewed from a greater distance than signaling in the daytime.
- Your field of vision using a flashlight carried as a low angle to the ground will minimize the immediate search area and should enhance the discovery of tracks and clues such as cigarette butts or candy wrappers.

While these procedures are intended to advise you on initiating a basic search, precautions taken before and during an outing can prevent the need for these measures.



A c t i v i t y I d e a s

- In a camp setting, have a member of the group get lost. (Choose a person who is confident with their skills as well as good with map and compass. Have them plot a course where they will be. The Warden should take back bearing so he/she knows where the camp is.) Have the group establish a Search and Rescue Plan. Advise them of the procedure as they go through the process of developing the plan.



Conducting a Preliminary Search

When you are together as a group it is important to keep track of everyone. When you discover that someone is missing, take the following steps to conduct a preliminary search:

1. Gather Information

Establish when the person was last seen, direction headed, and was anything said about where she/he was going. Compare the last time the person was seen to give you an idea of how far the person could have travelled. Estimate the hiking speed of the person and determine how far the person could have walked.

The point at which the person was last seen and the distance the person could have walked to this time (calculated with rate of walking speed) will be the radius of the circle that will be searched.

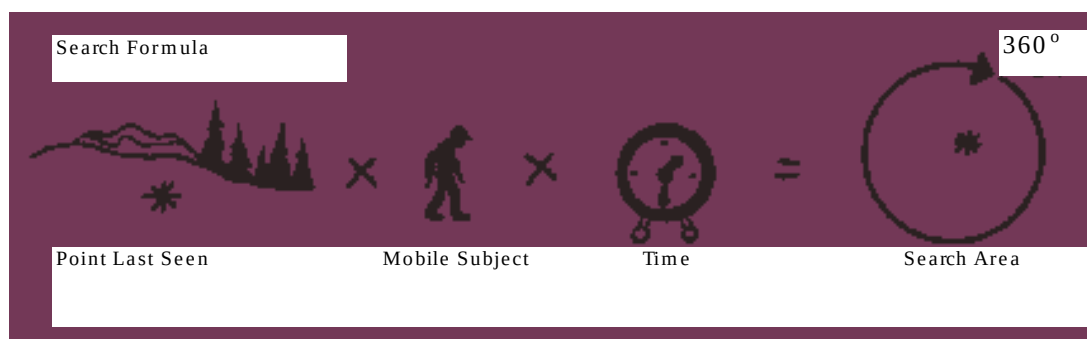
2. Make a Quick Check of the Areas Last Seen

Make a quick visual check in the vicinity of where the person was last seen. Shout the person's name and look around. Make a quick check inside tents if at a base camp.

3. Make a Hasty Search

When you have no response from shouting, group members may pair up and perform an organized hasty search. A hasty search is a sweep of the area, nearby trails, lookout points, nearby streams or lakes and other obvious places where the person may have gone. Search for 20 to 30 minutes.

Take the time to plan where the searchers should go on the hasty search before sending all the pairs out.





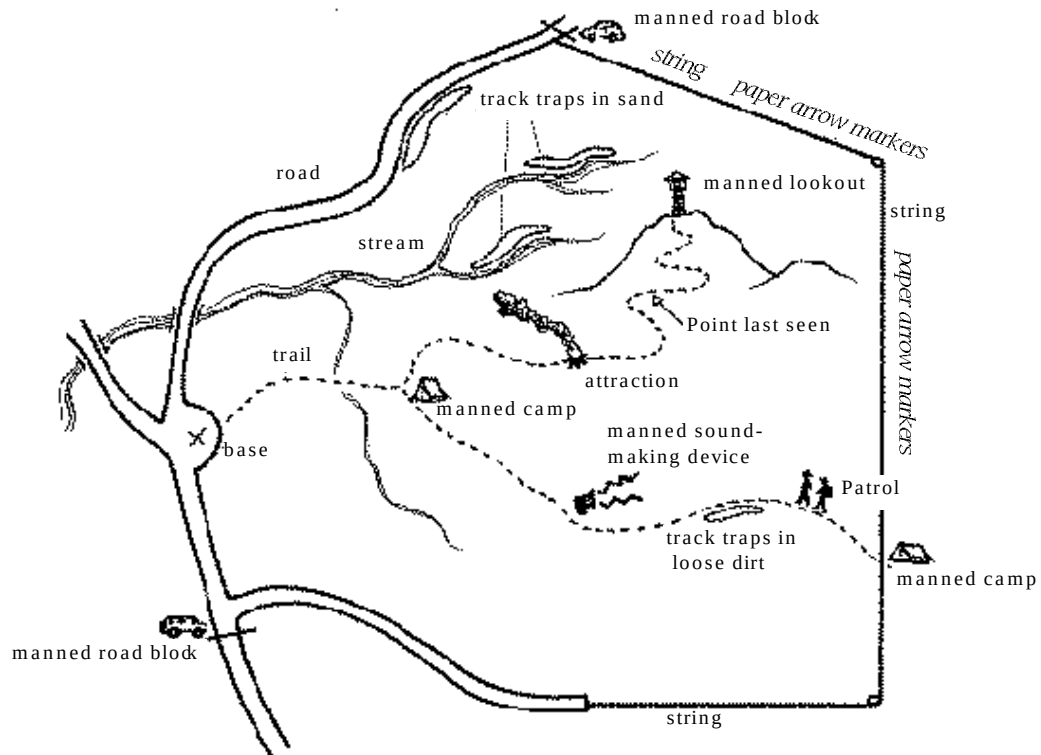
2. Conduct a secondary search using the containment and confinement method.

Background

Confinement allows you to limit the size of the search area. The smaller the area that must be searched, the less time will be required to effectively cover it. It is imperative that an effort be made to establish a search area with specific boundaries beyond which the missing person has not passed.

Confinement

The purpose of confinement is to limit the search area should a clue search fail. A healthy and disoriented victim can keep moving for several days. If no attempt is made to confine his movements, the victim can wander for miles from the last known position. Confinement techniques may not stop the victim, but will detect if and when the person leaves the search area.





Confinement Techniques

○ Blocks (road block, trail block, camp-in)

A search team places itself at a major trail junction, mouth of a canyon, access road or any possible exit from the search area. This will secure any possibility of the victim wandering the wrong way on a trail or hitchhiking home. One person from the team should be alert at all times and never make the assumption that the victim will stop just because he/she sees your camp. That may convince the lost person that the car is just around the next bend. In wilderness areas, trail blocks and camp-ins will preserve perimeter boundaries. A camp-in is setting up camp along a trail or open area.

○ Lookouts

The search team positions itself on anything that will provide a view of most of the search area. If the team has radios, it will report to base which routes it has under surveillance and any gaps in the coverage.

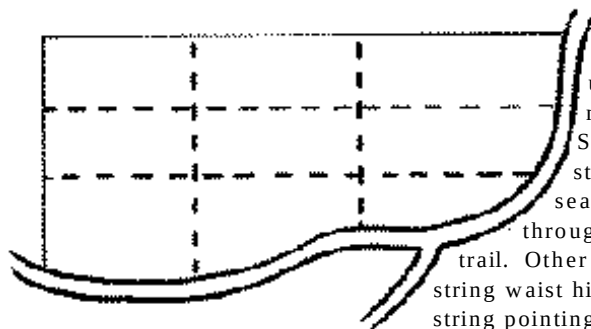
○ Track Traps

A track trap is a band of ground that will easily show tracks. Examples of natural track traps are steep banks of loose dirt, shoulders of dirt roads, broad shallow streams and snow banks. If there are no natural features, you can make a track trap by clearing an area of debris and digging up the surface. The team regularly patrolling the exit routes will be able to tell if the victim has crossed one of the track traps.

○ Patrols

Teams in vehicles can patrol the roads in and around the search area. They can also check track traps.

○ String Lines



Where dense brush or timber prohibit the effective use of tracking, string lines are used to create a barrier. This ingenious method was developed by the Explorer Search and Rescue Organization. Spools of string are mounted in a backpack. As the search team member carrying the pack walks through an area, the string unrolls leaving a visible trail. Other search members follow along and tie the string waist high on brush and place paper arrows on the string pointing toward a road or base camp. It is assumed that the victim will follow the arrows or the string.



○ Attraction

Attractions help the victims help themselves to safety. The string line is a form of attraction. Leave a note on the person's car telling them that they are the subject of a search and ask them to check into base camp. Notes can also be placed at trail registers and at shelters. Blocking teams can also keep a campfire going all night to attract the victim.

Line Search

Line search or gridding is used when there is no other alternative. The objective of a line search is to locate the victim or clues when other methods have failed. A line search consists of four to 10 searchers. They line and walk abreast through the area to be searched. The spacing between the searchers depends on the terrain and vegetation and on the level of thoroughness desired.

Three spacings are used:

1. **Voice** - searchers maintain voice contact but may not be able to see each other. This is similar to a hasty sweep.
2. **Visual** - Searchers maintain visual contact. This is usually the best compromise between quick coverage and search thoroughness.
3. **Eyeball** - Searchers walk shoulder to shoulder, perhaps crawling on hands and knees. This is a fine-tooth sweep.

All members of a line search should walk at a moderate pace so no one gets ahead or falls behind. Otherwise, gaps develop in the line. The team leader will shout "guide right" or "guide left". "guide right" means the teams members adjust their pace and direction to maintain the proper spacing with the person to their right. If the person to your right speeds up, slows down or veers to the left or right then you must too.

The spacing maintained is average spacing. Rove in your assigned corridor and look closely at bushy areas, logs, piles of rocks and so on. Remember, no one in the search will catch the things you miss. Look around and behind you often. Viewing things from several angles doubles your chances of finding something. Be alert for tracks and other clues.

The search line follows a natural boundary on one end such as a road, a stream, a ridge or a previously marked boundary. At the other end, streamers are tied so they are visible from one to the next. The streamers are marked and tagged with the following information: date, spacing used, team number, and grid number if any.



Search lines should be short with four to six people. Longer lines waste time getting organized and in regrouping. Experimental data and mathematical analysis suggest that multiple sweeps of an area at wide spacing is preferable to a single sweep with tight spacing. Multiple sweeps with wide spacing achieve a greater probability of detection (POD) with much less effort. The probability of early success is higher too. So the best strategy is hasty search that covers lots of area very quickly, then cover it again.



A c t i v i t y I d e a s

- In a camp situation, practice developing confinement methods using a topographical map of the actual area. Discuss the methods that would be effective in that area.



XI

OUTDOOR EQUIPMENT●

Learning the proper use of camping equipment contributes to a safe campout.

- _____ ☒ Demonstrate how to light a camp stove. page 165
- _____ ☐ Demonstrate how to make a candle lamp or light a lantern. page 168
- _____ ☐ On a campout, describe the advantages and disadvantages of using stoves and fires. page 170
- _____ ☐ Describe how to select two of the following: daypack, backpack, sleeping bag, tent and canoe paddle. page 173

XI. Outdoor Equipment

1. Demonstrate how to light a camp stove.

Background

There are two basic types of backpacking stoves, those that use liquid fuel and those that use some form of compressed gas in a canister.

- **Liquid Fuel Stoves** - These stoves burn white gas (Coleman fuel), kerosene or alcohol. The fuel is readily available. Alcohol and kerosene is available worldwide. These stoves require more maintenance and some of these stoves don't simmer well. Alcohol does not burn well over 2,133 metres (7,000 feet)
- **Compressed Gas Stoves** - These stoves burn butane, isobutane or propane. One advantage is that they have an easy on and off and there is low maintenance. But it is difficult to tell how much fuel is left and there is the problem with canister disposal. As well, they do not burn well at high altitude (2,133 metres or 7,000 feet.)

How Stoves Work

To understand how a stove works, it is necessary to know about vapourization. Vapourization is the process whereby liquid becomes gas and mixes with oxygen to become combustible. This process works differently with each fuel type. In gasoline and kerosene stoves, heat is used to expand the liquid fuel inside a vapourization tube. This process pushes the gas through a jet and towards a burner plate. Oxygen is sucked in along the way and the fuel is then ready to light. In the case of liquid petroleum gas stoves, heat isn't required to create vapourization because the gas is already a vapour when it leaves the canister.

Liquid Fuel Stoves

Fuel is stored in a separate tank and in most cases, this tank has a pump to help pressurize the stove. The tank should be filled only to three-quarters, leaving some air in the tank.



Priming the Stove

The pump forces air through a one-way valve into the tank increasing the pressure inside. Opening the fuel flow valve allows the pressurized liquid fuel to flow from the tank through the generator tube, out a small opening called the jet and into the priming cup. Initially, vent only a small amount of fuel into the priming cup and then shut off the fuel flow valve. Priming can also be accomplished by using a separate priming source such as alcohol or priming paste.

Once the generator tube is hot, the fuel flow valve can be opened and the stove burner lit. The pressurized fuel from the tank flows through the heated generator tube where it is vapourized. The fuel that flows through the jet now is gasoline vapour. It strikes the flame spreader and ignites. The flame spreader redirects the flame from a single, vertical "candle" flame to a wider flame for more efficient heating. When the stove is properly primed, a blue flame should be visible.

If the flame is yellow or orange, it means that the fuel is not being completely vapourized in the generator. As the generator heats up further, it may begin to run properly, or the stove may have to be turned off and re-primed.

Safety Guidelines

- Know how to operate a stove properly before you light it. Read the stove's operating manual. Conduct a test-run before beginning a trip.
- Ensure that fuel tanks are secure and controls are turned off before using. Check for leaks.
- Make sure your stove has enough fuel before you light it.
- Do not overfill.
- Always work from the side of a stove, never put your face or body directly over the burner.
- Take particular care when lighting a stove as flare-ups can occur.
- Make sure the fuel bottle to be used under pressure is in good condition. Dented cans can be used for storage instead of being connected to the stove.
- Do not prime a hot stove. It can result in an instantaneous and violent ignition. Wait for at least 15 minutes.

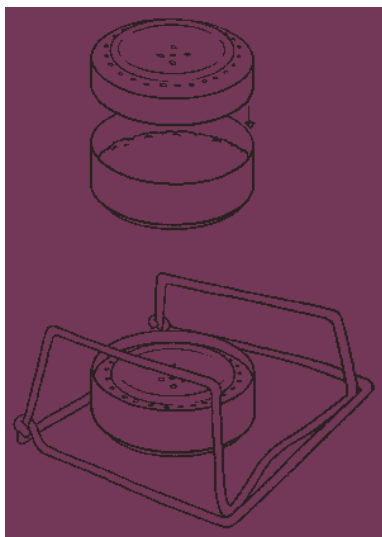


- Stoves give off carbon monoxide so never use white gas inside a tent, snow cave or any other shelter, it can lead to asphyxiation. Also, tents are flammable.
- Store fuels a safe distance from the stove when lit. Always refill stoves away from flames and heat. Do not open the bottle or stove tank while the stove is in operation.
- Regular maintenance of your stove will help prevent poor performance and possible malfunctions.



Activity Ideas

- Have wardens make a Buddy Burner Stove. For one stove you will need a large coffee can, one small tuna can, paraffin wax, cardboard, wick material. Use a cleaned, empty tuna can. Cut strips of corrugated cardboard the width that the tuna can is deep. Coil the cardboard strip(s) around a wick. Keep coiling and place snugly but not too tight into the can. Fill with melted paraffin wax. Cut vent holes into the bottom of the coffee can. Place the tuna can filled with wax inside and light. Place the pot of water on the top of the inverted coffee can and wait for the water to boil.
- Have wardens make their own lightweight backpack stove. They are relatively easy to make. See Instructions and illustrations on page 134.



Lightweight Backpack Stove

Materials Required

- 2 aluminum pop cans
- 1/4 cup (60 ml) Perlite (found in gardening department)
- wire coat hanger
- de-natured alcohol (found in paint department or boating supplies)

Tools Required

- wire cutters
- scissors
- drill and drill bit 1/16" (2 mm)
- fine sandpaper



Here's How

1. For the base, neatly cut one can approximately 1 1/2" (3.5 cm) from the bottom. For the top, cut the other can about 1" (2.5 cm) from the bottom.
2. Use the 1/16" drill bit and drill a number of holes, about 18 to 30, around the edge of the top and in the centre as shown.
3. Fill the base with Perlite just over half full.
4. Make six to eight vertical cuts around the top. The cuts should be up to, but not over, the rounded edge. Slowly press the top into the bottom. You can use a small board for pressing down to help make it even.
5. Fill the stove about half full of alcohol. Light the burner slowly by moving a match over the edge of the burner. Note: If it does not stay lit, tip the burner up to leak some fuel into the rim and re-light. Hold it until it stays lit or gets too hot.
6. Cut and straighten a coat hanger. Use a fine sandpaper to remove any paint or coating. Bend the coat hanger into a shape that will hold a pot a few inches above the burner. With a little imagination you can create a number of stove bases. One idea is shown in the illustration.

2. Demonstrate how to make a candle lamp or light a lantern.

Background

Flashlights and batteries are not the only solution in the quest for good outdoor illumination. A variety of other options burn some kind of fuel to produce light. Fuels include various forms of gas and the meeker, ever-reliable candle.

Flashlights

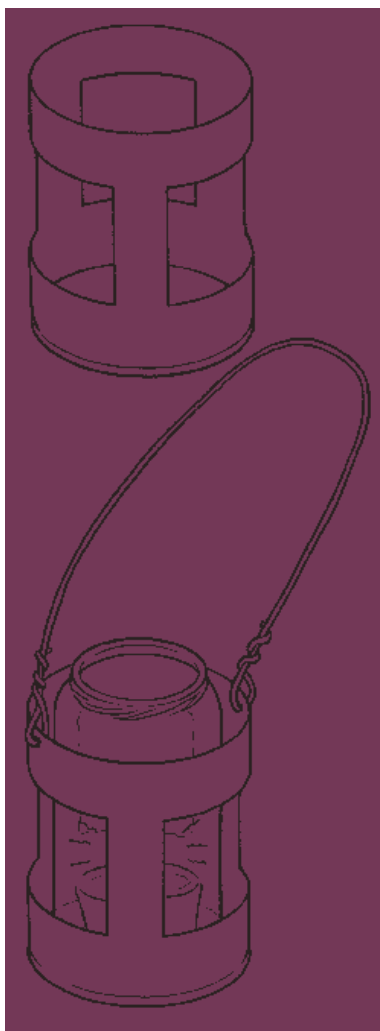
A good flashlight is one of those essential camping items. A flashlight will help you see around the camp when the sun goes down, it is a good safety device that can be used to summon help and as a bonus you will be able to read maps



and novels in the tent. Head lamps, based on the lights on miners' helmets, are the way to go. They allow you to have both hands dexterity and will light in the direction you are looking.

Candle Lamps

Candle lamps are safe outdoors but not inside the tent. The potential for disaster increases when you introduce anything with a flame into your nylon tent. Candle lanterns offer a reasonable amount of light but not for spotlighting a huge area. They are good for general lighting needs, casting a romantic and ecological friendly glow over whatever is around them. Good quality candle lanterns can be purchased. You can easily make one too.



Materials Required

- tin can, cleaned with bottom still on
- glass jar that fits inside tin can
- candles
- large nail
- hammer
- clothes hanger for wire or re-bar wire
- wire cutters
- tin snips
- sand paper (optional)

Here's How

1. Mark three large openings around the can that can be cut out with tin snips. Cut out the windows around the can and sand edges if too sharp and jagged.
2. Use a hammer and nail, and hammer a hole on both sides of the can so the wire can be put through the holes for the handle.
3. Cut the wire length to your preference for a handle. Leave enough to twist around each end.
4. Put the candle on the bottom of the jar and place the jar into the can.
5. Light candle with a long match or a burning twig.
6. Hang from tree branches, leave on picnic table or carry.



Lighting a Lantern

When weight isn't too much of a concern or you are planning to stay at one campsite for a long periods, gas-powered lighting offers bright and reliable light. Much like gas stoves, gas-powered lighting uses white gas or butane or propane canisters. Like their cooking counterparts, gas-fueled lights should never be used inside a tent. Fire and oxygen depletion are real dangers, Use a battery-powered lamp inside the tent.

Always bring extra fuel and an extra mantle. Mantles come in different sizes, bring one that fits your lantern.

Some people find the gas-powered lamps too bright. This is a personal opinion. A bulky gas-powered light is also difficult to handle and aim, these lights are meant to stay put. They are heavy and bulky and reasonably hardy, however, if the glass globe or mantle break and there are no extra supplies, then the lantern will not work.

Follow the manufacturer's instructions for the lantern. They are much the same as stoves with the same fuel. If you have never put on and burned a mantle, practice before you go on a trip.

3. On a campout, describe the advantages and disadvantages of using stoves and fires.



A c t i v i t y I d e a s

- On an outing where your group is using a stove, discuss its advantages and disadvantages.
- On an outing where your group is having a fire, discuss its advantages and disadvantages.



Stoves

Advantages of a Stove

- Hot food or purified water can be ready in minutes, even under the most adverse conditions.
- A stove has no adverse impact on the environment.
- A stove can be used in areas where fire danger is moderate to high, when there are restrictions against fires in certain locations or above certain altitudes, on windy days when sparks from a fire might be dangerous, when dead wood is scarce, and when a fire is used solely for group bonding,

Disadvantages of Stoves

- If you run out of fuel and there's no fire, then no meals or warmth.
- Stoves can flare up and fires can result.
- You have to be familiar and know how to use a stove to be able to use it in adverse conditions.
- If the stoves breaks or stops working, you have to know how to fix it.
- Fuel is highly flammable and must be cared for properly.

Fire

Advantages of a Fire

- Fires can make the difference between living and dying.
- Fire provides warmth which helps your mind stay positive.
- Fire has a strong positive psychological impact upon a person in a survival situation.
- A fire can be made with minimum equipment (one match) and dead fall in survival situations.
- A fire helps to cook meals and use many edible plants that would otherwise be difficult to prepare.
- A fire's size can be changed from small (for cooking) to large (for warming up) as needed in very little time.
- A fire can keep animals at bay and make you feel protected from predators.
- A smoky fire can keep away insects.



- A fire can dry clothes and prevent hypothermia.
- Fire can be used to burn trunks or large sticks so that they are more manageable to be used for construction of a shelter.
- Smoke can be used to smoke out wild bees to get their honey.
- Fire can be used to send smoke signals and signal fires.
- A fire can heat metal, shape tools, sharpen sticks and bake pots.
- Water can be boiled for purification.
- If there is an established fire ring, you can have a leave no trace fire.
- If your stove is not working, have a fire.

Disadvantages of Fire

- If the weather is too windy or a torrential down pour, a fire will not stay lit.
- A fire placed in the wrong location and during a dry spell may cause a forest fire and potential death.
- A campfire poses a danger to people when burns occur.
- When the fire danger is moderate to high, a fire must be avoided.
- Fires are prohibited in certain locations or above certain altitudes.
- Even the best no impact fires leave an impact on the land.
- Using fuel for a fire has an impact on the environment. Especially if there is little to no dead fall.

What else can you add?



4. Describe how to select two of the following: daypack, backpack, sleeping bag, tent and canoe paddle.

Daypack

A day pack is great for short, low capacity outings such as day hikes, photography or bird watching excursions. Their capacity is relatively small, 15 to 35 litres, the weight of a loaded daypack can easily be carried on the shoulders. A daypack should have a waist strap for stability and extra padding along the back for extra comfort.

Alpine packs have a larger capacity, 30 to 55 litres compared to daypacks, making them useful for equipment intensive activities such as cross country ski touring, climbing or even overnight trips. Most alpine packs use a weight-bearing hip belt because of the additional load that may be carried. Foam or plastic panels are often used to provide extra support and rigidity although some high-end alpine packs may have internal frames and suspension systems.

Backpack

Backpacking packs are also called expedition packs and have a capacity 70 to 100 litres. These packs are necessary for long trips. The large capacity in these packs requires that they have a frame to provide the structural rigidity needed to transfer the weight of the load from the back and the shoulders to the hips.

Backpacks have three distinct components: frame, packbag and suspension.

Frame

1. **External Frame** - the ladder-like frame is the heart of the system. Constructed of seamless, aircraft quality aluminum alloy or high-tech composites, the frame is rigid enough to distribute most of the weight to the hips where 80 percent of the load should be carried. External frame packs carry the load high, putting the centre of gravity over the hips. On uneven trails, this pack sways and can cause havoc with balance.
2. **Internal Frame** - An internal frame is not as stiff as an external frame allowing the pack to flex and move with the



body. Integrating a frame into the pack allows the pack to be worn closer to the body. There is less ventilation but it keeps the centre of gravity lower and closer to the body.

Packbag

The packbag is where the bulk of the materials will be packed. Zippers, side bags, and places where webbing can be attached are all good features. Evaluate the pack for keeping things dry. Will rain seep through the zipper? Is the zipper sturdy and made of nylon?

Suspension

A pack's suspension system is made up of a hip belt, shoulder straps and some form of back support. When properly adjusted, up to 80 % of the load weight should be on the hips making the hip belt a critical part of the system.

Sleeping Bag

Buying a sleeping bag is not a simple process. Consider the kind of fill, comfort rating, shape and construction and weight and compatibility. First, consider the conditions you expect to encounter. Sleeping bags have four comfort ratings:

- ☐ summer weight (above freezing)
- ☐ 3-season (as low as -10°C)
- ☐ 4-season (15° to -20° C)
- ☐ winter/extreme (as low as -40°C)

The fill in a sleeping bag creates thousands of small dead air pockets. These pockets trap warmth generated by your body.

Down is an excellent insulator and nothing beats the warmth to weight ratio, compressibility or luxurious feel of a good down bag. The quality of down is measured by fill power, for example one ounce of 550 fill has a volume of 550 cubic inches when fully lofted. The major drawback with down is that it loses most of its insulating power when wet and air drying takes a long time.

Synthetic fills are made of small diameter polymer fibres. Quality bags will contain respected brand names such as Hollofil II, Polarguard HV (high void) or Lite Loft. A synthetic bag is less expensive than down, but not as light or as compressible. A synthetic bag will dry quickly and will still keep some of its lofting and warmth when wet.

The **outer shell** of the sleeping bag must serve three critical functions: Hold insulation in place, create an effective wind



block and allow internal moisture from perspiration to escape. Ripstop or taffeta nylon are frequently used because of their light weight and tight weave. For comfort, the inner lining must be soft, breathable and be able to wick moisture away from your body. To prevent the outer shell and inner lining of the bag from touching which can be a potential cold spot, sheets or batts of fill should be overlapped so that each stitch is backed up by one or more layers of insulation. In a down bag, baffles are constructed to keep the loose fill in place. The baffles are like channels filled with down made by sewing mesh fabric to the shell and the lining.

There are four basic bag shapes: mummy, modified mummy, barrel and rectangular. A close fitting bag will have a higher thermal efficiency than a roomier one even if they have the same amount of loft.

Features of a Sleeping Bag

- **Hoods** - should be contoured with lots of insulation.
- **Yokes** - keep warm air from being forced out around your neck whenever there is movement in the bag.
- **Foot boxes** - should allow room for your feet to rest naturally without compressing insulation. There should be extra insulation here.
- **Draft tubes** - should run the entire length of the zipper to prevent cold spots. It is best when they are sewn to the inner lining and to the outer shell.
- **Zipper** - should be made of nylon and be light, easy running. Nylon coil zippers are less likely to snag fabric and conduct less heat than a metal zipper.

Tent

See page 62-3 for a description of tent features.

Canoe Paddle

A good paddle is essential for obtaining the best performance from a boat. Paddles come in a wide variety of designs to suit different types of water and travel, for example, whitewater and flatwater touring



Discounts
Junior Forest Wardens are able to obtain discounts at most sporting good stores. Be sure to ask for one.

Construction

- One-piece wood paddle - the oldest type of paddle design. They are flexible and light. The most common wood types used are: (from the heaviest to the lightest) maple, ash, cherry, basswood, spruce and butternut.
- Laminated wood paddles - made from strip of wood laminated together. They are usually wider than a one-piece wood paddle. They tend to be stiff which allows them to transfer power better.
- Synthetic paddles - made from a variety of materials: kevlar, fibreglass, aluminum and plastic. They vary in quality and performance.

Shape

Paddle blades come in a variety of shapes. The most common canoe paddle is dihedral. A dihedral blade has a bulge in the centre tapering to thinner edges designed to reduce turbulence. Good for flatwater paddling.

Width and Length

A wide blade provides more propulsion and leverage but also more muscle power than a narrower blade. A narrow blade does not have much resistance and a paddler may have more strokes per kilometer of travel than a wider one. Paddle length is important too. A long paddle gives more leverage but a heavier one has a greater recovery arc.

The Shaft

The ultimate paddle shaft should be strong, light and comfortable. There should also be some flexibility and this depends on personal taste. Flexible shafted paddles are good for long trips. The shaft should also fit a person's hands and body length. Boat size, paddling style and body type are also factors when choosing a paddle.

There are four broad groups of paddles: traditional, recreational, bent-shaft and whitewater. The traditional paddle has a long narrow blade that performs well in deep water touring. Traditional designs include the beavertail and ottertail. Recreational paddles are typically square shaped. These are multi-functional paddles that work well in a variety of conditions. Bent-shaft paddles provide optimum propulsion. The angled blade maximizes the amount of time the paddle spends perpendicular to the surface of the water. Whitewater paddles usually have a larger blade for maximum power. These paddles are stiff and strong, designed to be durable and powerful.



XII

DAYTRIPS AND CAMPOUTS●

Through participating, planning and leading a variety of daytrips and campouts, wardens have the opportunity to practice the skills they have learned in real-life situations.

- ✓
☐ Participate in nine daytrips. page 179
- ☐ Participate in six campouts. page 180
- ☐ Demonstrate an intermediate level of skill in two and a beginner level in one of the following: hiking, canoeing, cross-country skiing, or snowshoeing. page 181

XII. Daytrips and Campouts

1. **Participate in nine daytrips.**

Background

A daytrip is an excursion which consists of several hours (5 to 8 hours) of an activity which covers distance (skiing, snowshoeing, hiking, canoeing) with at least a snack and a meal planned and prepared by the Wardens. A daytrip can be a day's activity in a campout situation. For example, Wardens may do a hike from a base camp for a day and return to base camp to spend the night.

List the nine daytrips below. On a separate sheet of paper describe the trip, who attended, the route taken, a map and so on.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____



2. **Participate in six campouts.**

Background

A campout is an overnight excursion in a tent, hand-made or constructed shelter for one or more nights with at least three meals (supper, breakfast, lunch, and snacks) planned and prepared by the Wardens. Campouts may include a daytrip where Wardens do a daytrip from a base camp, for example in canoeing, hiking or snowshoeing and return to camp.

List the six campouts below. On a separate sheet of paper, include who was on the trip, who was the leader, date, duration, weather, food menus, activities done, and so on. Include a photocopy of a map with areas visited marked.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____



3. **Demonstrate an intermediate level of skill in two of the following and a beginner level in one of the following: hiking, canoeing, cross-country skiing, or snowshoeing.**

Refer to the Appendices section in this program for information on each skill.

It should be noted that there are provincial associations for canoeing and cross country skiing (but not for hiking or snowshoeing) which Warden leaders may contact to receive their own training or to possibly employ an instructor to teach your group. Contact information is located in the Phone Book Yellow Pages section of this program.

Interpretation

To assist leaders with an understanding of what constitutes the two skill levels, a summary is below:

Beginner Level

- a new learner, novice or apprentice
- demonstrates no prior experience or a brief introduction
- knowledge and skill level is nil to brief introductory level
- person is an apprentice in learning
- over time the person will demonstrate improvement in skill and knowledge levels and will then move onto intermediate level.

Intermediate Level

- shows independence in preparation of equipment, demonstrates proper care of equipment,
- demonstrates some proficiency in the basic skills and the development of advanced skills
- average skill level, halfway between initial skill level to advanced and expert class.



Hiking

Trip Planning

Planning for a trip is important because it can prepare a group for leaving no trace, it will ensure the safety of the group and individuals, it contributes to accomplishing trip goals, and it increases self-confidence and opportunities for learning.

Consider the following when planning a trip:

- What are the expectations (goals) of the trip?
- Identify the skills and abilities of the group.
- Select a destination to match goals, skills and abilities.
- Get information on the area you plan to visit.
- Choose proper equipment and clothing.
- Plan trip activities to match goals, skills and abilities.
- Evaluate your trip and make a note of any changes recommended.



A c t i v i t y

Pack a Pack

Summary

Have Wardens pack a backpack and evaluate the contents at a club meeting.

Material Required

- picture of a destination site for a day hike

Procedure

1. Explain to the group that they are going on an imaginary day hike. Build suspense by asking Wardens to guess the destination.
2. Show the destination pictures and describe the location you have selected. Describe the terrain, weather, things to see.
3. Explain the goal of the day hike. (fish, view wildlife)
4. Ask the Wardens to pack a pack and bring for next meeting.



Next Meeting

1. Ask the Wardens to unpack their packs. Discuss the following questions:
 - Do the contents ensure your safety?
Check for proper clothing, maps, compass, small flashlight, water filter, first aid kit . .
 - Do the contents ensure you will leave no trace and not damage natural resources?
Check for stove, repackaged food, cathole trowel, no hatchet, plastic jug for water . . .
 - Do the contents ensure your trip will meet your goal, for example, wildlife viewing, fish safely and enjoyably?
Check for binoculars, camera, bird book, fishing gear, fishing license . . .
2. Because the Wardens packed their packs without proper information, it is unlikely they will be adequately prepared.
3. This activity demonstrate the importance of planning. Discuss the results and then play the short matching game, Will You Make It?, page 148.

Discussion

- How would the contents of your pack differ with different destinations?
- What other information do you need to pack properly for a trip?
- What is the value of knowing pieces of information before packing?



A c t i v i t y

Game - Will You Make It?

Summary

Wardens will explore some real life scenarios to help them see the importance of good preparation for a successful trip.



Materials Required

- 8 Travel cards
- 8 Solution Cards
- 16 Wardens

Procedure

1. Make a copy of page 186, Travel Cards and page 187, Solution Cards. Cut apart the cards for a total of 16 cards.
2. Randomly give one card to each Warden. If you have less than 16 Wardens, adjust the number of cards given out. Make sure that all Travel Card being used have Solution Cards to match.
3. Have the Wardens mingle to match the cards, the travel event to its solution.
4. Once the cards are matched, have the pairs plan some way to teach this plan ahead concept. Allow group members to be as imaginative as they like. Perhaps pantomime, acting out, lecture, drawing.
5. Give a presentation. Have each pair teach their concept to the rest of the group using the presentation method they have prepared.
6. Discuss every scenario. Emphasize the key concepts to trip planning. What other scenarios may have been used?

Answers:

Travel Card # 12 Blisters! - 1, Travel Card # 2 Lightning! - 9, Travel Card # 15 Pack Weight! - 3, Travel Card # 4 Steep Trail! - 11, Travel Card #14 Private Property! - 5, Travel Card #6 Water! - 13, Travel Card #10 Campfire Ban! - 7, Travel Card #8 Campsite! - 16.

Summary Discussions

Your group has participated in two activities, one identifies reasons for trip planning, the other identifies key elements to consider when planning a trip. Create a Planning and Preparation Checklist that you can use to plan your next trip. Use the groups discussions to create a checklist.

- Identify at least three reasons why trip planning is important?



- Describe seven key elements included in successful planning and preparation.
- Do the planning elements change depending on the environment visited? For example, high alpine versus grassland?
- Recall safety concerns Wardens have experienced or witnessed as a result of poor planning.



A d d i t i o n a l A c t i v i t i e s

- Create new Travel Cards and solutions as the Wardens learn new and more leave no trace concepts.
- Share the planning process with your family and use it to plan a family vacation or gathering.



8 Travel Cards

Copy on a blank piece of paper and cut apart.



Travel Card #12 BLISTERS! You have a nasty blister and can no longer carry your pack. You are not sure you can even walk to your campsite.	Travel Card #2 LIGHTNING! A storm is quickly blowing into your area. From your vantage point on the trail you can see lots of lightning. You estimate you have about five minutes before the storm reaches you.	Travel Card #15 PACK WEIGHT! Your pack did not feel heavy when you left, but now you can hardly move. You're so tired you would just as soon sit right down and not walk another step!	Travel Card #4 STEEP TRAIL! Your hike is 5 km long and gains 300 metres for every km. You must reach camp before dark. Everyone is walking very slowly because it is so steep.
Travel Card #14 PRIVATE PROPERTY! Your group is walking along a trail when suddenly in front of you there is a "No Trespassing" sign.	Travel Card #6 WATER! Your group brought two litres of water per person, but your hike has been very hot and now everyone is low on water. You can't boil water to drink because there is a fire ban in effect and you don't have a stove because you were only going on a hike.	Travel Card #10 CAMPFIRE BAN! You have no stove and the area you came to visit has been heavily used and does not permit campfires. It's dinner time and everyone in the group is very hungry.	Travel Card #8 CAMPSITE! When you arrive at your destination you find both of the campsites recommended to you by friends are being used. It will be dark soon and there is little time to search for another site. You are tempted to set up camp right on the trail, even though you know that does not follow good backcountry ethics.



8 Solution Cards

Copy on a blank piece of paper and cut apart.



Solution Card #1 An adhesive felt-like material acts like a second skin and can be applied to the feet or other areas of human skin to prevent rubbing. Always carry this with you and break in new footwear before a trip.	Solution Card #9 Before you left on your trip, you researched safety. You remember that lightning is attracted to the highest point and that water and metal conduct the electrical charge. You take off your metal frame pack, stay away from puddles of water and choose a low spot in which to crouch away from the tallest trees.	Travel Card #3 Too bad. Your heavy pack made it impossible for you to hike fast. You find a campsite for the night, but you never made it to your destination. The weight of your pack should generally be no more than your body weight. Pack your backpack before you leave and weigh it on a scale. Leave items behind if necessary. Some things, like cook kits, may be shared by several people and the contents divided among several packs.	Solution Card #11 You believe in planning ahead. You looked at a map and talked to the agency that manages this trail, so you were aware it was steep. Realizing that people make an average of 3.2 km/h on that terrain, you figured flat terrain hiking time of 1 to 1 1/2 hours for the 5 km trail and doubled it to account for the steep elevation gain. You set out early in the morning and have plenty of time to reach camp before dark.
Solution Card #15 Your group leader pulls out a statement signed by the owner of the private property who posted "No Trespassing" giving the group permission to cross the private property. A review of maps revealed this private property, and a couple of phone calls resulted in the signed statement.	Solution Card #13 After another hour of an uncomfortably dry hike, you run across a prepared hiker who pulls out a water filter designed to remove bacteria from wild water sources. After taking a break on the rocky shore of a small pond and filtering water, you have enough water to finish the hike.	Solution Card #7 Because this was only an overnight camping trip, someone suggested you bring prepared food for dinner. As the sun begins to set, everyone gathers together on a rock outcrop near camp and pulls out a sandwich, piece of fruit, and a snack for dessert. As darkness falls the group watches the stars appear and tells stories about shadows in the night.	Solution Card #16 Your group leader hiked to this area two weeks ago in anticipation of your trip and found three perfect campsite options. After following your leader for another 10 minutes you move off trail to a campsite with big flat rocks to sit on and a great view of the canyon.



Silver Tree Adventurers - Woodstravel Framework

First Aid

1. Complete a St. John's Ambulance or Red Cross emergency first aid course.
2. Demonstrate how to manage an accident and how to get help.
3. Construct and demonstrate how to use a first aid kit.

Fire Lighting Techniques

1. Explain the needs of a fire while building a fire.
2. Prepare a three-course meal over an open fire.
3. Build and maintain a warming fire.
4. Build, use and put out a no trace cooking fire.
5. Demonstrate how to make three types of fires, at least one in winter or during wet, windy conditions.

Outdoor Clothing

1. Demonstrate how to use outdoor clothing to manage thermoregulation.
2. Describe three types of clothing fabrics and the qualities of each.
3. Give a 10-minute outdoor clothing lecture at school or to a Pathfinder group.

Shelter

1. Construct and use a lean-to.
2. Construct and use three types of snow shelters and/or shelters from natural products combined with plastic and nylon.
3. Demonstrate two techniques for low-impact emergency shelters for use in natural areas.



4. Demonstrate the proper location of shelters, considering survival and natural hazards.
5. Explain qualities and desirable features of tents.

Navigation

1. Identify the features on topographical maps and plot a course.
2. Demonstrate orienting a map to the terrain.
3. Demonstrate orienting a map with a compass.
4. Demonstrate techniques for setting a bearing and proper pacing.
5. Demonstrate the use of a map and a compass on a trip in order to prove proficiency in staying found.

Outdoor safety

1. Demonstrate how to cope with two of the following in a camping and survival situation: sunburn, frostbite, hypothermia, dehydration, and wildlife problems.
2. Describe emergency techniques to acquire water during a simulated survival situation.
3. Describe six natural indicators of a storm and demonstrate the actions that should be taken.

Responsible Hiking and Camping

1. Demonstrate food packaging techniques for a weekend campout. Describe how the packaging considers spoilage, food preservation and protection from wildlife.
2. Develop a cost-effective menu (not freeze-dried items) for a group of six for a week-long ski or backpack trip.
3. Discuss the philosophy of leave no trace camping and demonstrate leave no trace camping in the following skill and knowledge areas: food preparation and cooking, fire building and fuel selection, shelter, and waste disposal.
4. List ways you are responsible to and for others while planning a trip, during a trip and after a trip.



Knots and Lashings

1. Make a shelter or an outdoor tool using cords and demonstrate the proper use of three knots and two lashings.
2. Construct a knot display board which includes the name and use for at least eight knots.
3. Make cordage out of natural materials.

Survival

1. Describe factors affecting survival.
2. Describe the priorities of survival.
3. Practice a pattern for staying alive for one full day. Demonstrate proficiency in the use of map and compass, shelter, fire, finding water, natural navigation aids, emergency first aid, signals, and dealing with boredom.

Search and Rescue

1. Conduct a preliminary search for a person lost at camp.
2. Conduct a secondary search using the containment and confinement methods.

Outdoor Equipment

1. Demonstrate how to light a camp stove.
2. Demonstrate how to light a lantern.
3. On a campout, describe the advantages and disadvantages of using stoves and fires.
4. Describe how to select two of the following: daypack, backpack, sleeping bag and tent.



Daytrips and Campouts

1. Participate in nine daytrips.
2. Participate in six campouts.
3. Demonstrate an intermediate level of skill in two of the following and a beginner level in one of the following: hiking, canoeing, cross-country skiing, or snowshoeing.

APPENDIX



Wind Chill



APPENDIX



Windchill Factors at Different Temperatures and Wind Speeds

		Temperatures in Still Air										
Wind Speed	KPH	0°C	-5°C	-10°C	-15°C	-20°C	-25°C	-30°C	-35°C	-40°C	-45°C	-50°C
	5	-2°C	-7°C	-12°C	-17°C	-23°C	-28°C	-35°C	-40°C	-44°C	-49°C	-54°C
	18	-5°C	-14°C	-20°C	-26°C	-32°C	-38°C	-44°C	-51°C	-57°C	-63°C	-69°C
	24	-11°C	-18°C	-25°C	-32°C	-38°C	-45°C	-52°C	-59°C	-66°C	-72°C	-78°C
	32	-13°C	-21°C	-28°C	-35°C	-42°C	-49°C	-57°C	-64°C	-71°C	-78°C	-85°C
	40	-16°C	-23°C	-31°C	-38°C	-46°C	-53°C	-61°C	-68°C	-76°C	-83°C	-90°C
	48	-17°C	-25°C	-33°C	-41°C	-48°C	-56°C	-63°C	-72°C	-78°C	-86°C	-94°C
	56	-18°C	-26°C	-34°C	-42°C	-50°C	-57°C	-65°C	-73°C	-81°C	-88°C	-97°C
	64	-19°C	-27°C	-35°C	-43°C	-51°C	-58°C	-66°C	-74°C	-82°C	-91°C	-98°C
	72	-19°C	-28°C	-36°C	-43°C	-52°C	-59°C	-67°C	-75°C	-83°C	-91°C	-99°C
	80	-20°C	-28°C	-36°C	-44°C	-52°C	-60°C	-68°C	-76°C	-84°C	-92°C	-100°C

Little Danger

(If properly dressed)

Considerable Danger

(Exposed flesh may freeze
within one minute)

Very Great Danger

(Exposed flesh may freeze
within 30 seconds)

Wind Speeds greater than 40 kph have little additional effect

APPENDIX



II

APPENDIX

Knots, Lashings & Splices



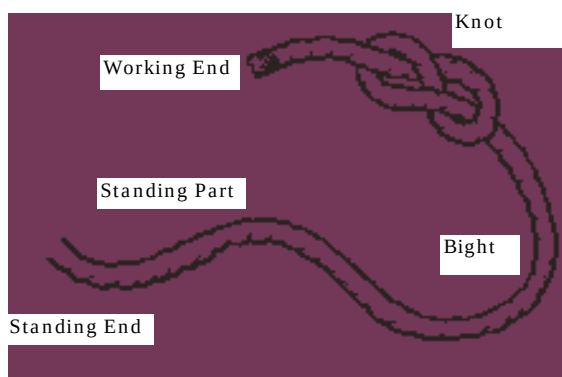
Knots

There is a knot for every job and it is important to select the right one for the job at hand. You never know when you will need to tie a knot so learn their uses and how to tie each one in the dark, behind your back and under all kinds of conditions.

Tom Brown Jr. In his book entitled, *Tom Brown's Field Guide To Wilderness Survival*, suggests that you only need to know three knots: knots to join two pieces of cordage, knots to attach cordage to another object and knots to ensure lashings.

Below are some terms used in knots:

- Running end - the end of the rope that is the free end, commonly called the end.
- Standing part - the fastened part of the rope, may also be called the line or the rope.
- Bight - a simple turn that does not cross itself.
- Loop - a turn that does cross itself.
- Half-hitch - a loop that runs around a shaft or another piece of rope so that it locks itself.





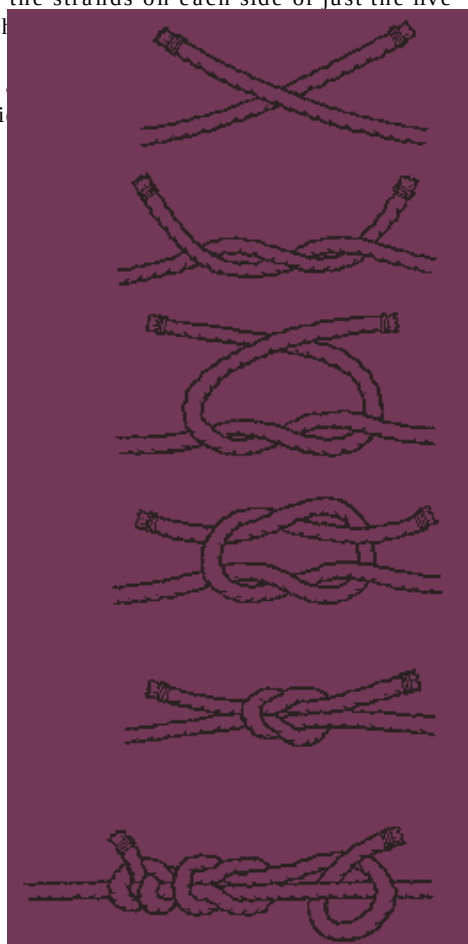
Simple Knots

Reef Knot

Also known as the square knot. This is the best known of all knots. It is used for tying rope of the same thickness and will hold firm even under strain, yet is easily untied. This is not a good knot if the ropes are of different diameters and if used with nylon will slip. It is a good first aid knot and will lie flat against the victim.

Pass the right end over the left and then under. Then take the left over the right and under. The two loops should slide over each other. (If they are tied the wrong way, you have a granny knot which may not hold and is hard to untie.) Remember: "Right over left, left over right."

Tighten by pulling both the strands on each side or just the live ends, but be sure to tighten properly. To be doubly sure, pull off the knot by making a reef knot with the live ends on both sides.





Slippery Reef Knot

This knot is tied the same way as a reef knot but before pulling it tight, slip one of the ends back through the bight. By pulling on this end the knot can be untied easily and quickly.



Surgeon's Knot

This is another variation of the reef knot. The difference is by having the left end taken around the right end twice instead of once on the first crossing. The double first crossing gives it enough friction to hold until the second end is tied.



Overhand Loop

This is the easiest of all knots. Make a loop and pass the live end back through it. It has very little purpose on its own except to make a stop at the end of a rope. It is, however, a part of many other knots.

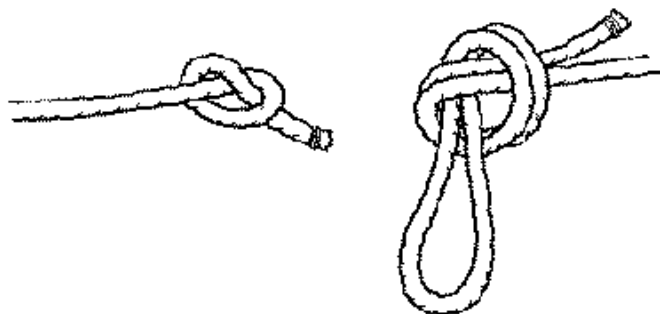




Figure-of-eight

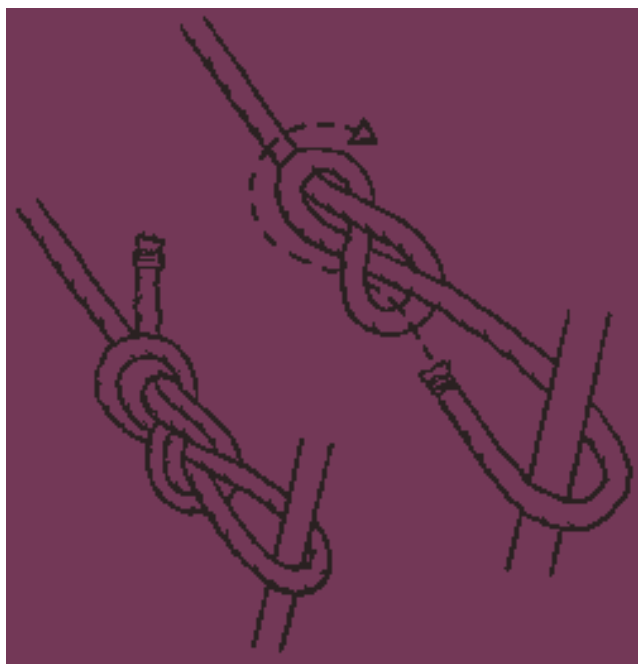
This is a good stopper knot, will not allow a rope to slip through a hole or out of a pulley. This makes a much more effective end-stop than an overhand knot. Note that when snugged, the end of the rope projects at a right angle to the standing part.

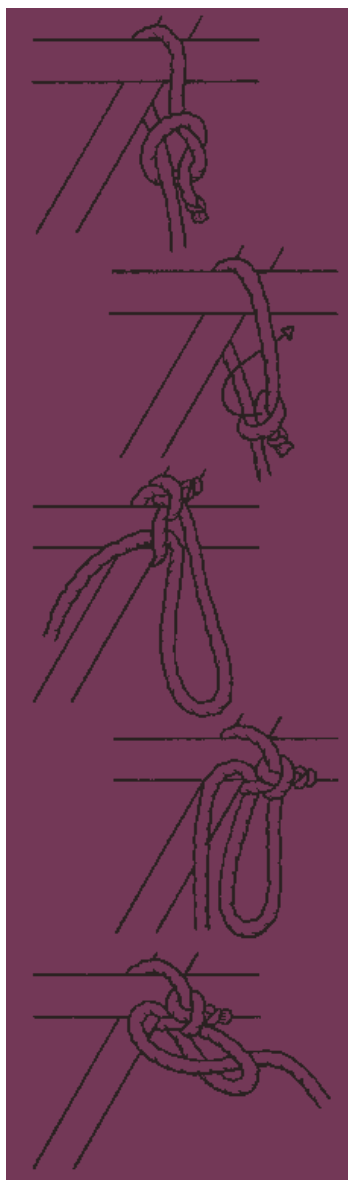
Make a loop. Carry the live end first behind, then around, the standing part. Bring it forward through the loop.



Figure-of-eight Loop

More secure than the overhand loop, this is made in the same way as the figure-of-eight, but with the line doubles, using the loop as the live end. It can be used over a spike anchor for a belaying rope.





Jam Knot

The jam knot is used to lash or tie anything together very tightly. The Roycraft emergency snowshoe requires as few as 18 to as many as 42 jam knots to lash a pair together. The lash can be very tight if nylon cord is used, if the slight elasticity of nylon is utilized.

Tie an overhand knot about one cm from the end of the lash cord. Pass the cord around the object to be lashed and tie another overhand knot to end up against the first knot with the short end pointing down the long part of the cord.

Before the knot is pulled too tight, invert the knot in order to form the loop to be used later in locking the knot. Draw the knot up snug with a firm pull, with the knot being positioned about one cm from where it is to end up. Using the Parbuckle technique, a crushing lash can be made if the lash cord is strong enough.

Firmly hold the objects being tighten up, the knot may move some distance as the elasticity of the cord is taken up. The knot is locked by passing the end through the loop and pulling the loop closed.

If a single lash is used, the ends may be left about long enough, about one cm, to melt together. Nylon cord has a bad reputation for untying on its own which is prevented by melting the ends together.

The strongest lash is made with two jam knots in the opposite diagonals. The knots should be brought together and tied off with a reef knot. The cords are cut off sufficiently long to be melted together.

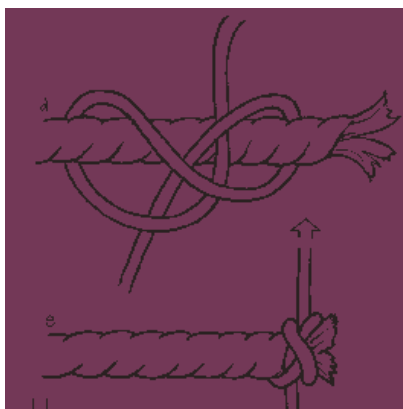
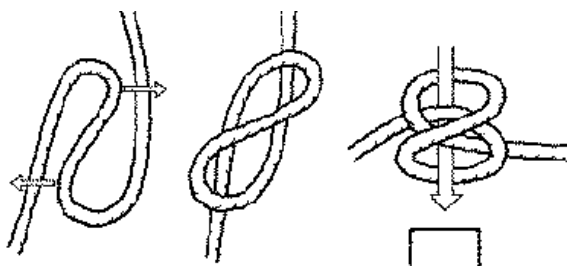


Constrictor Knot

This knot is a clove hitch with an additional step, an overhand knot tied under the crossing part. It is the most secure of all binding knots as long as it is tied around a convex surface. The tenacity of the knot makes it somewhat difficult to untie. If you want it to untie quickly, it may be “slipped.”

The knot has many applications such as attaching cordage to a stick, to clamp splinters ski poles or canoe paddles, clamping, closing bags, hoisting objects and attaching a line or rope to a post or spar or another rope. It is also used for tying feather fletching on arrow shafts and for a quick whip on rope.

Begin with a clove hitch which can be made by forming an “S”. Lay the ends over as shown. The knot is picked up through the holes and place over what need to be tied.





Joining Ropes

Sheet Bend

This is an important for joining two rope ends together and especially useful when the ropes are not of the same diameter. It should not be used if the ropes are going to be under a great strain.

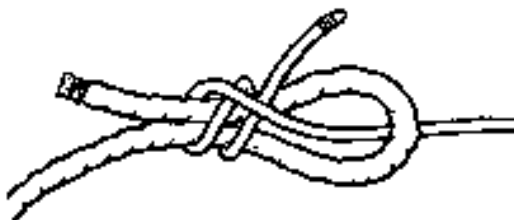
Create a bight in one rope. Feed the running end of the other rope through the centre of the bight. Bring the standing end back around behind the bight and back through the centre, underneath itself. Cinch the knot down by pulling on both ropes.

Double Sheet Bend

This is a knot that is even more secure that the sheet bend. It is useful with wet ropes, especially if they are of different thickness'. It will also provide a good strong join with even thickness ropes. It is useful where strain is constant and an ordinary sheet bend may slip.

Make a loop in the thicker rope. Take the live end of the thinner rope through the loop, beneath the thicker live end and then forward on the outside of the loop and right around it. Bring the thin live end back between itself and the outside of the thick loop.

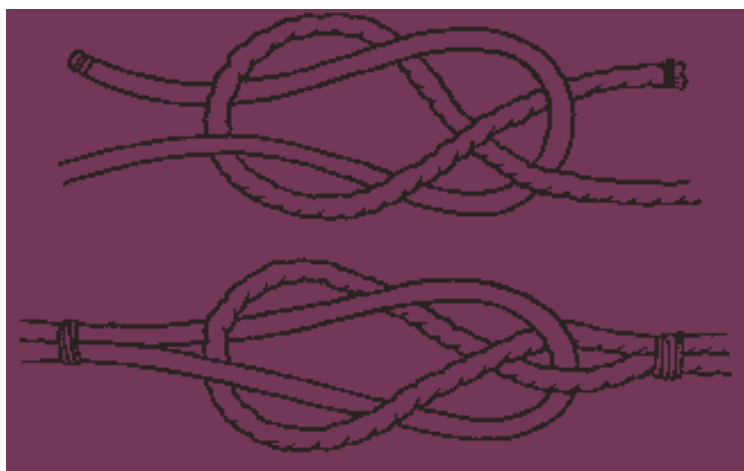
Take the thin live end and completely around the loop again and back through the same place on the outside of the thick loop. Draw it tight and ease into shape. If not tightened, these knots ten to work loose. Do not use smooth materials such as nylon fishing line.





Carrick Bend

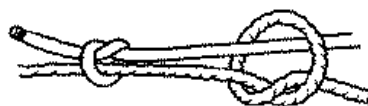
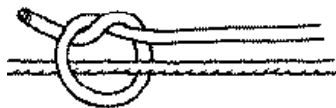
This bend should be used instead of a reef knot. It is a general heavy-duty bend of a special use with large rope. It is strong and secure and easily untied even when wet. It is necessary to seize the ends (lash together) when used with a very large rope (hausers.) In this knot the ends must be diagonally opposite. When the knot is tightened, the transformation of appearance it undergoes is no cause for concern as the knot continues to retain its full effectiveness. This somewhat complicated looking knot is not as well known as it ought be.



Fisherman's Knot

This is a useful knot when using light cordage and can take considerable strain and can be undone easily.

Overlap the ends of the lines, and with the free ends of each put an overhand knot around the standing part of the other. Draw them together until they lock firmly. Leave a reasonable tail below each overhand knot.



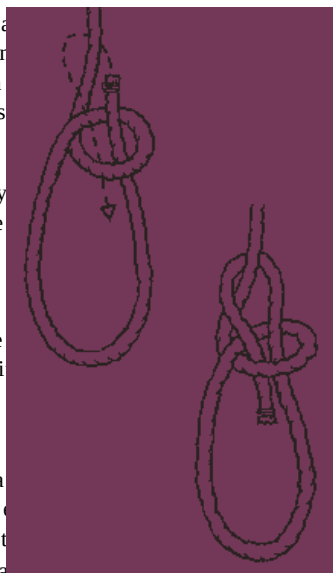


Loop-making Bowline “The Queen of Knots”

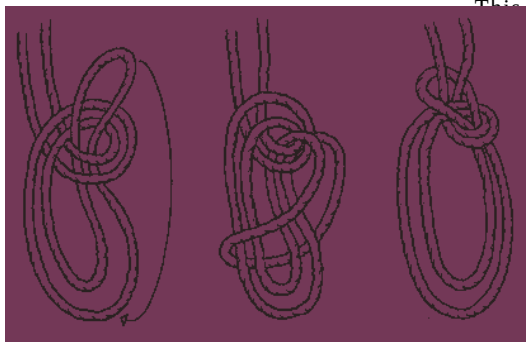
This quickly tied knot makes a fixed loop that will neither tighten nor slip under strain. It is used in many places, such as the end of a lifeline or wherever a fixed loop is needed.

Make a small loop a little way along the rope. Bring the live end up through it, around the standing part and back down through the loop. Pull on the live end to tighten, easing the knot into shape. Finish off with a half-hitch.

Remember this story: Make a small loop (small loop). The rabbit (live end) goes through the hole, around the tree (standing part) and back into the hole again.



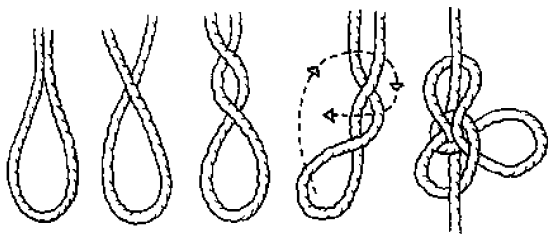
Bowline-on-the bight



This is a useful knot for lifting someone from a mass or anyplace where they cannot climb out. Tie it with a doubled line, producing two loops which will neither tighten or jam. It forms a kind of sun’s chair, one loop fitting around the buttocks, the other around the upper body. As with any knot, practice this before you need to know it.

Using the doubled line, form a loop and pass the live end through it. Bring this end down and over the end of the large double loop now formed. Ease the knot up to behind the standing part. Pull on the large double loop to tighten.

Manharness Hitch



This knot is also known as the Butterfly Knot, Lineman’s Rider or Artillery Knot. It is a non-slip loop and one of the best of the single loops in the bight. It has the advantage that it can be made along the length of the rope but does not require access to an end. Several loops could be put on a rope for harnessing people to pull together in hauling or raising a weight.



Make a loop in the rope. Allow the left side of the rope to cross over the loop. Twist the loop. Pass it over the left part of the rope and through the upper part of the original loop. Pull the knot gently into shape, ease tight and test it carefully. Note: If this knot is not eased tight correctly, it is possible to end up with a slipping knot.

Honda Knot

This is a knot that makes a free-running noose like a lasso. This one gives a clear circular loop suitable for throwing. Unless you are well practiced in throwing a lasso, catching animals with a lasso in a survival situation takes up a lot of time and energy.

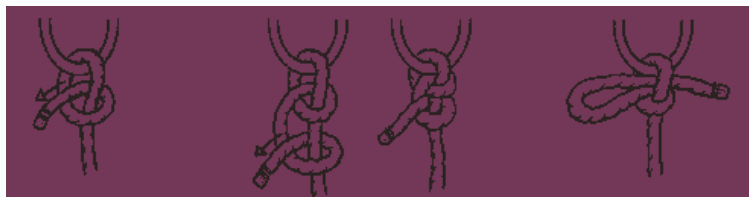
Start with an overhand knot. Form a loop further down the rope. Double the rope into a bight between loop and knot. Pass the bight through the loop. Tighten the loop around the bight. Pass the long end of the rope through the new eye formed by the bight.



Hitches

Half Hitch

Take the running end around an object and then around itself and back through.



Half Hitch

Two Half Hitches

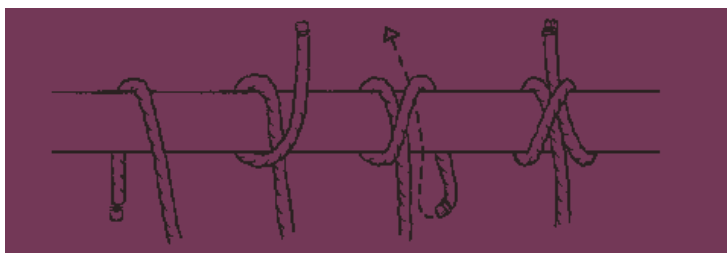
Slippery Half Hitch



Clove hitch

Make tow similar loops, side by side in the rope. Slide them together. Slip over the end of a pole and pull tight.

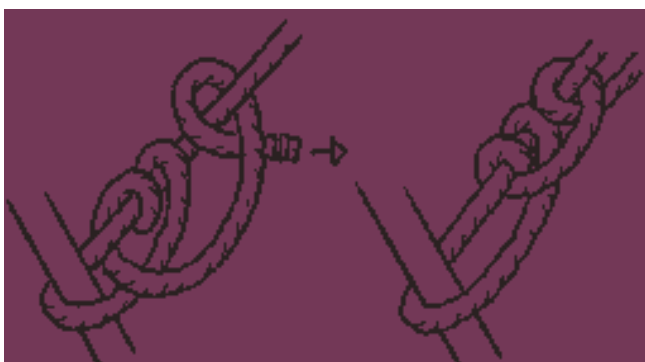
This is a very useful knot and is the start and finish of some lashings. It is used frequently around boats, gadget making, rope ladders and camp craft. Passing the rope around an object in one continuous direction puts little strain on the rope fibres.



Taut Line Hitch

This is a knot that slides and locks on a rope. It is excellent for the other end of a tarp because tension can be adjusted. It can be used from one rope to another or to itself.

Wrap the running end of the rope around the standing end with two complete wraps. If you do any more greater friction is created. From the lower most wrap, bring the running end over itself, "bridging" the other wraps, back around the standing end, and then cinch the knot down. When cinched, friction keeps the knot from sliding on the standing end. By loosening the "bridge" you can slide the knot up and down and reset it.

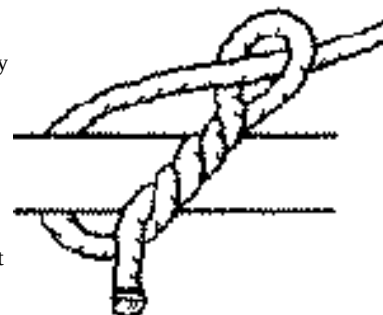




Timber Hitch

This hitch is used for towing or lifting a log or spar. It has a high breaking strength and is impossible to jam. The end must be twisted around the other part in the same direction as they lay.

Bring the live end around the log and loosely around the standing end. Carry it forward and tuck it beneath the rope encircling the log. Twist it around as many times as comfortably fit. Tighten the knot by gently pulling on the standing end until a firm grip is achieved.

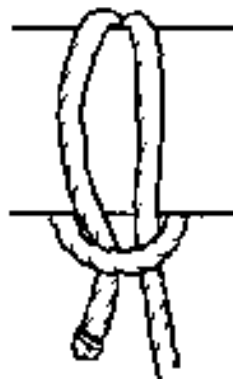


Larkshead or Cow Hitch

The larkshead is a knot of convenience only. It is not to be used when the rope will be subject to any degree of strain.

The larkshead makes a good sling but not for hooking the hook of a block to an anchorage with a strop. It is commonly used to hitch a horse to onto a post and to attach luggage tags.

To form the cow hitch, take a turn around the ring or spar, and pass the end over the standing part. Then take a second turn, but in the opposite direction to the first and tuck the end under itself, thereby forming a second standing part.



There is another way to tying this knot which is easier and simpler. Make a bight in the rope. Push this through the ring or over a spar and then pass the two ends through the bight.

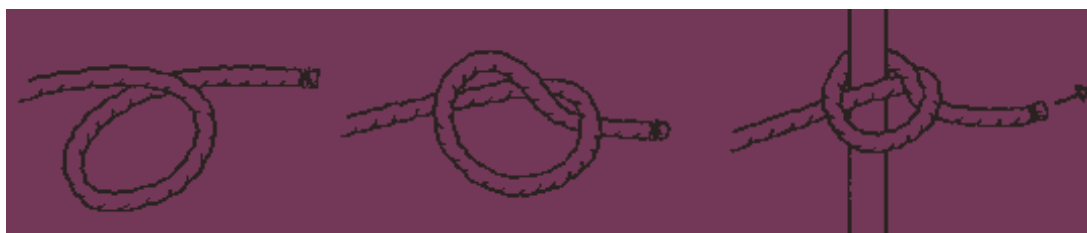
Unfortunately is it not always possible to do the knot this way.



Marlin Spike Hitch

This is a fast but temporary knot for securing a mooring line to a post. It is useful when tightening lashings.

Form a loop in the rope. Bring one side of the loop back up, over the standing end. Drop this over the pole. The pole coming between the extended loop and the standing part. Pull the live end to tighten.

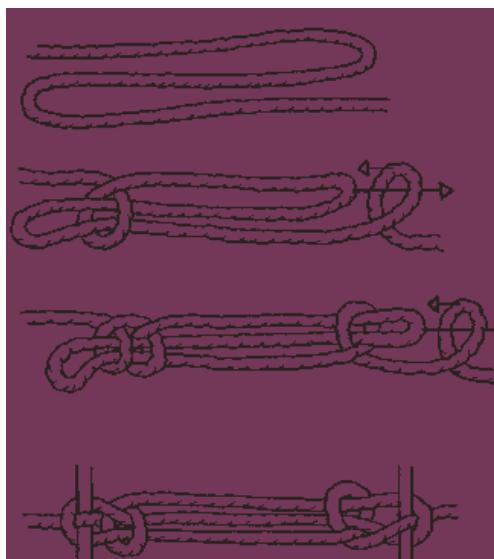


Shortening Rope

Sheepshank

This knot is used for shortening a long rope which is fastened at both ends.

Fold the line twice to take up the slack. Form an overhand loop and slide it over the bight and pull it taut. DO the same at the other end to complete the knot. To lock the sheepshank and to keep the loops from sliding off, add a second half hitch at each end.



Make a sheepshank more secure by passing a stick through the bend and behind the standing part. If you have access to the rope's end, pass that through the bight. A stick would make this more secure.

Never cut a rope unnecessarily, you never know when you may be glad of its full length. A knotted rope has only half the strength of a continuous one. Use the sheepshank to shorten or to exclude a damaged or weakened section.



Securing Loads

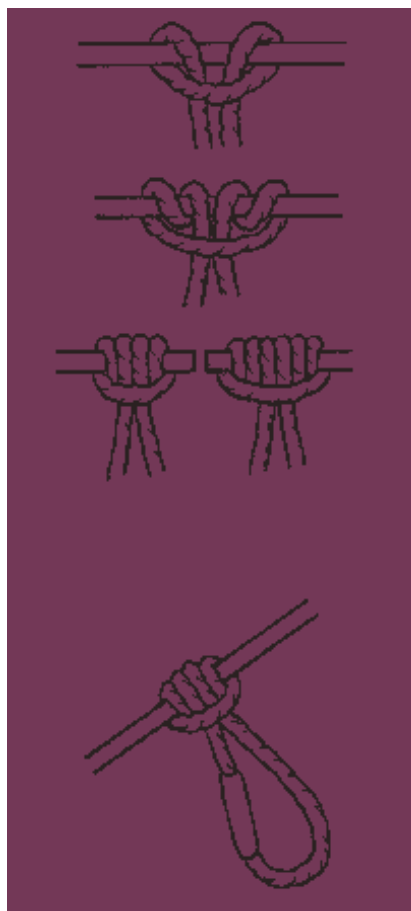
Prusik Knot

A knot that makes a sliding loop can be useful when attached along a climbing rope. It will not slip under tension but will slide when tension is released. Also useful for ropes that need re-tensioning from time to time such a guyline on a tent. A pair of prusik knots along a rope provide hand and foot hold for climbing or swinging along a horizontal line. They slide along the main rope as you proceed.

Pass a bight around the main rope and pill the ends through. Keep this loose. Take the ends over again and back down through the loop. Ease tight. Do not allow the circuits to overlap. This gives the appearance of four turns on the main rope. Mountaineers sometimes take the ends around again and back through to give the appearance of six turns on the main rope.

The prusik knot can be made using a fixed spliced loop, in which case pass the bight over the main rope and back through itself and repeat. For use as a tensioning line, attach the guy rope etc. and secure ends to an anchor.

Note: When used for climbing or travelling along a rope, a spliced loop is safest. If you have no spliced loop, join the ends after the knot is made. Test joins rigorously before relying upon them.

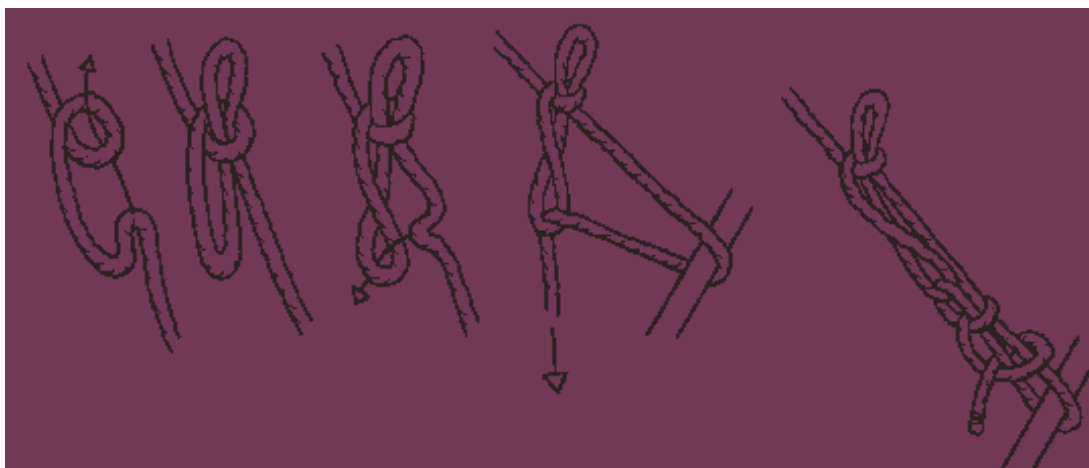




Truckers Hitch

This is a useful knot for securing loads to a boat, raft or tying down a roof. It can be pulled tight and yet be released immediately. Also known as the Wakso Transport Knot. If it comes loose, undo the hitches, retighten and secure. This knot can also be used for a line across a river or chasm which needs tightening from time to time.

Make a loop in the rope. Further down, towards the end of the rope, make a bight. Pass the bight through the loop. Make a twist in the new lower loop. Pass the end of the rope around securing point and up through this twist. Pull on the end to tighten. This will give you a 2:1 mechanical advantage to pull the rope tight. Tie off the running end to some object or to itself with two half hitches.

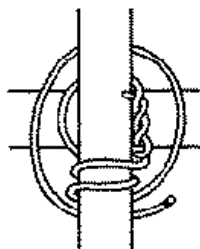




Lashings

Lashings

The method of lashing depends on the position of the components. Lashings tie down or attach objects together so they will not move. Knowing how to lash is valuable for making shelters, rafts and other structures.

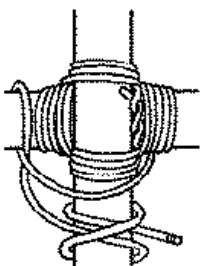
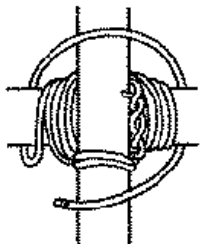


Square Lashing

Used for lashing spars which cross and is effective when set at right angles.

Prerequisites: timber hitch, half hitch, clove hitch

1. Make a timber hitch carrying the line alternately above and below both spars in a complete circuit before securing it. Then carry the rope over and under both spars in an anti clockwise direction.
2. After three or four circuits make a full turn around a spar and circuit in the opposite direction.
3. Complete the circuits with a half hitch around one spar and secure with a clove hitch on a spar at right angles.

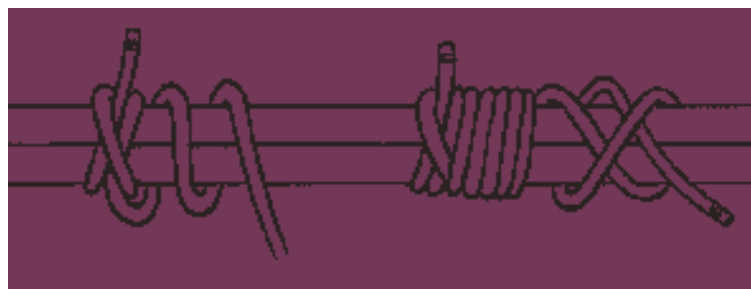


Round Lashing

Used for connecting two spars beside each other to extend the length of the spar.

Prerequisite: clove hitch

1. Begin with a clove hitch around both spars. Bind rope around them.
2. Finish the knot with a clove hitch at the other end.
3. Force a wedge under the lashings to make them really tight. If the spars are vertical. Band the wedge in downwards.



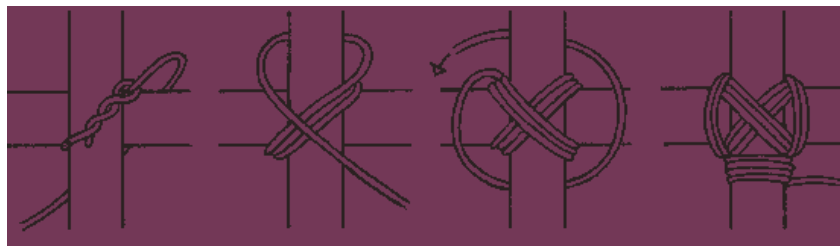


Diagonal Lashing

Use as an alternative to square lashing when spars do not cross at right angles or when the spars are under strain and have to be pulled towards one another for tying.

Prerequisites: timber hitch, clove hitch

1. Begin with a timber hitch around both spars diagonally.
2. Frap both spars with a few turns of rope over the timber hitch. Make a full turn under the bottom spar.
3. Frap across the diagonal then bring the rope back over one spar and make two or three circuits of the spars above the upper spar and below the lower.
4. Finish with a clove hitch on a convenient spar.



Shear Lashing

Used for tying the ends of two spars at an angle, for example, when making an A-frame.

Prerequisite: clove hitch

1. Begin with a clove hitch around one spar. Bind tightly around both spars.
2. Bring the rope between the spars and frap a couple of times around the binding.
3. Finish with a clove hitch around the other spar.



Splices

Splices are used to mend damaged rope or fasten one rope to another. A good splice has up to 95% of the rope's strength, while a knot's efficiency varies from 45 to 60% of the rope.

The short splice is the strongest way is that it cannot pass through a block.

The long splice allows the rope to run a block, and should be made only with two ropes of the same size, however, the log splice is time consuming to make and uses a lot of rope.

The eye splice is used in the end of a rope for mooring or for when a permanent loop is required.

The back splice is used for pointing a rope and is much superior to shipping.

Keep in mind the following when making splices:

To prevent the strand of rope from unravelling, they should be whipped or melted if the rope is synthetic and to prevent the rope from unravelling more than necessary, a constrictor knot may be tied at the required point.

A fid (a pointed, usually conical, tapered tool made of wood) is used for opening a rope when splicing. A tool with similar function made of steel is called the marlin spike.

Rolling under the foot smoothes out the surface of the splice and helps to even up the strains within the splice. Like rolling under the foot, gentle pounding helps to even out the adjustment of the strand.

When trimming the ends, if the ends are cut off too closely, they are apt to work out. Tapering is achieved by cutting away a portion of each strand as the splice continues in order to reduce the bulk of the splice. This is usually done more for appearance than for anything else. The strength and security is likely not enhanced.

Short Splice

- A. Unlay the rope a few turns and alternate the strands.
- B. Tie the strands down to prevent further unlaying.
- C. Tuck one strand (#1) over an opposing strand and under the next strand.



- D. The tuck of strand #2 goes over the first strand #5, under the second, and out between the second and third.
- E. Repeat operations with the other two strands (#1 and #3) from the same rope end. Remove tie and repeat operation on the other rope end.
- F. Make two more tucks for each strand, roll tucks, clip ends.

Long Splice

- A. Undo each rope about 15 turns and place the ropes together, alternating strands at each end.
- B. Using opposite pairs, unlay (unravel) one strand (#4) and fill its place with its partner strand (#2). Repeat this exactly with another pair of strands (#1 and #6) in opposite directions.
- C. Trim the longer strand (#4) and tie each pair of opposing strands (#2 and #4) with an overhand knot, tucking each strand twice. The tuck goes over one strand, under the second and out between the second and third. Strands #3 and #5 are simply tied with an overhand knot. Strands #1 and #6 are halved. Strands #3 and #5 are simply tied with an overhand knot. Strands #1 and #6 are halved, and opposite strands are tied with an overhand before tucking.
- D. Roll and pound tucks into the rope and clip the strand ends.

Eye Splice

- A. Unlay the ends.
- B. Strand #2 is tucked under strand C, under B and out between A and B.
- C. Strand #1 is tucked once over B and under A.
- D. Tuck strand #3.
- E. Tuck each strand, in turn, two more times. Clip ends.





Back Splice

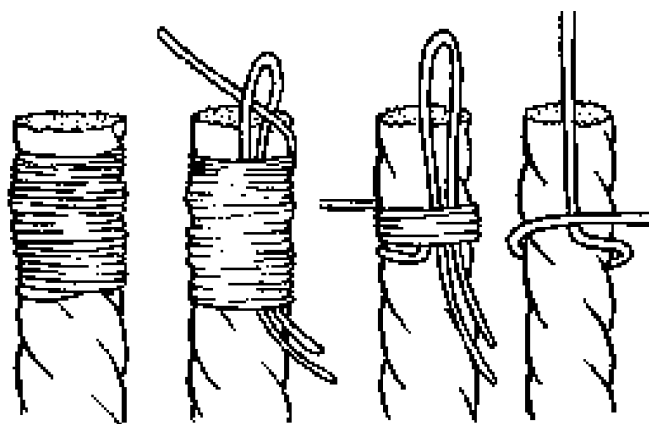
The ends are first laid over each other in a crown knot and protrude from the crown knot back along the standing part of the rope. They are tucked as in the short splice with the same over and under movement. Trim the ends and smooth the splice by rolling it on the floor with your foot.

Rope of any length should not be put into use without having had the ends properly prepared. Whipping is one way to prevent fraying and unravelling. Back splicing is a durable method.



Whipping

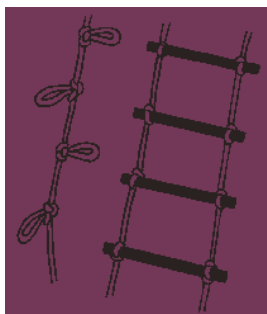
Whipping is binding the end of a rope with twine to prevent it fraying or unlaying.





Project Ideas

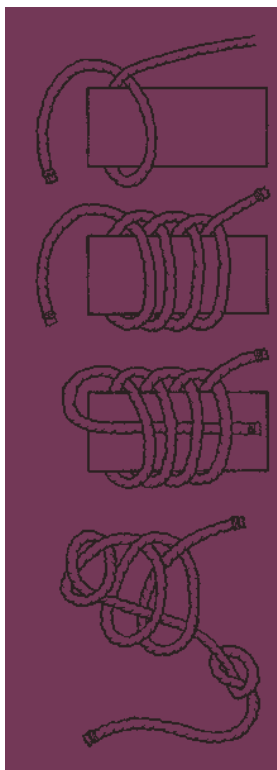
Make a ladder



A ladder can be made by simply tying as many Manharness hitches in a rope as you need for hands and feet. It could also be made with rungs by using strong sticks or other pieces of wood.

Use two ropes or a long rope, doubled, with Manharness hitches placed equally along both side to make a rope ladder. Pass sticks through the corresponding loops as you make the loops and ease tight to hold the sticks firmly. Allow the sticks to project a reasonable amount on either side of the ropes for safety and test each for strength.

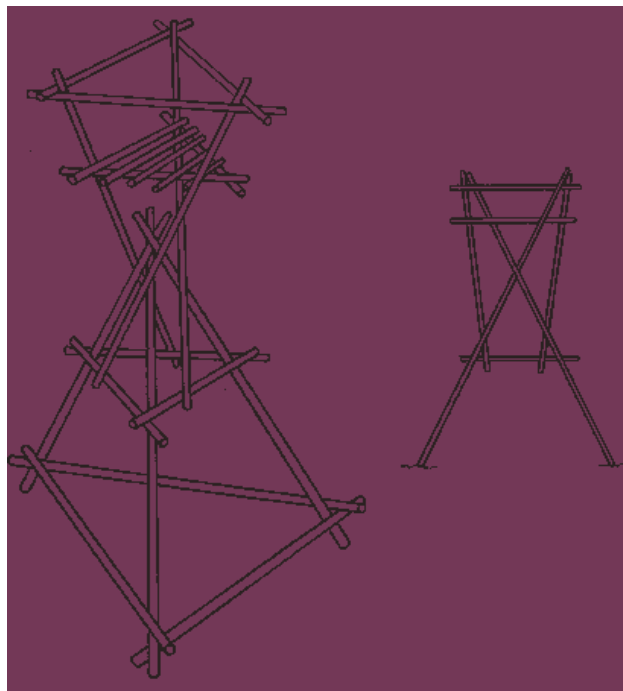
Make a Ladder of Knots



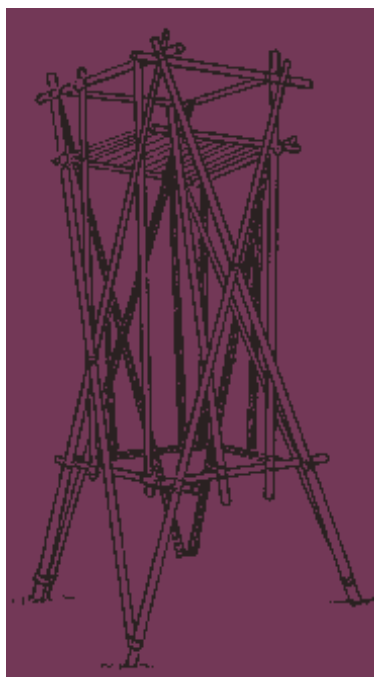
A series of overhand knots tied at intervals along a smooth rope will make climbing a rope much easier. There is a fast way of making the knots once you have the knack.

Leaving a reasonably long free end, make a half-hitch near the end of a short piece of a branch or log. Continue making loose half-hitches along the log, the diameter of which will fix the spacing of the knots. Pass the start end back through all the loops and then slide them all off the end of the log. As each turn of rope goes through the centre of the half-hitch loops to other end, shape and tighten each knot.

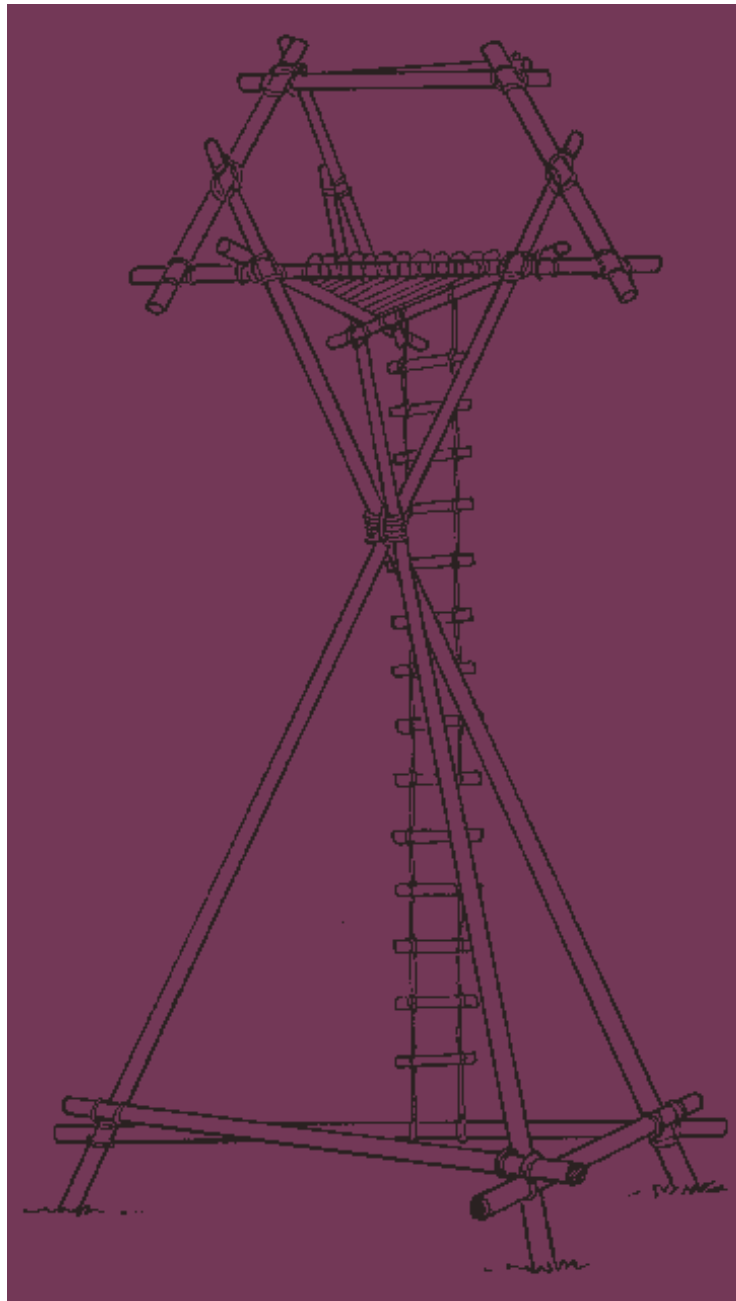
If you know the length of your rope, you can estimate the number of knots needed. With a half-hitch for every knot, choose a thickness of log to allow the required number of turns, and therefore the required number of knots.



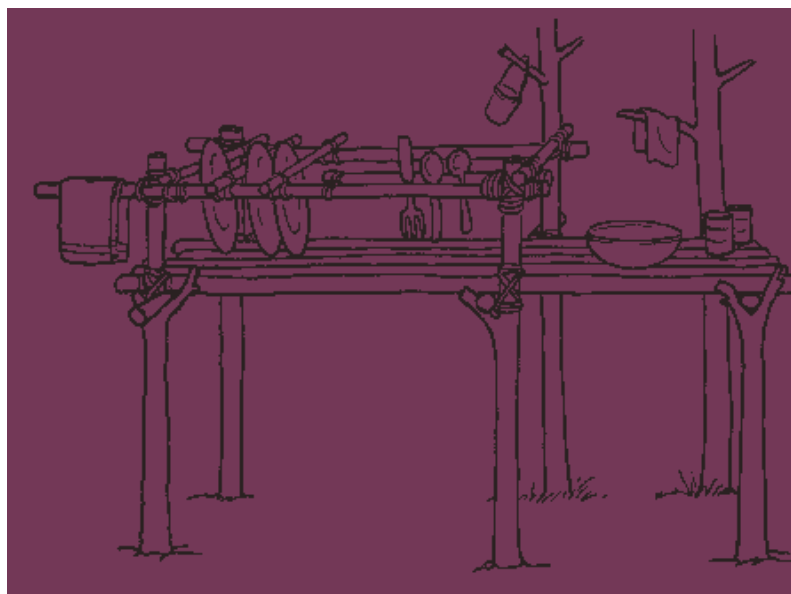
The Corkscrew Tower



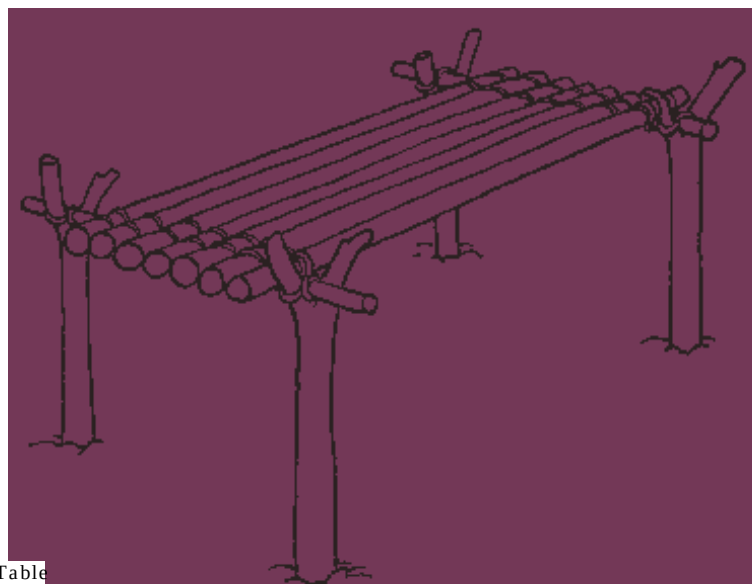
The Dan Beard Tower



The Bryanbach Tower



Camp Dish Rack



Pole Table



APPENDIX



III



Wild Edibles

APPENDIX





Wild Edibles
This information is provided so Wardens are aware of the literature on the subject of eating wild edibles versus fasting. Should Wardens ever be in a situation where they may have to make this decision, they can make a decision based on factual information.

Wild Edibles

To Eat or to Fast - That is The Question

In attempting to live off the land, it is more preferable to only drink water, than to eat less than the minimum number of calories required each day. By not meeting the basal metabolic rate, which can be from 1,100 to 1,700 calories per day, there is such a disproportionate use of protein reserves in comparison to fat reserves that one may die of protein depletion in at least a quarter of the time as compared to fasting. In fasting there is a more balanced use of proteins and fats so that a healthy person of normal weight of 65 kg will not begin to suffer any irreversible deficiencies for at least six weeks. Overweight people may get by for longer than this. The record stands at over a year.

By realizing that there is no need to eat for six weeks, panic may be more easily held in check. Fasting can act as the stopgap measure until you have had the time and opportunity to become competent in living off the land. You can learn fasting techniques in less time than you can learn to use one edible plant. In some instances you may have no choice but to fast. Unless you are reasonably expert and well practiced in hunting and trapping, and game is plentiful, or you happen to have a firearm, you may mismanage your energy budget. You could spend more energy catching and eating the animal that you would have saved by resting. This takes into account any fruitless attempts. If you are to subsist on plants you may have to know anywhere from 50 to 200 to have a workable number in your given area of survival.

Fasting usually brings on greater clarity of thought and improves recall that assist in making plans and decisions. In a true fasting state, within two to six days your energy reserves become available to be used at a more normal rate of expenditure. You may not feel like it, but you can now exert yourself to the point of expending 4-5,000 calories per day. On a diet that is less than your basic metabolic rate you may collapse from exhaustion. If you are going to walk out, you will do better in a fasting state. In a Swedish experiment, 10 people walked 320 miles in 10 days injecting only the spring water found en route. On being examined by doctors after the walk, all were in a perfect state of health.

Generally, you heal more quickly in a fasting state and overcome any illness more readily. The ketosis in fasting



usually brings on euphoria, making the discomforts of survival more tolerable and any depression less acute.

To fast, simply eat nothing and drink far more water than you normally would. The water should be brought to a boil and drunk as hot as possible.

Problems with Fasting

Ketosis is a build up of undesirable levels of ketones in the blood and is a by-product of fat reserve metabolism. This was once thought to be a dangerous condition to be avoided, probably because of the association of ketones with other often-grave diseased states. The situations may be somewhat eased by drinking more water. One should attempt to make the urine as colourless as possible. Drinking too much water can make you ill as well. Some euphoric irrationality is also associated with the ketosis.

The general impression seems to be that the first major fast is the most uncomfortable one. Your past eating habits may also have a considerable influence on the ease of comfort experienced in your first fast. Once you have detoxified, you may find fasting to be relatively pleasant. The detoxification process works on the principle that your body will burn up fast what it needs the least. The substance first burned up are those that accumulate in your body that can not be eliminated by the normal process. Uric acid and cholesterol are the first substances to go.

Some of the unpleasant and temporary side effects that you might expect are: foul breath, severe headaches, aching joints and teeth, loose teeth, coated tongue, boils, foul odour about the body, pains of various levels of intensity in the esophagus, and fasting may also result in prescription glasses becoming too strong. These conditions are far more tolerable than the conditions associated with death in a quarter of the time.

Some Reasons for Using Wild Edible Plants

1. Wild edible plants can be a hedge against hard times, be they wilderness survival, times of scarcity or outright poverty. The use of wild edibles may be a means of reducing pressure on conventional supplies in times of need.
2. Wild edibles can add a variety to an otherwise monotonous diet. This was an important consideration in pioneer days.
3. Most of the plants in this appendix have an especially high content of vitamins and minerals. During pioneer days, wild edibles were used to supplement a deficient diet, especially at the end of a long winter when garden plants were months away from being available. Old timers can still be encountered who can recall using cow parsnip, marsh marigold, stinging nettle and cattail as early spring vegetables.
4. Learning to use wild plants as food can help you to better understand how natural communities work. By learning to manage edible plants in a way that ensures the ongoing availability of these plants, you can develop a responsible relationship with this natural resource.



A definite responsibility rests with everyone who uses wild plants, to know enough about them to properly conserve them. You should have some idea as to whether the plant is rare, slow to regenerate or readily eradicated by certain methods of gathering. What forms of harvesting does the plant react to most favourably?

Some plants may best tolerate being pulled up while others prefer to be sheared off if eaten by a rodent or ungulate. Will leaving parts of plants start a new one? Does the plant readily grow from seed? Can a rare or more desirable plant be encouraged to grow in your garden especially when nearby competition is removed? Once planted it can provide a handsome return for a minimum of tending.

The plants in this appendix were chosen with the knowledge that they tend to respond favourably to usage and none are rare in Alberta. All the same, they should still be used by the same conservation rules that apply to the gathering of all plants, common or rare.

Gathering

1. Gather plants only where you are not prohibited to do so by law. Laws protect all plants within Provincial and National Parks and Reserves. Anyone picking, damaging or transplanting any plants can be prosecuted. Some municipalities have regulations governing the gathering of plants, trees and shrubs in their jurisdictions. Some plants are protected by law, for example, the Western Blue Flag.
2. Plants should not be gathered where they serve the public in any way, such as along trails, nature walks or in school study areas.
3. Gather plants where the collecting activity, especially digging for roots, will not contribute to erosion or create any other unacceptable effect.
4. Collect only what you can use. If it is the leaves you want, pick only those you can use, leaving the rest of the plant uninjured. When using the roots of perennials be sparing, use cup quantities rather than litres. When collecting parts other than the root, leave the root intact.
5. Vigorous, introduced plants should be considered fairer game than less competitive native ones.
6. Create as little disturbance as possible to the surrounding vegetation with your foraging activities.
7. When you have determined that your plant is obviously abundant and thriving and you have ascertained that it will tolerate harvesting (through the literature mostly), you may consider collecting it in the following manner.
 - ▶ First, take the overcrowded plants.
 - ▶ Depending on prevalence and other factors, you may take one in five if the plant is common, one in 10 if less common, and one in 20 if somewhat scarce in any given locale.
8. There are places where plants may not be fit for consumption. Plants near a well-travelled road may have a higher than normal lead content from vehicle exhaust. Avoid collecting plants where herbicide use is suspected, such as along some municipal roads, railroad corridors, power line right of ways and near fruit orchards.



Positive Identification

It cannot be over-emphasized that you should be positive about the identification of the plants you plan to eat. Your enthusiasm in the use of wild plants should be tempered by a cautious and careful attitude. Although relatively rare, there are plants that can kill. Learning the scientific name of the plants you can use can be very important. A plant can have many common names and many different plants can end up with the same common name, especially in different parts of the country.

The common name is very much like a nickname. The scientific name is the one and only name assigned to a particular plant throughout the whole world. The scientific name comes in two parts, the first part is known as the Genus. It is always capitalized and is analogous to a person's surname. The second part, which is not capitalized, is known as the species and corresponds to one's given name. The scientific or Latin names will be underlined or in italic.

Unless you learn to use the scientific name of a plant, there may be many instances where others will not be sure what plant you talking about when you are seeking assistance in identification. It is essential to know the plant's identification if you are trying to tell a doctor what plant it was that you think made you ill.

Occasionally, you may encounter a statement such as "the *Viola* species are edible." By this we mean that all plants of the Genus *Viola* are edible. Although occasionally there are plants where the whole Genus is edible, one must not assume that if one plant in a Genus is edible, that all plants in that Genus are. You can have edible and toxic plants in the same Genus. If there is the slightest doubt about a plant's identification get an expert opinion or leave it alone.

Eating Wild Plants

Generally, the taste of any wild plant is a new experience to the normal palate. Some plants can be uncommonly bitter on the one extreme and completely tasteless on the other.

In comparison to our garden vegetables, the wild plants contain more nutrient gram for gram, mainly because they are of much lower water content. You may find that eating less than half the quantity expected for a domestic vegetable may adequately meet one's nutritional needs.

Acclimatizing to Wild Plant Food

Simply sampling a known wild edible can cause sharp stomach pains in some people. Accepting wild plants and mastering their use is a skill that requires persistence and concerted application. This is likely one of the greatest achievements in wilderness living skills.

By becoming thoroughly knowledgeable about edible plants, you will develop confidence in your abilities to safely use wild plant foods. The plants chosen in this Appendix are similar enough to the taste and texture of familiar vegetables to make their use relatively easy. The other 900 wild edible plants of Alberta may demand a considerably greater effort from both the body and the mind to accept them. You may need to gradually include a plant in your diet before your body can tolerate or properly digest any great quantity of it.



The first step is to begin eating a plant in small quantities until you become accustomed to the taste. Your gut might also require time to develop the flora that may better handle the new food. As you become accustomed to the plant you may gradually increase the amounts perhaps without experiencing any unusual digestive disturbances. It bears repeating that care must be taken to use wild plants in moderation not only as a conservative measure but to avoid excessive stomach pain.

It is a bit too late to begin the process of familiarizing yourself with a plant in an actual survival situation. You may find you've burned up more energy gathering and trying to use it than you've gained back by digesting it.

Edible Plants

Use the information about the plants listed below as a guideline. Buy yourself a good field guide book and use it frequently. Take advantage of every and any opportunity to learn about wild edibles, for example, first hand experiences, slide shows, books, and talking with others.

Below are a few suggestions to help you begin and nurture your identification skills.

- Find a field guide to suit your knowledge of botany and identification skills.
- Make notes in your personal copy of a field guide with the important plants listed below.
- Take your Junior Forest Warden group on an outing and identify the plants in the spring and summer.
- Take every opportunity to learn about edible plants and try to find some on every outing. Challenge Wardens to do the same on every outing.
- Make a plant press and file the pressed samples in a binder to help maintain your identification skills.
- Talk to other JFW leaders and Wardens or take a walk with them to learn more about wild edibles.
- Have a guest speaker in with slides to talk about wild edibles.
- Take a course about wild edibles from an experienced gatherer.
- Take photographs and keep a scrapbook for your own field guide reference.
- Practice, practice, practice.



The Plants (more or less in order of importance)

1. Cattail (*Typha* species)

The cornucopious cattail, from the tips of its roots to the tip of it's flowering stalk, sooner or later some part of the cattail becomes edible.

Root Starch

The thick puffy rind of the root is peeled away to expose a core that may be as thick as a pencil. This core consists of starch packed away amongst rather bothersome strong thin fibers. The fibers may be dealt with by:

- i. roasting until they are brittle
- ii. by chopping the core into fine pieces
- iii. by washing out the starch and discarding the fiber
- iv. by drying the core, then pulverizing it by pounding

Some authorities claim that a heavy growth of cattail can produce about 6,700 kilograms per hectare of starch (or 6,000 pounds per acre). No feasible commercial process has yet been developed to exploit this tremendous resource.

The starch can be used in place of flour for cakes and pancakes.

Shoots

The plant extends itself by horizontally advancing shoots. Although there are more prevalent in early spring, they can be found at any time of the year. There is usually from 8 to 16 cm of edible shoots that may be eaten raw or cooked, with numerous shoots on each plant.

Stem

In late spring the stem may be pulled up and eaten raw or cooked. The plants without stems have a lump of starch at the junction of the plant and the root that is cooked like potatoes.

Head

Heads that are still in the sheath (in June) are boiled and eaten like corn. There is a tedious method of extracting the somewhat oily seeds from the head. The pollen bearing spike is a more productive endeavor. Before it matures it is scraped to produce a thickener for soup. The pollen itself is later gathered in early August by enclosing the head in a bag, bending the plant over and giving it a rap to dislodge the pollen. The pollen can be used as a flour substitute.



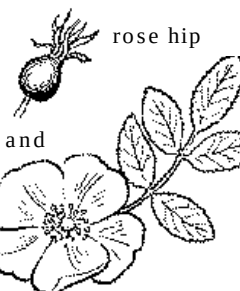


Bear Root or Sweet Vetch (*Hedysarum boreale*)

Next to the cattail this is one of the most important wild edibles in Alberta. Bear root is available throughout the summer. Its taste changes by the way it is prepared. The roots are hard to dig and taste best just after the shoots have started to come out. The raw root tastes like a mixture of coconut and peas. It was used as a licorice substitute by the First Nations People and early settlers. The baked roots taste like potato chips, and the fried root, like a parsnip. Bears are fond of this root and you may sometimes see where they have dug a hole for the roots. Allergy Caution: Those allergic to any foods, especially fruits, may react violently to this plant.

Wild Rose (*Rosa* species, especially *Rosa acicularis*)

When the first frost occurs, the rose hip (the mature seed container) is at its best. The fleshy part of the hip can be eaten raw or added to other foods and soups. Rose hips are renowned for their vitamin C content: eating five to 10 hips may provide you with your daily vitamin C requirement.



4. Stinging Nettle (*Urtica* species, especially *Urtica gracilis*)

The stinging principle, formic acid, is destroyed by heat in about 15 seconds of boiling. The tops are gathered in May when the plant is no more than 15 cm tall and cooked in as little water as possible. This ranks as one of the more tasty and nutritious edibles available.

5. Marsh Marigold (*Galtha palustris*)

This plant is usually available in early spring and is best picked before the plant blooms. The plant contains a toxic glyceride that is destroyed by boiling. A bitter component may require the cooking water to be changed once or twice.





6. Dandelion (*Taraxacum officinale*)

The tender leaves make an excellent salad ingredient. Protecting leaves from the sun with a board produces especially tender, pale leaves. The roasted fresh root is quite tasty. Dried, roasted and ground, the root makes an interesting coffee substitute. Dandelion may be one of the most nutritious plants growing on any lawn.

7. Quackgrass (*Agropyron repens*)

The roots are roasted at any time of the year. Quackgrass is a very nutritious but malignant and neglected edible.



Fire Weed (*Epilobium angustifolium* and *E. latifolium*)

The shoots are boiled and the core of the flowering stalk is eaten raw. The flowering stalk is used to thicken stews. The dried stems and leaves can be used to make tea.

Cow Parsnip (*Heracleum maximum*)

Before the leaves open, the stalks are peeled and eaten raw or cooked. This skin has to be peeled off before use because it contains a substance which, if eaten, can induce a photodermic rash. The contents of the seed head, before it opens, are used in salads. The root is cooked like rutabaga or turnip.

Caution: Be sure not to confuse this plant with a similar looking but notoriously one known as water hemlock (*Cicuta* species).



Cow Parsnip



Water Hemlock



10. Timothy (Phyleum pratense)

In the fall, the ripe heads are stripped off, crushed and winnowed to extract great quantities of seed resembling miniature wheat. The seeds can be crushed and made into gruel.

11. Sedges (Carew species, especially Carex aquatillis)

From May until August, the tender hearts of this grass-like plant are eaten raw or cooked.



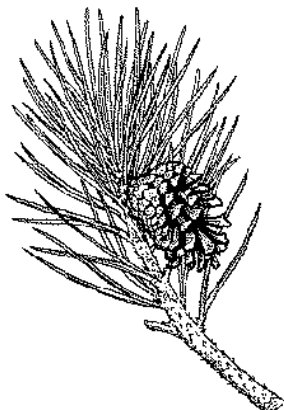
12. Silverweed (Potentilla anserina)

In spring and fall the root is eaten raw, roasted, boiled or fried. The dried root has a pleasant nutty flavour. Delicious, similar to parsnips and sweet potatoes in taste.



13. Aspen (Populus tremuloide)

In late May to mid-July when the bark is easily removed from the tree, the surface of the wood or cambium layer is scraped with a knife to obtain a sweet, juicy, stringy material, sometimes called Indian Spaghetti. It is eaten raw or dried for future use.



14. Lodgepole Pine (*Pinus contorta*)

Use it exactly the same way as aspen.

15. Violets (*Viola* species, especially *Viola canadensis*)

From spring to first frost the whole plant can be boiled like spinach.



16. Thistles (*Cirsium* species, especially *C. hookerianum*)

The core of the young plant can be eaten raw and the roots can be eaten raw, boiled or roasted. The seeds make a good timber.



17. Wild Onions (*Allium* species, especially *A. schoenoprasum*)

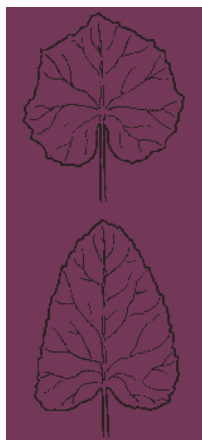
The plant must look, smell and taste like an onion and taste like an onion or it may be confused with Death Camus (*Zigadenus elegans*.) Use all parts at any time of the year.

Caution: Excessive use could cause anemia.



18. Coltsfoot (*Tussilago farfara*)

The round leaves are cooked like spinach. Yellow flowers, stalks have reddish scales. The green leaves can be rolled into tight balls, thoroughly dried, burned to ash, and then used as a passable salt substitute. Dried leaves make a fragrant tea.



19. Plantain (*Plantago major*)

The young leaves with the veins removed are cooked like spinach. The dry roots are edible. The main part of the plant is almost like celery in taste.





20. Bulrush or Tule (*Scirpus validus*)



g shoots are peeled and eaten raw or cooked. The roots are processed similar to cattail roots. The roots can be ground for mush or flour.

21. Labrador Tea (*Ledum groenlandicum*)

At any time of the year, the leaves may be boiled to make a Jasmine-like tea or dried and brewed in the normal fashion. Use with caution until you are used to it. Stomach cramps and diarrhea may result.



22. Lamb's Quarters (*Chenopodium album*)



For the most part, the leaves are safe to eat. Lamb's Quarters has a high Vitamin A and C content than most greens. The tender leaves may be eaten as a salad and seeds boiled and eaten as a gruel.

Caution: Leaves with reddish tints should not be eaten. Oxalates are particularly high in the late summer and fall, so it is best not to use this plant at this time of year. Oxalates give a tangy taste and can interfere significantly with your body's ability to absorb calcium from food.

23. Curly Dock (*Rumex crispus*)

In the spring the very young leaves are cooked like spinach in several changes of water.





24. Mountain Sorrel or Sour/scurvy Grass (*Rumex acetosella*) and Sheep Sorrel (*Oxyria digina*)

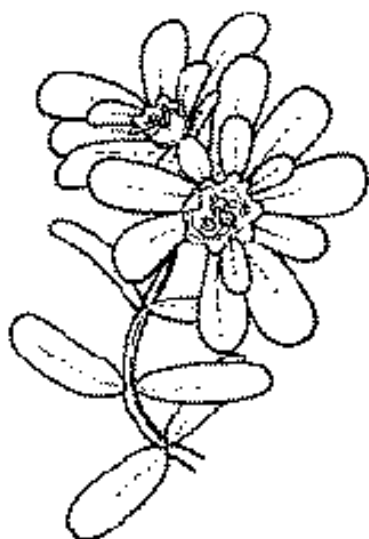
From spring until fall the leaves are cooked like spinach and made into soups with other ingredients. **Note:** Like rhubarb, Rumes contain oxalates. Oxalates give a tangy taste and can interfere significantly with your body's ability to absorb calcium from food.



Sheep Sorrel



Mountain Sorrel



25. Purslane (*Portulaca oleracea*)

From spring until fall the whole plant is cooked like spinach or used raw in salads.

26. Common Chickweed (*Stellaria media*)

From early spring to first fall the whole plant or sprouts in s





Edible Mushrooms

One of the more common misconceptions about mushrooms is that they have no food value. Many survival manuals suggest that mushrooms should be avoided altogether as the risk is much too great for the small benefit gained. There tends to be a view that mushrooms are a luxury vegetable, providing only variety and an agreeable flavour to otherwise ordinary dishes. Their main justification for use is that they have always been seen as only flavour for soups, sauces and gravies and as a garnish on accompanying dishes.

This view is changing. Mushrooms are proving to be a rather significant source of protein. Being about 37 % protein by dry weight, mushrooms also rank high in chromium nutrients as well as being a source of phosphorous, copper, iron, potassium, thiamin, riboflavin and niacin. Mushrooms also contain varying degrees of all essential amino acids and body building acids, especially the somewhat less common folic acid.

Mushrooms are low in calories, containing about 235 calories per kilogram. Mushrooms contain little sodium.

Collecting Mushrooms

There are safe ways of using mushrooms and some pitfalls. Below are the pitfalls you may encounter:

1. Never eat any mushroom or fungus that you do not know well. Avoid all risk of making a mistake. Pay attention. Be cautious. Be prudent.
2. Go slow in adding to your list of edibles. Limit efforts to well defined types.
3. Realize that a young child or an elderly person may react adversely to a mushroom that is perfectly edible to teenagers and adults.
4. Certain digestive upsets commonly associated with mushrooms are usually the result of the overuse of butter or cooking oil rather than the mushrooms themselves.
5. Do not assume that a given mushroom is not poisonous because it comes from a species that is not poisonous.
6. For reasons yet little understood, some species of mushroom may be toxic in one locale and safe in another. The same looking mushroom on Vancouver Island may be



safe yet those growing in Ontario may be lethal. European mushroom lovers who have immigrated here should double-check any similar-looking mushrooms that they find in this country before they use them.

7. There are a few people who will react violently to a mushroom that is safe to everyone else.
8. In some species a fresh mushroom may be quite safe, yet in an old or decaying state it is toxic. Use only fresh mushrooms and discard everything else.
9. Some mushrooms are toxic raw but perfectly safe cooked. DO not assume that all edible mushrooms may be eaten raw.
10. Some mushrooms become toxic if frozen.
11. It has been observed that some animals such as rabbits, squirrels and deer can safely eat certain poisonous mushrooms which would cause certain death to humans. Observing an animal eating a mushroom is no assurance that it is safe for people.
12. The presence of insects or worms in a fungus is no clue to its edibility.
13. The poisonous quality of a mushroom cannot be determined by whether or not silver tarnishes nor by any other simple chemical test.
14. The safe or poisonous quality of a mushroom cannot be determined by the ease of peeling the cap.
15. It is dangerous to assume that soaking or boiling in salt water may neutralize all or any poisonous mushroom. The worst mushrooms to start with are those that have some probability of being confused with dangerous types.
16. Do not experiment with mushrooms. Taking a small amount will not prove that a mushroom will be safe to eat in larger quantities. Your body may have the capacity to effectively deal with small quantities of certain toxic elements. Some mushrooms may be lethal in minute quantities. The toxicity in some mushrooms may vary considerably from place to place.
17. Unless you know what you are doing, do not collect mushrooms in the button stage, because poisonous and non-poisonous mushrooms may appear very similar at this stage.
18. Beware of mushrooms with similar appearances growing intermixed with each other, singly or in clumps. Pay attention. Be cautious. Be prudent.



Identifying Mushrooms

Many people would prepare mushrooms for the table if they had the confidence to believe in their ability to positively identify the edible mushrooms from the poisonous ones.

The mushrooms that are appropriate for the beginning collector are ones that are easy to identify positively. There are at least a dozen one can start with, and for most of us these are sufficient to provide a lifetime of enjoyment.

A common question that has been asked is how to distinguish a poisonous mushroom from a safe one. There is no general rule or test that will help you to separate one from the other except knowing each and every species of mushroom by its own characteristics. Until you are absolutely sure that you have properly identified a mushroom you are wise not to eat it.

We recognize our friends by many characteristics that combine to make the person look like our friend: eyes, hair, nose, ears, voice, height, the walk and so on. The same applies to the great majority of the mushrooms you may encounter in the field. There are also some mushrooms that tax the abilities of the most experienced of mycologists.

If you are anxious to use some mushrooms right away and you want to work alone you can start with the following list. The first four are so easy to identify that we call them the foolproof four. They are abundant, widespread and good tasting. They are the morels, puffballs, shaggy mane and coral fungus.

If you pay attention to the positive identifying feature and the diagram there is only the remotest chance of error.

Morels (*Morchella*)

Their taste is delectable.

- In early spring look for this mushroom in mature aspen forest. Avoid morel-like mushrooms in summer and fall, they are usually false morels.
- The cap has irregular pits and ridges of a brown to tan colour. Looks a bit like honeycombs. (False morels look like exposed brains.) A similar mushroom found at the same time in the same environment is *Verpa bohemica*. Some people may encounter digestive problems with this mushroom.
- The cap and stem are continuous and hollow as illustrated. The flesh of both cap and stem are brittle.

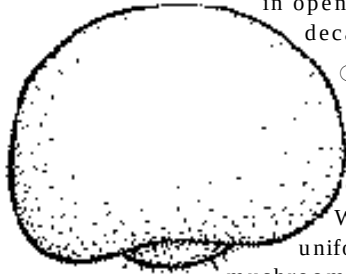




Puffballs (Lycoperdaceae)

Their taste is good.

- Puffballs may be found at anytime and especially in the fall in open forests. Look everywhere on the ground or on decaying wood.



- The size may vary from that of a grape to that of a watermelon.
- The shape is generally spherical or rounded.
- Edible when young and the flesh is white. When sliced in half, the interior must be white, uniform and firm. If the outline of a small mushroom is visible you may have an amanita which could be poisonous.

Shaggy Mane (Coprinnaceae)

Their taste is excellent.

- They look like a closed erect umbrella when young, spreading with age.
- This mushroom is usually found in the same place, year after year. It appears after the first frost in the fall. The shaggy mane prefers sandy soil.
- The coprinus family to which the shaggy mane belongs are the only mushrooms that dissolve into a bluish inky mass as they grow old due to digestive enzymes.



Coral Fungus (Clavariaceae)

Their texture is a bit tough.

- Usually found on fallen, decaying black poplar trees.
- Insects seldom inhabit this fungus.

branched clumps showing
that point downward like





Other Mushrooms

If you are more adventuresome, you might consider adding the following to your list. They are easy to identify if you look them up in a good book about mushrooms.

- False Morels (Helvellaceae) POISONOUS
- Pasture or Field Mushroom (*Agaricus campestris*)
- Delicious Milkcap (*Lactarius deliciosus*)
- King Boletus (*Boletus edulis*)
- Yellow Cracked Boletus (*Boletus subomentosus*)
- Scaly Hedgehog (*Sarodon imbricatus*)
- Honey Mushroom (*Armillariella mellea*)
- Oyster Mushroom (*Pleurotus ostraetus*)

Information gleaned from articles written by Mors Kochanski

Supporting Resources

Books

Edible and Medicinal Plants of the Rocky Mountains and Neighbouring Territories Terry Willard. 1992. ISBN 0-9691727-2-9 Published and available from: Wild Rose College of Healing, Ltd. 302, 1220 Kensington Road N. W., Calgary, Alberta T2N 3P5.

This is an excellent book full of information and coloured photographs with approximately 150 major species of medicinal and edible plants. This is an excellent field guide helping beginners to easily identify plants. It also includes collecting techniques and definitions.

Mushrooms of the Boreal Forest. Eugene F. Bossenmaier. University of Extension Press: University of Saskatchewan. 1997. Coil bound, Index, Table of Contents, Glossary. 105 pages.

This is an excellent book written for anyone whom would like to learn about mushrooms in the boreal forest. There are more than 200 distinctive mushrooms with coloured photographs and descriptions. It identifies the edible mushrooms as well as poisonous ones. Other information includes where to find them, ecology of wild mushrooms and the book is arranged by major mushroom groups for easy identification.

APPENDIX



IV. Canoeing

APPENDIX





Canoeing

Canoeing and Junior Forest Wardens

No book or amount of written materials about canoeing will take the place of first hand experiences in a canoe. If you are a leader with limited skills, contact the Alberta Recreational Canoeing Association for information about some personal or group lessons. A short course may give you the confidence to teach basic canoeing on flatwater. A basic course will also teach you how to enter and exit a canoe properly, how to paddle with a partner, and basic maneuvering skills such as how to keep the canoe going straight and how to make turns.

Canoeing is a peaceful way to travel in backcountry. It will give Wardens an appreciation of the explorers and traders who ventured through some of Canada's wildest and longest rivers. No matter what technology contributes to the materials that the canoe is made of, it is basically the same boat it was hundreds of years ago and will remain so for many more years to come.

Basic Canoe Types

There are four general categories that may help you understand the differences between canoes:

1. Recreational - designed for easy river and flatwater trips.
2. Expedition - Designed for extended wilderness trips. Also called touring canoes. They are very stable and have a good carrying capacity.
3. Slalom - Designed for whitewater and are exceptionally maneuverable. They are short, with round bottoms.
4. Marathon - Designed for racing. They are long and narrow and easier for tip over to a novice paddler. They have a straight keel which makes them track effectively but difficult to turn.

Canoe Materials

Most boats manufactured are made of plastic, composite, aluminum or wood.

Plastics - Not all plastics are alike. Molded polyethylene can be molded into complex shapes. These canoes are inexpensive, durable and slip easily over rocks. Royalex is a foam core sandwiched between sheets of ABS (acrylonitrile butadiene styrene) with layers of vinyl on top. It's extremely tough and a good choice for whitewater and recreational canoes. These canoes require little maintenance and are moderately priced.

Composites - These canoes are made by fitting layers of cloth like fiberglass into a mold and adding resin to create a stiff, tough shell. The most durable is Kevlar. Kevlar weighs 25 percent less than fiberglass. Composite canoe hulls have a gel-coat resin as the outer layer which protects the fabric from UV rays but can add up to five kilograms to the weight.



Aluminum - Aluminum canoes offer no maintenance, light-weight, low cost and remarkable durability. There are a few drawbacks, however, they stick when scraping over rocks, radiate heat and cold, are noisy and lack aesthetics.

Wood and Canvas - Canvas is stretched over a cedar planked hull. The outside of the hull has several coats of a watertight finish. They are beautiful to behold but require love and care, frequent maintenance and are expensive.

All Wood - Similar to wood and canvas without the canvas. The inside and outside of the hull are finished with fiberglass and resin. Often called "strippers" because of the look of the long planks of the hull. They are expensive, attractive and not as durable as plastics or composites.

Other Materials - Folding canoes have a coated nylon or canvas stretched over a wooden or aluminum frame. When disassembled a canoe can fit into two or three duffel bags. Inflatable canoes may seem out of place but their compactness and portability is a big advantage. They are harder to paddle than hardshell boats and perform the best on rivers with a current.

Accessories

Standard paddling gear consists of a paddle, life jacket, painters on the canoe, and a bailer.

Paddles - Paddles come in as many designs as canoes. Choose a design to suit the kind of canoeing you will be doing.

Some features to consider are blades, grips materials, and size. Blades can be shaped like a square tip for whitewater, a beavertail or round-tipped or tulip. Large paddles move more water but a smaller blade is good for flat water and wind. Grips are important because that is where a paddle has control over the paddle. There are T-shaped and pear-shaped grips. T-shaped grips are good for whitewater while the pear-shaped is comfortable for recreational canoeing. The materials used for paddles are wood or synthetics. Wooden paddles are more flexible than synthetic materials, require more care and are expensive. Sitka spruce, western red cedar and ash are common materials covered with a protective layer of fiberglass.

Life Jacket - For your personal safety a life jacket is essential and will provide years of protection. Each person is required to have a personal flotation device (PFD). When choosing a PFD, choose safety over comfort. The amount of flotation each person requires in a life jacket depends on their own personal flotation, experience and the kind of whitewater canoed. There should be enough straps and snaps to secure the jacket firmly around the body. Add a plastic whistle to the zipper as an added safety device, which can be used to get the attention of other paddlers.

Painters - Painters are short ropes attached to the bow and stern of the canoe. They are used to tie the canoe to a dock, tow another canoe or walk a canoe through rapids. The lengths can vary from three to eight metres.

Bailer - A bailer is legally required by small craft safety regulations for the simple reason that it is an important safety tool. A bailer allows you to keep the bottom of the canoe empty of water without having to go ashore to empty the boat. An empty bleach bottle with the bottom cut off is a simple and effective bailer. Don't forget to permanently glue the top onto the bottle.



Make a Bailer For Your Boat

The law requires that each small craft needs to have the following items in the boat: an approved life jacket for every person in the boat, a spare paddle, a bailer and a line attached to the canoe called the painter. You can easily make a bailer and keep with your equipment so it's ready to go in the boat with you.

Materials required:

- empty bleach or vinegar plastic bottle with screw on lid, cleaned
 - sharp straight razor-edge
 - marker
1. Use the marker and draw a line around the jug about 5 cm from the bottom, up the middle, along the ridge below the handle and back down to the line at the bottom.
 2. Hold the jug by the handle and carefully cut along the line.
 3. Make sure the lid is securely fastened on the jug.

Keep the bailer handy in one place in the boat. You may use a long cord and tie to the thwart in the canoe. If the canoe goes over the bailer will not sink out of sight. When it's time to bail, scoop the water up and dump overboard.



Safety

Until you have been there, it is difficult to imagine the force of a river pounding down on a boat out of control. Most accidents can be prevented with a little foresight and a healthy attitude of caution.

Personal Preparation

Trip leaders have a large repertoire of responsibilities which includes:

- detailed information about the trip which matches with the abilities of group members, maps, guidebook,
- gear: PFDs, rescue rope, first-aid kit, repair materials, spare paddles, and survival equipment.
- trip plan to appropriate authorities
- names and phone numbers of contacts in case of emergency

Group Travel

Never boat alone and travel in groups of two or more canoes for greater safety. As a group there should be a common understanding of safety procedures. Some are listed below:

- A set of hand and paddle signals is used for communicating from boat to boat. For example, a waved hand or paddle means help, a vertically outstretched hand or paddle means all clear, a horizontally outstretched hand or paddle means stop.
- Procedures for rescue of others
- Expectations for self-rescues
- Freeing a pinned and wrapped boat
- Emergency procedures
- Signs of Hypothermia in others
- Getting help
- Emergency contacts

Equipment

On canoe trips, ensure all equipment is in working order and that safety equipment is adequate.

- PFD - every person should have their own personal flotation device
- Bailer for each canoe
- Spare Paddle for each canoe
- Rescue Lines - Plenty of rope (at least 15 metres) is essential in case of rescues. Throw lines are made specifically for boaters and are excellent because the bag floats and can easily be thrown.
- First Aid Kit - A complete first aid kit in a water-tight container is essential, especially for longer trips.
- Repair Kit - Should include repair materials for canoe, paddles, stove and other equipment.



- Helmets - helmets are not required on easy water but can save a paddler's life on rough whitewater.

Skill Level and White water

Whitewater rivers and individual rapids are rated according to their degree of difficulty. A plus or minus sign is sometimes used to further refine the rating, for example Class III+ or Class IV-. Keep in mind that these ratings are subject to change because of rising water, which can increase or decrease the difficulty. Most rapids, however, are more difficult with a rise in water because the current gets faster and has a greater force.

Rating Scale of White water Difficulty

Class I

Beginner - Very easy; waves are small; passages clear; obstacles are easy to spot well in advance and avoid.

Class II

Novice - Small and regular waves; good for beginners.

Class III

Intermediate - Numerous waves; large enough to cover the boat; some maneuvering required. Rocks and eddies present; scouting may be necessary to determine spots for maneuvering through narrow spots.

Class IV

Advanced - Difficult rapids; precise maneuvering required; long stretches of violent currents; high and irregular waves; scouting is mandatory the first time due to risk of overturning or wrapping boat and long swims for paddlers; for skilled boaters.

Class V

Expert - Extremely difficult, long and very violent rapids, following each other almost without interruption; riverbed extremely obstructed; big drops; violent currents; very steep gradient. Scouting is mandatory but often difficult. A great risk of boat damage and serious injury to paddlers and for teams of experts with excellent equipment.

Class VI

Extreme - Extraordinarily difficult; extremes of navigability; nearly impossible and very dangerous.



Canoe Games

Games make the learning of technical skills more fun and exciting. Safety can also be part of the fun.

Shipwreck

This game is similar to the game Shipwreck played in a gymnasium. Use four buoys and make a rectangular playing field. The playing field must be large enough for the number of canoes to move, especially when the group's skills are good. Identify the four sides of the field using canoe terms: bow (front of boat), stern (back end of boat), port (left side) and starboard (right side.) All canoes are inside the field. One person calls out a direction and the paddlers have to paddle as fast as possible over that end of the rectangle. Note: Make sure the rectangle field has no objects on the other side that canoes may run into. Keep all canoes in the game, even the last one over the line. The last canoe over the line makes the next call.

Below are some other skills to call out in the game:

- Buddy Up! Two canoes have to get side by side but facing in opposite directions. This will help paddlers learn to pivot the canoe.
- Person Overboard! Paddlers have to jump out of the canoe and get back in without flipping the canoe over.
- Shark Attack! Canoes have to make small pontoons of three or four canoes side-by-side to have safety from the shark. The last boat not attached makes the next call.
- Octopus! Paddlers have to lie on their backs on the bottom of the canoes and wave their arms and legs in the air like an octopus waving tentacles. This teaches balance and about the low centre-of-gravity in the canoe.



Checklists

Daytrips

Canoe
 Paddle
 PFD with whistle
 Helmet
 Throw rope
 Duct tape/repair kit
 Small first-aid kit
 Bailer
 Lunch
 Water Bottle
 Sunscreen
 Spare clothing in waterproof bag
 Waterproof bag
 Rescue gear
 River clothing suitable for conditions
 Footgear
 Camera
 Map, guidebook
 Matches, fire starter
 Toilet paper
 Wallet and keys

Overnight Trips

Canoe
 Paddle and spare
 PFD with whistle
 Helmet
 Throw rope
 Full repair kit
 Full first-aid kit
 Bailer
 Water bottle
 Sunscreen
 River clothing suitable for conditions
 Footgear
 Camp clothing
 Camp shoes
 Wallet and keys
 Carabiner or pulleys for rescues
 Waterproof bags
 Tent or bivy shelter
 Sleeping bag
 Sleeping pad
 Food
 Cook wear and kitchen gear
 Camp stove
 Fuel
 Flashlight
 Emergency supplies (space blanket)
 Water containers

Firepan
 Map, guidebook
 Toilet paper
 Plastic trowel/folding shovel
 Insect repellent
 Garbage bags
 Signalling devices
 Camera
 Fishing gear
 Personal toiletries



Supporting Resources

Associations

Alberta Recreational Canoeing Association (ARCA)
c/o Calgary Outdoor Area Council
1111 Memorial Drive NW
Calgary, Alberta
T2N 3E4
Tel: 270-2262

Books

Canoe & Kayak Techniques: Canoeing Edited by Dave Harrison. Stackpole Books: Mechanicsburg, PA. 1998. ISBN 0-8117-2722-X (pbk.) 60 pages, Table of Contents.

A great little book with 29 articles. Each article focuses on a particular paddle stroke, boat-handling or river-reading skill. Detailed descriptions and schematic drawings show exactly how each maneuver is done. Also includes braces, ferries, rolls and eddy turns, reading the water, rescue techniques, righting a capsized boat, how to portage.

Paddling Basics: Canoeing Cecil Kuhne. Stackpole Books: Mechanicsburg, PA. 1998. ISBN 0-8117-2881-1 (pbk.) 150 pages, Table of Contents and Glossary.

This is an illustrated guide to equipment, technique, navigation and safety. It contains information about canoes, accessories, basic strokes, advanced strokes, reading currents, tackling hazards, safety and overnight trips.

Web Sites Worth Paddling To

The Wooden Canoe Heritage Association
<http://www.wcha.org/>

American Canoe Association
<http://www.aca-paddler.org/>

APPENDIX



V 

APPENDIX



Hiking & Backpacking

If you walk for a day, you can say you went hiking. If you carry all your supplies into the wilderness and spend the night, you can say you went backpacking.

Hiking and backpacking are minimalist sports that provide a wonderful escape from busy lives and almost anyone can do it. Walking is about as low-tech as you can get. Equipment, however, has gone high tech while appearing deceptively simple.

Equipment Needs

Deciding what gear will suit your needs can be a challenge and shopping can be overwhelming. The best way to know if you like a piece of equipment is to use it and test it before you buy it. Some outdoor fitters and university outdoor education clubs will rent gear for a minimal price. This is an excellent way to experiment with different brands and styles before you shell out money for your own equipment.

Some of your equipment needs may include:

- Footwear
- Backpack
- Tent
- Sleeping bag
- Sleeping pad
- Clothing (Information about dressing in layers is contained within the program)

Footwear

When you are on the trail, fully loaded, the wrong footwear can result in discomfort, injury, or inability to participate in some activities. There are many uses for outdoor footwear so it is important to make an informed decision when it comes to boots. Choose a boot for the activity you will do most of the time; some of the functions of different boots overlap.

- **Approach Shoes** - These shoes are for the approaches to various wilderness activities such as rock climbing, paddling, trail running or fast hiking. The emphasis is on lightness with a specific sole for the activity.
- **Day Hiking Shoes and Boots** - These are for short, easy hikes on a trail with a light load. The emphasis is on lightness, comfort and moderate support.



- **Hiking Boots** - These boots are for two to three day hikes on trails or aggressive off-trail day hiking. The emphasis is on lightness, comfort, durability, water resistance and support.
- **Backpacking Boots** - These boots are for long distance self-supporting hikes, on and off trails or light mountaineering. Emphasis is on control, long term support, water resistance and the boots' ability to withstand abuse.
- **Mountaineering Boots** - These boots are for mountaineering, glacier travel or aggressive backcountry travel. The boots are compatible with clip-on crampons, are stiff and durable.

Boot Features That Affect Choice

Some of the components that play an important role in boot design are listed below.

Upper Materials

The upper portion of a boot conforms to the upper part of the foot and is where the boot is fastened and tightened. Uppers can be made from full-grain leather, suede (split leather), fabric, plastics or nylon, and waterproof/breathable layers.

Construction

The construction of a boot describes the attachment of the upper to the sole unit.

- External welt is a visible seam where the upper is double-stitched to the insole and midsole. This is a classic construction for heavy-duty boots.
- **Glued construction** - Gluing is done instead of stitching. It is common on approach shoes and dayhiking boots.
- **Injected PU** - This involves mounting the upper on a last, then injecting the polyurethane that forms the band and sole directly into a surrounding mould. This forms a strong and lightweight bond to the leather without the need for glues.

Heel and Toe Counters

These maintain the shape of the boot and give protection from impact. The heel counter helps prevent the heel from lifting. They can be made from fibreboard or a synthetic material.

Lining

Most boots have a lining for comfort. It can be synthetic, leather or synthetic with Gore-Tex or other waterproof/breathable liners.

Lacing

Lacing systems may be one or a combination of the following: eyelets, D-rings, webbing, hooks or gusset.



Parts of the Sole

- **Shank** - the shanks controls the flexibility and rigidity of the sole. The shank can be flexible, medium or stiff.
- **Outer sole or sole** - A sole is available in different compositions of rubber and various patterns, depths, and quantity of lugs (the protrusions on the bottom of the sole.) A deep lug will grip loose surfaces but will be heavy. There is also a specialized design feature available such as sticky rubber for climbing or a flat area under the toe for edging.

Boot Pointers to Ponder

- Day-use on easy terrain will be more comfortable in flexible footwear.
- High-cut boots will give ankle support and protection from impact.
- The heavier the load, the rougher the terrain, and the longer the trip, the more support is needed for your feet. If you have any leg joints prone to injury, more support may be helpful.
- You lift each foot thousands of times on a hike. The rule of toe is that each additional pound on your feet requires the same energy as five pounds in your pack. Choose the lightest footwear that meets your needs.
- High heat and humidity may soak your feet on the inside if they can't breathe through the boot.
- Cold and wet weather, especially snow, requires water-resistance.
- High altitude increases the importance of all the other factors.
- Special tasks may need special designs: scrambling up rocks may require sensitivity, snow travel may need crampons, or steep slopes may need the ability to edge in with the boots.
- Heavy vibram soles last longer than thin and soft 5.10 rubber, especially if used on concrete.
- Some details of construction or materials are not readily apparent from just looking at a boot. If they are not printed on the boot's packaging, you should ask sales staff directly.

Backpacks

Backpacking packs are also called expedition packs with a capacity of 70 to 100 litres. These packs are necessary for long trips. The large capacity in these packs requires that they have a frame to provide the structural rigidity needed to transfer the weight of the load from the back and the shoulders to the hips.

Backpacks have three distinct components: frame, packbag and suspension.

Frame

1. **External Frame** - the ladder-like frame is the heart of the system. Constructed of seamless, aircraft quality aluminum alloy or high-tech composites, the frame is rigid enough to distribute most of the weight to the hips where 80 percent should be carried. External frame packs carry the load high, putting the centre of gravity over the hips. On uneven trails, this pack sways and can cause havoc with balance.



2. **Internal Frame** - An internal frame is not as stiff as external allowing the pack to flex and move with the body. Integrating a frame into the pack allows the pack to be worn closer to the body. There is less ventilation but it keeps the centre of gravity lower and closer to the body.

Packbag

The packbag is where the bulk of the materials will be packed. Zippers, side bags, and places where webbing can be attached are all good features. Evaluate the pack for keeping things dry. Will rain seep through the zipper? Is the zipper sturdy and made of nylon?

Suspension

A pack's suspension system is made up of a hip belt, shoulder straps and some form of back support. When properly adjusted, up to 80 % of the load weight should be on the hips making the hip belt a critical part of the system.

Tents

Three-season tents can be used in the moderate weather of spring, summer and fall while a four-season tent is designed to stand up to the worst possible conditions. They have stronger poles, additional waterproofing and a sturdier design.

The majority of tents have a breathable inner canopy and a separate waterproof fly. This two-walled construction is beneficial in two ways: 1. It moderates the temperature because of the insulating air space between the two walls; and 2. It allows ventilation of body vapour. During the night a person can lose up to a half a litre of water so ventilation is important. If the moisture is not allowed to escape, it will condense inside the tent and get the sleeper and gear wet.

Many tents are free-standing which means they come to life without being pegged down. This is an advantage because the tent can be assembled anywhere and then plopped down in the best site.

Desirable Features

Some of the things to look for in a tent will vary depending on where and how it will be used, how many people should it hold, weight, and cost. Some of a tents features include:

- **tent body** - The tent floor should be tough and waterproof up to 15 cm of the tent walls. The tent body should be made of non-waterproof fabric (taffeta or ripstop nylon.) Seam construction can be in two types: bound or lap felled. Good quality tents have lap felled seams where the two pieces of fabric are placed on top of each other, folded and stitched. Bound seams are weaker and are made stitching through a layer of material folded over the two pieces being joined.
- **poles** - Most tent poles have shock cord running down the centre and fixed at both ends. This makes the poles easier to assemble and holding them together. Three materials used to make tent poles are: fibreglass, carbon fibre/composite and aluminum. Aluminum is the most common and comes in a variety of qualities made from different alloys: the strongest is 7000 series, followed by 6000 and 2000 series. Carbon fibre/composite is expensive, light and strong. Fibreglass is cheap, heavy and prone to breaking.



- **fly** - The fly is the most exposed part of the tent to the elements. The fly must be made of waterproof material.
- **vestibule** - A separate extension added to the tent which is like a porch. It is useful for storing gear and taking off dirty boots outside of the sleeping area.
- **stakes/pegs** - Aluminum stakes are light and about 23 cm (9 inches) long. Carry separately in a stuff sack to protect the tent from punctures.
- **zippers** - There are usually the first thing to go on a tent. Look for a nylon coil zipper, it's light and less likely to stick than a metal zipper.
- **windows** - Windows should have zip closed flaps and bug netting to let the air circulate.

Before you buy a tent, set it up. Take it down and re-assemble if it is already up on the store's floor. This is the best way to judge how easy or difficult it is to pitch. Could you do it in the dark?

Also look for any tight or difficult zippers that could break later. Lie down inside the tent and imagine how many people can be comfortable sleeping there. Short ones, tall ones, skinny ones big ones plus gear.

Look at the outside of the tent to determine how strong it is. Push on the walls from different angles and directions to make sure it won't collapse or bend too easily. The canopy and fly should be taut, otherwise breathability, water repellency and stability are compromised.

Sleeping Bags

Buying a sleeping bag is not a simple purchase. Consider the kind of fill, comfort rating, shape and construction and weight and compatibility. First, consider the conditions you expect to encounter. Sleeping bags have four comfort ratings:

- summer weight (above freezing)
- 3-season (as low as -10°C)
- 4-season (15° to -20° C)
- winter/extreme (as low as -40°C)

The fill in a sleeping bag creates thousands of small dead air pockets. These pockets trap warmth generated by your body.

Down is an excellent insulator and nothing beats the warmth to weight ratio, compressibility or luxurious feel of a good down bag. The quality of down is measured by fill power, for example one ounce of 550 fill has a volume of 550 cubic inches when fully lofted. The major drawback with down is that it loses most of its insulating power when wet and air drying takes a long time.

Synthetic fills are made of small diameter polymer fibres. Quality bags will contain respected brand names such as Hollofil II, Polarguard HV (high void) or Lite Loft. A synthetic bag is less expensive than down, but not as light or as compressible. A synthetic bag will dry quickly and will still keep some of its lofting and warmth when wet.

The **outer shell** of the sleeping bag must serve three critical functions: Hold insulation in place,



create an effective wind block and allow internal moisture from perspiration to escape. Ripstop or taffeta nylon are frequently used because of their light weight and tight weave. For comfort, the inner lining must be soft, breathable and be able to wick moisture away from your body. To prevent the outer shell and inner lining of the bag from touching which can be a potential cold spot, sheets or batts of fill should be overlapped so that each stitch is backed up by one or more layers of insulation. In a down bag, baffles are constructed to keep the loose fill in place. The baffles are like channels filled with down made by sewing mesh fabric to the shell and the lining.

There are four basic bag shapes: mummy, modified mummy, barrel and rectangular. A close fitting bag will have a higher thermal efficiency than a roomier one even if they have the same amount of loft.

Features of a Sleeping Bag

- **Hoods** - should be contoured with lots of insulation.
- **Yokes** - keep warm air from being forced out around your neck whenever there is movement in the bag.
- **Foot boxes** - should allow room for your feet to rest naturally without compressing insulation. There should be extra insulation here.
- **Draft tubes** - should run the entire length of the zipper to prevent cold spots. It is best when they are sewn to the inner lining and to the outer shell.
- **Zipper** - should be made of nylon and be light, easy running. Nylon coil zippers are less likely to snag fabric and conduct less heat than a metal zipper.

Sleeping Pads

A good sleeping pad can make the difference of a good rest or one where every bone feels every bump. You can actually lose more heat to the ground than to the air around you if you do not have anything underneath your body. There are two types of sleeping pads: closed-cell foam and a self-inflating mattress with an open-cell foam. At the turn of a valve, the mattress pad inflates to about four cm thick.

Type of Sleeping pad	Advantages	Disadvantages
Self-inflating	Twice the insulating value Much more comfortable Less bulky to carry	Two to three times heavier More expensive (\$35 - 80) Can be punctured • (bring repair kit)
Close-celled Foam	Lighter Less expensive (\$10 - 20) Virtually indestructible	Not as insulating Not as comfortable Bulkier



Hiking is just like any other sport. It is important to warm up and stretch the muscles before using them. This is to help prevent stress and injury. Take five minutes and try some simple stretches. Do some squats, quadriceps and hamstrings stretch, and calf and Achilles stretches.

The History of Walking Sticks

A walking stick or staff is a basic tool for the outdoor traveller. For thousands of years, the walking stick has been a symbol, weapon, measure and support for tired feet and legs of the wanderer. It has a hundred uses.

For centuries, labourers used the staff to support loads and defend themselves. Egyptian hieroglyphics picture travellers with sticks in hand. The Bible is full of references to staffs. The ancient Druids, who believed every corpse has its own living spirit, apologized to a tree before cutting it for a staff.

The staff is also a symbol of authority and power. Moses used his to part the sea and to get water from a rock. In Egypt, the staff and the shorter rod were the Pharaoh's symbols of office. Today, the mace, an ornate version of the staff, symbolizes power in Parliament. The staff, especially a staff with a crook, has always represented the humble shepherd.

Record keeping is one of the oldest uses of the staff. The ancient Norse used a notched stick called a skor to keep track of the numerical information. Some native Americans carried coup (pronounced coo) sticks decorated with carvings and feathers to commemorate victories in battle. In Europe, every town and tourist attraction sells metal crests to tack onto a walking stick.

A walking stick for Wardens can be used to record achievements and will be a treasured companion. Some people find that when they travel without it, they want it. And for the people who know of its uses and benefits, the walking stick is as essential as a sleeping bag or a pair of boots.

Why Carry a Walking Stick?

- It will help keep your balance while crossing creeks, stream and rivers, traversing hillsides, crossing shale and scree, carrying heavy loads, and resting en route.
- It will help you maneuver while crossing downed trees over trails and to break or prevent a fall.
- It will reduce stress on your back, knees, legs and feet, provides extra power and balance going uphill, reduces shock on knees going downhill, and takes pressure off back and hips (mainly uphill.)
- Keeping in touch with the group in the dark by walking single file catching hold of the end of the next Warden's stick.



- Other uses: use as a center or side pole for a tarp; to prop up your pack; to lean on while resting; pushing aside spider webs and brush; self defense; held horizontally it can become a step; keeping back a crowd; testing the depth of a river; makes a stretcher.

Making a Hiking Stick

A walking stick can be made from almost any type of wood. Green wood is not suitable and good conservation practices mean never cutting down a living tree. Hardwoods such as ash, oak and maple are good choices. Diamond willow and saskatoon are popular. Poplar, aspen and birch are all right but a bit heavy. Conifer saplings are usually straight, light and strong.

You may use whatever you can find in your area. Choose standing deadfall that is straight and free from splits with the bark firmly attached. It isn't necessary to remove the bark but the handgrip should be smooth. If you decide to remove all the bark with a draw knife or a pocket knife.

The length of your walking stick is pretty much a matter of taste. Some people like a short, light stick just above waist height. While others choose one about chin height.

The staff needs to be thick enough to be strong, thin enough to be light, and comfortable to carry. A pole three to four cm in diameter at the base and four to five at the butt (thick end) is an ideal size. Some carry the butt end up for a preferred balance, while some prefer the butt down, and others whittle the butt so the staff is a uniform diameter the whole length.

You can protect the lower end with a metal ferrule to reduce the wear. A short piece of iron pipe works well. Carve the bottom of the staff until it is barely too big to fit the pipe then heat the pipe with a torch or boiling water. Use gloves to handle the hot pipe and drive it firmly over the end of the staff. It will grip tightly when it cools. If that doesn't work, drive in a wedge or glue on with epoxy cement. A rubber cane or crutch tip may be glued on.

You may also apply an outdoor varnish or occasionally a coat of stain or oil. Raw wood will take on a beautiful sheen from perspiration.



Planning

When planning overnight and day hiking trips with your group, discuss the advantages and disadvantages of group size. Consider how many leaders are available, familiarity with the area being visited, and experience of group members.

Travel	Pros	Cons
Travelling as One Large Group	Can be a positive group building experience Keeps equipment and human resources close at hand Minimizes anyone getting lost. Good for groups with little experience	Increase in noise impact. Requires adjustment to a common pace. Can compromise a pristine area where low impact travel is necessary.
Splitting into Smaller Groups	Reduce impact. Each group has its own equipment and human resources. Small groups can be formed by a common pace.	Each group will need more equipment such as maps, compasses, first aid kits. Each group needs a higher level of backcountry skills. Need to establish a rendezvous and a definitive backup plan in case groups get separated.
Travelling Alone	Unique wilderness experience Reduces impact.	No other human resources are immediately available if an emergency arises. May need more equipment, i.e. map and compass. Individual must have backcountry skills.



Conserving Energy

It is extremely important to pace yourself and conserve energy. Every day you should examine your route and identify difficult stretches, estimate travel time and schedule rest stops. A good schedule is about five minutes of rest for every hour of hiking. Compare the estimates you made yesterday. And if necessary, consider rethinking your route. Check the less experienced hikers to see how they are doing. The hike may need some adjusting to account for their pace. If the group gets too spread out, Wardens may miss trail junctions and turns. Ensure the faster hikers are sensitive to the slower pace and will adjust themselves to accommodate the group.

Walking Uphill

The best position to be in going up a steep incline is standing straight and keeping steps small so you can easily recover if you lose your balance.

Walking Downhill

Walking downhill can be hazardous and strenuous. Lace your boots up firmly, take small controlled steps and keep the knees bent slightly to absorb the shock. Try to avoid the toes smashing repeatedly into the front of the boot.

Rest Step

A rest step will rest the leg muscles and is easily done by briefly locking the knee when the weight is shifted to the leg. The locked knee causes the body weight to be supported by the skeletal system.

Rhythmic Breathing

Your hiking pace should allow you to breathe comfortably and be able to talk. You are hiking too fast if you cannot keep up a conversation and are gasping for breath. Synchronize the rhythm of your walking with your breathing. Your pace can be adjusted as you climb steeper terrain so your breathing remains controlled.

Dayhikes

Water

Often hikers don't take enough water. Two litres per person per day is a good rule of thumb. It may vary depending on the length of the hike, the weather and the hiker's level of fitness.

Food

On a day hike, bring foods which are high energy, packable and nutritious. For example, chewy bread, hard meats like salami, chocolate, sturdy fruit such as oranges. Do not discard biodegradable items such as apple cores or banana peels. The back country rule is pack out what you pack in.



Crossing Streams

- The most experienced person should cross first to find the best route.
- Waterproof hiking boots should be kept on when crossing a stream. Do not cross barefooted.
- Always face upstream when you cross moving water.
- Check the depth carefully as you cross and use a stick for better balance.
- Exercise caution if you are using a log as a bridge. Those who are less confident should straddle the log and inch their way across. Sure-footed hikers should carry the packs across one at a time.
- Crossing with a rope - Securely anchor one end near the shoreline 1.5 to 2 metres above the river. The first person to cross holds the rope (never tie around the body) and anchors that end to trees or rocks above the river to create a hand line. The last person over crosses like the first person, taking the rope along.
- Crossing without a rope can be done in a variety of ways.
 - ▶ **Triangle Method** - Each person faces inwards and links arms at the shoulders, feet are spread apart. The triangle rotates as each person takes a turn at being the stationary, down stream anchor.
 - ▶ **Line Astern Method** - Three or more people form a line facing upstream. The upstream person moves across first and stops and then number two moves and so on. If the current is really strong, the line moves together at the same time.
 - ▶ **Line Abreast Method** - The whole group forms a line by linking arms, facing the opposite bank and the group walks across together.
 - ▶ **Paired Crossing Method** - Two people face each other and link arms. One acts as the upstream water break. The upstream person moves first, stops and the downstream person moves into the eddy created by the water break of the first person.

Travel Tips While Hiking

- Establish a steady, rhythmic pace while hiking.
- While travelling in groups, do not get ahead of the leader or fall too far behind. The slowest moving person should be behind the leader and everyone should follow that pace.
- Conserve energy by not swinging arms unnecessarily.
- Look for level foot placements.
- Ascending 400 metres an hour is a good pace. If you are in good physical condition, ascending at 600 metres an hour may be expected.
- Place the whole foot on the ground rather than just a toe. The upward thrust then comes from the thigh and stomach muscles rather than the calf.
- Take short steps on unsure ground.
- When passing or crossing obstacles, pause long enough to keep the group together.
- Do not crowd the person in front of you. This invites injury from branches snapping back.
- Inform the leader of any problems with equipment. The group should keep together while adjustments are made.



- Develop the habit of looking in all directions around you. Don't hike looking at the toes of your boots and the patch of ground a few metres ahead of you. Look behind after every few hundred metres of travel. Frequently scan the skyline and the distance of visual penetration into the bush. When you enter a clearing, scan the perimeter. You may see a bear in time. Scanning helps you become familiar with the surroundings and helps you maintain your orientation. This also helps you feel more secure on your return journey..
- Short frequent rests are better than infrequent long ones.
- When you feel a hotspot on your foot (the early sign of a blister), stop immediately and apply first aid. This will save you from a serious problem later on.

Backpack Packing Checklist (Essentials)

Back pack	with plastic bag)	Can opener
Pack rain cover	Sleeping pad	Dish scrubber
Clothing	Food	Other Essentials
Boots	_____ Breakfasts	First-aid kit
Socks	_____ Lunches	Foot care items
Underwear	_____ Dinners	Maps
Shorts	Condiments	Compass
Long pants	Hot drinks	Flashlight
Synthetic knit top	Emergency food	Spare batteries and bulb
Synthetic knit bottom	Cooking Equipment	Repair Kit (pack, tent, stove)
Short-sleeved/long-sleeved shirts	Water bottles	Sunglasses
Pullover sweater	Water purification tablets	Sunscreen
Jacket/parka/windbreaker	Stove	Lip Balm
Rain gear (poncho, rain pants)	Fuel bottle(s) full	Insect repellent
Gaiters	Funnel for pouring fuel	Nylon rope
Sun hat/visor	Windshield for stove	Pocket knife
Gloves/mittens	Cooking pots	Toilet paper
Warm hat	Frying pan	Plastic trowel
Sleeping Equipment	Cup	Pen and paper
Tent with fly, poles, pegs	Plate/bowl	Plastic bags
Ground sheet/space blanket	Spoon	Candle/fire starter
Sleeping bag (in stuff sack)	Waterproof matches	Whistle/signal mirror/flares
	Water filter	Biodegradable soap
		Toothbrush and toothpaste



Bandannas

Scissors

Watch

Miscellaneous

Walking stick/ski pole

Guidebook or copies of pages

Comb

Field Guides

Paperback book

Thermometer

Swimsuit

Towel

Washcloth

Camp shoes

Binoculars

Magnifying glass

Photography equipment

Playing cards/games

Dirty water container

Spare prescription glasses

Day Trips

snacks

sandwiches

water (4 litres per day,
minimum)

First Aid Kit

Toilet paper/tissues

Insect repellent

topographical maps

pencil

hat

ziplock bags

compass

watch

sunscreen

rain gear

whistle

hiking boots

appropriate clothing

matches/lighter

moleskin

Overnight

tent

ground sheet

stove

fuel

cutlery

pots, pans

sleeping bag

sleeping mat

water bottles

water (4 litres per day,
minimum)

water filter/purification
tablets

First-aid kit

toilet paper

insect repellent

topographical maps

pencil

biodegradable soap

flashlight/candle

lantern/extra batteries

hat

camp shoes (sneakers)

sunglasses

hiking socks

zip lock bags

toothbrush

toothpaste

signal mirror

rope (15 metre length)

compass

watch

sunscreen

food

snacks/energy food (power
bars)

rain gear

whistle

hiking boots

tarpaulin

appropriate clothing

garbage bags

matches/lighter

towel

portable bladder shower

moleskin



Supporting Resources

Books

The Backpacker's Field Manual: A Comprehensive Guide to Mastering Backcountry Skills. Rick Curtis. Three Rivers Press. New York, New York: 1998. 374 pages ISBN 0-517-88783-5. Cost \$21.00

This is a great book full of comprehensive information about trip planning, equipment, cooking, nutrition, first aid, navigation, wilderness travel safety, no trace hiking and camping, hygiene and water purification, and weather.

Hiking and Backpacking. Eric Seaborg and Ellen Dudley. From the Outdoor Pursuits series. Human Kinetics Publishers, Inc.: Champaign, Illinois. 1994. ISBN 0-87322-506-6. 146 pages. Table of Contents, Index, Glossary.

This is a handy book; covers such topics as equipment needs for hiking and backpacking, water treatment, what to wear, minimizing impact, breaking in boots, planning a trip, packing a pack, picking a campsite, safety skills, the best places to hike, long distance trips, off-trail travel and much more.

Web Sites Worth Exploring

Hiking Resources

<http://www.campfirefoods.com/links.html>

Ultralightweight Backpacking

<http://ourworld.compuserve.com/homepages/rwgross/ultrahow.html>

APPENDIX



Snowshoeing

VI

APPENDIX





Snowshoeing

Snowshoes, a North American Indian invention, allow you to “float” on snow. Traditional snowshoes have wooden frames and are beautifully crafted. White ash frames and rawhide lacing are traditional materials. The maneuverable bear-paw is the most popular style of snowshoe. The elongated Algonquin (also called Maine, Michigan, or beavertail) and the Athabaskan are better when heavy loads are carried.

Ever-improving technology has increased the materials and designs and now there are enough types to suit everyone’s taste and needs. The rule to remember when choosing the best snowshoe is to choose the smallest and lightest weight snowshoe that will give you the necessary flotation. Most new snowshoes are made of high-quality light durable, aircraft aluminum. Instead of rawhide lattice, the deckings are made of rubber and other “high-tech” materials. Lifetime warranties are usually assured because of their durability.

Anatomy of a Snowshoe

There are five parts to most snowshoes: the frame, binding system, pivot system, crampons or claws, and decking. When it comes time for your club to purchase snowshoes, rent some first and try out various designs.

Frames

Either wood or metal (usually aircraft aluminum); this is the structural foundation of the “shoe” which defines its shape and size. There are three basic sizes: short-oval, medium-wide, and long-narrow.

Bindings

Traditional snowshoes are held on the foot by a rawhide harness in either an “A” or “H” shaped binding. The advanced sport bindings now work in coordination with the pivot system. Bindings should have a solid landing platform and a secure connection between the foot and the snowshoe. Whatever the design, the bindings should be easy to use, have little sideways and forwards motion, have no pressure across the foot, fit all sizes of boots, have a quick release and proper heel positioning.

Pivot Systems

The pivot is a highly stressed point on the snowshoe and must withstand a lot of weight and at the same time the rotational forces of walking. Snowshoes can have a stationary pivot system (snowshoe doesn’t allow the snow to drop away from the foot as foot pushes) or a rotational pivot system (tail drops and front of snowshoe rises.)



Decking

The decking is the material within the frame, which enables the “shoe” to “float” on the snow. It can either be made of lace or solid material like Hypalon, a rubberized synthetic material. Continuous decking material in sport snowshoes allows people to now use a smaller snowshoe, get more flotation than traditional designs. For example, a 25 cm X 91 cm traditional wedged shoe may hold a 91 kg carrying weight. A sport snowshoe 20 cm X 61 cm will provide the same if not better flotation and it’s half the snowshoe weight.

Crampons and Claws

Many snowshoes come equipped with both toe and heel crampon-type claws for traction on icy surfaces, especially slopes and hard snow. Sport snowshoes have either crampons or claws. Crampons are attached to the pivot rod and provide much-needed traction with their “points.” Claws are used on racing snowshoes or where conditions are a few steep slopes and little ice.

Other Equipment

Boots

Waterproof hiking boots (preferably leather) work well with snowshoes. Your goal is to keep your feet dry, warm and comfortable.

Gaiters

Gaiters cover the ankle, instep and lower leg and are made of water-repellent fabrics. They come in two lengths: long (go to just below the knee) and short (go about 5 cm over top of boot.)

Snow Poles

Poles are critical to help keep you safety balanced while travelling forward as well as when doing tricky maneuvers. The poles also help to propel you forward. Poles that telescope into two or three sections are preferable because: they pack down to fit into a backpack; they can be adjusted to your height; they can be adjusted to suit the terrain, for example, short for going up hills.



Size of Snowshoes

Sizing snowshoes is relative to your weight plus the weight of your pack, the type of snow you're travelling on, and what and where your recreation is.

Myth: The more you weigh, the bigger the shoe must be in order to keep you afloat. The key factor is the amount of moisture in the snow. In dry, powdery snow everyone sinks no matter what size the snowshoes are. Sport snowshoes with rubber decking can decrease the size of the shoe size compared with a traditional snowshoe.

Light, dry snow requires a bigger shoe to keep you from sinking. Heavy wet snow, a smaller shoe with excellent traction.

If your recreation is in steep, mountainous terrain, you need smaller shoes with excellent traction. If you are travelling mainly in open country, you will typically need a larger shoe with a nice tail to provide good flotation and tracking. For running, racing and casual walking, you will probably need smaller, lighter snowshoes.

Basic Maneuvering Skills

If you can walk, you can snowshoe. There is not a long learning curve and it doesn't require a large investment. You can start today and have fun, now! Snowshoeing can accommodate a wide variety of activities such as a hike in the woods, an overnight backpacking trip, or an alpine climb. Snowshoes can take you places where cross-country skis cannot, like thickly wooded areas and steep terrain.

Skills Checklist

With a little practice, Junior Forest Wardens will be able to do the following skills in no time.

Horizontal Moves

- ☐ Striding
- ☐ Stamping
- ☐ Turning
- ☐ Breaking trail
- ☐ Bushwacking
- ☐ Using poles
- ☐ Herringbone stepping
- ☐ Downhilling
- ☐ Jumping

Vertical Moves

- ☐ Rest-stepping
- ☐ Switchbacking
- ☐ Scrambling
- ☐ Side-kicking
- ☐ Kick-stepping
- ☐ Side-stepping



Remember These

You'll do well if you remember these three things.

Never cross tails. You will always fall flat on your face if you step on the back of a fast-moving snowshoe.

Never back up. When you step backwards the tail goes into the snow. Instead, make a U-turn with small steps.

Avoid traversing. Avoid cutting across a slope because snowshoes aren't designed to dig their edges into the snow.

Basic Step

The basic step is made with feet spread no farther apart than as for normal walking. Lift one shoe up and over the other far enough to completely clear the stationary shoe.

When using snowshoes, step out far enough for the forward shoe to clear the edge of the rear shoe. Hesitate between strides to let the snow compact to give you a firm foundation for the next step. As much as possible, walk as you normally walk. It is not necessary to keep the feet wide apart since snowshoes are designed to fit into each other. The knees should be lifted a little higher than normal before moving on the snowshoe ahead, and this will enable it to clear the snowshoe on the ground. In deep snow, the knee lift is increased and must occur before moving the foot forward or you will catch the snow with the tip. In deep snow, try to place the heel down first to keep the tips from becoming loaded with snow.

Running

Running requires a somewhat similar technique to walking, and lifting the knee first is important. This results in a bounding stride with the heel landing first rather than a normal running stride. A normal running action causes the tips to dig into the snow, causing you to trip. Running should only be attempted after you are familiar with the snowshoes, as it is the greatest cause of broken equipment.

Step Turn

The step turn is simply walking in a tight circle. The toes move while the heels stay in the direction of the turn. Tail of the inner snowshoe remains almost stationary while its tip pivots in direction of turn. The outer shoe follows. It looks like stepping around a clock.



Kick Turn

The kick turn is more than a step turn. Lift inside shoe until it is vertical, plant heel, pivot it 180 degrees. Then swing other shoe around in pirouette movement. Poles will help you maintain balance while practicing this turn.

Falling

Move the hips in close to the feet before trying to get up. On a slope, put the snowshoes on the downhill side and horizontal across the slope. A pole, friend's hand, trees, branches are helpful aids to getting on your feet. As a last resort, you can take the snowshoes off to get back on your feet. Be careful, you may sink in deep snow.

Uphill Travel

In deep snow, one can walk straight up gentle to moderate steep hills. For steeper slopes, the following three techniques can be used.

1. Edging

On steep slopes, most snowshoers find they slip downhill in spite of using the traverse. An edging technique with the traverse will reduce slipping. Swing the heel over toward the uphill edge of the snowshoe and tramp down firmly at each step to create a 'step' on the hillside. This should be done particularly with the foot on the uphill side in order to reduce the difference in level between the two snowshoes. On a very steep slope, it is necessary to create a 'step' or 'terrace' for both the uphill and downhill snowshoe.

2. Side Step

In a very narrow steep slope, it may be necessary to use the edging technique to make steps directly up the slope. The use of a pole on the downhill side would be very helpful in this situation.

Downhill Travel

Downhill travel is a good test of whether the bindings are tight enough as the foot will be forced farther into the toe piece. If the toe strap is not tight enough, the foot will slide under the crossbar causing a fall forward.

Lean Backwards - On moderate slopes, lean backwards and try to put pressure on the tails first.

Cords on the Toes - Some snowshoes attach cords on the toes and can pull them with their hands to keep the toes up and force the weight back to the tails of the snowshoes as they descend.



Traverse - On steeper slopes, a downhill traverse reduces the steepness. Edging and the use of poles makes the technique even more effective.

Sliding - On narrow steep slopes, one can slide down by placing one snowshoe in front of the other and sitting on the rear one, however, this gets snow on the clothing, causing the dampness that leads to rapid heat loss and consequent cold to the body.

Crossings

1. Gullies, Ditches, Logs

Care must be taken never to put weight on snowshoes when the tips and tails are only supporting the person or the snowshoe frames will break. Therefore, gullies, ditches and logs must be crossed by side-stepping over them rather than bridging the snowshoe between logs.

2. Frozen Bodies of Water

Extreme care must be taken to ensure the ice is thick enough to support the group. Spread the group out over a large area and do not walk in single file. If the thickness of the ice is questionable, it is safer to take the snowshoes off. To fall through the ice with a pair of snowshoes on makes it extremely difficult to get back onto the ice surface.

Snowshoeing Tips and Techniques

- Always Check Your Gear Before You Go
- Are the snow poles telescoping okay? (A squirt of silicone will help.)
- Are there suspicious cracks in the snowshoe bindings?
- Survival gear and knowledge intact?
- Are you familiar with the terrain? Do you have a map?
- Do you have essential items?
- In case of emergency, make sure someone at home knows where you are.
- Take duct tape for emergency patchwork on snowshoes and poles.

Breaking the Trail

- When you snowshoe with other people take turns leading. It gets tiring breaking the trail.
- Put the energetic person in front for as long as is practical and safe.
- When leading, consider the pace of the slowest member of the group.
- When leading, make the steps short enough so everyone of the group can follow in them.
- When following, try to stay in the leader's footsteps whenever possible. This conserves energy and retains a better trail for those following you.



Take Breaks

Take breaks as necessary to make clothing adjustments. Try to stay dry and avoid chills. Drink water and eat something. Snowshoeing is strenuous and burns off calories and uses up body fluids in the form of perspiration.

Snowshoe Sports and Games

Almost any outdoor sport or game played on foot can, theoretically, be played on snowshoes. Old standards, like baseball or tag, become hilarious comedies with snow or abnormal footwear, increasing the entertainment value without diminishing the competition increases the degree of difficulty. Such diversions can also be terrific training in the art of maneuvering snowshoes for the beginner and experienced user alike. There is no need to dread that first large snowfall in anticipation of weeks spent indoors. Break out the snowshoes and choose up sides.

Some of the more common sports activities are included below. A note of caution: Some of the suggested activities may be hard on the wood and leather snowshoes. Discretion is advised. Beanbags or nerf balls may be substitutes for snowballs in any of the games.

Snowshoe Races

Rules for snowshoe races are the same as for foot races. Four or more persons may team up for cross-country racing or "marching." Points are awarded for placing in heats, one point for first, two for second, three for third, and so on. The lowest score, after all heats, is declared the winner. Spotters or checkers, are extremely important in winter long-distance events to provide immediate aid to fatigued or injured participants. Speed events may include 100, 200, 400, 800 metre races, kilometre, or believe it or not, hurdles 60 cm high and 80 cm wide. For any and all competitive events, the snow must be packed firmly and evenly to provide equal degree of difficulty for all.

A Rough One

A form of field hockey can be played on snowshoes if a coloured ball is used and the playing area is well trampled. The ball should be smaller than a volleyball but larger than a lacrosse ball, about the size of a softball is ideal. Colour the ball so it is easy to see. Helmets may be desirable if the play becomes too fierce. Spills will be the order of the day so any stick swinging near an opponent who is down should be curtailed.

Tracking and Trailing

Select two Wardens to be trail-makers. They need a 10 to 20 minute lead to set their trail. The object is to confuse and test the followers. This can be done by such devices such as blind trails, obstacles, double trails which circle in two directions then merge, walking backwards, walking on a fence or wall or rock outcrop, and swinging from tree to tree. A treasure or some



food may be hidden at the end of the trail.

Arctic Escape Hunt

A person has escaped through the snow and a patrol follows her or his tracks, but when they think they are nearing the hiding place, they advance with great caution because for them, one hit with a snowball means death. The escaped person has to be hit three times before dying. If the escapee has taken refuge up in a tree or any such place, it will be difficult to hit him or her without being hit first. The hunted person has to remain at large for a certain time, one to two hours, and then get safely home without being caught. Feel free to adjust the time to suit your group.

Fox Hunting

Play where there is plenty of fresh, unmarked snow. Two Wardens representing foxes, start from the middle of a field or piece of open ground and five minutes afterward the rest are put on their trail. The two foxes are not allowed to follow any human tracks. If they approach a pathway where other people have been, they must turn off in another direction; but they can walk along the top of walls or use any other ruse they like, such as treading in each other's tracks and then vaulting aside with a staff. Both of them have to be caught by the pursuers for it to count a win. The foxes have to avoid capture for one hour and then get back to the starting point. Feel free to adjust the time to suit your group.

The Dash for the Pole

Two rival parties of Arctic explorers are nearing the Pole. Each has sent out one scout in advance but neither has returned. They know the direction each started in because their tracks can still be seen in the snow. What has really happened is that each has reached the Pole, and each is determined to maintain her or his claim to it so dare not leave the spot. They both purposely left good tracks and signs so that they could be easily followed up if anything happened. These two, one from each patrol, should start from headquarters together and then determine upon the spot to be the pole, each approaching from a different direction.

The two parties of explorers start off together about 15 minutes after the forerunners and each follows up the tracks of its own scout. When the first patrol reaches the spot where the two are waiting for them to take possession; the leader sets up the group flag and the rest prepare snowballs, after laying down their staves in a circle around the flag at a distance of six paces. When the other party arrives they try to capture the staves. The defenders are not allowed to touch their staves but two hits with a snowball will put a person out of action. Each defender killed and each staff taken counts as one point and if the rival gains more than half the possible points, they claim discovery of the Pole. Before the defenders can claim undisputed rights, they must kill all their rivals, by pursuing them, even if only one or two are left. The two forerunners do not take part but act as umpires.







Fox and Geese

Fox and Geese can be played on the same circle as the compass game but preferably before as once this lively game starts, the wheel soon becomes unrecognizable due to the many criss-crossing tracks. In fox and geese, the fox stays in the middle while the geese run around the outside rim and dare the fox to catch them. The fox must catch them between the spokes on the rim, so there can't be too many spokes and enough distance between them to give the fox a chance.

Potatoes, Anyone?

For any kind of fun on snowshoes, why not stage an old-fashioned potato race. A basket is set in the centre of a level snow-covered field or on the surface. On a frozen lake, potatoes, or similar objects, are then laid out at equal intervals in straight lines extending away from the basket in the same way that the spokes radiate outwards from the hub of a wheel. Each snowshod contestant is assigned to a line of potatoes and stands with the tail of her/his snowshoes to the basket just far enough away from the basket so as not to interfere with other competitors and yet close enough so no one has an advantage at the start. At the word "Go", all contestants run out to the first potato in their lines, pick it up and return to drop it in the basket. The process is continued until the winner has gotten all the potatoes from her/his line into the basket before anyone else. It soon becomes obvious that this game requires great skill in manipulating snowshoes in addition to considerable running ability.

A Hard One

Try the ring race. Here the emphasis is laid on skill in getting into and out of snowshoe harnesses, as well as running on snowshoes and manipulating a ski pole. For this race, the contestants line up about 10 metres behind their snowshoes, which are laid out in pairs in a straight line pointing down the course. Each racer carries a single ski pole and at the starting signal, runs forward, fastens on the snowshoes and then runs ahead along the course.

Halfway down the course, along each racer's track, a ring with an interior diameter of five cm is laid on the snow. Each contestant must pick up the ring on the tip of the ski pole, holding the pole in one hand at the upper end only, and then continue along the course to the end where a pin is set vertically in the snow. This pin should have a diameter only slightly less than the inside of the ring. On arriving at the pin, the racer must deposit the ring over the pin still holding the pole in one hand at the upper end only. After the ring is on the pin, the contestants run back to where they put on their snowshoes, then take them off and run back to the starting point. In such an event, the snowshoe bindings should be of similar style so that one racer does not have an advantage over another.



Games for Winter Outdoors

Most of the following games can be played on snow-covered ground with snowshoes or cross-country skis. Note: they do not need snow or ice to be played. All the games require vigorous activity that will keep the players warm no matter how blustery the day. Since most of them are familiar games, there will usually be one or two in the group who know the rules. As a preliminary for participating in outdoor games, it is important that a few warm-up activities be used.

Red Rover

The players are divided into A and B teams. Players on each team join hands. Someone on Team A calls out, "Red Rover, Red Rover, we call (someone's name from Team B) over." This player dashes across and tries to break through Team A's line. If the player breaks through, he/she is allowed to return to Team B and take along a Team A player. Failing to break through the line, the player must stay on Team A's side. Now Team B has its turn to call someone over from Team A. After a period of play, the team with the most players wins.

Polar Bear

A bear's den is marked off on the ice or snow. In the den is a Caller and a Polar Bear. The Caller sends the Polar Bear out after other bears, which he or she captures by tagging. When the number outside the den is reduced, the caller may send the bears out in couples or in fours and order them to hold hands while chasing other bears. The game continues until all players are caught. Any number can play this game.

Sham Battle

The players divide into two teams, one wearing red armbands, the other wearing green armbands. One team is given two minutes to hide and then the other team starts to look for them. In the battle, the object is to remove the armband from an opponent. After losing the armband, the player is out of the battle. The team that loses its entire arm bands first, loses the battle.

Quick Line-up

The players line up in four lines to form a square. The leader, standing in the middle of the square, tells the group "Regardless of where I roam over the field or where I stop, you, the human square moves with me. The number one line must always face me, the number two line must always be on my left, the number three lines always is at my back, and the number four lines is at my right." The leader moves over the area in any direction, and stops facing in any direction. The side that moves into position and forms its new line fastest after each of the leader's moves scores a point. Five points is the game. This game is still fun without scoring.



Dodge Ball

One team forms a circle, the second team scatters inside the circle. Players on the circle throw a softball and try to hit the players in the circle who may dodge and twist to avoid being hit by the ball but cannot leave the circle. A player hit by the ball is eliminated. The eliminated player joins the circle, throwing the ball. The total time taken to eliminate all the players is noted. The group reforms and the second team makes the circle, while the first team dodges the ball. The winning team is the one whose players are able to avoid the ball for the longest time.

Skirmish

Two teams line up facing each other about 10 metres apart. Players place their caps or sticks on a line just behind them. The game is for each player to guard his/her own object, and to advance and gain possession of an opponent's object and return to base position. If a player is caught after gaining possession of an opponent's object and before reaching base position, the object must be returned to the opponent and the player must go back to his/her base position before setting out on another attack. One point is scored for every object seized from the opponents and successfully brought back to a player's base. The game continues until one team has acquired all objects. Or it may be played for a designated number of minutes, with the team holding the most objects at the end of the time is declared the winner.

Crown and Cranes

A centre line and two safety lines are marked. Midway between the centre line and its safety line, each team lines up, with players spaced about one metre apart. One team is Crows, the other is Cranes. When the leader calls "Crows", the Crows run for their safety line before the Cranes tag them. If the leader calls "Cranes", the Cranes run and the Crows chase them. If the leader calls "Crawfish", no one runs. The secret is to pronounce "Cranes, Crows and Crawfish" with emphasis on the "Crrrr" sound so that the players will cannot anticipate the word being spoken. Each team receives a point for every member of the opposing team tagged before that team reaches its safety line. Each team loses a point for every one of its members who runs in the wrong direction or who runs at the word "Crayfish" or who does not run at the proper call. The team with the most points after a 10-minute period wins.

Chain Dodge Ball

The players divide into teams of five or six. One team is in a line and has each player grasping the player in front around the waist to form a chain. The remaining players make a circle around the chained team. Players forming the circle pass a ball around in any manner and attempt to hit the end person of the chain with the ball. Players in the chain try to keep the end person from being bit by weaving and dodging but still keep the chain unbroken. The first player of the chain may use her/his hands to bat the ball to keep it from hitting the end person.

When the end person is hit, he/she joins the circle. Players then try to hit the new end person and continue until the entire team is eliminated. Each team in turn forms the chain or is part of



the circle. The winning team is the one that stays in the circle the longest.

Seal Tag

Players pair off. Pairs stand three to four metres apart, forming a circle with one player in front and one behind, who clasps the front player around the waist. One pair is not joined and these two players act as chasers and the one who is chased. "It" is the player who does the chasing. The player who tries to escape will attempt to get in front of one of the pairs. The front player of the pair tries to stop there. As the front player tries to aid the pursued player by holing him/her, the rear player in the pair tries to prevent this by swinging the front player away. If the player being chased succeeds in getting in front of the pair and is held by the front player, then the rear player drops away. He/she now becomes the one who is chased and must try to get in front of another pair of players. The game has two struggles: the struggle of the front and rear players of each pair, and a running match for "It" and the one being pursued. If "It" catches the chased player, they reverse roles.

Jab Relay

The equipment you need are a ball, broom handle, softball bat or a stick for each team. A ball is placed on the starting line before each team. At the signal, "Go", the first player holds the stick and jabs the ball until it crosses the finish line, about 10 metres away. He/she picks up the ball, runs with it back to the second player, and goes to the rear of the line. This continues until the ball has been jabbed across the line by the last person in the column. The team finishing is the winner.

And Next Try

Snowshoe your way to a winter or early spring cookout and at the same time search for buds, watch for tracks, or go birdwatching on a winter dayhike. Wardens can learn to lead and organize snowshoe games as part of their leadership program component.

At the Gold Tree level, Wardens can use snowshoeing as their means of travel in an extended winter camping trip.



Equipment Checklist

Use the following items as a starting point to help you get the clothes, gear, tools, equipment, food and drink that you may need for an outing. This sample list is an excellent framework for all outdoor winter activities.

Clothing

Inner Layer

- ☐ Tights
- ☐ Long-sleeved shirt
- ☐ Inner socks
- ☐ Earband
- ☐ Neck gaiter/scarf
- ☐ Thin gloves
- ☐ Balaclava

Middle Layer

- ☐ Long-sleeve, polar fleece shirt
- ☐ Polar fleece pants
- ☐ Sweater
- ☐ Outer sock
- ☐ Down/synthetic vet or jacket
- ☐ Insulated gloves

Outer Layer

- ☐ Jacket or anorak
- ☐ Over-pants
- ☐ Over-gloves or over-mittens
- ☐ Booties or gaiters/coveralls
- ☐ Hat
- ☐ Sunglasses



Equipment

- ☐ Snowshoes
- ☐ Snow poles
- ☐ Ice ax
- ☐ Waterproof sunscreen
- ☐ Maps
- ☐ Compass
- ☐ Hand and pocket warmers
- ☐ Backpack or fanny pack
- ☐ Waterproof matches
- ☐ Plastic whistle
- ☐ Flagging tape (to mark trail)
- ☐ Pencil
- ☐ Candle
- ☐ Flashlight and/or headlamp
- ☐ Extra batteries
- ☐ Flares
- ☐ First-aid kit

Tools

- ☐ Duct tape (to repair snowshoes)
- ☐ Rope or nylon cord
- ☐ Sewing kit
- ☐ Spare parts

Food & Drink

- ☐ Thermal container with 1 L water (minimum)
- ☐ dry soup
- ☐ oatmeal
- ☐ fruit
- ☐ chocolate
- ☐ nuts
- ☐ energy bars

APPENDIX



Cross Country Skiing

VII

APPENDIX



Cross Country Alberta's Mission Statement

Cross Country Alberta's mission is to lead, develop, and promote the sport of cross country skiing throughout Alberta. We will accomplish our mission through quality service, leadership and skier development, responsible management, and education, thereby enhancing communities and lifestyles throughout Alberta.

Cross Country Skiing

Equipment

Canadians are great consumers of all the bells and whistles when we purchase outdoor equipment. And that seems to be the way to market a lot of ski equipment. Thankfully the needs of cross country skiing are simple and so is the equipment. Following is a short description of the equipment you will need to cross country ski. Staff at outdoor equipment stores and books will provide more detail about equipment. Shop around, ask a lot of questions and you should end up with the best equipment for your skill level.

Skis

There are three basic types of cross country skis available: racing, light touring and touring. Racing come in widths from 5.3 to 5.9 cm. They are fragile and may break in crust and deep snow. Touring skis are the heaviest and widest, ranging from 7.3 to 8 cm. They are used in deep snow and when the skier is carrying heavy backpacks. They require a more sturdy binding. Light touring is generally what most of us use for recreation skiing. The skis are about 6.5 cm wide and light enough for the efficient "rattrap" binding.

Wood has been used for cross country skis for over 2,000 years. Wood is stronger in flexure than any other material, they hold the wax better and seldom break. There are several makes of so-called waxless skis. These skis rely on specially grooved or fur-stripped bottoms in order to stop backsliding. They work but have their own set of problems, for example, grooved skis are noisy and fur tends to ice up.

A light touring ski should be 30 cm longer than you are tall. A touring ski can be shorter because it has more surface area.

Bindings

The "rat trap" type of binding is the best, it binds at the toe. Your binding should also include a plastic plate to prevent balls of snow sticking under your feet. There should also be a heel popper, which allows you to set your heel into the ski when turning. This is usually a simple serrated alloy plate.

Boots

Boots should be light and comfortable when you are wearing a light pair and regular pair of wool socks. You should be able to wiggle your toes without the heel lifting. The boots will



feature a moulded sole, which is standardized to fit the two or three pin "rat trap" binding. Boots can be lined or unlined. If you tend to get cold feet, lined boots may be the best choice.

Poles

Ski poles should be light and inexpensive. Poling is only 15% of your effort in skiing. Bamboo poles are the least expensive. If one breaks while on the trail, you can splint it using a branch and black plastic tape you carry along with you.

The handles should be tapered at the upper end so you can grasp it lightly and in a relaxed follow-through. The leather strap should be adjustable so the pole can hang from your wrist during this maneuver. The snow baskets should be small. Large baskets are unwieldy and make it hard to whip the pole forward.

Pole Length: The pole should reach under your armpit when standing in your ski boots without skis. If the poles are too long, you will have difficulty climbing hills with it, because your leverage angle will be too shallow.

Clothing

Most beginner skiers are amazed how warm they get skiing on the coldest of days. The reason is simple, as you ski you increase your circulation. This means that you need an adjustable clothing system. Dress in layers so you are able to adjust your temperature. As you get warm, take off a layer and put it in your pack. As you get cool, for example when you stop for lunch, you will put on more clothing.

Gloves or mitts are a personal preference. Gloves are better for gripping the poles because on the back swing the pole is held with the thumb and index finger. If you suffer from circulation problems with your hands, wear mitts, they won't make that much difference.

Whenever possible, wear wool. It's an excellent material for socks, shirts, hats and sweaters. Outer wear can ideally be made from synthetic materials which are light and wind proof.

If your ego can stand it, dress properly--not fashionably.

Cross Country Canada Youth Program

Jackrabbit Ski league is a program of Cross Country Canada.

Program Name	Age level	Skills	Emphasis
Bunnyrabbit	4 to 6	Yellow to Green Badges	Balance on skies
Jackrabbit	7 to 11	Orange to Purple Badges	Instruction
Racing Rabbits	9 to 12	Purple to Gold Badges	Racing
Challenge	12 to 18	Purple to Gold	Variety of skiing activities



Below are the skills required at each badge level. The skills will give you an idea of the skills and the progression level.

Green

Ready position
Falling and rising
Star Turn
Side Step
Ski walking without poles
Herringbone

Yellow

Ready position
Falling and rising
Star Turn
Side Step
Kick Turn
Straight Running
Herringbone
Free Skate
Diagonal Stride
Braking Snow Plow

Orange

Double Pole
Step Turn
One-step Double Pole
Free Skate
Diagonal Stride
One Skate
Kick Turns
Skate Turn
Marathon Skate
Diagonal Skate
Braking Half Snow Plow
Snow Plow Turn

Red

Double Pole
Snow Plow Turn
One-step double pole
Step Turn
Diagonal Stride
Kick Turn
Free Skate
Marathon Skate
Diagonal Skate
Offset Skate

Straight Running

Endurance:
Classic 10 minutes
Skating 5 minutes

Blue

Step Turn
Telemark Straight Running
Parallel Side Slipping
Snow Plow Turn
Diagonal Skate
One Step Double Pole
Endurance:
Classic 15 minutes
Skating 10 minutes

Purple

Diagonal Stride
One Step Double Pole
Diagonal Skate
Marathon Skate
Two Skate
Step Turn
Telemark Turn
Endurance:
Classic 20 minutes
Skating 10 minutes

Bronze

Diagonal Stride
Uphill Diagonal Stride
Double Pole
Classic Change-overs
One Skate
Offset Skate
Skating Change-overs
Step Turn
Linked Telemark Turns
Endurance:
Classic 30 minutes
Skating 15 minutes

Silver

Two Skate
One Skate
Skating Change-overs
Diagonal Stride
Uphill Diagonal Stride
Double Pole
One Step Double Pole
Parallel Skid Turn
Classic Change-overs
Endurance:
Classic 30 minutes
Skating 15 minutes

Gold

Diagonal Stride
Double Poling
One Step Double Poling
Classic Change-overs
Uphill Free Skate
Offset Skate
Two Skate
Endurance:
Classic 30 minutes
Skating 15 minutes



Awards
speed
distance
special

There are also three awards: Speed awards, distance awards and special awards.

Speed Awards are available for 10, 20, 30, 40, 50, 60, 70 80 and 85 minutes.

Distance awards are available for 10, 25, 50, 75, 100, 150, 200, 250, 300, 400 and 500 kilometers skied in one year. Distance awards are to recognize annual distance skiers.

Special Awards include:

Racer - Participate in two inter-club or Division races during one ski season.

Touring - Ski 20 kilometers in a supervised tour.

Challenge: Purple technique badge and Distance 350 kilometers or more.

Starting a Cross Country Ski Club

Junior Forest Warden clubs may join Cross Country Alberta as a cross country ski club. Your club must meet the requirements outline in the CCA by-laws. Once your club is registered, clubs and members have access to CCA programs, information (including newsletter) and insurance coverage. As a member of a registered CCC Club, you automatically receive second and third party Liability insurance for your activities as a leader of an approved club program.

Skier development programs begin with the Jackrabbit program, developed by the national governing body, Cross Country Canada (CCC), and delivered on a club basis. Jackrabbit leader manuals are available from CCA for \$35 for non-association members and \$25. For CCA members. Jackrabbit leader courses are run throughout the ski season for a \$50 fee which includes two days of instruction and a manual.

Going It Alone

If you decided to teach cross country skill on your own, below is a list of skills that may help you start.

Beginner Level Skills

- ☐ Ready Position
- ☐ Falling and Rising
- ☐ Start Turn, Kick Turn, Side Step
- ☐ Ski Walking without Poles
- ☐ Herringbone



- Free Skate and Diagonal Stride
- Braking Snow Plow
- Straight Running
- Clothing and Cold Weather Safety

Intermediate Level Skills

- Double Pole and One-step Double Pole
- Braking Snow Plow and Snow Plow Turn
- Step Turn
- One Skate and Offset Skate
- Skate Turn
- Basic Waxing

Waxing Skis

Never let your dog lie on your freshly waxed skis, the fur will wreck your glide.

Waxing is part of the sport of cross country skiing. It has a mystique about it but it is really very simple. Waxing is fun and has been compared to cooking, especially if you exchange recipes or waxing secrets. You'll have days where you'll feel like you have wings on your feet or lead boots on other days. Lead boots are skis with the wrong wax applied.

To achieve best easiest results in waxing, pick one brand of wax and stick to it (no pun intended.) In this section, information about Swix waxes is presented.

Waxes should be applied, on an average, every time you go skiing. It depends on how much skiing has been done with the previous wax application and if it needs to be changed to suit the changing snow conditions and temperatures.

When ski touring, it is a good idea to carry extra waxes with you plus a scraper and applicator. The snow conditions may change during the day, which will require a change in wax.

Use a gloved hand, make a snowball and examine it.

Dry snow falls away in flakes.

Moist snow packs and holds together.

Wet snow shows water on the surface.



Swix Hard Waxes for Powder Snow

Color	Snow Temperature
Polar	-15° C to -30° C
Green Special	-10° C to -15° C
Green	-7° C to -13° C
Blue Special	-5° C to -9° C
Blue	-3° C to -8° C
Blue Extra	0° C to -7° C
Violet Special	0° C to -1° C
Violet	0° C
Violet Extra	0° C to +1° C
Red Special	-1° C to +2° C
Red	0° C to +3° C
Red Extra	+1° C to +3° C

Waxing Hints for Hard Waxes

When in doubt between two waxes, always apply the hardest (wax for the lowest temperature) first. Softer waxes can be applied over harder waxes, never the opposite.

- For extreme cold weather use Special Green or Polar wax.
- For dry to wet snow conditions, a two way combination is best. First apply a layer of Blue. If you back slip add a thin layer of Violet in the middle third of the ski (the higher the temperature the thicker the layer.)

Waxing Hints For Klister Waxes

- Icy conditions: Use Blue klister (a thick layer is best)
- Icy to wet snow conditions: Violet klister
- Wet dirty old snow conditions: Red klister
- Soaking wet conditions: Yellow klister (a thin layer is best)

When in doubt apply the klister in a thin rather than thick layer.

Skis with Synthetic Base Need Waxing

Correctly waxed skis will have the best glide and grip performance. A thin layer of Swix Base Binder, if applied first, will make final waxing more durable and also result in a better grip. Synthetic based skis need a bit more wax in the mid-section.



Swix Universal Line of Waxes

The Swix Universal line of waxes is designed specifically with the recreational skier in mind. One wax for dry snow, one wax for wet snow, one glide wax, and one klister for refrozen snow.

Grip Waxes

Blue (dry)

Blue wax is for dry snow, with air temperature of 0° C and below. Use Blue if you can't make a snowball with the snow. Apply starting from 10 cm behind the heel plate, extending approximately one metre toward the tip.

Red (wet)

Red wax is for wet snow, with air temperature of 0° C and above. Use Red if you can make a snowball with the snow. Apply starting about 10 cm behind the heel plate, extending approximately .75 metre toward the tip.

Glide Wax

Universal Glider

To improve the gliding performance of your skis, rub and cork on a layer of Swix Universal Glide Wax on tips and tails where the grip wax is not applied. This wax works on all types of snow from -5° C to +10° C.

Klisters

Universal Klister

This is used for a very wide range for coarse-grained, old, frozen snow and wet spring snow. Use the air temperature in shadow is -5° C to +10° C.

Also available is the Universal Silver Klister that resists dirt better and is lightly harder than the Universal Klister.

Apply klister in a herringbone pattern on each side of the groove. Smooth to an even layer with a scraper. Apply starting 10 cm behind the heel plate, extending approximately .75 metre toward the tip.

APPENDIX

VIII

Supporting Resources



APPENDIX



Supporting Resources

Jackrabbit Program Leader Manuals. Available from CCA, 11750 Groat Road, Edmonton, Alberta T5M 3K6 Cost: \$35. for non-association members and \$25. for CCA members.

Internet Addresses

Cross Country Canada (CCC)

<http://canada.x-c.com/>

Cross Country Alberta (CCA)

<http://www.xcountry.sport.ab.ca/>

Books

The Backpacker's Field Manual: A Comprehensive Guide to Mastering Backcountry Skill Rick Curtis. Three Rivers Press. New York, New York: 1998. 374 pages ISBN 0-517-88783-5. Cost \$21.00

This is a great book full of comprehensive information about trip planning, equipment, cooking, nutrition, first aid, navigation, wilderness travel safety, no trace hiking and camping, hygiene and water purification, and weather.

Be Expert With Map & Compass: The Complete Orienteering Handbook Björn Hjelström. Simon & Schuster Macmillan Company: New York. 1994. Table of Contents, Glossary, Index. 120 pages. ISBN 0-02-029265-1.

This book includes everything a beginner needs to know about orienteering. It covers the following topics: map symbols, travelling by map alone, compass alone and by map and compass together; finding bearings; sketching maps; travelling in the wilderness.

The Cactus Guide to Outdoor Cooking. Written and compiled by Phyllis McBride. 4332 Brisebois Drive NW, Calgary, Alberta T2L 2G2. 72 pages Available for \$8.00

Phyllis McBride, a member of Alberta Junior Forest Wardens Alumni, compiled this book. It contains information on the following topics: trip planning guidelines, methods of cooking, steps to safer food, food storage, Canada's Food Guide, kitchen conversions, equivalents, suggested menus, food purchasing for 100 people, weekend camp for 30 to 50 people, recipes for breakfast, soups and salads, lunch and supper, and breads and desserts.



Camping Made Easy Micheal Rutter. The Globe Pequot Press: Old Saybrook, Connecticut. 1997. ISBN 0-7627-00433-2. Table of Contents, Index. 301 pages.

This is a practical and informative book about the many aspects of camping. It is good reading for inexperienced campers and will help anyone get interested and started. It includes information on equipment (sleeping bags, sleeping pads, tents, packs, cooking gear, knife, hatchet, saw, flashlight and lantern), dressing for the outdoors, rain gear, footwear, setting up camp, planning a trip, low-impact camping, campfires, cooking, water, camping with children, if you get lost, canoe camping, mountain biking, trailer camping, and fishing.

Edible and Medicinal Plants of the Rocky Mountains and Neighbouring Territories Terry Willard. 1992. ISBN 0-9691727-2-9 Published and available from: Wild Rose College of Healing, Ltd. 302, 1220 Kensington Road N. W., Calgary, Alberta T2N 3P5.

This is an excellent book full of information and coloured photographs with approximately 150 major species of medicinal and edible plants. This is an excellent field guide helping beginners to easily identify plants. It also includes collecting techniques and definitions.

The Essential Wilderness Navigator David Seidman. Ragged Mountain Press: Camden, Maine. 1995. ISBN 0-07-05323-3. Table of Contents, Index. 160 pages.

This is another good book about navigating in the backcountry. It contains information with the following chapter topics: a sense of direction; maps; compasses; navigation; looking to nature for clues; and extreme environments.

Leave No Trace: Minimum Impact Outdoor Recreation Will Harmon. Falcon Publishing Co. Inc: Montana. 1997. ISBN 1-56044-581-5 (pbk) Table of Contents. 119 pages.

This is a pocket-sized book that can be carried on the trail. It covers the importance of leaving-no-trace, the principles of leave-no-trace behaviour, techniques, and leave-no-trace guidelines for different types of recreation and special environments.

Northern Bush Craft. Mors L. Kochanski. Lone Pine Publishing. Edmonton, Alberta. 1987. 287 pages and a color photo supplement.

This is an excellent resource full of information on such topics such as firefighting, axe, saw and knifecraft, making cordage, shelters, trees, the moose and the Varying hare. Every Warden should have a copy of this book.

Staying Found: The Complete Map and Compass Handbook June Flemming. 2nd edition. Published by The Mountaineers: Seattle, Washington. 1994. ISBN 0-89886-397-X 158 pages. Cost: \$14.50

This is a good book enabling the reader to easily learn map and compass. It includes the simplest ways to plan routes and find your way through the trickiest terrain. It includes instructions for reading various types of maps, determining "true" directions, following bearings, backbearings and baselines, using nature as a guide, and coping if you are really lost.



Recipes for Roaming: Adventure for the Canadian Rockies Astrid Blodgett, Brenda McIntyre, and Janet Pullan. Babes in The Woods Press, Spruce Grove, Alberta. 1996 ISBN 0-9680996-1-0. 104 pages. Cost: approximately \$13.95

This is a great cookbook full of ideas and recipes for light-weight cooking in the outdoors. It may help Wardens plan meals for outings. It is spiral bound and 14 cm X 22 cm.

Tom Brown's Field Guide to Wilderness Survival Tom Brown Jr. Berkely Books, New York. 1983. ISBN 0-425-07702-0. 287 pages.

The author is a famous tracker and hunter taught by an Apache elder named Stalking Wolf. He disappeared for a year in the wilderness with only a knife, where he honed his skills. He presents them well in this book. It covers topics such as attitude, shelter, water fire, plants, animals (trapping, fishing, skinning, cooking and preserving), tools and crafts. This is a must read for those interested in survival.

Videos

Bush Survival Tape Series.

The four in the series are: Building a Super Shelter, Making Cordage, Kindling and Fire Building, Matchless Fire by Friction. Starring Mors Kochanski. Available from Karamat Wilderness Ways, 12137 - 85 Street Edmonton, Alberta T5B 3G5, Tel: 464-5405. Costs: \$30.00 a tape or \$105. For all four tapes, add GST and \$5 for S & H. These are also available for borrow from your Regional Coordinator.

○ **Building a Super Shelter**

One of the greatest challenges in survival is the construction of an efficient shelter adaptable for four season use. This video demonstrates the construction of a shelter that is adaptable for year-round use. Common misconceptions such as sleeping on the ground are discussed and dispelled based on extensive experience. The shelter is an evolutionary compilation and distillation of 30 years of experience in the bush. This shelter works.

○ **Making Cordage**

A serious bottleneck in survival in the bush is making cordage to be used for binding. If unexpectedly caught in the bush, and string or cord is not at your disposal, most people would be hard pressed if no alternative could be found. Such simple tasks as building a shelter together or setting a snare would be impossible. In this video, demonstrations of how to produce your own cordage are made using commonly found materials in the bush. Grass, bark, and cattails are used to produce snare cord and thicker cordage for heavier uses.



○ **Kindling and Fire Building**

It is said that a person can survive in the bush wet and warm but not cold and dry. The first priority in survival is to build a fire for warmth if the environment is cold. In this video, various types of kindling such as birch bark, resin, other barks, and twig bundles are discussed and their use demonstrated. Where they can be found and their proper gathering is shown. Wet weather techniques are also discussed. Making feather sticks, an important aid in wet weather, is presented, as well as the use of the incredible zirconium rod in fire lighting.

○ **Matchless Fire by Friction**

You probably have heard of building a fire by rubbing two sticks together, but question whether it can really be done. In the non-desert environment it is not quite that simple, but given the right tools and the techniques discussed in this video, anyone can learn to produce a fire if caught without matches in the bush. This video discusses what to look for as tools, how to prepare them and their proper use. An actual fire is started on this video using these techniques.

Miscellaneous

Basic Knots Deck of Cards. Available from Ynot Us International, Inc. 28-51420 Range Road 270, Spruce Grove, Alberta T7Y 1G5. Cost approx. \$6.99 add \$1. For postage and handling per deck.

The following basic knots are illustrated on the cards. Angler's Loop, Artillery Loop, Barrel Loop, Bill Hitch, Bowline, Bowline on a Bight, Bowline for climbers, Bowline on a ring, Branch Knot, Carrick Bend, Cat's Paw, Chain Sinnet, Clove Hitch (pole, post, ring), Constrictor Knot, Cow Hitch (post, ring), Double Fisherman's Knot, Double Overhand Bend, Dropper Loop, Figure-eight Knot, Fisherman's Bend, Half Hitches, Hangman's Knot, Heaving Line Knot, Highwayman's Hitch, Hunter's Bend, Japanese Bend, Jury Mast Knot, Knotted Sheepshank, Loop on the Bight, Loop Knot, Multiple Clove Hitch (pole, post), Multiple Overhand Knot, Multiple Sheet Bend, Noose, Overhand Knot, Portuguese Bowline, Reef-square Knot, Rolling Hitch, Sheepshank, Sheet Bend, Spanish Bowline, Sturgeon's Knot Bend, Swivel Hitch, Tarbuck Knot, Thief Knot, Three-part Crown, True-lover's Knot and Water Knot. A deck of these cards would be a great asset on a trip. Have Wardens practice their knots in the tent when it's raining or around the campfire.



Web Sites Worth Exploring

Cooking Clan of the Cave Bear Style!

<http://www.wynja.com/arch/cooking.html>

Food

<http://www.gorp.com/gorp/food/recipe.htm>

Hiking Resources

<http://www.campfirefoods.com/links.html>

Knots on the Web

<http://www.earlham.edu/~peters/knotlink.htm>

Map and Compass

<http://www.usgs.gov/fact-sheets/finding-you-way/finding-your-way.html>

Scouting Recipes

<http://www.isd.net/srtobin/sc-cook.html>

Solar Cooking Archive

<http://www.accessone.com/~sbcn/index.htm>

Ultralightweight Backpacking

<http://ourworld.compuserve.com/homepages/rwgross/ultrahow.htm>

The World Wide Web's Knotty Index

<http://www.geocities.com/Yosemite/2158/knotix.htm>

E-mail

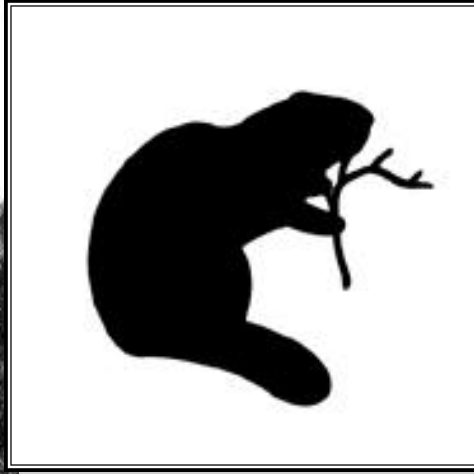
Mountaineers Books

(Ask for a free catalog with 350 titles on climbing, hiking, mountain biking, paddling, backcountry skiing, snowshoeing, adventure travel, natural history and conservation, and many more titles on how-to books to sharpen outdoor skills).

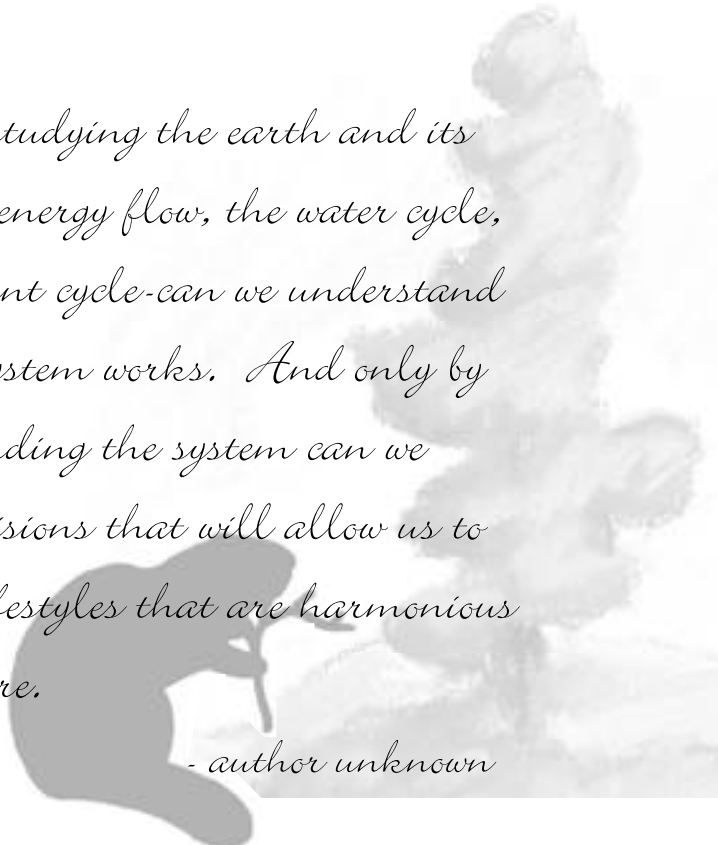
mbooks@mountaineers.org



Ecology



MODULE



Only by studying the earth and its parts-the energy flow, the water cycle, the nutrient cycle-can we understand how the system works. And only by understanding the system can we make decisions that will allow us to develop lifestyles that are harmonious with nature.

- author unknown



Introduction

The Junior Forest Warden Adventurer Ecology Module will enhance the study of the interrelationships of organisms and the environment. The word ecology is derived from the Greek word oikos which means home. Ecology literally means "the knowledge of home" or "home-wisdom." Ecology invites our understanding of the world's living space and all contained therein. Today ecology it has been limited to bits and pieces, however, organisms do not "stand alone", they exist and evolve within a complex ecological web.

Leaders will find the Ecology Module stimulating. The content is interesting, some components are thoughtful, and the knowledge can be a tool for making a difference in the human journey through the millennium. This module will provide you and the wardens with information that is a starting point for further study of our home planet.

It may seem like a lot of information to cover and it is if each objective is treated separately. However, when you combine the concepts in this module with skills required in the Leadership Module or combine components from Forestry, Woodstravel and Ecology together into one field trip, then the task of covering all the material is not so daunting.

Warden Manual

The Warden's Manual is similar to but not exactly the same as the Leader's Manual. The reason the manuals are not the same is to provide the leader with the advantage of being the only person giving instruction, leading discussions and providing answers. The Leader's Manual also has activity master sheets that are not in the Warden's manual. This was done to give the leader more programming control during meetings. Leaders have to plan, copy the necessary information before meetings and facilitate an interesting agenda.



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The Junior Forest Warden program enables Leaders to adapt activities to suit their circumstances. Leaders are encouraged to contact local experts who are able to share their area of expertise with Wardens. Ensure that your years as a JFW Leader are enjoyable and stimulating. It is important to pass on meaningful knowledge to young people who are our future leaders and caretakers. Let us do our part in teaching our children well.

JFW Ecology Learning Objectives

The Wardens will develop an appreciation for the beauty and uniqueness of all living things by observing and comparing the differences in colour, form, texture, arrangement or design of objects in the environment and demonstrating knowledge, skills and attitudes regarding the diversity of the environment, including life found within.



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IV Ecological Issues	55

APPENDICES

- I. Canadian Wilderness Charter
- II. Children's Behaviours and Interests
- III. Monitoring Programs



Framework

The Wardens will develop an appreciation for the beauty and uniqueness of all living things by observing and comparing the differences in colour, form, texture, arrangement or design of objects in the environment and demonstrating knowledge, skills and attitudes regarding the diversity of the environment, including the life found within.

I. Enjoying the Outdoors

Wardens will develop and further instill a deep appreciation for the diversity of our natural world.

- ☐ Lead one nature awareness walks for younger wardens.
- ☐ Present a slide show, video recording, talk or photo album on why natural areas are important to you.

II. Classification

Organisms are classified on the basis of similarities and differences. The fundamental unit of classification is a single kind or species. Wardens will learn to identify and classify species of living things.

- ☐ Identify at least two trees using a dichotomous key.
- ☐ Show younger Wardens how to use a field guide of your choice.
- ☐ Discuss how wildlife is monitored and identify some endangered species in your province.
- ☐ Participate in a provincial species count or a monitoring program.



III. Understanding Ecology

Wardens will develop an understanding of the interdependence of living things and the relationships between species, including humans, and their environment.

- ☐ Define and understand the following terms: biosphere, ecosystem, biological diversity, niche.
- ☐ Discuss how food webs and food chains demonstrate the flow of energy through an ecosystem.
- ☐ Examine the interactions of plants and animals with a project showing one of the following: tree reproduction and growth, insect reproduction and growth, insects and disease in a forest ecosystem, forest disease reproduction and growth, habitat infringement from human activities.
- ☐ Illustrate and explain one of the following global climactic changes to younger wardens: the greenhouse effect, acid rain, or thinning ozone.
- ☐ Describe how environmental factors affect plants and animals.
- ☐ Discuss how human actions modify the environment in positive and negative ways.

IV. Ecological Issues

The only way in which Wardens can approach a knowing and understanding of a subject is by reading, discussing and listening to what other people have to say about it.

- ☐ Choose an environmental issue and find differing opinions about the issue from a variety of sources.
- ☐ Choose an newspaper or magazine article and evaluate the writer's bias or point of view. Share your opinions with your group.
- ☐ Present a 250 word essay or a letter to an editor or a 10 minute presentation about an environmental topic you feel strongly about and share with your group.
- ☐ Discuss the dynamics of social change in our culture and how it affects environmental issues.

Ecology Learning Objectives: The Wardens will develop an appreciation for the beauty and uniqueness of all living things by observing and comparing the differences in colour, form, texture, arrangement or design of objects in the environment and demonstrating knowledge, skills and attitudes regarding the diversity of the environment, including the life found within.



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ENJOYING THE OUTDOORS

*Wardens will develop and further instill a deep appreciation
for the diversity of our natural world.*

date completed



Lead one nature awareness walk for younger wardens.
page 3



Present a slide show, video recording, talk or photo album on
why natural areas are important to you. page 7

I. Enjoying the Outdoors

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1. **Lead one nature awareness walk for younger wardens.**

Introduction

Nature walks can have a profound effect if an experienced and caring person leads the way. It can take some people several years and many kilometers to learn how to lead an effective nature hike. Don't be discouraged, every great journey begins with one step.

Below are some things to keep in mind as you develop your walk:

Plan it. Don't go out with a bunch of kids and "wing it." Choose a topic and narrow down so you have a focus or theme. For example, you may decide to choose ecology as your topic and theme of the hike will be "Everything is becoming something else." Develop three main points that you will develop during the hike.

Pre-visit the trail as part of your planning process. Look for interesting things to talk about and hazards that may detract from the hike or cause an injury.

Encourage hikers to use all their senses- smell, touch and listen. Kids learn best from first-hand experience, and they learn better when they are actively involved in the learning process. Be careful about tasting unless you are positive about the edibility of a wild plant. A nice drink of lemonade, however, would be welcome after a hike on a hot day.

Structure your walk to include variety. Don't do the same types of things all through the walk. Using a variety of approaches to enhance learning.



Try to find out unusual information to spark interest, for example, the male mosquito never bites and the main diet for mosquitoes is plant liquids.

Be enthusiastic. This should be easy for you, after all, you are an older Warden with knowledge to share and a role model for the younger Wardens.

Use Questions. Questioning can encourage involvement in three ways:

1. Ask questions to get hikers thinking.
2. Encourage younger Wardens to ask you questions.
3. Answer questions in such a way that draws wardens into further discussion.

When you are asked questions, wardens will give you hints about what they really want to know and whether you are addressing their interests.

- ☐ Keep in mind that some friendly competition stimulates learning.
- ☐ Consider including a game that can make specific point(s) to fit your theme.
- ☐ People learn best from first-hand experiences.
- ☐ An organized presentation is more memorable than an ad-lib one.

The opposite page is an example of a Nature Walk Record. This can also be used as a planning outline to keep you organized and on task during your walk.

WARDEN



Record of Nature Walk

N a t u r e W a l k

Topic:
Theme:
Three main Points:

- 1.
- 2.
- 3.

Outline:

Introduction

Main Points

Closing Points

Location:

Duration:

Length:

Evaluation:

Things that went well:

Things I would change:



Last Updated: 11/00



2. **Present a slide show, video recording, talk or photo album on why natural areas are important to you.**

BACKGROUND

Natural areas can range from a green space in your neighbourhood, right-of-ways, provincial parks, protected areas, wilderness areas, or the six major natural regions in Alberta. Wardens can include all, some or one of the areas mentioned. Natural areas can be wild or have some development in them for the purposes of ecotourism.



Activity Ideas

- ▶ Discuss the characteristics of natural areas.
- ▶ Discuss the pros and cons of natural areas.
- ▶ List all the natural areas in the local community.
- ▶ Have Wardens keep a journal of their thoughts about natural areas when you go on outtrips.
- ▶ Have Wardens finish this sentence and develop it into an essay or journal entry: "This I believe about natural areas:"
- ▶ Have Wardens decide on some areas that should be protected as a natural area by the local community or government.
- ▶ Make a night of the presentations or have them interspersed though the year. First-year Adventurers can do their presentations one meeting night, second-year Adventurers another night and so on.



Guidelines for a Presentation

Getting Started

- Start with an idea and then develop objectives for your presentation.
- Express your idea concisely. Write a short paragraph, describing what you wish to accomplish.
- Decide whether you want to inform your audience or to instruct them. An information presentation is general in nature, serving as an introduction or an overview. It can be motivational, entertaining or dramatic. An instructional presentation should be planned systematically so learning principles are incorporated and learners are able to check their understandings.
- Develop objectives to provide guidance so that your presentation will be orderly. Objectives can be written in such a way that you and the learners are able to measure what they have learned. In planning, write no more than a few concisely stated achievable objectives.
- Consider the audience. The characteristics of your audience and your objectives cannot be separated from each other. The audience is the determining factor when considering the complexity of the ideas to be presented.

Audio Visual Presentations

Slide and video presentations come in a variety of themes and are limited only by the number of images that you have available. If you have access to a camera then you can design your talk about anything. The images show the audience important segments of your theme.

Slides

Make sure you have experience with the camera you are using. Practice first by taking a roll of film and having it developed before you take the pictures you want for your presentation.

- Use the right film. Ensure that the film you buy is for slides and not photographs.
- Plan the presentation. Write out the presentation in two columns. The text first on the left and the images to match



the text on the right.

- Take a lot of pictures. You will probably discard a lot of photos because of the poor quality.
- Do a dry run of the slide show to make sure the slides are placed in the carousel correctly, e.g. upside down and backwards will give the correct image on the screen.
- Make sure there is an extra bulb for the slide projector and a reasonable place to project the images. Will the room get dark enough? Do you need a small penlight to read the text in the dark?

Your presentation may have more impact if you plan to leave the viewers with a final thought or an interesting question.

Video

Use the video camera in good lighting and make sure the image is steady. Use a tripod if necessary. Plan the video by writing out a storyboard. A storyboard is like a cartoon strip with draft cartoon like pictures of the images you plan to take. The text runs underneath the cartoon pictures. A storyboard gives you the opportunity to plan the video production before you head out and videotape the images you need. This will prevent a bad production and keeps you from creating an “off the cuff” production. Plan it and they will come . . . to watch.

Verbal Presentations

A talk on why natural areas are important to you is a talk about your opinion. It’s not about what other people think of natural areas. The focus is why something is important to you. Keep your presentation within a short time limit, 10 to 15 minutes.

Then practice, practice, practice. Prepare an outline to ensure that all your points will be covered. Above all, remember that you are unique and have a valid and unique perspective on how you see the world. The talk you develop and deliver will be unmatched.

Appendix III - “Making Presentations” in the Leadership module of your program has information on developing effective presentations.



Photo Album

Photo albums are collections of pictures that may be labeled and sorted in chronological order. In the old days they were mounted onto black pages with corner stickers. Writings were around the pictures in white ink. Nowadays, photo albums are turning into stylish scrapbooks using construction paper, coloured markers, and decorative-edged scissors.

- Scrapbook pages tell the story behind the photos. Try some of these ideas:
- Creative lettering, alphabet stickers and creative cropping of photographs will strengthen a picture's impact.
- Cropping will eliminate unwanted backgrounds and spotlight the primary subject. Keep in mind to think twice, cut once. Play with the layout before you crop. Experiment with different ways to position your photos or use your photos.
- Make plastic templates in various shapes as guides to crop photos. Layer the cropped photo with background paper cut in the same shape but slightly larger to add colour.
- Save all the picture trimmings and cut them into shapes such as leaves on trees, flowers, borders, letters or numbers. Or use your scraps to make a background collage.
- Don't be afraid to use your imagination to express how you really feel about natural areas. Try it from another perspective, with thought balloons, as a documentary. Anything goes. Do what feels right for you.



Last Updated: 11/00

II CLASSIFICATION

Organisms are classified on the basis of similarities and differences. The fundamental unit of classification is a single kind or species. Wardens will learn to identify and classify species of living things.

date completed





Identify at least two trees using a dichotomous key.

page 13



Show younger Wardens how to use a field guide of your choice.

page 14



Discuss how wildlife is monitored and identify some endangered species in your province.

page 15



Participate in a provincial species count or a monitoring program.

page 16

II. Classification

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1. Identify at least two tree species using a dichotomous key.

Background on the Dichotomous Key

The Linnaean (inventor Carolus Linnaeus, 1707-1778) or Dichotomous System, is the acceptable classification system which assists us today in classifying newly discovered species and in communicating about already known species.

The classification system we use today groups living organisms into seven different levels based on similarities: Kingdom, Phylum, Class, Order, Family, Genus, and Species.

The system is based on a series of paired or binary statements about physical qualities that plants, animals and other living organisms may possess, for example, leaflets attached singly or leaflets clustered. The system starts with the broadest characteristics first and moves through to more specific features. Some examples of choices regarding characteristics of leaves: Broadleaf or needle leaf? Alternate or opposite? Sheathed or unsheathed? Compound or simple? Smooth or toothed? In this way all plants and trees can be classified and identified, as well as animal species.

Linnaeus used Latin names and gave all living things a two-part name. People have two-part names (first & surname). Similarly, he developed the two-part name to show which family the organism belongs in and then the individual. Biologists put the family name first, for example, *Populus tremuloides* and *Populus balsamifera*. *Populus* is the family name covering a group of related species known as genus, *tremuloides* & *balsamifera* refer to the particular species.



Activity Ideas

There is an excellent resource developed for trees and shrubs in Alberta entitled, Guide to Common Native Trees and Shrubs of Alberta. Refer to the Supporting Resources section in this module for more information. Wardens should have their own copy of this key.

- ▶ Practice using the guide on every outing or in the area surrounding your meeting place.
- ▶ To help wardens understand dichotomous keys, have them classify the leaders or members of their group using one.

2. Show younger Wardens how to use a field guide of your choice.

BACKGROUND

Field guide books come in a variety of sizes, formats and methods of identification. For example, some are presented in a dichotomous key format, species are organized by colour (flowers) or size (birds), or by structure (mushrooms, lichen.) There are many formats to choose from and you will likely find one that will suit your knowledge level and overall preferences. Most field guide books are presented in a colourful, easy to use, handy-sized format, and some are further enhanced for non-biologists and technical terms have been avoided. If they have been used, definitions are usually provided in a glossary to explain the more technical terms. An effective field guide is not bulky and is easy to carry and store. Most field guides books are useful at two levels: the general information contained in them is accessible and understandable to an interested person and the book also serves as a resource for the more advanced student in that area. All field contribute to further understanding of Alberta's flora and fauna.

Please note that any field guidebook developed to identify edible mushrooms should be used in conjunction with a hands-on course in identifying edible and non-edible mushrooms.

Lone Pine Publishing has a wide variety of field guides for Alberta. Check out the current list of available titles in the Supporting Resources section of this module.



Activity Ideas

Don't bluff your way through a field guide when you are teaching younger Wardens about them. Become familiar with how the species are organized in the field guide and how you can do the following two things: identify a species and find a species you already know the name of.

- ▶ Explain why range maps in field guides are important in helping to correctly identify species.
- ▶ Teach a younger group of Wardens how to use two to three field guides. Show the whole group how the field guides are to be properly used. Break the young Wardens up into smaller groups and give each group a field guide.

For each field guide have the small groups do three tasks.

For example in a bird field guide:

1. Find the summer range for ___(name species) .
2. Find a bird about the size of a sparrow and list some identifying marks.
3. What does a Rudy-crowned Kinglet look like?

Make up your own questions based upon the field guides you plan to demonstrate. Have the young Wardens read the written description and information on the species and not just to focus on correct identification as the only goal for using a field guide. Field guides also help us broaden our understandings and increase our knowledge base.

3. Discuss how wildlife is monitored and identify some endangered species in your province.

BACKGROUND

Alberta's wildlife is a part of the landscape as much as its citizens are. It is important for Albertans to become well informed and learn about some of the issues about wildlife, for example, what component of a wildlife species is at risk, which species are at risk. There are good reasons for appreciating and keeping wildlife in our lives. A species listed as threatened is the first step toward creating awareness that something is wrong. What happens after that is up to us all.



Wildlife includes all species of mammals, fish, birds, plants, insects, amphibians and reptiles. The majority of wildlife species in Alberta have healthy populations and adequate habitat. Components of habitat include food, water, shelter and space.



A c t i v i t y I d e a s

- ▶ Invite a speaker in to talk to your group about species at risk in Alberta.
- ▶ Collect the Threatened Species brochure series (Refer to Supporting Resources section in this module.) Have each Wardens choose a species and make a short presentation to the group about its status and the causes of its status.

4. Participate in a provincial species count or a monitoring program.

Refer to Appendix III, Monitoring Programs for information on some ongoing programs to get involved with.



III UNDERSTANDING ECOLOGY●

Wardens will develop an understanding of the interdependence of living things and the relationships between species, including humans, and their environment.

date completed



Define and understand the following terms: biosphere, ecosystem, biological diversity, niche. page 19



Discuss how food webs and food chains demonstrate the flow of energy through an ecosystem. page 22



Examine the interactions of plants and animals with a project showing one of the following: tree reproduction and growth, insect reproduction and growth, insects and disease in a forest ecosystem, forest disease reproduction and growth, habitat infringement from human activities. page 28



Illustrate and explain one of the following global climactic changes to younger wardens: the greenhouse effect, acid rain, or thinning ozone. page 35



Describe how environmental factors affect plants and animals. page 50



Discuss how human actions modify the environment in positive and negative ways. page 46



Last Updated: 11/00

Understanding Ecology

Last Updated: 11/00

1. Define and understand the following terms: biosphere, ecology, ecosphere, ecosystem, biological diversity, and niche.

BACKGROUND

It is important for Wardens to have a strong base knowledge of terms and definitions when reading and learning about ecology.

Biosphere

The biosphere is commonly used as a synonym for ecosphere but it makes more sense to define biosphere with all the earth's plants and animals. All life exists within a thin film of air, water and soil about 15 km deep. This shell is known as the biosphere that can be divided into three layers: the atmosphere (air), the hydrosphere (water) and the lithosphere (rock and soil.)

Ecology

Ecology is the study of the structure and function of ecosystems, dealing mainly with the interaction of organisms with one another and with the non-living setting.

Ecosphere

All of the living things on earth together with the part of the nonliving world in which and with which they interact.

Ecosystem

A self-regulating community of plants and animals interacting with one another and with their nonliving environment. Ecosystems perform functions that are essential to human existence, such as oxygen and soil production and water purification.



Biological Diversity

Often referred to as biodiversity, biological diversity refers to the variety of species and ecosystems on Earth and ecological processes of which they are a part.

Three components of biodiversity are:

1. Ecosystem diversity

Ecosystem diversity describes the variety of different natural systems found in a region, country or on the planet.

2. Species diversity

A species is a group of plants or animals that are more or less alike and are able to breed and produce fertile offspring under natural conditions. One way of describing biodiversity of a region is to measure the number of species of living things. Some environmental factors that can affect species diversity are climate, geography, and history.

3. Genetic diversity

Genes carry genetic information affecting how an organism looks and behaves. Genetic diversity refers to how each individual is different in some way from every other individual of its species. For example, genetic diversity in humans can be seen with different eye colour, body sizes, or behavioural variance. It can also be less obvious such as how individuals resist disease or how they grow.

Niche

A species niche refers to the unique, functional role or “place” of that species in an ecosystem. You could think of it as the organism’s profession—how it makes its living, how and when it gets its energy and nutrients, how and when it reproduces, how it relates to other species.

A habitat niche exists within an ecosystem. A forest, for example, can be seen as having layers of habitat niches. Some species are found on the forest floor, some found beneath the surface and other may occupy trunks.



Food niches can be differentiated by time of day and food type. A hawk hunts by day and an owl hunts by night. Both hunt for the same prey but have different—night and day niches. Other species feed at daylight and twilight. Food niches can also be separated by food type. Birds, for example, eat at the same time and in the same place because they eat different food such as insects and seeds.

It is important to be aware of these subtleties in niches because they reinforce the general rule in nature that no two different species can occupy the same niche at the same time for very long.



A c t i v i t y I d e a s

- ▶ Choose one species of Alberta's flora or fauna and discuss its niche.
- ▶ Discuss why biodiversity conservation is important.
- ▶ Write a poem with the theme; "the forest is like a salad."
- ▶ Make a Wanted poster with the theme, Wanted: A World Rich in Biodiversity.
- ▶ Have Wardens discuss biodiversity listing the diversity of species and ecosystems in Alberta.
- ▶ Discuss the threats to biodiversity.
- ▶ Locate and read Millennium in Maps: Biodiversity Supplement to National Geographic, February, 1999 It contains some of the following information: Threats to Biodiversity, Conservation and Research, Have We overdrawn Our Account?, Rapid Extinction, Slow Recoveries, and The Natural Vegetation Biomes Throughout the World.
- ▶ Find articles in local newspapers and magazines that use any of the above terms. Evaluate their interpretation and meaning.



2. Discuss how food webs and food chains demonstrate the flow of energy through an ecosystem.

BACKGROUND

The Earth depends on a continuous supply of heat and light from the sun. The only organisms that are able to make use of light energy to make food are green plants and a few bacteria. The light energy captured by green plants is converted to chemical energy, which is used by animals. Chemical energy is the fuel that drives biological processes.

The conversion of energy in an ecosystem may be traced from one level to another. Primary producers are eaten by primary consumers such as herbivores. No animal can convert its total food intake into an equal amount of energy. The flow of energy is linear (flowing in one direction) and the available energy decreases at each level of the food chain. All energy is eventually lost as heat and must be replaced by energy from the sun.

Organisms can be divided into three groups based on their source of food: producers, consumers and decomposers.

1. *Primary Producers*

Terrestrial plants cover less than one quarter of the planet, but are responsible for fixing 50% of the total sunlight captured by plants and make up 97% of the Earth's biomass (the total mass of organic life.)

The seemingly magical transformation of the sun's energy into organic materials is possible due to the green pigment in plants called chlorophyll. Most plants appear green because their chlorophyll absorbs red and blue wavelengths and reflects the green wavelengths of light. They are able to trap the sunlight and use it to make food in a process referred to as photosynthesis. Carbon dioxide and water combine using the light energy to produce carbohydrates (sugar) and oxygen. Carbohydrates are stored in the plant as needed. Respiration uses up to half of the stored chemical energy. The other half is used for new growth and becomes available to animals that eat the plant.

One of the byproducts of photosynthesis is oxygen. Green plants contribute this vital gas to our planet. It was about two billion years ago that the first photosynthesizing organisms began preparing the Earth's atmosphere to become suitable for life that now exists.



2. *The Consumers*

Consumers are organisms that depend on producers for food. Primary consumers, or herbivores, feed directly on plants. Herbivores include insects, reptiles, birds and mammals. Herbivores are adapted to feed on plant material and must break down the cellulose to unlock the energy in the plant. All plants have a rigid form because of the cellulose in their cell walls.

Only a few herbivores can digest cellulose. A herbivore rarely eats an entire plant because it cannot digest all of the cellulose. Most of the food it eats is passed through the digestive system undigested. Ruminants, such as goats and cows, chew their food well before passing it on into the rumen, a compartment of the stomach where it is fermented. Bacteria in the rumen secrete cellulose enzyme, which breaks down cellulose. The digested food and some bacteria then pass into a second stomach where digestion is completed.

Secondary consumers prey on herbivores, and are called carnivores. In a food chain there are always fewer secondary than primary consumers, fewer tertiary than secondary and so on through to the top of the chain. The primary consumer is usually physically smaller than the secondary consumer and gets its food over a smaller area.

Some consumers are omnivores, feeding on both plants and animals. The ability to eat a variety of foods is a great advantage; if the main food source is scarce, the animal can eat something else.

3. *Decomposers*

Decomposers feed on wastes and the remains of dead plants and animals. Without decomposers, the Earth would be buried in dead organic matter. Fungi and bacteria are the main decomposers. When they break down the dead organisms, they release carbon dioxide, nitrogen and other substances back into the environment to be used by producers to make new food.



4. *Food Chains and Food Webs*

In a well-defined ecosystem, such as a forest, more than 90% of primary production is consumed by the organisms in the detritus chain. Less than 10% is consumed in a grazing chain.

plants > herbivorous animals > carnivorous predators

Grazing Food Chain

dead plants > decomposers

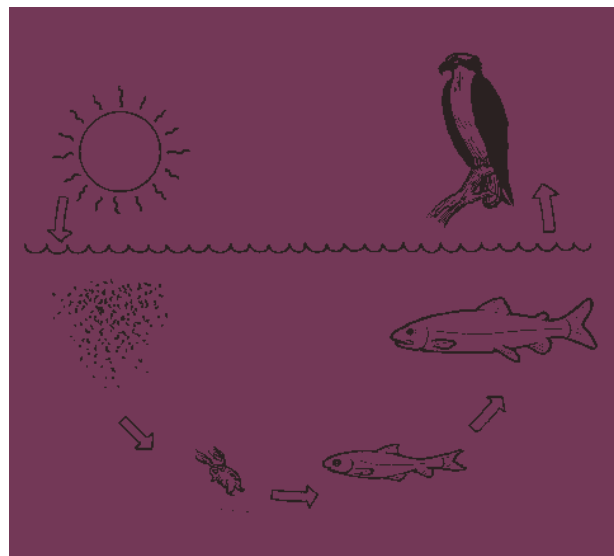
Detritus Food Chain

The amount of energy that is transferred between organisms in a food chain is only 10 to 15%. This small amount is due to energy wastage, up to 85% at each level, most of which is lost as heat when organisms respire.

In a less developed ecosystem such as a fishpond or farmland, 50% or more is consumed in grazing.

Each level in the chain is called the trophic level. The first trophic level is composed of the primary producers and the second trophic level by the primary consumers.

Because of the inefficiency of the energy transfer process, and the huge energy losses that result, food chains rarely have more than four or five links.





Food Webs

A food web is a complex relationship formed by interconnecting and overlapping food chains. In any ecosystem it is possible to build a complex food web that shows all the feeding relationships. This food web may show an animal as both a primary and secondary consumer feeding on both plants and animals; it can also be a secondary or tertiary consumer depending on which animals it feeds at a given time. An ecosystem can easily support a larger base of primary consumers than secondary or tertiary consumers.





In an aquatic ecosystem, at the first level of the food web, only a small amount of food is needed as long as the pond remains well supplied with sunlight. A large base of consumers feeds on the small base, in turn supporting a large number of higher consumers, up to the top of the web. In a land-based food web, the first level usually needs to be larger.

The food web in a pond or lake ultimately relies on photosynthesis. Microscopic phytoplankton on the surface and green plants in shallow water both make up their food source. These primary producers occupy the first trophic level. The other trophic levels or consumers are made up of a variety of animals such as insects, fish, larger fish and a top consumer such as a predatory fish, bird or human. Detritus feeders (decomposers) are always on the bottom and are not considered a trophic level.



A c t i v i t y I d e a s

- Have Adventurers explain to a group of younger Wardens why we are not up to our necks in dead leaves. What happens to the leaves that fall annually during the autumn season? (Without decomposers, the Earth would soon be piled high with organic wastes.)
- Have Adventurers work on developing a wetland food web. Use the activity ideas on page 27 as a guide. Answers are provided on page 28.



Develop a Wetland Food Web

Use a pencil and draw arrows between the organisms to show the various relationships they have in a wetland food web, or enlarge and cut apart the drawings of wetland organisms, arrange them on a large piece of paper or display board to show their relationships. Share this with younger Wardens on

Wetland Food Web

1. Producer (green plants)
2. Detrites (organic decay)
3. Water snail
4. Earth worm
5. Zooplankton
6. Phytoplankton
7. Mayfly larvae
8. Caddisfly larvae
9. Dragonfly larvae
10. Freshwater shrimp
11. Isopod
12. Mosquito larvae
13. Lake whitefish
14. Stickleback
15. Minnow
16. Water beetle
17. Northern pike
18. Tree frog
19. Kingfisher
20. Great Blue heron
21. Trumpeter swan





Last Updated: 11/00

a nature walk or in a presentation.

Wetland Food Web

1. Producer (green plants)
2. Detrites (organic decay)
3. Water snail
4. Earth worm
5. Zooplankton
6. Phytoplankton
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16. Water beetle
17. Northern pike
18. Tree frog
19. Kingfisher
20. Great Blue heron
21. Trumpeter swan





3. *The Wetland Food Web*

Examine the interactions of plants and animals with a project showing one of the following: tree reproduction and growth, insects and diseases in a forest ecosystem, forest diseases and growth, habitat infringement from human activities.

Tree Reproduction and Growth

BACKGROUND

An adult tree is ready to reproduce when it can produce flowers and seeds. The length of time it takes for trees to mature varies. A tree's ability to flower may have more to do with size and growing conditions than with age. Many people are surprised to find out that trees have flowers. Flowers are the sex organs of plants and trees and are necessary for reproduction. The black spruce has a small reddish cone-like flower. Pollination depends primarily on the wind. Pine trees have both male and female flowers on the same tree. Other species, such as willow and poplar, are either male or female.

Tree pollination begins when pollen released from the male flowers fertilizes female flowers. The pollen is commonly carried by wind and surrounding trees usually fertilize each other. It is common for the large floating masses of pollen on ponds to be mistaken as pollution. Insects (bees, wasps, butterflies, beetles and moths), hummingbirds and bats carry pollen from one tree to another and are responsible for pollinating most of the small flowering plants, however they do not play a significant part in the pollination of trees.

The male produces the pollen and the female produces a fruit or seed when fertilized. The number of seeds a tree produces each year varies significantly. Generally, intolerant trees such as a poplar and birch have shorter amount of time between each period of seed production.



Some trees depend on fire, flooding, wind throw or other disturbances to get started. These events open up areas of the forest that previously had little or no light. Trees are adapted for the difficult conditions found in the forest and establish themselves in three major ways:

1. Pioneer trees are quickly established after a disturbance such as fire, flooding or harvesting. These trees do not like shade and seeds grow quickly. E.g. aspen. Female aspen trees can produce millions of seeds each year and are carried by the wind up to 30 km away. Most aspen reproduce without seeds. A parent tree sends out underground shoots and suckers grow up into genetically identical trees. A stand of trees that has grown from a single parent is called a clone.
2. Intermediate trees can handle a little shade until some kind of disturbance helps them find a gap to grow more quickly. e.g. black spruce, lodgepole pine
3. Shade tolerant species can grow in the dark, shady understory of a forest. Sometimes spaces are created for them when the bigger trees around them die are get blown over. e.g. balsam fir

Other factors such as soil temperature, moisture and animals determine how well a seed germinates. Seeds need heat to germinate and the soil's warmth can be important. The most difficult time in a tree's life is getting established. Millions of seedlings perish during this delicate stage. If seedlings are not eaten or destroyed, they compete with each other for food, light and water.

Soil, water, and temperature are the main influences on tree growth. Many trees do most of their growing in May and June

Tree Species	Cones/Flowers
White Birch	male and female flowers in separate catkins on same tree.
Trembling Aspen	drooping catkins, male and female on separate trees
Balsam Poplar	male and female on separate trees, both have catkins
Green Ash	male and female on separate trees
Manitoba Maple	male and female on separate trees
Tamarack	pollen cones small, seed cones erect, seeds are winged
Balsam Fir	pollen cones small, seed cones erect, seeds are winged
Lodgepole Pine	pollen cones small, seed cones slightly curved
Jack Pine	pollen cones small, seed cones usually curved and pointing towards end of branch, small winged seeds
Black Spruce	small pollen cones, small seed cones
White Spruce	pollen cones, seed cones hang down



when the water is plentiful and temperatures are not too warm. Grass growing near seedlings can inhibit growth because of the many small fine roots take up a lot of nutrients.

Activity Ideas

- Have Wardens collect and keep a scrapbook with the flowers and cones of local tree species.
- Obtain some tree cookies (cross sections of trees) and interpret the growth of the tree. What do rings close together mean? Is there evidence of fire? Damage?
- Take the wardens on a walk through a woodlot. Look for all stages of a tree species' life cycle: seeds, cones, flowers, seeds, seedlings, young tree, adult, snag and in various stages of decay.

Insects and Diseases in a Forest Ecosystem

BACKGROUND

In Canada every year, fire, insects and disease destroy approximately as much wood as loggers harvest. They are nature's own forest management tools and ensure both the renewal and survival of the forest. But when it comes to harvesting forests, fire, insects and diseases become enemies of the forest. Insects can damage wood, kill seeds and trees by chewing leaves and buds or by sucking sap. To keep pests in check, forest companies spray chemical insecticides in the forest. Pesticides may harm living creatures other than the pests they are directed at. Insect infestations can actually increase by killing the pests' natural enemies and competitors.

Unlike a fire that is easy to see and does damage quickly, some insects and diseases are slow acting and hard to see. Often, these pests go totally unnoticed until a tree is seriously damaged or dead. Another major difference between fires and insects or diseases is that wildfire control measures are implemented quickly, but insect and disease problems may go unchecked for long periods.

The most common form of injury caused by insects include reductions of height growth and stem volume, tree mortality



and stem disfigurement. They reduce volume and quality of wood product. Infestations may cause fire hazards, alter wildlife habitat and diminish recreational value of a forest or stand of trees.

Activity Ideas

- Make an exhibit entitled, Forest Insect and Disease Identification. Collect a sample of damaged trees that clearly show the injury. These samples can range from bark pieces to evidence of defoliation. Use index card to describe the insect or disease.
- Take photographs of common insect and diseases in your area. Prepare a slide show or a scrapbook.
- Invite a forester to come in and speak to your group about forest insects and diseases.

Forest Diseases and Growth

Background Tree diseases tend to spread slowly and sometimes there is no evidence of disease until the tree is cut down or dies. Diseases can be broken down into two categories: abiotic (non-infectious) and biotic (infectious.)

Abiotic Injury (non-infectious)

Abiotic diseases are caused by high or low temperatures, water abundance or deficiency, mechanical injury, chemical damage or pollution.

1. Climate

- High Temperatures (heat defoliation; sun scald; heat canker; birch dieback; shoot droop)
- Low Temperatures (freezing of unprotected roots; frost damage to buds, leaves and other tissues)
- Temperature Fluctuations (mid-winter thaws; frost crack where sudden, excess cooling makes outer layers of trees contract more than inner layers; frost shake where sudden warming makes the growth ring separate from cooler inner wood)
- Water Stresses (drought; red belt winter drying; leaf scorch; flooding; leaf wilt)



2. Mechanical Injuries

- Bruising and breaking from ice, snow, wind, hail, lightning, and machinery; transplant injuries; root compaction; animal browsing (girdling); windfall

3. Nutrient Deficiency

- Low nutrient levels; salt toxicity.

4. Pollution

- Herbicide damage; industrial pollution; acid rain; chemical damage (animal urine, industrial fumes)

Biotic Diseases (infectious)

Biotic diseases are caused by living organisms such as bacteria, fungi, viruses, nematodes or parasitic plants. Not all bacteria, fungi or viruses are harmful. Certain bacteria are associated with nitrogen fixation in trees. Many fungi are beneficial and their most important role is to decompose organic matter, while certain species develop favourable relationships with tree roots.

Some Biotic Diseases

1. Stem and root decay and stains – caused by fungi that break down and stain the wood fibre. They can greatly reduce wood volumes without affecting tree growth or mortality. Stem decay does provide habitat for cavity-dwelling and nesting wildlife.
2. Dwarf Mistletoes – are parasitic plants that attack lodgepole pine, jack pine, and black spruce in the prairie provinces. The trees form "witches brooms" which are unsightly and may weaken branches, creating a potential safety hazard.
3. Root diseases – are caused by fungi that attack and destroy roots. Growth loss and tree mortality may occur. Infected trees become less windfirm and are susceptible to windthrow.
4. Stem canker/rusts - are caused by fungi that attack stems and branches.
5. Foliage and cone diseases – may look bad, but account for only a limited amount of wood loss. Foliage diseases include



needle casts, needle rusts, and leaf spot diseases. Cone rusts may cause considerable seed loss in spruce stands.

From "Woodlot Management Guide for the Prairie Provinces".



Activity Ideas

- Make an exhibit entitled, Forest Diseases. Collect a sample of damaged trees that clearly show the injury. These samples can range from bark pieces to evidence of defoliation. Use index cards to describe the diseases.
- Take photographs of common biotic diseases affecting trees in your area. Prepare a slide show or a scrapbook.
- Invite a forester to come in and speak to your group about forest diseases.

Habitat Infringement from Human Activities

BACKGROUND

The fragile balance of plants and animals that share the Earth took millions of years to develop. Some life forms have perished and will not return. Humans, who are relative newcomers to the planet, are largely responsible for habitat destruction, introduction of invasion species, over-harvesting, pollution and an increasing population. The nature of Canada is endangered. We have ploughed the prairies for farms, harvested the forests, and filled in the wetlands causing habitat loss. Wild animals and plants space where they can live, breed and obtain food. Some species can adapt to changes and move to different habitats; others are very vulnerable because they cannot adapt.



How Healthy is the Nature of Canada

Test yourself. What do you know about Canada's spaces and species?

1. What percent of Canada's tall grass prairie remain?
a) 11% b) 25% c) 1%
2. What percent of Canada's West Coast rainforest is undisturbed?
a) 25% b) 65% c) 3%
3. In comparison, what percentage of Brazilian rainforest has been destroyed to date?
a) 12% b) 23% c) 78%
4. How many Canadian species, including plants and animals are officially being listed as being at risk?
a) 79 b) 236 c) 11
5. What is the biggest reason for wildlife problems in Canada?
a) over-hunting b) pollution c) loss of habitat d) acid rain

Answers: 1-c, 2-c, 3-a, 4-b, and 5c

From Department of Canadian Heritage, Parks Service



A c t i v i t y I d e a s

- Look around your community and list some new building developments. How have they had an impact on habitat. What flora and fauna were/are affected?
- Have a closer look at Alberta's natural regions. What kinds of activities are affecting the grassland, boreal forest, aspen parkland, Canadian Shield, Rocky Mountains and Foothills? Are the human activities the same or different among the regions? Which natural region is affected the most by industrial activities such as oil and gas extraction and coal mining?
- Determine the amount of land being transferred from agricultural use to municipal use such as housing or transportation. How much land is annually logged, affecting wildlife habitat?
- Discuss the human perspective of land use. How do people today view the land? How does it compare to traditional views of First Nations Peoples?
- Illustrate and explain to younger Wardens one of the following phenomena affecting atmospheric changes: the greenhouse effect, El Niño, La Niña, or thinning ozone.



4. Illustrate and explain one of the following global climatic changes you younger wardens: the greenhouse effect, acid rain or thinning ozone.

BACKGROUND

Climate change is a complex and pressing environmental global challenge. Climate change can have serious impacts on our environment, economy, society and our way of life.

Unless we change our direction, we are likely to end up where we are headed.

- Chinese proverb

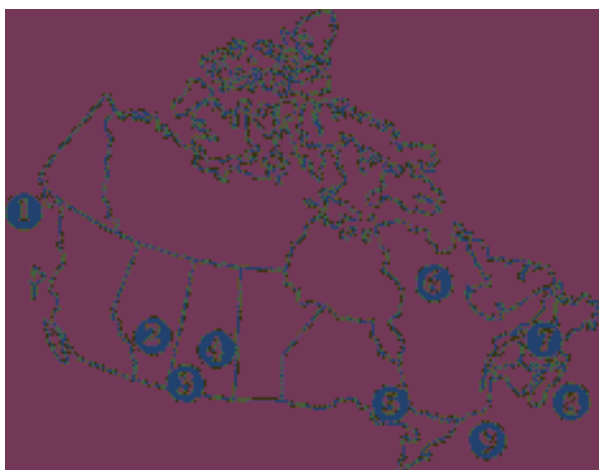
Potential Impacts of Climatic

Change on Various Regions of Canada:

1. Warmer temperatures could cause changes in fish populations.
2. Changes in rainfall could increase drought in the prairies.
3. Water supplies in Southern Canada could decline significantly
4. Soil degradation and erosion of prairie land may increase due to moisture loss.
5. Great Lakes winter ice system may disappear
6. Forest region could shift northward with deciduous trees growing as far north as James Bay
7. Many coastal areas could be flooded.
8. Inshore fisheries season could be extended.
9. Southern Ontario snow seasons could disappear

The temperature on earth is regulated by a system known as the greenhouse effect. Greenhouse gases (primarily water vapour, carbon dioxide, methane and nitrous oxide) trap the heat of the sun, preventing radiation from dissipating into space. Without the effect of these naturally occurring gases, the average temperature on Earth would be -18°C , instead of the current 15°C . Life as we know it would be impossible.

When we increase the amount of greenhouse gases in the atmosphere, it is projected that we may increase global average temperatures and produce climate changes.





Greenhouse Effect

The Problem:

Human activities are causing the release of heat-trapping gases into the atmosphere in sufficient concentrations to change the composition of the atmosphere. Furthermore, humans are cutting down the world's trees and not replanting. In both of these ways, humans are causing global warming which is commonly known as the greenhouse effect.

The Solution:

Reduce emissions of pollutants into the atmosphere, stop massive deforestation and plant trees. The greenhouse effect is caused by emissions of over 20 gases into the atmosphere. The major contributors are carbon dioxide (CO_2), ozone, methane, nitrous oxide and chlorofluorocarbons (CFCs.) The primary source of these emissions is the burning of fossil fuels in automobiles, boilers and furnaces. When released in large quantities, these gases cause the earth's atmosphere to warm by trapping the sun's heat. The infrared radiation that would normally be reflected back into space is now trapped in the earth's atmosphere like a thick blanket.

Acid Rain

The Problem:

Pollutants causing acid rain are released into the atmosphere and are killing forests, lakes and animals.

The Solution:

Reduce emissions of pollutants into the atmosphere.

Acid rain is the result of sulphur dioxide (SO_2) and oxides of nitrogen (NO_x) emissions into the air. When in the atmosphere, they react with moisture, sunlight, oxygen and other gases to create sulphuric and nitric acids which fall to the earth as acid precipitation (includes rain, snow, fog, sleet, hail and dew) or dry acidic particles or dust. The effects of acid rain can be divided into the following categories: aquatic, terrestrial, material and human health.



Aquatic

An aquatic ecosystem is adversely affected if the pH of the water is below 6. At pH 5.5 there are fewer species in the lake and those remaining have trouble surviving. The more acidic the water is, the more metals such as lead, mercury and aluminum are leached from the surrounding rock and soil. Fish, being the primary consumer, ingest these metals initiating the process of contamination. When a bird eats a fish, the poisons are passed up the food chain.

Terrestrial

Acid rain affects the pH of soil and what grows in it. The more acidic the soil, the easier it is for minerals to be leached from the soil. Potassium, for example, is washed away before plants can absorb it. Plants can absorb harmful metals that are also leached out of acidic soil such as aluminum and mercury. Plants also become more susceptible to pest and fungi infestations because of the constant assault of acid on protective surfaces of leaves and bark.

Material

Acid rain speeds up the natural corrosion and deterioration of materials such as brick, paints, stone and concrete. Materials that are especially vulnerable are limestone, marble, iron, steel, copper and zinc.

Human Health

Evidence is inconclusive as to whether acid rain directly contributes to human health problems. One study has found that respiratory problems admitted to hospitals doubled during periods of ground level ozone and sulphate pollution. There are higher incidences of breathing problems (dust allergies, stuffy noses and coughs with phlegm) reported in Canadian areas with high acid rain.

Acidity is measured using the pH scale which ranges from 0 to 14. The scale is logarithmic which means that a pH 3 is 10 times more acidic than pH 4 and 100 times more acidic than pH 5.



The pH Scale

Acid Rain begins at pH 4.8
 pH 5 – salmon & trout fail to breed
 pH 4.5 – fish disappear from lakes
 pH 4 – lakes become lifeless
 pH 3.2 – plant leaves are damaged

A	14.0
A	13.0 - Lye (caustic soda)
L	12.4 - Lime (calcium hydroxide)
K	11.0 - Ammonia (NH ₃)
A	10.5 - Milk of Magnesia
L	8.0-8.5 - The Great Lakes
I	8.3 - Sea Water
N	8.2 - Baking Soda
E	7.4 - Human Blood
*	7.0 - Neutral (distilled water)
≠	6.6 - Milk
A	5.6 - Clean or normal rain
C	5.0 - Carrots
I	4.2 - Tomatoes
D	4.0-4.5 - Average rain in Canada
I	4.0 - Wine and beer
C	3.0 - Apples
C	2.2 - Vinegar
C	2.0 - Lemon Juice
C	1.0 - Battery Acid
Ø	0.0

Major sources of sulphur dioxide are ore smelters and coal burning power stations. Nitrous oxides come mainly from vehicle exhaust and power plants. In North America, the breakdown of nitrous oxides emissions are:
 27% residential and commercial (fuel combustion and heating)
 40% vehicle exhaust (cars, trucks, trains, planes)
 33% power plants

Acid rain can fall hundreds of kilometers from the pollution source. It is estimated that half of the acid deposition in eastern Canada originated from emissions in the United States. From 10 to 25% of the acid rain in parts of northeastern U.S. originates from Canada.



El Niño

The first available record of El Niño dates back to 1567. South American fishermen noticed the appearance of warm waters in the eastern Pacific Ocean along the coast of Ecuador and Peru. Because the phenomenon typically becomes apparent around Christmas, the name El Niño, or the Christ Child, was eventually bestowed.

During the 1920s, the head of the Indian Meteorological Service, Sir Gilbert Walker, recognized patterns in the rainfall in South America. His discovery led him to theorize additional associations between the change in the ocean temperatures and with atmospheric pressure changes measured at stations on both sides of the Pacific. Noticing that as pressure rises in the east, there is typically an accompanying decrease in the west. The reverse is also true. He coined the term Southern Oscillation. Further study led to the realization that Asian monsoon seasons under certain barometric conditions were often linked to drought in Australia, Indonesia, India and parts of Africa and with mild winters in Western Canada.

It wasn't until the late 1960s that a connection was established between the changes in sea surface temperatures and the weak winds from the east and heavy rainfall that accompany low-pressure conditions. Ultimately, this led to the discovery that the warm waters of El Niño and the Southern Oscillation are interrelated leading to the full naming of the phenomenon as El Niño Southern Oscillation (ENSO.)

El Niño is thought to occur due to changes in the normal patterns of the trade wind circulation. Normally, these winds move westward, carrying warm surface water to Indonesia and Australia and allowing cooler water to upwell along the South American coast. For reasons not fully understood, these trade winds can sometimes be reduced or even reversed. This moves warmer waters toward the coast of South America and raises water temperatures.

Warmer water causes heat and moisture to rise from the ocean off Ecuador and Peru, resulting in more frequent storms and torrential rainfall over these normally arid countries. Air circulation at five kilometers into the atmosphere is altered during El Niño and La Niña years. During El Niño winters, the jet stream over the North Pacific is likely to split on approach to North America. A weaker branch would be diverted northward into the Northwest Territories while the lower subtropical branch, whose mean position is over the Pacific



Northwest and southwestern Canada, would be shifted several degrees of latitude southward. The southern Canadian region lies between the two jet streams and receives a milder and drier than normal winter.

Scientists are questioning whether climate change may be affecting the observed increase in strength and frequency of El Niño events in recent decades, or whether the El Niños themselves are contributing to global warming. There is no consensus on any direct link. Further research is needed before scientists can provide confident answers to these questions.

La Niña

La Niña is the antithesis of El Niño. About every four to five years, a pool of cooler than normal water develops off South America. The effects of this cooler water are called La Niña. This usually brings colder winters to the Canadian west and Alaska and drier, warmer weather to the American southeast.

La Niña is thought to occur due to increases in the strength of the normal patterns of trade winds circulation. Under normal conditions, these winds move westward, carrying warm surface water to Indonesia and Australia and allowing cooler water to upwell along the South American coast. For reasons not yet fully understood, periodically these trade winds are strengthened, increasing the amount of cooler water toward the coast of South America and reducing water temperatures.

The increased amount of cooler water toward the coast of South America, causes increases in the deep cloud buildup towards southeast Asia, resulting in wetter than normal conditions over Indonesia during the northern hemisphere winter.

The changes in the tropical Pacific are accompanied by large modulations of the jet stream within the middle latitudes, shifting the point at which the stream normally crosses North America. The shifted jet stream contributes to large departures from the normal location and strength of storm paths. The overall changes in the atmosphere result in temperature and precipitation anomalies over North America that can persist for several months.

The annual cycle of jet stream averaged over nine years shows intensification and weakening of the jet stream from the cold to the warm season in the Northern Hemisphere. The previous La Niña during the winter of 1995-96, was partly to



blame for the flooding in Northern California, Oregon, and Washington states, and higher than normal snowfall in the northern plains and Atlantic states.

Thinning Ozone - What You Can't See Can Hurt You

The Problem:

Synthetic chemicals are destroying the ozone layer that protects the earth from the sun's ultraviolet rays.

The Solution:

The need to stop producing and releasing ozone-depleting chemicals is urgent. Even if these chemicals were banned today, thinning of the ozone layer will continue for about 100 years.

The ozone layer is in the stratosphere, a layer of the earth's atmosphere between 15 and 20 km above the earth's surface. This layer is densely concentrated about 20 km thick. If the whole layer is compressed to ground level pressure, it would only be a band three-mm thick.

The ozone layer is being destroyed by a group of chemicals that do not exist naturally. The major culprits are chlorofluorocarbons as well as halons (from fire extinguishers) and methyl chloroform and carbon tetrachloride (industrial chemicals.)

Chlorofluorocarbons takes 10 to 100 years to reach the upper atmosphere where they are broken apart by ultraviolet light from the sun. As the chemicals break down, chlorine is released from CFC molecules. Similarly, bromine is released from halons. Chlorine and bromine eat away at the ozone layer.

A single atom of chlorine destroys between 10,000 to 100,000 molecules of ozone. Bromine is 10 times more destructive to ozone than chlorine.



A c t i v i t y I d e a s

- Invite a speaker in to talk about the changes to the global climate and what countries are doing about it.
- Test the pH of local water bodies. Investigate the organisms and animals that live in that aquatic environment.
- Make a copy of **“Catch the Culprits”** activity sheet on page 44 for each Warden. The activity sheet is not in the Wardens’ manuals. The sheet will help Wardens review the sources of air emissions.
- Make a copy of Ozone Questionnaire activity sheet on page 39 for each Warden. The activity sheet is not in the warden’s manual. The sheet will help Wardens review facts about ozone.



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Catch the Culprits

Match the emissions to its source. Some emissions have more than one answer.

1. Chlorofluorocarbons (CFCs)	A. Lead is an example.
2. Nitrous Oxide (NO ₂)	B. Released when halons breakdown.
3. Carbon Dioxide (CO ₂)	C. From vehicle exhaust, coal combustion and from agricultural fertilizers.
4. Methane	D. Found in refrigerators, air conditioners and some foams and aerosols.
5. Sulphur Dioxide (SO ₂)	E. Mainly from vehicle exhaust and emissions are increasing 3% to 4% per decade.
6. Total Suspended Particulates	F. The by-product of incomplete combustion mainly from automobiles.
7. Carbon Monoxide (CO)	G. Formed when emissions of hydrocarbons and nitrogen oxides interact in the air. At ground level is a greenhouse gas.
8. Ozone rain.	H. The major contributor to acid
9. Bromine	I. Is 10 times more destructive to ozone than chlorine.
	J. Molecule for molecule, traps 20 more heat than carbon dioxide.
	K. Major sources of emissions are ore smelters and coal burning power stations.
	L. Major component of natural gas, rotting garbage in landfill sites, burning wood and vegetable and bacteria in the guts of cattle.
	M. A variety of particles suspended in the air.
	N. Contributes to 25% of current greenhouse effect.



Answers:

1. Chlorofluorocarbons - D, N. Found in refrigerators, air conditioners, some foams and aerosols. Contribute 10,000 times more to Greenhouse Effect than carbon dioxide. Developed in the 1930s for refrigerants. In the 1950s they were used as the blowing agent in the production of plastic foam. In the 1970s they were used as propellants in aerosol cans and thousands of tonnes were released directly into the atmosphere. When released they take 10 to 100 years to reach upper atmosphere. Contribute to 25% of current greenhouse effect.
2. Nitrous Oxide (NO₂) - C. Vehicle exhaust, coal combustion, use of fertilizers in agriculture. A product of combustion. This emission contributes to photochemical smog and the formation of ground level ozone.
3. Carbon Dioxide - E. Vehicle exhaust. Increased use of fossil fuels is escalating this emission at 3 to 4% per decade.
4. Methane - J, L. Major component of natural gas, rotting garbage in landfill sites, burning wood and vegetable matter, bacteria in the guts of cattle. Traps 20 times more heat, molecule for molecule, than carbon dioxide.
5. Sulphur Dioxide (SO₂) - H, K. The major contributor to acid rain. The major sources of sulphur dioxide are ore smelters and coal burning power stations.
6. Total suspended particulates - A, M. A wide variety of particles that remain suspended in the air; lead is an example.
7. Carbon Monoxide (CO) - F. By-product of incomplete combustion mostly from automobiles.
8. Ozone - G. At ground level this is a greenhouse gas. Formed when emissions of hydrocarbons and nitrogen oxides interact in the air.
9. Bromine - B, I. Released from the breakdown of halons. Is 10 times more destructive to ozone than chlorine.



Ozone Questionnaire

Name _____

Match the emissions to its source. Some emissions have more than one answer.

1. The ozone layer is protecting us from:
a) infrared radiation b)ultraviolet (UV) radiation
c) harmful gas d)all of the above
2. The ozone hole above the Antarctic is caused by:
a) volcanoes b)sun spots
c) Chlorofluorocarbons d)none of the above

(CFCs)
3. The ozone layer is found where in the earth's atmosphere:
a) only above urban centres
b)between 5 and 10 km above the earth
c) between 15 and 20 km above the earth
d) only at 27 km above the earth
4. Which of these products generally contributes to ozone destruction?
a) computers b)air conditioners
c) tobacco d)spices
e) halon fire extinguishers
5. The chemical which most efficiently destroys ozone molecules is:
a) bromine b)chlorine
c) fluorine d)nitrogen oxides
6. Increased UV radiation, due to ozone depletion, can't cause:
a) skin cancer b)immuno-suppression
c) premature aging d)cataracts and other forms of blindness
e) strokes f)all of the above
7. To protect yourself from increased UV caused by ozone depletion:
a) wear a hat b)wear long pants and shirts
c) use 100% UV sunglasses d)always wear SPE 15+ sunscreen
e) all of the above
8. The Montreal protocol signed in 1987, achieved the following results:
a) nothing b)banning all ozone depleting substances
c) banning CFCs d)organizing the phase-out of most ODs
9. What can I change in my lifestyle that will help protect the ozone layer:
a) avoid foam cups b)find alternatives to air-conditioners
c) don't buy CFCs d)buy locally produced organic food
e) all of the above f) none of the above

Answers: 1-b, 2-c, 3-c, 4-b, 5-a, 6-e, 7-e, 8-d, and 9-e.





5. Describe how environmental factors affect plants and animals.

BACKGROUND

An ecosystem takes into account both the organic and inorganic aspects of the processes of life. The environment is constantly changing and life is constantly changing in the physical environment. Volcanoes, earthquakes, hurricanes, floods and meteorites cause natural disasters.

The interconnection of living things is not limited to the biological level. There is a flow of energy, wastes and nutrients between the biotic or living and abiotic or non-living parts of the environment. The fabrics of living and non-living elements of the ecosystems and ecosphere are tightly woven together.

The fire of the sun's energy streams into the forest trees and herbs. The plants pry off oxygen from the water molecule, release it into the air, fuse the hydrogen with carbon dioxide breathed out by animals and plants, making carbohydrates, food for the forest realm. In the dark soil a hundred thousand kilometres of fungal filaments pipe, in thin threads, nutrients and moisture to the trees. Springtails, mites, worms gnaw the fallen leaves and twigs. A trillion bacteria convert the remains of wastes to nutrients and build nitrite fertilizer out of nitrogen molecules from the air. The plant roots pull in water from the rain, leaves breathe it out into the air, clouds build up and spill the rain down once more. Some seeps, pure and slow from the leaf litter and humus into the stream where a stonefly larvae creeps encased in tiny pebbles to hide it from the eye of trout and sculpin. Leaves fall into the stream to feast invertebrates, fishlets, and the chattering impossibly blue, kingfisher. A mouse watches. A grain of stardust falls from the sky. It is all connected together, one family

From **"The Green School Biodiversity Booklet"** by Don McAllister, 1995.

The physical environment dictates the kind of life that will survive. A species survival depends on water supply, light, temperature, soil and so on. The living environment is made up of living organisms that depend upon each other and the physical environment. This is called the biotic environment



(Greek for bios meaning life). Every living thing, in some way or another, depends on other living things. Most of the living environment is tied together by food chains where plants are eaten by animals, which in turn are eaten by other animals.

The three main agents of environmental change are:

1. climate
2. the water cycle
3. chemical processes

1. Climate

The sun in a process that controls temperature, rainfall, and wind fuels the Earth's climate. Changes of only a few degrees can create an ice age or the melting of the polar ice caps.

2. Water Cycle

Water is the key agent of environmental change and is part of the cycle essential to all life. It regulates climate and global chemistry. Water circulates around the planet on a global scale. The water cycle is a complex process powered by the sun and gravity.

Water covers 70% of the Earth's surface but freshwater makes up only 0.01% of the total water

The Life of Aqua, A Molecule of Water

Suppose we were to follow a single molecule of water vented from an active volcano on a Hawaiian island. We'll call this molecule Aqua. Liberated from a mix of other gases from deep within the planet, Aqua is blown skyward, buffeted by convection forces and atmospheric winds that are constantly blowing across the planet. Eventually, Aqua finds itself streaming east from the islands, 10 kilometers above the ocean, moving along a ribbon of moisture that is like a great atmospheric river

Reaching the coast of North America, Aqua moves inland until it encounters the upthrust of the Rocky Mountains. The cloud Aqua is in begins to cool, condense and finally liquefy, and the water molecule falls towards the land as part of a drop of rain. On striking Earth, Aqua slithers into the soil pulled by the forces of gravity, moving erratically around grains of sand that loom like miniature planets.

As Aqua sinks into the soil, it encounters a slender rootlet of a tree, which slurps Aqua up in its xylem tissue, drawing the molecule by capillary action up through the trunk into



the branches. Eventually Aqua ends up in one of the seeds of a pinecone. A bird pecks at the cone, dislodging and swallowing the seed containing Aqua. As the bird flies south on its migration, it absorbs Aqua into its bloodstream.

Resting in a tropical rain forest in Central America, the bird is preyed upon by a mosquito. Aqua is sucked into the mosquito's gut, and as the blood-laden insect drops close to a creek, it is snapped up by a sharp-eyed fish, which incorporates Aqua into its muscle tissues. An Aboriginal fisher spears the fish and triumphantly carries it, and Aqua, home for a meal. And so it goes, the endless, eventful peregrination of every molecule of water

From "The Sacred Balance: Rediscovering Our Place in Nature" by David Suzuki.

3. Chemical Process

The chemical make-up of air, water and soil is always changing. Carbon, oxygen, nitrogen, phosphorus and sulphur are the main components of life. When there is a change in carbon dioxide in the air, for example, it affects the temperature of the earth's atmosphere. The earth's chemistry has undergone huge changes over time. Human activities have disturbed atmospheric chemistry in creating pollution, increasing greenhouse gases and acid rain and depletion of the ozone.

Some Facts about Environment and Food Supply

- Most of the world's food crops are sensitive to UV radiation: wheat, rice, barley, oats, peas, cowpeas, corn, tomatoes, cucumber, cauliflower, broccoli, carrot and soybean crop yields will be decreased.
- Food production could be reduced by as much as one percent for every one percent increase in UV-B radiation reaching the earth.
- UV-B radiation will also reduce the productivity of agricultural land by disrupting fixed nitrogen in the soil.
- If plant productivity is reduced, livestock will require more land for feed and pasture.



Activity Ideas

- Have Wardens develop a project that illustrates the interaction between biotic and abiotic factors affecting plants and animals.
- Lead a guided imagery activity. Read the passage that begins "The fire of the sun's energy . . .", page 40 or The Life of Aqua a Molecule of Water, page 41 as Wardens sit quietly with eyes closed.
- Have Wardens go through old magazines and collect pictures to make a collage showing the biotic and abiotic interactions in an ecosystem.
- Go on a nature walk using a theme that focuses on the biotic and abiotic interactions in the local area.

6. Discuss how human actions modify the environment in positive and negative ways.

BACKGROUND

The development of culture sets human beings apart from all the other creatures. Humans have the ability to change the environment on the grandest scale. Over the past 200 years, the human population has multiplied eight times and economic activities such as agriculture, energy, forestry and manufacturing have increased dramatically.

- Since 1850, nine million km² of the earth's surface has been converted to farmland. That's about the size of Europe. Agriculture has doubled the amount of methane gas and carbon dioxide in the atmosphere by 25 percent.
- Energy use has increased 80 times in the past 100 years. The Industrial Revolution in the early 18th century has created a growing demand for fossil fuels and minerals.
- Industry has multiplied more than 100 times in the past 100 years. Industry manufactures 100,000 chemicals that affect the environment. Canada now produces some six million tonnes of hazardous waste every year.
- Each Canadian throws out over 1.5 kg of household waste every day. There are 10,000 solid landfill sites throughout Canada.



Only 3.7% of Canada's forests are protected from logging.

The impact of human activities on natural ecological processes is the primary cause of biodiversity loss worldwide. As the human population grows and consumes an increasing share of the planet's resources to meet its needs, the impact on current levels of biodiversity increases. To conserve biodiversity and use biological resources sustainably, a better balance must be struck between our use of the earth's resources and the earth's capacity to produce them, recognizing that these resources must be shared with millions of other species.

Widespread development has affected every part of the biosphere—pollution in the air, water and land. Many of these pollutants became incorporated into the food chains, passing chemicals from one organism to another.

As humans, an essential part of our life experience and education is to care for the biosphere. There is a delicate balance in which a change in one part affects other parts of the biosphere. Once the balance has been upset, the damage is difficult to repair, due to substantial costs; in both time and money.

Life in the biosphere is possible because of three great global cycles: the water cycle, the soil cycle and the air cycles. Survival for all living things is a challenge shaped by the environment. Human activities, however, are taking over the planet and we have not factored in time for the natural systems to cleanse themselves.

Logging aggravates the global warming cycle by releasing stored carbon into the atmosphere. One of the best ways to delay global warming is simply to leave trees standing. Although reforestation may seem an obvious answer to the problem, studies by the U. S. Forest Service have shown that replacing old forests with young plantations do little to soak up excess greenhouse gases. Even fast growing seedlings do not absorb significant amounts of carbon dioxide for decades. Although we call the tropical rain forests the lungs of the world, research shows that the forests in the earth's northern hemisphere (one-quarter of which are in Canada) play a bigger role in removing carbon dioxide, the main greenhouse gas, from the atmosphere.

Some of the large, global issues affected by human activities are:

- increasing human population
- disappearing forests
- water pollution

Soil forms from a slow process. It takes 1,000 years to form 2.5 cm of soil from hard rock.

- atmospheric pollution (acid rain, depletion of ozone, increased greenhouse gases)
- threats of extinction
- soil loss
- waste disposal

Brundtland Commission

The United Nations Conference on the Human Environment was held in Stockholm, Sweden in 1972. It brought it to the attention of the world of the deteriorating health of the world's environment. In 1987, The World Commission on Environment and Development, also known as the Brundtland Commission, made a report that said humans must accept the limits imposed by nature. Humans must not exceed these limits if we wish to survive.

Earth Summit

In 1992, delegates from all over the world met in Rio de Janeiro, Brazil, to talk about the future of the earth's environment. The Convention of Biological Diversity was a special treaty signed at this Earth Summit. Canada was the first industrialized nation to sign the treaty that came into effect December 29, 1993. The treaty is a legal binding agreement that gives a framework for the conservation of the biological diversity and the sustainable use of biological resources.

Some of the positive activities taking hold:

- Federal and provincial governments have laws and policies to protect the environment and flora and fauna
- an awareness of and a decrease in atmospheric pollution (decrease in greenhouse gases, decrease of emission contributing to acid rain, decrease in and finding alternatives to ozone depleting substances)
- conserving and restoring wilderness
- preserving diversity
- private initiatives (Ducks Unlimited, World Wildlife Fund, Wildlife Canada, Canada Nature Federation, Alberta Fish and Game Association, Federation of Alberta Naturalists, Canada Parks and Wilderness Society, Alberta Wilderness Association, Alberta Native Plant Council, and many more) work for conservation of the environment and flora and fauna.





- local community initiatives (recycling depots, Christmas tree chipping, Toxic Round Up, educational events, and so on)

Solutions Are Closer When You Think

Awareness of environmental problems is the first step. Next is creating **knowledge and understanding**, and then taking **action**.

- Join an environmental organization.
- Learn about nature.
- Share space with other species.
- Humans must see that they are part of the web of life.
- Encourage eco-agriculture, eco-forestry and low impact fishing methods.
- Encourage the establishment of a protected area.
- Burn less gas and enjoy nature from a canoe or cross-country skis.
- Pre-cycle, reduce, reuse, and recycle.
- Write letters for change and thank those doing good work.
- Restore your spirit and walk with nature.



Activity Ideas

- Follow frequently used products from the "Cradle to the Grave"—from their creation to their disposal. Consider the impact each stage has on the environment. Consider from where the product's original materials come and the impact resource extraction has on the environment. How is the product disposed of safely? Can the product be reused? Recycled? Is there more or less energy used when reused or recycled? Have wardens make a poster showing the Cradle to Grave product cycle.
- Have Wardens investigate one of the global cycles (air, water or soil cycle) and discuss the human activities affecting it. What activities are being done locally and globally to solve some of the affects.
- Invite a speaker to come in and speak to the group about the Brundtland Report and the steps taken to achieve its recommendations.
- Have Wardens look around at some environmental problems. Ask, "For every negative effect a specific activity is having on the environment, is anything being done to take make it right?"
- Investigate the local activities that are done to improve the state of the environment. Look into the local community, large towns and cities, provincially and nationally.
- Have Wardens discuss how the Earth's biosphere is like a terrarium. (Draw it, write about it, or speak about it.)
- Discuss why we refer to the Earth as "Spaceship Earth".
- Discuss global, international, national, provincial and community initiatives. Discuss how all these governments must communicate with each other. Is one level more successful than another?



Last Updated: 11/00



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IV

ECOLOGICAL ISSUES●

The only way in which Wardens can approach a knowing and understanding of a subject is by reading, discussing and listening to what other people have to say about it.

date completed



_____ ☐

Choose an environmental issue and find different opinions about the issue from a variety of sources.
page 57

_____ ☐

Choose a newspaper or magazine article and evaluate the writer's bias or point of view. Share your opinions with your group.
page 62

_____ ☐

Present a 250-word essay, a letter to an editor or a 10-minute presentation about an environmental topic you feel strongly about and share it with your group.
page 64

_____ ☐

Discuss the dynamics of social change in our culture and how it affects environmental issues.
page 65

Ecological Issues

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1. Choose an environmental issue and find different opinions about the issue from a variety of sources.

BACKGROUND

The media bombards us constantly with statements and generalizations about social and moral issues. To think clearly about these problems, it is useful if we can make distinctions between facts, opinions, biases or invalid statements. Consumers of information should constantly be aware that the media and other sources often contain statements of a controversial nature.

The activities suggested in this section are designed to allow Wardens to experiment with statements that are fact and opinion, provable and those that are not. The activities will give Wardens a chance to think critically about what they read. Can we believe everything we read?

Developing Basic Thinking Skills

A number of basic skills for critical thinking are listed below:

1. **Locating a point of view**
The ability to determine which side of the issue an author supports.
2. **Evaluating sources of information**
The ability to choose from among alternative sources, the most reliable and accurate source in relation to a given subject.
3. **Distinguishing Between Primary and Secondary Sources**
The ability to understand the important distinction between sources which are primary (original or eyewitness accounts) and those which are secondary (historically removed from, and based on, primary sources.)



4. **Separating Fact from Opinion**

The ability to make the basic distinction between factual statements (those which can be demonstrated or verified empirically) and statements of opinion (those which are beliefs or attitudes that cannot be proved.)

5. **Distinguishing Between Prejudice and Reason**

The ability to differentiate between statements or prejudice (unfavourable or preconceived judgments based on feelings instead of reason) and statements of reason (conclusions that can be clearly and logically explained or justified.)

6. **Identifying Stereotypes**

The ability to identify over-simplified, exaggerated descriptions (favourable or unfavourable) about people and insulting statements about racial, religious or national groups, based on misinformation, or lack of information.

7. **Recognizing Ethnocentrism**

The ability to recognize attitudes or opinions that express the view that one's own race, culture or group is inherently superior, or those attitudes that judge another race, culture, or group in terms of one's own.

It is important for Wardens to consider opposing viewpoints as well as critically analyze the viewpoints.



Activity Ideas

- **Distinguishing Between Fact and Opinion** activity sheet, page 62. Make one copy for each Warden or small group and provide enough time for adequate discussions. No answers are provided.
- **What's Provable and What's Not** activity sheet, page 63. Make one copy for each Warden or small group and provide enough time for adequate discussions. No answers are provided.
- Have Wardens peruse the local newspapers for a week and come to a meeting with two examples of fact statements and two examples of opinion statements. Share and compare the examples.
- Have Wardens peruse the local newspapers for a week and come to a meeting with two examples of provable statements and two examples of statements which cannot be proven. Share and compare the examples.



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Distinguishing Between Fact and Opinion

Consider each statement carefully. Write O by the statements you think is an opinion or interpretation of facts. Mark F by the statements you believe are a fact. Be prepared to discuss and compare your decisions with those in your group.

O = Opinion
F = Fact

_____	1.	An unprecedented two- percent for the next two decades makes population growth the single greatest threat to world peace.
_____	2.	One reason for low rates of childbearing now and in the future is that women are achieving growing economic independence from men.
_____	3.	No land reform program, no amount of outside help will be sufficient to combat world hunger if nations do not deal effectively with another basic problem—population.
_____	4.	Substantial environmental progress has been made in the past ten years.
_____	5.	Canadians can no longer afford to dissipate and destroy the natural resources that constitute the web of life.
_____	6.	Western culture sees the natural environment as a resource to be exploited for profit.
_____	7.	Nature creates no junk piles. What it produces is not disposable but reusable.
_____	8.	It is the extremists who are dangerous: the environmentalists who demand instant cures, and the industrialists who won't budge.
_____	9.	The financial costs of pollution control are enormous.
_____	10.	Many manufacturers are investing outside Canada in countries where there are no tough environmental regulations.
_____	11.	The only way for Canadians to clean up their environment is to radically change their lifestyle.
_____	12.	Pollution is perceived increasingly as a threat not only to individual health but to individual survival as well.

- Adapted from the “**Opposing Viewpoints**” series



Last Updated: 11/00

What's Provable and What's Not

Consider each statement carefully. Write a P by the statements you think are provable, a C if the statement is too controversial to be proven by anyone's satisfaction, or a N if Not provable because of the lack of evidence. Be prepared to discuss and compare your decisions with those in your group.

P = Provable

C = Too Controversial

N = Not provable

_____	1.	India has the people and the resources: What India lacks are the institutions that make for productivity and prosperity.
_____	2.	There are somewhere between 75 and 80 million people being added to the world's population every year.
_____	3.	The efforts of environmentalists have made the public aware of the pressing environmental issues of today.
_____	4.	Almost half the topsoil in some of the most productive prairie farmland has washed away.
_____	5.	Those who would destroy capitalism in Canada have embraced the environmental movement.
_____	6.	There is no conflict between clean air, water, and land and economic growth.
_____	7.	Many more animals become extinct through the natural course of evolution than through pollution or destruction of natural resources by industry.
_____	8.	Air pollution has caused the premature death of people with respiratory or heart disease.
_____	9.	Canada's investment in underdeveloped countries has made it possible for the people of those countries to enjoy a material abundance which they otherwise could not have imagined.
_____	10.	Communist countries show a greater concern for the environment than do capitalist countries.
_____	11.	The decline of population is a central element in the decline of a civilization.
_____	12.	The visible things that make up air pollution—the soot, ash, dust and other large particles—have been eliminated or greatly reduced since Earth Day began in 1980.

- Adapted from the "Opposing Viewpoints" series



2. Choose a newspaper or magazine article and evaluate the writer's bias or point of view. Share your opinions with your group.

BACKGROUND

All writers have a frame of reference from which they write. Readers understand this when they read some of their favourite publications, newspapers or magazines. There is nothing wrong with authors and publications that have a political slant or bias, each writer has a point of view and most of the time it is not easy to hide. An important skill for wardens to develop when reading information about the environment is to be able to locate and identify the writer's point of view.

Some Skills to Develop When Reading Information

We all need to **think critically** about the information that floods us. Look at the source of the information carefully. Organizations funded by companies which use certain natural resources may have a vested interest and may not be reliable.

Use and **trust your common sense and ability** to assess information. Some material may have an anti-environmental bias but proclaim objectivity and balance.

Think deeply about some of our most widely held **assumptions**. For example, here are some common beliefs: humans are special and our intelligence has placed us out of the natural world; science and technology provide us with the knowledge to find solutions to our problems; a clean environment is only possible with a strong economy, the planet is here for the taking.



Evaluate Articles to Become a Better Writer

- Was the article inspiring?
- How did the writer form the main idea?
- Is this person making a difference?
- Is this idea new or recycled? If new, then watch it to see if it is part of a gradual change in social dialogue and acceptance.
- What sorts of mantras are repeated over and over again by the media? The real bottom line is free trade, global economy, marketplace)
- Does the media treat environmental issues as if avoiding an unpleasant sight?
- Is there harsh debate over the state of the biosphere?
- Is the media all about a story? Is the media between stories? When humans are in trouble, we have a good story. When it's an old story, it's no longer effective.



A c t i v i t y I d e a s

- Have Wardens read Letters to the Editors to begin the practice of reading critically and determine the writer's point of view. Locate the articles that the writers were responding to.
- Have Wardens choose a partner, then write down a list of some of the beliefs the partner has. Discuss how difficult it is to cover up a belief system. Our values, beliefs, and points of view govern our behaviour. Have Wardens share what they know about each other.
- What belief-based behaviours do we find acceptable as a society? For example, drinking and driving, abortion, violence, dishonesty.



3. Present a 250-word essay, a letter to an editor or a 10 minute presentation about an environmental topic you feel strongly about and share with your group.

BACKGROUND

It is important for Wardens to have their own opinions about the world around them. Leaders model their own beliefs and speak from their own points of view.

Some Topics to Write About:

Read and discuss some of the essays written by David Suzuki (Refer to Supporting Resources) and have Wardens write their own essay on a similar or different topic.

- Living in an era of “Last Ones.”
- Carbon dioxide is the exhaling breath of our industrial society.
- The Earth’s circulatory system (water cycle.)
- During the lifetime of my species, there will never be fossil fuels again.
- Our use of energy in the industrialized world has given us a Pandora’s Box of miseries.
- Helping the Earth in the New Millennium.
- Improvements in industrial practices since the Industrial Revolution and how they have responded to environmental crisis.



4. **Discuss the dynamics of social change in our culture and how it affects environmental issues.**

BACKGROUND

The earth has been home to human beings for possibly 40,000 years. During the past 150 years or so, humans have done as much to alter this planet as the profound climate change and mass extinctions of the past.

There are several reasons for the unprecedented recent impact of our species on the environment.

- An explosive increase in human population (1/4 million daily) causing pressure and destruction of forests (40 hectares/100 acres of tropical rain forest per minute) and wetlands.
- Extinction of at least 20,000 species a year.
- Over-use of resources. Oil and water are being used faster than are being replenished.
- Pollution into the air, water, soil and food. Toxicity are so high that the earth's filtering and diluting systems are not able to break them up or flush them out.
- Atmospheric degradation: global temperatures are increasing due to increase of chlorofluorocarbons and carbon dioxide; destruction of ozone layer; and acid rain that is sterilizing lakes and forests.
- Annual loss of billions of tons of agricultural topsoil and the steady decline in food production.

We tend to view them as isolated issues and as a result our solutions are piecemeal. We are always putting out fires—put one out here and another one flares up somewhere else. Humans are the catalytic agents, the centre of all the issues. We consume too much, we pollute too much and are blinded by complacent acceptance.



Earth Time Clock

Planet earth is believed by some to be anywhere from 4,000 and 8,000+ million years old. Imagine this time condensed into 12 hours. Earth began at 8:00 this morning and it's now 8:00 at night. Look below to see what has happened during the course of the day.

8:00 am - 9:50 am

Nothing much is known about the earth during the first hour and fifty minutes.

9:50 am – 6:57 PM

The first flowering plant appeared

7:00 PM

Scientists have pieced together thesis to find information about the development of the earth's atmosphere, continents and rocks during the first 11 hours..

7:44 PM

Dinosaurs and reptiles evolved just 16 minutes ago.

7:50 PM

The first mammals arrived 10 minutes ago.

7:59 PM

The first human-like creatures appeared 20 seconds ago.

7:59 PM

Modern humans, homo sapiens, developed just five seconds ago.

7:59 PM

Agriculture was discovered just over a second ago.

7:59 PM

The Industrial Revolution began about one five-hundredths of a second ago (the time it takes a camera to take a photograph.)

8:00 PM

Today.

It seems the human race has little time to change some bad habits. The affluent lifestyle and our high standard of living have come with a cost. Our primary purpose must be to lower consumption while increasing our quality of life. We must relearn that "more is less" and develop a few practical approaches to changing the way we think and live.

The advertising industry attempts to make us believe in false truths. Although there are rules governing what advertisers can say, public misconceptions are part of the plan. For example, a product is claimed to be "Cholesterol Free" when the product is not even a fat. Does "light" mean the same as "fat free"? Some advertisers take advantage of the subtle differences in language and if the consumer is not discriminating, so much better for the



advertiser. Sometimes it seems like a snake oil salesman is talking to the consumer.

One of the subtexts in the consumer value system is **materialism** and **planned obsolescence**, joining forces to create a need. It's all around us: the latest fashions, the latest gadgets, the latest "look" in cars/houses/kitchens/bed sheets, furniture, beer, and on and on it goes. We are bombarded daily with advertising that cajoles and seduces us into keeping up. Advertising is directed at turning people into consumers.

Within our short lifetime, we have already lived through some changes in our lifestyle that has had some effect on the environment. Grassroots organizations and public pressure brought changes on little by little so that now some environmental practices are part of the infrastructure and are common habits for most people.

- Backyard composting
- Municipalities collecting grass clippings
- Chipping of Christmas trees
- More use of artificial Christmas trees
- Recycling depots and businesses
- Imagination Markets (non-profit organizations that collect throwaways from business/industries for use in arts and crafts)
- Bulk food in supermarkets.
- Cloth shopping bags.
- The celebration of the environment during special weeks such as Environment Week, Forestry Week and Wildlife Week.
- Collection of special wastes from the public for proper disposal (Toxic Roundup)
- Lunch bags full of plastic containers for re-use.
- Availability of information to the public on energy and water conservation.
- Proper disposal of dry cleaning fluids, photographic chemicals and collection of used oil.
- Photocopy machines that copy back to back and take paper that has been used on one side.

What others can you think of?



Will humans have to embark on a crash program to develop new values and priorities? We must rethink our future and see that it lies with group survival and group success, not in individual achievement.



Activity Ideas

Make a time capsule that will be opened in three, five or 10 years. Include pictures of the Wardens and Leaders, club members, a newspaper, flyers to show cost of food, music and so on. Remember it's a snapshot in time, keep in mind all aspects of life.

- Have Wardens make a list of 20 cultural ideas or things that have changed in their lifetime.
- Have Wardens list 10 ways humans have changed.
- Discuss the North American "all consuming" passion for stuff. What are some implications for the future?
- Discuss some of the things we still practice in our lifestyle that could use some changes: What is the future of the daily newspaper? Do you have any alternatives to one time use containers at fast food outlets?
- Talk about some of the things that help you change your view about new ideas? How do you see advertising influencing and affecting how we think and what we believe? Does the news media play a role in changing public opinion?
- Think the Unthinkable. Discuss the rapid changes that may happen to climate and civilization.
- Hindsight is 20/20 vision. When we look back from the year 2040, what would we say we should have done?
- Do we live in the era of "last ones?"

APPENDIX



Canadian Wilderness Charter

APPENDIX



Canadian Wilderness Charter

1. Whereas humankind is but one of millions of species sharing planet Earth and whereas the future of the Earth is severely threatened by the activities of this single species,
2. Whereas our planet has already lost much of its former wilderness character, thereby endangering many species and ecosystems,
3. Whereas Canadians still have the opportunity to complete a network of protected areas representing the biological diversity of our country,
4. Whereas Canada's remaining wild places, be they land or water, merit protection for their inherent value,
5. Whereas the protection of wilderness also meets an intrinsic human need for spiritual rekindling and artistic inspiration,
6. Whereas Canada's once vast wilderness has deeply shaped the national identity and continues to profoundly influence how we view ourselves as Canadians,
7. Whereas Canada's aboriginal peoples hold deep and direct ties to wilderness areas throughout Canada and seek to maintain options for traditional use,
8. Whereas protected areas can serve a variety of purposes including:
 - a) preserving a genetic reservoir of wild plants and animals for future use and appreciation by citizens and the world,
 - b) producing economic benefits from an environmentally sensitive tourism,
 - c) offering opportunities for research and environmental education,
9. Whereas the opportunity to complete a national network of protected areas must be grasped and acted upon during the ten years, or to be lost,

We the undersigned agree and urge:

1. That governments, industries, environmental groups and individual Canadians commit themselves to a national effort at least one representative protected area in each of the natural regions of Canada by the year 2000,
2. That the total area thereby protected comprise at least 12 per cent of the lands and waters of Canada as recommended in the World Commission on Environment and Development's report *Our Common Future*,
3. That public and private agencies at international, national, provincial, territorial and local levels rigorously monitor progress toward meeting these goals in Canada and ensure that they are fully achieved, and
4. That federal, provincial and territorial government conservation agencies on behalf of all Canadians develop action plans by 1990 for achieving these goals by the year 2000.

For more information and copies of the Canadian Wilderness Charter, contact:

Endangered Spaces Campaign
c/o World Wildlife Fund
90 Eglinton Avenue E., Suite 504
Toronto, Ontario
M4P 2Z7

It's your country, your future and your right. Add your signature to the Canadian Wilderness Charter and ask your friends, family and neighbours to do the same.

Adventurers

APPENDIX

II.

Children's Behaviour and Interests



APPENDIX



Children's Behaviours and Interests

It is important that Adventurers and Challengers be aware of some of the behaviours of younger age groups, especially when you will be conducting activities and presentations to them. This information will help Wardens develop appropriate activities and content for a nature walk required in the Ecology module. Not only do children go through these stages but the behaviours are also cumulative. Older children retain the attributes from earlier stages. Use the information as a reference guide in helping you understand the audience for your nature walks.

Age Level: 4 to 6 years

Typical Behaviours and Interests

- Physical activity is a predominant theme.
- Beginning to learn benefits of being patience to achieve their goals.
- Sense-oriented and take in descriptive information quickly.
- Their goal is to absorb information, not necessarily to use it in problem solving.
- Interested in concepts related to amounts.
- Beginning to appreciate seasonal changes.
- They are beginning to see cause-and-effect relationships.
- They have excellent photographic memories.

Appropriate Activities

- They want to know “why”
- Keep explanations simple.
- They enjoy using their senses.
- Appreciate contrasts and distinctions.
- Recognize colours, shapes, textures and enjoy using categories.
- Enjoy collecting, sorting, stacking and making collages.
- Enjoy contrast variety and contrast of activities.
- Have a limited curiosity about time relationships.



- Enjoy counting and measuring (expect “more” or “less.”)
- Enjoy direct action on objects, especially physical manipulation.
- Enjoy matching colors and shapes with found objects.

Suggestions for Nature Hike Themes

- Have a colour hike. Obtain some paint chip samples from a paint store and have kids try to find the colours in nature.
- Organize a “feely” walk. Make a list of feeling words, for example, prickly, hard, cool. Have kids find things in nature that feel like the words.
- Have kids collect found things laying on the ground during the walk that they like. After the walk have them classify the objects.
- Have kids find opposites in the environment using all the senses (except taste.)

Age Level: 6 to 10 years

Typical Behaviours and Interests

- Able to work answers out in their heads.
- Wonder if the things they imagine can really happen.
- Are eager for things to imagine.
- Proud of personal achievements and special talents and interests.
- Are willing to stand apart from peer group as a specialist because of their special interests.
- Are interested in larger, abstract categories.
- They have more concrete personal experiences they can use for reference and enjoy identifying with them.
- Are able to refer to seasonal events and patterns correctly.
- Able to use conceptual forms of reference.
- Can relate to objects symbolically, although subjectively.
- Enjoy playing with crazy comparisons.

Appropriate Activities

- Enjoy “what if” situations and absurdities.



- This is a good age to extend their vocabulary and awareness to colour and form.
- Like to investigate alone and report findings.
- Enjoy doing special projects that distinguish them from others.
- Enjoy classification exercises and learning distinctions.
- Interested in refining their knowledge of what happens when and how life forms change over time.
- Appreciate life cycles and food chains.
- Enjoy being scientific, taking measurements and reaching conclusions.
- Like comparing objects and identifying with other life forms.

Suggestions for Nature Hikes

- Lead a Question Walk. Make a small sample list of questions and have kids suggest possible answers.
- Take an Unfamiliar Walk. Encourage kids to look at nature with a different viewpoint, for example, look upside-down through legs, look as closely as possible at something, look at a tall tree slowly, walk backwards down a wide level path.
- Pretend to be aliens that have crashed on this planet. Look at nature with their point of view.

Age Level: 11 to 17 years

Typical Behaviours and Interests

- Moral and social attitudes are emerging.
- Enjoy merging their values with an interest in experimenting with various roles.
- Can follow and enjoy abstract themes.
- Able to identify with situations in nature.
- Social pressures demand conformity to group standards.
- Aware of their role in environmental issues.

Appropriate Activities

- Aware of the “right” answer and are willing to work to learn if the information has an application in a group context.
- Developing communication skills is important.



- Enjoy thinking and discussions situations from all angles.
- Enjoy role playing.
- Enjoy testing hypotheses.
- Enjoy analogies and allusions.
- Activities where you can set up situations where individual contributions enhance group achievements.
- Are willing to take apart and support larger issues involving larger issues involving environmental quality.
- Are able to seek out local situations in which they can get involved and contribute as a group.

Suggestions for Slide Shows, Photo Album or Hikes

- Organize a Roundtable discussion about an environmental issue.
- Appoint group members to respond to an environmental issue from a viewpoint that is not their own.
- Develop a slide show about how the world is like a single, living organism.
- Be creative with a scrapbook and show the reasons why nature is important for human and also for nature itself.
- Lead a nature hike with the perspective of an original settler to the area, as a mammal that lives in the area or as a child full of wonder.
- Lead a guide imagery exercise with other Wardens. Read the journey of a water molecule through the environment to the group as they sit quietly with their eyes closed.
- Do a slide show that explains the water cycle, the nitrogen (soil) cycle, the greenhouse effect, or any environmental issue.



Idea Bank

Use the projects below to give you some ideas for activities that you can do with younger Wardens or as projects with your own group. Many of these activities may help you fulfill some of the skills required in the Leadership module.

Advertisement	Label	Quilt
Acronym	Letter	Radio show
Banner	Magazine	Rap
Booklet	Map	Riddles
Cartoon	Mask	Role-play/drama
Ceremony	Message in a bottle	Secret message
Charades	Mime	Scrapbook
Chart	Mobile	Scroll
Charter	Mock Trial	Sculpture
Cheer	Model	Skit
Choral speaking	Mosaic	Slide/tape show
Collage	Multimedia presentation	Slogan
Collection	Mural	Song stories
Comic strip	Music	Speech
Commercial	Nature walk	T-shirt
Construction	Newspaper	Talk show
Cooking demonstration	Newspaper article	Television show
Craft	Oral report	Time capsule
Dance	Painting	Timeline (illustrated)
Debate	Pamphlet	Top 10 list
Demonstration	Panel discussion	Toy
Diagram	Papier-mâché	Video
Diary	Photo album	Web page
Dictionary	Photographs	Word poster
Drawing	Picture	Written report
Essay	Play	
Exhibition	Poem	
Fact file	Postcard	
Game	Poster	
Game board/cards	Project cube	
Graph	Project triangle	
Illustrated poem	Puppet show	
Interview	Puzzle	
Job description	Questionnaire	

APPENDIX



Monitoring Programs

III.

APPENDIX



Some Existing Monitoring Programs

Amphibian Monitoring Program

This program has volunteers surveying ten species of amphibians. If you seriously want to participate, you will receive a manual and audio-tape. Volunteers read the manual and listen to the tape to become familiar with Alberta's amphibians and the data sheets. You chose a site and go out and listen for frogs and toads calling. Volunteers repeat the survey year to year. The manual is also on the net, and in colour!

Alberta Amphibian Monitoring Program
Tel: 422-9535
Alberta Environmental Protection
Dial 310-0000 first
Wildlife Management Division then the government number
7th Floor, O. S. Longman Building
6909 - 116 Street
Edmonton, Alberta
T6H 4P2
Web Site:
<http://www.gov.ca/~env/nrs/wildlife/amphib/index.html>

Bluebird Project

Volunteers can assist the biologist at the Ellis Bird Farm in Lacombe with monitoring nest boxes, recording productivity information and assist with nest box construction, and possibly some research project and banding.

Ellis Bird Farm

Tel: 346-2211
Box 2980
Lacombe, Alberta
T0C 1S0

Butterfly Survey

This is another great monitoring program for wardens. CWF will provide small a small booklet with coloured illustrations to help with identification. You may order one for each warden if you choose to do this project. An excellent book to support this project is Butterflies of Alberta by John Acorn.



Canadian Wildlife Federation

Tel: 1-800-563-9453
Fax: 613-721-2902
E-mail: info@cwf-fcf.org
2740 Queensview Drive
Ottawa, Ontario
K2B 1A2

Burrowing Owls

This was formerly known as Operation Burrowing Owl and now includes the entire grassland ecosystem. If your group lives in southern Alberta, you may already know some landowners involved in protecting the habitat of Burrowing Owls. Contact Operation Grasslands. Your club may be able to make underground burrows for the Burrowing Owls.

Operation Grassland

Tel: 362-1400
c/o Eastern Irrigation District
Contact: David Scobie
P. O. Bag 8
Brooks, Alberta
T1R 1B2

Feather Care Program

The Telus Feather (previously AGT) program helps Alberta's birds. Orange, cylindrical signs that mark the location of Telus' buried telecommunications cables have been converted into nestboxes for many of Alberta's feathered friends. Your club can help by convert the orange cylinders into nestboxes and annually monitor these nesting sites.

Telus Feather Care Program

Tel: 403-493-2822
Toll Free: 1-800-667-1125 (outside Edmonton)
Floor 6-E
10035 - 102 Avenue
Edmonton, Alberta
T5J 0E5



Ladybug Survey

The Canadian Nature Federation has a program that wardens can get involved in monitoring. There are 16 species of ladybugs or lady beetles. CNF's Ladybug Survey contains a small poster with coloured illustrations to help with identification and reporting cards, as well as additional information. Best done in late spring, summer, and early fall.

Canadian Nature Federation

Tel: 613-562-3447, ext. 299
Fax: 613-562-3371
Toll Free: 1-800-267-4088
E-mail: epiccnf@web.net
1 Nicholas Street
Suite 606
Ottawa, Ontario
K1N 7B7

Plantwatch

Plantwatch is a phenology (the study of seasonal timing of life cycle events) program which links wardens as the eyes of science, tracking the green wave of spring moving north. Wardens will develop scientific skills while observing springtime changes in plants and learning about biodiversity. The information gathered allows Plantwatch to measure the earliness of spring and to understand some of the effects of climate change.

Wardens collect information on the flowering times of four of ten plants being watched across Canada:

- saskatoon, serviceberry: *Amelanchier alnifolia*, *canadensis*
- prairie crocus: *Anemone patens*
- common purple lilac: *Syringa vulgaris*
- aspen popular: *Populus tremuloides*

Illustrations of plants and data sheets will be supplied to volunteers.



Plantwatch

Tel: 987-5455/3054

Fax: 987-4141

E-mail: ebeaubie@gpu.srv.ualberta.ca

Contact: Elizabeth Beaubien Research Assistant

University of Alberta

Devonian Botanic Garden

Edmonton, Alberta

T6G 2E1

Other Observation Activities

Christmas Bird Count

Two publications are available: How You Can Plan a Christmas Bird Count (8 page pamphlet) and Christmas Bird Count Organizer's Manual (52 pages). Both available at no charge from the contact information below.

Watchable Wildlife Program

Tel: 427-5185

Dial 310-000 then government number

Wildlife Management

4th Floor, Great West Life Bldg.

9920 - 108 Street

Edmonton, Alberta

T5K 2M4

Peregrine Falcons

They're back after a 30 year absence! Once again Peregrine Falcons can be seen in southern Alberta. In recent years, Alberta Environmental Protection has been releasing Peregrine Falcons within historic nesting areas. Many of these birds are returning to Alberta to nest. Information on observations is needed to ensure the protection of this magnificent bird of prey. There is a brochure to ensure that observers can distinguish between the Merlin, Prairie Falcon and the Peregrine Falcon.

Contact your local Natural Resources Service, Wildlife Division Office or Alberta Environmental Protection, Wildlife Management Division.



Know Your Ducks.

Ducks Unlimited Canada has a poster 20 pairs (both male and female) species that can be very helpful to wardens near a habitat rich with waterfowl. Poster size: 30 X 60 cm. Coloured illustrations. Available from any Ducks Unlimited office or the Provincial office.

Ducks Unlimited Canada

Tel: 489-2002
Fax: 489-1856
Contact: Al Richard
202, 10470 - 176 Street
Edmonton, Alberta T5S 1L3

Riparian Habitat

If your JFW club is interested in the state of local riparian land, contact the Fish and Cows program. You may be able to help in areas such as clean up along water ways, fencing, tree and shrub plantings, and annually monitoring habitat enhancement improvements.

Cows and Fish Program

Tel: 381-5377
RITE 310-0000 then dial number above
Lethbridge, Alberta

Heritage River System

JFW clubs may be able to help local community groups interested in getting a local river system classed as a Canadian Heritage River. Although Alberta Environmental Protection does not actually monitor the rivers, they may have some leads as to some local community interest groups in your area and throughout the province.

Canadian Heritage Rivers System

Tel: 427-9381
Dial 310-000
Contact: Ted Dykstra
Alberta Environmental Protection 2nd Floor, Oxbridge
Place
9820 - 106 Street
Edmonton, Alberta
T5K 2J6



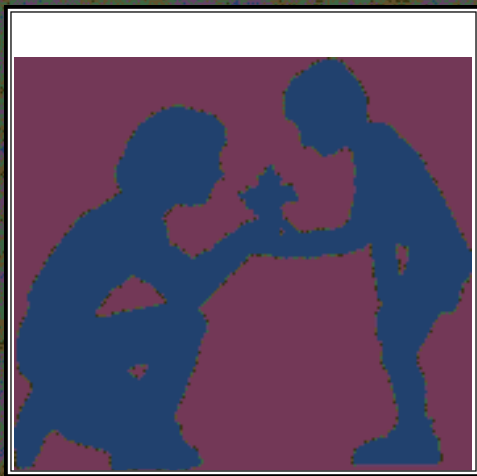
Last Updated: 11/00

My List of Other Monitoring Programs Junior Forest Wardens Can Do



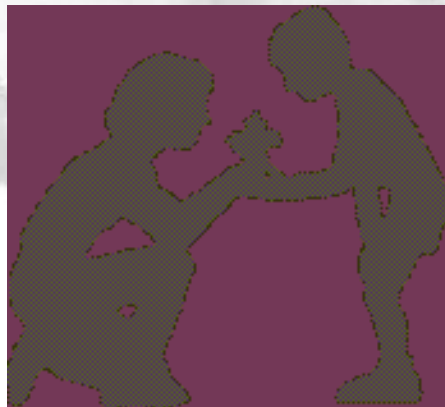
LEADER MANUAL

Leadership



MODULE

*Good leaders inspire others to perform
at extraordinary levels.*





Introduction

We are not born with leadership skills. This Leadership module outlines the characteristics of leadership and how Junior Forest Warden leaders can give Wardens the opportunity to practice leadership skills. Without practice, leadership skills will not be there when needed. One of the most important components of effective leadership is allowing the group to function at its best. And that is what you as a JFW leader will facilitate within your group.

Another part of leadership training is mastering processes and skills such as making decisions and dealing with conflicts. Wardens must be given opportunities to develop these skills, as well as provide feedback to each other after an experience. Wardens can be encouraged to keep notes on what does and doesn't work. The confidence and skills that Wardens gain are cumulative. They must be encouraged to challenge themselves, take risks and learn from their mistakes. You can easily train the Wardens to make good decisions by allowing them, in real situations, to face the challenges by themselves.

This is an exciting module. You will observe the Wardens' skills and abilities develop and grow. It can be extremely gratifying for a leader to participate in the lives of some of today's youth and watch them stretch and grow to their potential.

This module includes a checklist for the leader to evaluate each individual Warden. As leadership skills are practiced and demonstrated through the three year program by each Warden, the skills can be checked off, the date noted and comments entered about the skill. Keeping track of the skills Wardens develop will enable you to plan the program activities to suit the individuals in your group.



Last Updated: 11/00

Like the other modules, the Leader's version of this module is different than the Warden's version. This was purposely done to give you the advantage for meeting activities and to prevent Wardens from reading ahead and doing worksheets before their time. The items not in the Wardens manual are individually noted in your copy. There aren't many and includes such things like problem solving scenarios, scoring lists, and discussion questions.

This module may test your own skills and abilities as a leader. The secret of leadership lies within a person. As wardens discover them, encourage them to practice the skills so they are able to become a successful leader. Remember, good leaders liberate people to do what is needed in the best possible way.



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Framework

I. Understanding Leadership

Leadership is not a science to be learned from a book. It is an art to be learned over time. Leadership is liberating people to do what is needed in the best way possible.

- ☐ Understand and define what leadership means.
- ☐ List the characteristics of a good leader.

II. Communication

Good communication is not simply a matter of getting your facts straight and delivering them accurately. It is also about common sense, and being willing to take responsibility for your impact on people's lives.

- ☐ Prepare and deliver a 10 minute presentation to younger Wardens in your club.
- ☐ Conduct and evaluate a special event or outtrip with your group.
- ☐ Demonstrate communication skills while leading an activity.
- ☐ Develop communication skills through practice. Plan and deliver six activities of your choice. Participate in a land use planning game.

III. Responsibility

Taking responsibility includes completing duties and obligations as leader, as well as taking charge of your impact on other people and forming fair and positive relationships.

- ☐ Sign the contract which lists some of the responsibilities of being a leader and a follower.



Last Updated: 11/00

- ☐ Lead a brainstorming session.
- ☐ Coach peers or younger wardens to help improve their skills and abilities.
- ☐ Demonstrate one problem solving technique.
- ☐ Demonstrate cooperation in the group at club meetings and on outtrips.

IV. Planning

The most important aspect of leadership is planning and preparation. No other aspect of leadership counts for more. A well-organized, well-prepared and well-informed group will likely reach its goals, avoid accidents and have a positive experience.

- ☐ Learn how to write goals.
- ☐ Complete a Personal Equipment Locator and a Group Equipment Locator.
- ☐ Plan and conduct two JFW program activities for younger Wardens.

V. Leadership of Others

Good leaders care about those they lead. They also see activities and outtrips as opportunities to help people learn and grow

- ☐ Create a team by building trust through ice breakers and cooperative games.
- ☐ Determine the strengths of Wardens in your group.
- ☐ Assist in leading a daytrip for younger wardens.



Last Updated: 11/00

UNDERSTANDING LEADERSHIP

Leadership is not a science to be learned from a book. It is an art to be learned over time. Leadership is liberating people to do what is needed in the best way possible.

date completed



Understand and define what leadership means.

page 3



List the characteristics of a good leader.

page 7

I. Understanding Leadership

Last Updated: 11/00

1. Understand and define what leadership means.

What is leadership?

Leadership is not a science to be picked up in one book or course, but an art to be learned over time. Good leaders sometimes tell people what to do, but leadership is not just giving directions-it's liberating people to do what is needed in the best possible way

- from **"Outdoor Leadership"** by John Graham

Leadership is not a science. Leadership is a process of getting things done through people. Being a leader is like an adventure because you must delegate and empower, then trust others to help you reach your goals. Leadership means responsibility and making sure the job gets done. If you lead, they will do the job. If you don't lead, they may expect you to do the job all by yourself.

What Affects Leadership?

Leadership is not magic that comes out of a leader's head. The leader learns how to get the job done and still keep the group together. This does not mean that the leader does the same things in every situation. Leadership styles differ with the leader, the group and the situation.

No leader can take over another leader's job and do it the same way. Group dynamics vary also. When a leader changes groups, the leader changes the way he or she leads. Similarly, a leader may change his approach depending on the circumstances.



Leadership Improvement

How will you know when you are improving? You learn best by working with groups. You can't keep track of your progress without a guide. You must know and understand what you are trying to learn. This means you have to know what the skills of leadership are.

Leadership Test

To find out if you are a true leader, see if you possess these qualities:

- Leaders start projects by asking, "What has to be done?" instead of "What do I need to do?"
- Leaders never ask "What do I have to do to make a real contribution?" The answer best suits the leader's strengths and the needs of the project.
- Leaders continually ask, "What are my organization's purposes and objectives?" and "What qualifies as acceptable performance and adds to the bottom line?"
- Leaders don't want clones of themselves as employees. They never ask "Do I like or dislike this employee?" Leaders won't tolerate poor performance.
- Leaders aren't threatened by others who have strengths they lack.

Adapted from Peter Drucker, cited in "**Forbes ASAP**" magazine.

A c t i v i t y



Read the true/false statements from "What is Leadership?" on page 5, or copy the page for each individual or group of Wardens. Discuss Wardens' reasons for choosing the answers they did. Use the discussion summary on page 6.

WARDEN

What is Leadership?

Answer True or False to the following statements.
Circle T or F.

1. The only people who lead have some kind of leadership job, such as chairman, coach or king. T or F
2. Leadership is a gift. If you are born with it, you can lead. If you are not, you can't. T or F
3. "Leader" is another word for "boss." T or F
4. Being a Warden leader in a JFW club is like being a leader anywhere else? T or F
5. A leader has two jobs, dealing with people and the job. T or F



Discussion Summary

Question #1

You are not a leader because you have a hat on that says leader, you are leader because you lead. Leadership is something people do. It's true that some leaders are elected, inherited, or appointed.

Question #2

Leadership does take skill and not everyone learns to lead as well as they should. People can learn most of the skills and develop their own potential.

Question #3

A leader is not a person who pushes other people around. A leader is a person who has a job and works with other people to get it done.

Question #4

If you are a Warden leading in a JFW club or group then you are doing the same things as any leader anywhere. You can learn and practice how to lead in JFW. Then you can lead other groups too, the skills are very much the same.

Question #5

Every leader deals with two things; the job or task and the group or relationships. The job is what has to be done, it doesn't necessarily mean work. The group or relationships are the people who get the job done. The group continues after a job is done, and this presents challenges to a leader.



2. List the characteristics of a good leader.

BACKGROUND

Leaders have individual characteristics that people recognize and value. Leaders have a following, people who are willing to take direction from them and help them stay on course. Not everyone is born to be a leader, but certain skills and attitudes we all are capable of attaining give all of us the capacity to lead.

- True leaders will always pour forth their best work even if it's not something they want to do.
- True leaders set expectations. They are the people asking for agendas at meetings and help to move through the agenda.
- True leaders never belittle. Every person is equal as an individual.
- True leaders know that in developing others and helping them create their own successes, it takes nothing from them.
- True leaders want things to work out well for everyone. They recognize the potential of win-win situations.
- True leaders recognize that life is full of failures and successes and it is up to them to minimize failures and maximize successes. Each failure is an opportunity to learn, a stepping stone to the future.
- True leaders recognize that they don't go it alone. They share the credit for successes because they know the group effort resulted in success.
- True leaders pursue ideas and continually test their own thoughts and ideas.

What It Takes to be a Leader

Based on surveys of more than 15,000 people, which of these traits do you think was selected as the key to effective leadership:

- Being fair-minded?
- Being cooperative?



- Being honest?
- Being imaginative?

If you guessed "honest" you get a high mark. It scored far above any of the others in a list of 20. In fact, the top four characteristics of admired leaders and the percentage of people that selected them are:

- Being honest - 87%
- Being forward-looking - 71%
- Being inspirational - 68%
- Being competent - 58%

Honest people have credibility and that gives leaders the trust and confidence of their people. High credibility leaders foster such things as greater pride in the organization, a strong spirit of cooperation and teamwork, and feelings of ownership and personal responsibility.

What are some of the other characteristics of credible leaders?

- They do what they say they will do. They keep their promises and follow through on their commitments.
- Their actions are consistent with the needs of the people they lead. They have a clear idea of what others value and what they can do.
- They believe in the inherent self-worth of others. And they learn "how to discover and communicate the shared values and visions that can form a common ground on which all can stand."
- They are capable of making a difference in the lives of others, and liberating the leader in everyone.
- They admit their mistakes. They realize that attempting to hide mistakes is much more damaging and erodes credibility. When they admit to making a mistake, they do something about it.
- They arouse optimistic feelings and enable their people to hold positive thoughts about the possibility of success.
- They create a climate for learning characterized by trust and openness.

Adapted from "**Credibility: How Leaders Gain and Lose It, Why People Demand It**" by James Kouzes and Barry Posner



Activity Ideas

- Have Wardens think about some people they know who are effective leaders. Play "Leaders are like . . ." Wardens have to come up with an advertising slogan that credits leaders. Here are a few example:
 - ▶ Leaders are like Coke, they are the real thing.
 - ▶ Leaders are like Frosted Flakes, they are gr-r-r-eat!!
 - ▶ Leaders are like Ford, they make quality job one.
 - ▶ Leaders are like Nike, they just do it.
 - ▶ Leaders are like Hallmark Cards, the care enough to send the very best.
 - ▶ Leaders are like V-05 hair spray, they hold together in all kinds of weather
 - ▶ Leaders are like Energizer Batteries, they keep going and going and going.
- Repeat the same exercise but with a more serious note.
 - ▶ Leaders are like vegetable soup, they have many different qualities that make the recipe great.
 - ▶ Leaders are like a garden, they grow in many areas, and even weeds grow. But with pruning and proper care, the garden will flourish for all to enjoy.



Last Updated: 11/00

II COMMUNICATION

Good communication is not simply a matter of getting your facts straight and delivering them accurately. It is also about common sense, and being willing to take enough responsibility for how your message may impact people's lives.

date completed



_____	☒	Prepare and deliver a 10 minute presentation to younger Wardens in your club.	page 13
_____	☐	Organize and evaluate a special event or outtrip with your group.	page 13
_____	☐	Demonstrate communication skills while leading an activity.	page 16
_____	☐	Develop communication skills through practice. Plan and deliver six activities of your choice.	page 23

II. Communication

Last Updated: 11/00

1. Prepare and deliver a 10 minute presentation to younger Wardens in your club.



Activity Ideas

- Use any of the topics from Pathfinder or Trailblazer programs. Some suggestions are: dressing for the outdoors, how to choose a good tent, information about water filters, how to build a shelter or fire, or packing a backpack. You have to plan for a 10 minute presentation of an idea. You may use pictures or props to make your points effective.
- Make a list of all the possible subjects that you can use to do a presentation for younger Wardens. Remember that your knowledge level may not be "expert" but it is probably higher than Pathfinders and Trailblazers.

Refer to Appendix III -
Making Presentations for
more information.

2. Organize and evaluate a special event or outtrip with your group.

BACKGROUND

Planning an event requires a common sense approach to achieving a goal. "What do we have to do to get there?" If it's a large event, the answer can seem daunting, but don't let that stop you. A little at a time can be part of your plan to achieve a successful event. Successful planning has two components: things to do and time. List all the things that have to be done and allow enough time for them to happen.

Have Wardens brainstorm all the things that have to be done. Organize them into three time periods: before the event, during the event and after the event. The planning process looks like a bow tie with most of the time and planning happening before the event. The event takes place in a very short time period. This is the knot in the bow tie. After the event, things still happen such as the wrap up and evaluation and planning for next year.



Before the Event

Arrange the tasks that need to take place before the event on a time line. What activities need the most time to be accomplished? What things need to be done first? As you get closer to the event, what can be done two months before, one month, 2 weeks, one week, two days and the day before. When all the bases are covered, the event should run smoothly.

The Event

When the day of the event actually arrives you will be well prepared, preferably with a contingency plan in case there is an unavoidable snag in the proceedings. It is rare for any event to go perfectly, so try to relax and enjoy the fruits of your labour.

Evaluation

Evaluation is an essential component to the planning process. Evaluation consists of two parts, measurement and judgment. Measurement is done by comparing the event to a standard. What do you consider makes up a successful event? When evaluating, compare the process and event to the model.

In making a judgment, you have to decide whether it was "good enough."

Evaluation is a continuous process where the organizer continually monitors the progress of each step and records them as they are completed.

How to Run a Good Meeting

When you are in charge of planning an event, there will be times when you will need to conduct short meetings to coordinate activities and update those helping out. Here are some tips on how to run a meeting:

- Don't compete with group members. Give their ideas due consideration.
- Listen to everyone. Paraphrase but don't judge.

Adapted from Financial Times.

- Don't put anyone on the defensive. Assume that everyone's ideas have value.
- Control the dominant people without alienating them.
- Realize that your interest and alertness are contagious.
- Keep all participants informed about where they are and what's expected of them. Keep notes on flip charts or a board that everyone can see.
- Check with the person who owns the problem to find out if an idea is worth pursuing or if a proposed solution is satisfactory.
- Give others a turn at running the meeting. Those who learn to lead, learn how to participate.



Activity Ideas

- Make a planning template or an individualized planning model. Have Wardens work together as a group to develop the steps and items to be done to carry out an event. Use a real or fictitious event as a guide to help make the lists. Ask, "What has to be done to make this event run smoothly?" Have Wardens organize the things to be done into categories of likeness, for example, Advertising (one month before, one week before, during the event), Organizations and/or People to Contact, Things to be Purchased (keep a ledger), Things to be Borrowed (Create and maintain a list of contacts), Volunteer Jobs (list all with job descriptions), and so on. Remind them that they must include three time periods: before the event, during the event, after the event. Create an event planning sheet that will be like a template for other events to be planned by Wardens.
- Develop an evaluation specific to the event being planned. Have Wardens list what they would consider to be the elements of a successful event. Use these as criterion to measure the event's success.
- Special Event to Plan: Have Wardens practice brainstorming and develop a list of events that they can plan.



3. **Demonstrate effective communication skills while leading an activity.**

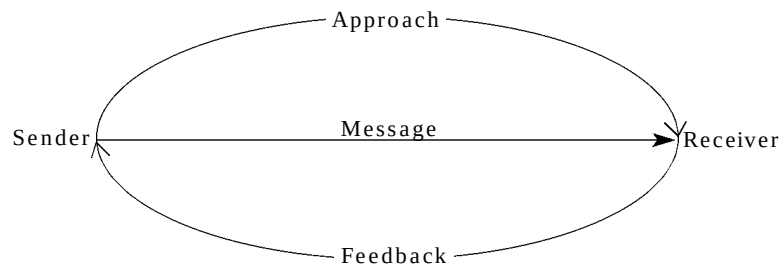
BACKGROUND

Communication is the transfer of messages from a sender (the speaker) to a receiver (the listener.) It is a transactional process of sharing meaning, feelings and ideas.

Messages consist of:

- Symbols - words, sounds and actions that represent meaning.
- Form or organization
- Meaning - ideas and feelings.

The Sender-Message-Receiver (SMR) Communication Model below shows the relationships between the major components of the communications process. A sender selects and encodes (using symbols) a message. The message is transmitted by a particular approach or method to a receiver. The receiver decodes the message and returns feedback to the sender.



For communication to be effective, messages must be understood and accepted the way they are intended to be. Receiver acceptance depends on:

- Communicator or sender factors
- Message design and delivery factors (approach)
- Receiver or audience factors



Communicator or Sender Factors

1. A person's tendency to accept a message depends on how well-informed, intelligent, trustworthy, confident and sincere the communicator is perceived to be.
2. A well-liked communicator usually puts an audience in a receptive frame of mind. A receiver also tends to agree with a well-liked speaker, and disagrees with a disliked one. Some methods to increase your "likability" include:
 - ▶ Be friendly, considerate, courteous and tactful
 - ▶ Smile
 - ▶ Involve your audience
 - ▶ Be interested and as empathetic as possible.
3. A receiver's tendency to accept a message depends on how presentable you are. Be cool, relaxed, well groomed and use good posture.
4. Wear your JFW uniform. It helps the receiver accept you as a credible source of information. Credibility affects a person's tendency to accept messages.
5. Use eye contact. An audience will listen if they know you are interested in them. Eye contact tells the audience that you are interested.

Message Design and Delivery Factors (approach)

1. A smooth, well planned and organized presentation will help get your message across.
2. The message should be designed and presented in such a way that the presentation is relaxed and enjoyable. This will help the audience to accept the message.
3. Your message can be designed and delivered to gain attention. Use music, stories, or activities.
4. Use words, symbols, analogies and situations that the audience can understand.
5. Avoid use of jargon, slang, wisecracks or voice inferences such as uh, ay, like, um, ok, right, you know.



6. Make appropriate use of your voice, volume, speaking rate, pitch, quality, facial expressions, grammar and pronunciation.
 - ▶ Pitch - Highness/lowness of tone
 - ▶ Volume - loudness
 - ▶ Rate- speed
 - ▶ Quality - sound of voice
7. The message must be designed and delivered so that it is relevant to the receiver. People remember better when the message relates to personal experiences.
8. Monitor your posture, gestures and movements. Make sure they are used properly and in context. Non-verbal behaviours can affect meaning.
9. Recognize the receiver's sensory limits when you are delivering a message, for example, you will have to speak louder for the people at the back.
10. The more senses you involve the audience in using, the better the chances are that your message will be received and understood.
11. Be specific and concrete when selecting words to minimize the chance of any misunderstanding. Abstract words or general terms can be confusing. Be clear. Use car instead of vehicle.
12. Eliminate noise as best as you can.
13. Keep your delivery as simple and as short as possible so it will be remembered. Stick to one or two concepts and develop them and use a variety of techniques.
14. Effective and persuasive communication should arouse needs in the receiver. Provide a means of action to satisfy these needs, for example, if you are talking about the threatened Northern Leopard Frog then make suggestions as to how the audience can help the species.
15. Look at the messages sent to you from the audience. Now you are the receiver. Some of the non-verbal messages are: facial expressions, head nods and shaking, body movements, yawns, lack of eye contact, and walking out. Some verbal cues are questions, comments and heckling.



Receiver or Audience Factors

There are many factors that can affect how an audience will accept you and believe your messages. A few are listed below:

1. Listening is important to understanding. Listening means making sense out of what is heard. People do not listen well. A normal person retains only about 10% of what you tell them if they actually try to absorb your message.
2. People's beliefs attitudes, prejudices, and interests influence what they hear.
3. People in unfamiliar surroundings tend to reject new ideas.
4. A receiver may simply not believe you if what you are saying doesn't sound true based on their own knowledge and experience.



A c t i v i t y I d e a s

- Practice communication skills. Choose any object (a key) or a symbol (JFW logo) and tape it in a folder so the group cannot see it. Choose a Warden to be the communicator. The rest of the group will be the receivers. Have paper and pencils ready. Tell the Communicator and the group the following: "Inside this folder is something that you cannot show the group. Look at it and without saying what it is, explain to the group how to draw it. You cannot use hand motions, only words. The group cannot say anything--they cannot ask questions or ask for clarification. They are to follow your instructions. Continue with your explanations until you are finished." Share drawings. You will probably have a good laugh. Most likely no one was even close to drawing the real thing. Discuss what happened. How can a communicator do a better job? What were some of the factors that prevented the group members from drawing with accuracy? How can this information help you do a better job in communicating during presentations?
- Have Wardens practice communication skills by explaining how to do a specific task or procedure. A procedure is a "how to" explanation with no props or aids or physical actions. Suggestions: Explain how to change an empty toilet paper roll, how to change a roll of film, how to pump gas, how to change a litter box, how to boil an egg, how to flip pancakes, how to start a fire, how to brush your teeth, how to sharpen a knife, how to write a cheque, or



how to plant a seedling. Any topic where the Wardens have to practice planning how they will deliver the information. This is not an impromptu activity. Wardens must plan, practice, present and evaluate.



Activity

Message Relay

Communication

This activity will examine communication between individuals, will explore various elements in the sending and receiving of a verbal message and to examine how these elements will work.

Ask five Wardens to leave the room. Choose one person from the group in the room to be an eye-witness at a car accident. Give the witness a complete, accurate report allowing time for questions that might arise.

The Accident

"I can't stay here to report to the police what I saw in this accident. I have to get to the hospital as soon as possible. This is what happened. The panel truck, heading south, was turning right at the intersection, when they saw a sports car, heading north, attempting to turn left. When they saw that they were turning into the same lane, they both honked their horns but proceeded to turn without slowing down. In fact, the sports car seemed to accelerate just before the crash."

After the eye-witness is briefed, have one Warden from outside the room come back in. The witness relates the accident report from memory. When completed, the warden calls in the next Warden to come into the room and relates the accident from memory. Continue this process until the last person, who is the R. C. M. P. Constable, is told about the accident. The Constable gives the final statement of the accident to the entire group.

The leader may wish to keep track of the additions, deletions and distortions.

Suggested Discussions

- What factors seem to contribute to the breakdown of information as it passed from one person to another?
- What techniques seemed to be useful in avoiding errors?



- How can you apply what you learned about communication to making effective presentation and improving communication skills?



Activity

Non-verbal Communication

This activity will help Wardens understand that all behaviour is communication even though a person does not use words. You'll need scraps of papers with either of the two things written on each slip: a feeling toward the group or a task. Here are a few ideas of what may happen at a group meeting:

- You are eager to get the meeting over as you have a very important engagement and you should be there now.
- The topic is dull. You are not interested at all.
- You are afraid that they are going to ask you to do something you don't want to do.
- You are highly excited and interested in what the group is doing.
- You are worried about a big job you have tomorrow.
- You are angry with the person chairing the meeting.
- You are extremely tired.
- You feel that no one is aware of your presence.
- You do not feel well.
- You wish you were someplace else.
- You have something very important you want to say.

Procedure:

The introduction of this game should include a discussion on how people often show by their behaviour how they feel about the members or a meeting or activity. Ask for a volunteer to draw one of the prepared slips of paper from a hat. The setting is a meeting. The leader will begin to discuss a very controversial topic. The volunteer will follow the instructions on the paper as to the behaviour to be expressed. The group will carry on the discussion and watch this person. After the volunteer has sufficiently communicated the feeling through behaviour or body language, the discussion will stop and the group will discuss the feeling being communicated. The person with the paper reveals what is written. Continue taking turns as long as it is helpful.



Variation:

In advance of the meeting, secretly give two or three people a slip of paper. The rest of the group will not know about the exercise in body language. Stop the meeting after you are sure the group has observed the others' behaviours.

Suggested Discussion

- What specifically was done to communicate their non-verbal messages?
- Can behaviour be seen as communication?
- How important is it to be attuned to non-verbal behaviour or body language?
- What have you learned that will help you with your own communication skills?



4. **Develop communication skills through practice. Plan and deliver six activities of your choice.**

Becoming a Better Speaker

If you are not accustomed to public speaking or you need to help someone improve his or her speaking efforts, these observations and suggestions might help:

- Most people should speak a bit louder than normal and use larger gestures than they feel originally comfortable with.
- Invest quite a bit of time in analyzing the audience. Be sure to tell that audience something they don't know.
- Avoid reading a speech or talking with eyes glued to the lectern or clue cards. If you are tempted to read to people, just remember your parents used to read to you to put you to sleep. Work from an outline and trust yourself.
- Establishing a rapport with the audience is vital, move away from the lectern.
- Videotape your rehearsals to strengthen the effort.
- Spend five or six seconds looking at each person in the audience. Shorter times can make you look like a scared rabbit.
- Pause instead of inflicting "ums" and "ahs" on the audience.

Source: Karen Padley, writing in **Investor's Business Daily**

Refer to Appendix III - Making Presentations for more information.



Last Updated: 11/00

Have Wardens record the six activities they planned and delivered. In their own manuals, have them write out the title of the presentation, the date presented, a summary of the content and how successful the presentation was.

1.	Presentation Title:	_____
	Date:	_____
	Summary:	_____

2.	Presentation Title:	_____
	Date:	_____
	Summary:	_____

3.	Presentation Title:	_____
	Date:	_____
	Summary:	_____

4.	Presentation Title:	_____
	Date:	_____
	Summary:	_____

5.	Presentation Title:	_____
	Date:	_____
	Summary:	_____

6.	Presentation Title:	_____
	Date:	_____
	Summary:	_____



Last Updated: 11/00

III Responsibility

Taking responsibility includes the duties and obligations as being leader, as well as taking charge of your impact on other people and forming fair and positive relationships.

date completed



_____	☐	Sign the contract listing some of the responsibilities of being a leader and a follower.	page 27
_____	☐	Lead a brainstorming session.	page 28
_____	☐	Coach peers or younger wardens to help improve their skills and abilities.	page 29
_____	☐	Demonstrate one problem solving technique.	page 31
_____	☐	Demonstrate cooperation in the group at club meetings and on outtrips.	page 33

III. Responsibility

Last Updated: 11/00

1. Sign the contract listing some of the responsibilities of being a leader and a follower.

Leadership Contract

I _____, understand that during the three year Adventurer program, I

print name

and fellow Adventurers will be learning about and practicing leadership skills. With this in mind, I promise the following:

- ☐ Leadership is a contract which I will honour to the end. Other people are expecting me to lead and have given me authority to do so.
- ☐ I promise to keep the group safe and sound.
- ☐ I will adhere to safety and group behaviour guidelines.
- ☐ I promise to help the group achieve its goal.
- ☐ I will create an atmosphere of caring and support.
- ☐ I promise to maintain a positive experience for the group.
- ☐ I promise not to abuse my role as leader to justify negative behaviour.
- ☐ I will encourage individuals who find some tasks difficult, recognizing that their attempt is more significant than performance results.
- ☐ I will respect other people's choices and ideas.
- ☐ When other Wardens are leading, I promise to follow. I will give the leaders the respect they need to do the job.

your signature

date

Review the contract with the Wardens. Discuss each of the points and what they mean. What implications do they have for each of them as a leader and as a follower? When you think that the Wardens understand what the leadership skills are about, have them sign the contracts.

Re-read this contract from time to time throughout the three year Adventurer program. Read it before going on an out trip or before activities where other Wardens will be practicing their leadership skills. If you are serious about developing leadership skills, this promise should always be evident in your behaviour.



2. Leading a brainstorming session.

BACKGROUND

The brainstorming technique is popular because it is so easy to use and is a quick way to generate ideas in a short period of time. The brainstorming rules are few and simple, but they must be adhered to if the technique is to be effective.

Before you begin, make certain everyone understands the problem in the same way. Write the problem down and hang it up or place it so everyone can see it.

Once the idea-generation stage has begun:

- Do not censor any idea that is given. No idea is a bad or useless idea.
- Do not judge any of the suggested ideas.
- The more ideas the better.
- Everyone is expected and should be encouraged to participate.
- Shout out ideas as fast as possible.
- Freewheeling and hitchhiking on someone else's ideas is encouraged.
- Write down all ideas on newsprint. You can also have someone else act as the recorder and write down the ideas.
- Work quickly without discussing ideas.
- Encourage the group to come up with as many ideas as possible. As they slow down, ask questions to get them going again.

Once the idea-generating stage is complete, ask the group if they see any common themes. Open the discussion and attempt to lead the group to a consensus on the common themes that are the most important. Evaluate the worth of each solution and pursue those that seem most promising. Discuss actions for implementation.

If you are in charge of planning a meeting, you may wish to use the brainstorming approach to help you decide which items would be most useful to include on the agenda or to determine in advance which committees should be formed, which assignments should be given and so forth.

Brainstorming Rules

Before beginning:

- Ensure that everyone understands the problem.

Idea-generating Stage

- Do not dismiss any ideas; record them all.
- Work quickly; don't discuss ideas.

Evaluation Stage

- Pursue those that are most relevant.



Activity Ideas

- Have Wardens lead a brainstorming session when the group needs a solution to a problem.
- Pass around an object (egg carton, screw driver, tweezers) and see how many other uses they can come up with for its use. Time to be creative.
- Brainstorm at every appropriate opportunity.

3. Coach peers or younger wardens to help improve their skills and abilities.

Coaching

When we think of coaching, we automatically think of sports but we have people coaching us at work, while parenting and in mentoring situations. A coach assists persons to reach their goals. A coach is your partner, someone you can trust and go to for support and guidance. Coaching can be a one on one or a group situation.

Purpose of Coaching Younger Wardens

1. To help younger Wardens, regardless of their abilities, to grow intellectually, socially, emotionally and physically through the coaching experience.
2. To create situations or activities in which this growth is most likely to occur.



How Does Coaching Help

Coaching can influence individuals or groups in many significant ways:

- Individuals take themselves more seriously.
- Individuals make an effort to focus actions.
- Creates momentum so it's easier to get results.
- Sets better goals that might not have happened without a coach.



A c t i v i t y I d e a s

- Have each Warden buddy up with a younger Warden. To help the older Wardens find some areas where they can coach younger Wardens, have them find out a couple of skills that the individual would like to develop or improve. The coach (older Warden) will help to set the goal and work with the individual toward achieving the goal.
- Wardens coaching peers is like creating a team. The coach will focus on the needs and goals of the group and helps the group accomplish more than they could without a coach. A coach helps the team to think bigger and set better goals.



4. Demonstrate one problem solving technique.

People differ, situations differ and solutions to problems often differ too. An approach that works for one person may not solve the problem for another. Similarly, a solution that works one day might be ineffective a week later in a different setting. When you are in a problem solving situation, be sensitive to the person, the group, the setting and the problem itself in order to achieve an appropriate solution.

Problem solving is a process consisting of several steps. Each step helps the group clarify the problem and move closer toward a solution.

The steps in the problem-solving process are as follows:

1. Identify the problem.
2. Analyze and clarify the problem.
3. Generate several possible solutions.
4. Select one solution and plan its implementation.
5. Implement the solution.
6. Evaluate the solution.

By exploring a problem in depth and developing solutions, Wardens have taken a big step in understanding themselves, their attitudes and the external factors affecting their activities. The process of solving a problem not only allows the Warden to move beyond the problem, it also provides an opportunity for personal growth.

The Principles of Problem Solving

- There is rarely only one solution to any given problem.
- There are a variety of approaches to problem solving.
- The process of problem solving often provides an important learning experience.



Activity Ideas

- Present the group with various problems and have them work on the solutions. The problems may be real or fictitious. After the Wardens have practiced solving problems, have them work on actual or potential problems you see in the group.

Here are a few ideas:

- ❑ One member of the group is always antagonistic, especially to the Warden who is leading.
- ❑ There is a couple in the club, a male and female Warden, and it causes problems while on outtrips. They always want to be together.
- ❑ Your club always has to be out of the building you are renting 30 minutes before the program finishes.
- ❑ The meeting place you have for club meetings is too small for all of you.
- ❑ The Leader of your group insists they are always right. It is causing some problems among the Wardens.



5. Demonstrate cooperation in the group at club meetings and on outtrips.

Cooperation

Cooperation is working one or more people together toward a common end goal or purpose. It's teamwork. Cooperation happens at club meetings and on outtrips.

Ask Wardens to list the attributes and qualities that describe someone who is cooperative. Tell them to state the qualities in positive ways in what a cooperative does, not what a cooperative person does not do. Below are a few examples.

- ☐ Willing to be agreeable.
- ☐ Accepts the decisions of the leader.
- ☐ Will work with everyone in group.
- ☐ Goes with the flow of things.
- ☐ Is always willing to help when asked.
- ☐ Is able to diffuse conflict before it accelerates.
- ☐ Is willing and able to discuss conflicts.
- ☐ Observes the Golden Rule: Do unto others as you would have them to do unto you.

Have Wardens fine tune the list to focus on the attributes they would like to see when they are being evaluated for cooperation. Have them consider including a rating scale (1 to 5) so they are better able to see the skills they need to improve upon. Use the "Cooperation Skills Chart" on the following page to create a useful evaluation tool. Then the Wardens may be evaluated by the leader or other Wardens based on their list.



Last Updated: 11/00

Cooperation Skills

Warden:

Date:

Skills	Rating Scale				
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5



Last Updated: 11/00

IV

Planning●

The most important aspect of leadership is planning and preparation. No other aspect of leadership counts for more. A well-organized, well-prepared and well-informed group will likely reach its goals, avoid accidents and have a positive experience.

date completed



Learn how to write goals

page 37



Complete a Personal Equipment Locator and a Group Equipment Locator

page 44



Plan and conduct two JFW program activities for younger Wardens

page 49

IV. Planning

Last Updated: 11/00

1. Learn how to write goals

BACKGROUND

Goal setting is a powerful tool that can yield strong returns in all areas of a person's life. At the simplest level, the process of setting goals and targets allows a person to choose a direction in life. By setting clearly defined goals, one can measure and take pride in the achievement of those goals.

Goal setting gives you
long-term vision and
short-term motivation.

By setting goals, you can:

- ☐ achieve more
- ☐ improve performance
- ☐ increase your motivation to achieve
- ☐ increase your pride and satisfaction in your achievements
- ☐ improve your self-confidence
- ☐ eliminate attitudes that hold you back and cause unhappiness.

Research has shown that people who use goal-setting effectively suffer less from stress and anxiety, concentrate better, show more self-confidence, perform better and are happier and more satisfied.

Goal setting helps
self-confidence

By setting goals and measuring achievement, you are able to see what you have done and what you are capable of. The process of achieving goals gives you the confidence and self-belief that you will be able to achieve higher and more difficult goals.





Providing that you have the self-discipline to carry it through, goal setting is also relatively easy. The way in which you set your goal strongly affects their effectiveness.

Below are some guidelines to help set effective goals:

- **Positive Statement.** Express your goals positively. For example, "...to steer a canoe in a straight line" is a better goal than "Don't do the stroke that makes the canoe go crooked." Frame the goal as a positive outcome. Do not offer an alternative goal by using the word "or", or set a goal because it is something that you should do. Each goal should have the word "to" followed by an action verb, for example, After the lecture, Wardens will be able to list five different tree species.
- **Be precise.** If you set a decisive goal, putting in dates, times and skills so that the goal can be measured, then you know the exact goal to be achieved, and can take complete satisfaction from having achieved it. Ensure that each goal will produce a single key result when accomplished.
- **Set priorities.** Where you have several goals, set priorities. This will help you avoid feeling overwhelmed by too many goals, and helps to direct your attention to the most important ones.
- **Write goals down** to avoid confusion and memory loss. Writing them down gives goals more power and force.
- **Keep goals small.** Keep the goals that you are working towards immediately, small and achievable. Will the goal stretch your abilities without being impossible to achieve? If a goal is too big then it seems that you are not making progress towards it. Keeping goals small and incremental gives more opportunities for reward. Your goal today should be derived from larger goals.
- **Set performance not outcome goals.** This is very important. Take care to set goals in which you have as much control as possible. Nothing is more disheartening than failing to achieve a personal goal for reasons beyond your control. What is beyond you control? How about the weather, poor judgment, injury, or just plain bad luck. Goals based on outcomes are extremely vulnerable to failure because of things beyond your control.



Performance Goals

When you base your goals on personal performance or skills or knowledge to be acquired, then you can keep control over the achievement of your goals and draw satisfaction from them. For example, you might achieve the best personal skill development in fire lighting but still not be successful in torrential rains.

Be cautious of setting outcome goals based on the rewards of achieving something such as recognition from fellow Wardens. In the early stages this can be highly motivating but as they are achieved, the benefits of any further achievement at the same level reduce and you will become progressively less motivated.

Set Specific Goals

Set specific measurable goals. If you achieve all the objectives of a measurable goal, then you can be confident and comfortable in its achievement. If you consistently fail to meet a measurable goal, then you can adjust it or analyze the reason for its failure and take appropriate action to improve skills.

Set Realistic Goals

Make sure the goal is something you really want, not just something that sounds good. Goals may be set unrealistically high for the following reasons:

- **Other People's Expectations:** Parents, leaders, classmates, and society can set unrealistic goals for you based on what they want. Often this will be done in ignorance of your goals, desires, and ambitions.
- **Insufficient information:** If you do not have a clear, realistic understanding of what you are trying to achieve and of the skills and knowledge to be mastered, it is difficult to set effective and realistic goals.
- **Expecting Perfection:** Many people base their goals on their best performance. This doesn't consider the inevitable backsliding that can occur for good reason, and ignores the factors that led to the best performance. It is better to set goals that raise your average performance and make it more consistent.
- **Lack of respect for self:** If you do not respect your right to rest, relaxation and pleasure in life then you risk burnout.



Setting Goals Too Low

Sometimes goals can be set too low because of the following reasons:

- **Fear of failure:** If you are afraid of failure you will not take the risks needed for optimum performance. As you apply goal setting and see the achievement of goals, your self-confidence should increase, helping you to take bigger risks. Know that failure is a positive thing. It will show you areas where you can improve your skills and performance.
- **Taking it easy:** It is easy to use the reasons for not setting goals unrealistically high as an excuse to set them too low. If you are not prepared to stretch yourself and work hard, then you are extremely unlikely to achieve anything of real worth.

Setting Goals at the Right Level

Setting goals at the appropriate level is a skill that is acquired by practice. You should set goals so that they are slightly out of your immediate grasp, but not so far that there is no hope of achieving them. No one will put serious effort into achieving a goal that they believe is unrealistic. Remember that if you believe a goal is unrealistic, then you are probably right.

Personal factors such as fatigue, other commitments and the need for rest should be taken into account when setting goals.

Thinking a Goal Through

When you are thinking about how to achieve goals, asking the following questions can help you to focus on the objectives that lead to their achievement.

- What skills do I need to achieve this?
- What information and knowledge do I need?
- What help, assistance, or collaboration do I need?
- What resources do I need?
- What can block progress?
- Am I making any assumptions?
- Is there a better way of doing things?



Where Goal Setting Can Go Wrong

Goal setting can go wrong for a number of reasons:

- **Outcome goals are set instead of performance goals.** Where you are using outcome goals and you fail to achieve the goal for reasons outside your control, this can be very dispiriting and can lead to loss of enthusiasm and feelings of failure. Always set performance goals.
- **Goals are set unrealistically high.** When a goal is perceived to be unreachable, no effort will be made to achieve it. Make realistic goals.
- **Goals are set too low.** This will cause you to feel there is no challenge or benefit in achieving the goal and that setting goals has been a waste of time. Always set goals that are challenging.
- **Goals are vague and useless.** It is difficult to know whether vague goals have been achieved. If achievement cannot be measured, then you will not observe progress towards a greater goal. Set precise, quantitative goals.
- **Goal setting is disorganized, infrequent and unsystematic.** Here goals will be forgotten, achievement of goals will not be measured and feedback will not contribute to new goals. The major benefits of goal setting have been lost. Be organized and regular approach to goal setting.
- **Goals are not prioritized.** If the goals are not set in order of priority it leads to a feeling of overload. Remember that you need time to relax and enjoy being in JFW.

When goal setting does go wrong, not only are the benefits of goal setting lost, but the whole process of goal setting can fall into disrepute. By avoiding these problems and setting goals effectively, you can achieve and maintain strong forward momentum.



Obstacles are frightening things when you take your eyes off your goal.

Beware of the Quantum Leap Approach

The Quantum Leap approach tries to force intense activity by setting a goal that will need a quantum leap in activity to achieve it. This is a dangerous technique because it is too easy for the whole process of goal setting to fail when quantum leap goals are not met. If you are not convinced that the goal is attainable, you will not put effort into achieving it.

Goals Evaluation and Feedback

When you have achieved a goal, take the time to enjoy the satisfaction of having achieved the goal. Absorb the implications of the goal achievement, and observe the progress you have made towards other goals. If the goal was a significant one or one that you had worked toward for some time, take the opportunity to reward yourself appropriately.

When you have failed to reach a goal, ensure that you learn the lessons of the failure. They may be:

- ☐ you didn't try hard enough
- ☐ your technique, skills, or knowledge were faulty and need to be enhanced
- ☐ the goal was unrealistic
- ☐ other (list): _____

Use this information to adjust the goal or to acquire new skills or knowledge. Feedback will turn everything into a positive learning experience. Even failing to meet a goal is a step forward towards better performance in the future. Remember that the fact of trying something, even if it does not work, often opens doors that would otherwise have remained closed.

The accomplishment of one goal should lead directly to the setting of new goals.

- ☐ If the goal was easily achieved, make the next goals harder.
- ☐ If the goal took too long to achieve, break the next goal into short-term goals or objectives.
- ☐ If you have learned something that would cause you to change goals that are not yet accomplished, then change them.



- If while achieving the goal you noticed a deficit in your skills, set goals to remedy this.

Remember too that goals change as you grow and mature. Adjust the long-term goals to reflect your growth. If the goals do not hold your attention any longer then let them go. Goal setting is your servant, not your master. It should bring you real pleasure, satisfaction and a sense of achievement.

Setting Group Goals

What exactly are group goals? How does a group arrive at them? How do we know they are the right goals? Group goals are a combination of the individual goals of all the group members. Individual members acting together set group goals. All group members should participate in discussing and defining their goals. If they are involved, they will be more cooperative and committed to achieving the group's goals.



2. Complete a Personal Equipment Locator and a Group Equipment Locator.

BACKGROUND

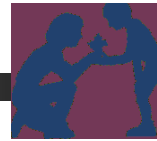
Leaders are organized. "Winging it" is fine if you want to get lost, eat uncooked food because you forgot to fuel the stove and listen to everyone's complaint about your trip planning. But who really likes this kind of misery? It is important to spend the time and energy to competently plan and organize the trip.

Trip planning includes researching the trip, making a plan, and keeping track of details. Planning is the most important management tool that leaders use to keep track of equipment, food, maps and environmental hazards.

The larger the trip, the more comprehensive the planning required. Use lists to keep track of transportation needs, group members, phone numbers and so on. Equipment always tends to present a major organizational challenge, so this activity will help Wardens organize their own and the group's equipment.

Do the Equipment Shakedown

List every piece of outdoor gear you own with a code that identifies where the item is stored. For example, Thermarest pad, GS (gear storage in house). Some other codes may be B for basement and BC means bedroom closet. Identify every conceivable trip that your JFW group may lead or participate in: for example, cross country skiing, hiking, group camping, and so on. If the piece of equipment is essential to a particular type of trip, put an E on the chart. If the equipment is optional, enter an O, and if it is not needed, leave the grid square blank. When you are planning for a trip, all you need to do is select the columns and look for the Es and Os.



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Below is an example of a section of a Personal Equipment Locator.

Personal Equipment Locator Example

Item	Location	Backpacking	Canoeing	Group Camping
heavy sleeping bag	GS	O	E	
light sleeping bag	GS	E		E
Thermarest pad	GS	E	E	E
2-person tent	GS	E		
4-person tent	GS		E	E
one burner stove	GS	E	E	O
fuel bottle #1	GS	E	E	E
fuel bottle #2	GS	E	E	O
eating gear	GS	E	E	E
large water bottle	GS	O	E	E
cook kit	GS	E	E	E
day pack	FC		O	E
trip back pack	GS	E		E
Duleuth Bag	GS		E	
life jacket	G		E	
knee pads/cushion	GS		E	
paddle	G		E	
light hiking boots	FC			O
heavy hiking boots	GS	E		
heavy wool socks	GS	E		O
light wool socks	GS	E	O	E
long underwear	BC		O	
rain gear	FC	E	E	E
etc.				

Legend:

GS - gear storage place E - essential
 G - garage O - optional
 FC - front closet
 BC - bedroom closet



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Group Equipment Locator

A group equipment locator is slightly different than the personal equipment locator. In the left column, items are listed. Across the top, write the names of the others in your group. These people either own, or are responsible for that item.

Personal Equipment Locator Example

Items	Warden John	Warden Tommy	Warden Harry	Warden Sally
one burner stove	✓		✓	✓
two burner stove	✓	✓		
lantern	✓			✓
cooler	✓	✓	✓	✓
backpack	✓	✓	✓	✓
axe			✓	
etc.				

The next 2 pages provide blank grids to create your own Equipment locators.



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Personal Equipment Locator

Item	Location	Backpacking	Canoeing	Group Camping

Legend:



Group Equipment Locator

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3. Plan and conduct two JFW program activities for younger Wardens.

Planning Activities

Plan activities that are appropriate to the age of a group of younger Wardens. Below are some examples of the characteristics of children of different ages and the types of activities that are appropriate.

Early Childhood - 5 to 8 years

What they are like, what they need, and what they like to do:

- They have short attention spans so they like to engage in activities of short duration. Choose activities where the kids can change frequently and can be explained quickly.
- They are individualistic and possessive. They like to play along with small groups and to play as an individual in a large group.
- They are curious and want to learn. They want to explore and handle materials in many types of play. Use materials such as ropes, trees, soil, etc.
- They want chances to act on their own and are annoyed at conformity. They like to make choices, to help make rules, share and evaluate group experiences. Do a variety of activities with minimum rules.

Middle Childhood - 9 to 11 years

What they are like, what they need, and what they like to do:

- They respond differently in varying situations. They like to participate in a wide range of activities using many kinds of materials and equipment. Individual, dual or small and large group activities.
- They want to be liked by their peers. They like to belong to groups and be on many kinds of teams.
- They want approval but not at the expense of their group relationships. They want to gain respect and approval of others. They like to participate in activities in which they are perceived to be good at.



- They enjoy rough and tumble activities. They like to participate in activities with an element of roughness but limit the bumping, pushing and body contact.
- They may show increasing independence and a desire to help. They can assist with equipment, leading and keeping track of scores.
- They have a strong sense of competition and crave recognition. They need to succeed in activities that stress cooperative and play along with activities that give individual satisfaction. They like to do self-testing activities as well as group and team activities.



A c t i v i t y I d e a s

- Have older Wardens discuss with the leaders of Pathfinders and Trailblazers what program activities they can plan and deliver.
- Brainstorm with your group some possible activities that can be planned and delivered.



The two JFW program activities I planned and delivered to younger Wardens.

Activity:

SUMMARY

DATE:

Activity:

SUMMARY

DATE:



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LEADERSHIP OF OTHERS

Good leaders care about those they lead. They also see activities and outtrips as an opportunity to help people learn and grow.

date completed



Create a team by building trust through ice breakers and cooperative games. page 55



Determine the strengths of Wardens in your group. page 57



Assist in leading a daytrip for younger wardens. page 61

V. Leadership of Others

Last Updated: 11/00

1. **Create a team by building trust through ice breakers and cooperative games.**

BACKGROUND

Being part of an effective team is a wonderful experience for all participants. Effective teams are developed over time and through positive and negative experiences. A leader is essential in helping a team work through and learn from experiences and put experiences into perspective. Leaders can help a group of people become a team.

Below are some commitments to foster an effective and enthusiastic team.

1. Help each other be right, not wrong.
2. Look for ways to make new ideas work, not for reasons they won't.
3. If in doubt, check it out! Don't make negative assumptions about each other.
4. Help each other win and take pride in each other's successes and victories.
5. Speak positively about each other and about Junior Forest Wardens at every opportunity.
6. Maintain a positive mental attitude no matter what the circumstances.
7. Do everything with enthusiasm, it's contagious.
8. Whatever you want, give it away. (If you want cooperation, give cooperation, if you want honesty, be honest)
9. Don't lose faith and never give up.

Trust is a powerful tool; it is the key to personal involvement. At the end of trust activities, it is satisfying to hear Wardens say "I'd like to try that," in contrast to their initial reaction, "No way!" A large part of this growth in personal confidence is due to the establishment of trust.

For participants, trust means:

- ☐ I don't have to do everything.
- ☐ The safety equipment and procedures work.



- What the instructor says is honestly presented.
- If I try something and I fail, my peers will be supportive of my efforts.
- I will not be laughed at or made to appear foolish.
- My ideas and comments will be considered without ridicule.

An individual will seldom take a physical or emotional chance if they perceive callousness and unreasonable risk as part of that risk-taking. A group surrounded with positive experiences and successes will experience trust growing apace with personal confidence.

Trust, within a framework of team building activities, is gained with patience, thoughtfulness and care over a period of time. Trust can be damaged or lost in a second of carelessness or inconsiderate behaviour. Cultivate and protect the trust that an individual offers and shares.

Cooperative Games

Cooperative games involve physical activity and seek to get as many people as possible playing. They are lots of fun and present sheer magic that comes from playing together in an atmosphere of trust and freedom. Cooperative games are easy to learn. You don't need any special equipment or an elaborate playing field or gym. You play to compete because competition is fun, not because you are concerned about who wins. Most of the games have people working together for a common goal.

Icebreakers

Icebreakers are short fun activities with the purpose of making people feel comfortable with each other. Ice breakers are frequently used for a group of people that have just met one another. These short activities encourage people to put their guards down and begin to be themselves.

Ice breakers have three purposes:

- To learn something about each person in the group
- To unselfconsciously relate something unusual about themselves
- To perform a task together.



Appendix I contains a variety of icebreakers, cooperative games, initiative tasks, trust activities and energizers. If you remember some fun games that you have played, record them in the appendix. Write comments beside the games that worked well and the ways you may have modified them.

2. Determine the strengths of Wardens in your group.

BACKGROUND

Resources include all those things necessary to do a job. Resources also include people, because people have knowledge and skills. Knowledge is what a person learns through familiarity or experience. It is what you know. Skill is the ability to use what you know. Attitude includes the desire to do something, motivation, and the belief that you can do it with confidence.

When the leader uses the knowledge and skills of the group members to get the job done, the members gain experience and improve skills. They also develop a positive attitude toward using a skill.

Below are some information items that may be updated annually:

- Keep the group's inventory up-to-date and use it in planning
- Understand the purpose and resources of the Junior Forest Wardens
- Determine member's skills, interests and resources and make available to all members

As a leader, you need to know the resources that are available to you. A resource is something you can use, such as, a book, equipment. A piece of wood or a handful of sand may be a resource. People can also be a resource because:

- They know how to do things.
- They have information and knowledge.



- They know how and where to get other resources.

Every member in a group can be a resource. Not everyone has something to give to every job, but each member of a group should be encouraged to add what they can. By doing an inventory of the groups individual strengths:

- You can eliminate making a lot of mistakes before finding out what someone has to offer.
- You can save time by not having to talk to other members of the group about the strengths of others.
- You can assign jobs to those who need practice in developing weaknesses and calling on those with strengths when it really counts.

Skills Checklist

- Have Wardens brainstorm to develop their own list of skills and strengths. Use the sheet on page 60, to list the skills and knowledge areas and have each Warden evaluate themselves.

Example

Check ✓ below all the skills you think you are pretty good at and rate yourself: wild edibles, cooking, lashing, able to tie 10 knots, making a fire in wet weather, making a fire in rain, making shelters using natural materials, and so on. Consider adding attitudes and personality traits that are considered to be important, for example, confident, analytical, cooperative, motivated, enthusiastic, inquisitive, and so on. Consider adding at the bottom: "List three strengths you bring to the group."

After a self evaluation, have the Wardens share their ratings with each other. There may be discussion as to how they each evaluated themselves. Some may tend to rate themselves higher or lower in comparison to each other. Discussions can even up the ratings for more accuracy. Group discussion will also help the Wardens recognize each others strengths. This should be done annually since each Warden's skill and knowledge levels will change after a year of programming.



- Don't trust your memory, make a photocopy of each Warden's "Strength Checklist". Ensure that each Warden has their own copy on file. If you have funds available, provide a copy of each Warden's Strength Checklist to each other.
- Encourage Wardens to write goals to increase the skill and knowledge areas that are weak.



Name: _____

Date: _____ Rating Scale: 1 is low, 5 is highest level



3. Assist in leading a daytrip for younger wardens.

BACKGROUND

Assisting a leader is not a slack job. An assistant leader works in partnership with the leader. It is your responsibility as an assistant to clarify your role. Prior to the daytrip, meet with the leader to clarify details. Make a list of questions and concerns. Your list may include some of the following:

- Get details of trip: Ask the 5 Ws - Who, What, Where, When, Why, and How.
- What is expected of me? What do I have to do?
- What do I want to do?
- Will leader delegate to me as we go along or will I play a role and stay with that for the whole trip?
- I have to do something. I will not go along without contributing.
- Here are some ideas of what I can do to assist the leader: (Warden makes a list)
- Some things that can I do on the trip, that will help me develop some of my leadership skills: debrief the group after the trip, help the group or individuals resolve conflicts should any come up, and teach the group one thing (be specific) while on the trip.



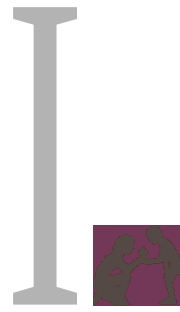
Activity Ideas

- Have Wardens write a job description for an Assistant Leader.
- Assist with a day hike, canoe trip, or cross country trip.
- Have Wardens make a list of the skills they wish to improve and concentrate on practicing them while assisting on a daytrip.
- Write a summary about the trip, describe the roles of the leader and your role as the assistant leader, how many attended, where and so on. Finish the summary with: Five things I learned about leadership are . . ., Three things I did well on the trip are. ., Three things I will improve are. . .

APPENDIX

Icebreakers, Cooperative Games, Initiative Tasks & Energizers

Adventurers
JUNIOR FOREST GARDENS



APPENDIX



Last Updated: 11/00

Ice breakers

Truth is Stranger Than Fiction

This is a fun, introductory activity. Have the group form a circle. Inform them that each have to state three statements, one must be the truth and the other two must be lies. As we go around the circle, say your name and the three statements. The group will ask questions for 30 seconds then vote on the statement that they think is the lie. Give the group members time to think of their three statements.

Here's my example:

Hi, my name is Joanne.

1. I parachuted from an airplane.
2. I had a close encounter with a bear.
3. I won some money in a lottery.

For 30 seconds the group will ask questions to check out their validity. They will take a vote and then I'll tell them that I never won any money in a lottery. Remind the participants that the statements don't have to be all that exciting. It can range from I have seen Queen Elizabeth to I baked muffins in a reflector oven.

Mingle Bingo

Make a quick list of skills, abilities, interests, or whatever theme you want to have. Make it into a chart similar to the one on the next page. Fill in your answers and then circulate through the group and find another person with the same match to one of the Things in Common. Sign each other's sheet when you have a match and continue asking others in the group until all the boxes are filled.





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Things in Common	Yourself	Friend
1. Favorite mammal		
2. Favorite movie		
3. Favorite JFW Activity		
4. Birthplace		
5. Favorite school activity		
6. Favorite meal		
7. Astrological Sign		
8. Favorite Vacation Spot		
9. Eye Colour		
10. Birth Order in Family		
11. Favorite Sport		
12. Favorite Outdoor Meal		
13. Favorite Camp Song		

Spider Web

Have all Wardens sit in a large circle. During this activity, everyone will have an opportunity to share their name and say something special about himself or herself. Give people one minute to think of something special about them. Begin the activity by stating your name and something about yourself, for example, "My name is Jill and I am wonderful at making Beanie Babies." While holding onto the end of the yarn, roll the yarn ball to someone across from you in the circle. This process continues until all have either shared, and a spider web has been created. This is a great activity to show how all the skills and abilities of each member can contribute to make the group a team.

Cool Colours

Review the colors of the rainbow (red, orange, green, blue, and violet). Have Wardens arrange themselves according to the colors of their socks, shirts (if not all red) or some other article of clothing. Individuals will have to work together to accomplish the task thus encouraging cooperation and teamwork.

Four Up

All the players need to be able to see one another for this game. Begin the game sitting down. Anyone can stand up at any time but cannot remain standing for more than five seconds at a time before sitting down again. The Warden can get right back up again if they choose. The object of the game as a group is to have exactly four people standing up at all times. It is best to play this game in groups of eight to 10 people.



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Shoe Scramble

Everyone takes off one shoe and places it in the center of the circle. All people join hands. With hands joined; each person must pick up one shoe, locate the owner of the shoe and return it to them without breaking their joined hands.

Do As I Do

Have the group sit in a large circle. One person begins by entering the circle and makes a gesture, sound or movement (the more ridiculous, the better) and then points to someone else in the circle to do the same thing. This person does the same thing the person before did and adds his or her own performance, and then choose the next person. This person need only repeat the preceding action and add one before choosing someone new. The game is over when all the people have had a chance to participate.

"I Love Ya Honey, But I'm Not Allowed to Smile."

Form a large circle. One person in the middle walks up to a person in the circle and says, "I love ya honey." The chosen victim is to respond (without smiling), "I Love ya honey, but I'm not allowed to smile." Guess what happens? They smile! The smiler joins the person in the center to try and entice others to smile.

Ball Toss

You'll need a blanket and a large ball, a soccer ball works well. Teams of four hold the blanket, one in each corner. A ball is placed in the center of each blanket. When you say, "Go" all the blanket teams throw the ball to the gym ceiling by using the blanket. The have to catch the ball on the way down. You may have teams throwing the balls to each other to catch in their blankets.

Hog Call

Ask Wardens to find a partner. Each pair must choose a matching set of words, for example, salt-pepper, black-white, Marco-Polo, or ham-eggs.. Split the pairs and have the people walk to opposite ends of a playing field. Put on blindfolds or promise to keep eyes closed. On a signal, everyone is to find their partners by shouting their matching words. Variation: In a smaller indoor area, have partners agree on an animal sound that they repeat to find each other.



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Name Game

Each member of the group must invent some action to accompany their name, a graceful bow, a wink, or a wave. Each person says their name and demonstrates their action, and then says the name and performs the action, of the others in the circle. This continues around the circle until each member has performed everyone else's name and action. This is a great game to break the ice and get people to know everyone's name.

Name Game Two

Each member is asked to give their first and last name and some history, some special personal fact or an interesting fib. For example, "I am named after my Great Grandmother who immigrated here from the moon" or "I am named after my Dad's cat."

The What?

Sit in a circle facing the center. One person starts the game by taking a salt shaker, turning to the person on the right and saying, "This is the salt." That person then turns and responds, "The what?" The first person says, "The salt." Then the second person says, "Oh, the salt." The second person turns to the third person and the entire exchange repeats until it has worked all the way around the circle. Once people have the hang of it, you can confuse them. Here are two ways you can:

1. Pass a rock around and call it a fish.
2. Start another object around the circle, like the peppershaker and have the conversations going both ways. Watch out, especially when they meet one person at the same time-Zap!!

Puzzle It Out

Materials required: Make the Puzzle Set, found on page 70 for every group of six Wardens. Place the six small envelopes into a large envelope and label Set I. Make more as required. Have a group of six Wardens sit around a table. Assign the sixth person to act as a referee. Give each group one large envelope containing the five small envelopes.

Rules:

Everyone must stick to the strict rules. Time Limit: 10 minutes

1. Open your individual envelope on the signal from the leader.
2. You are to exchange puzzle pieces with each other within your group until you have each made an identical square measuring 15 cm 15 cm.
3. You may not ask for, or signal for any piece held by any other member of your group. If you need a piece you must wait until it is freely given to you.
4. You may volunteer any piece you have to any other member of your group at any time. You may not ask for anything in return.



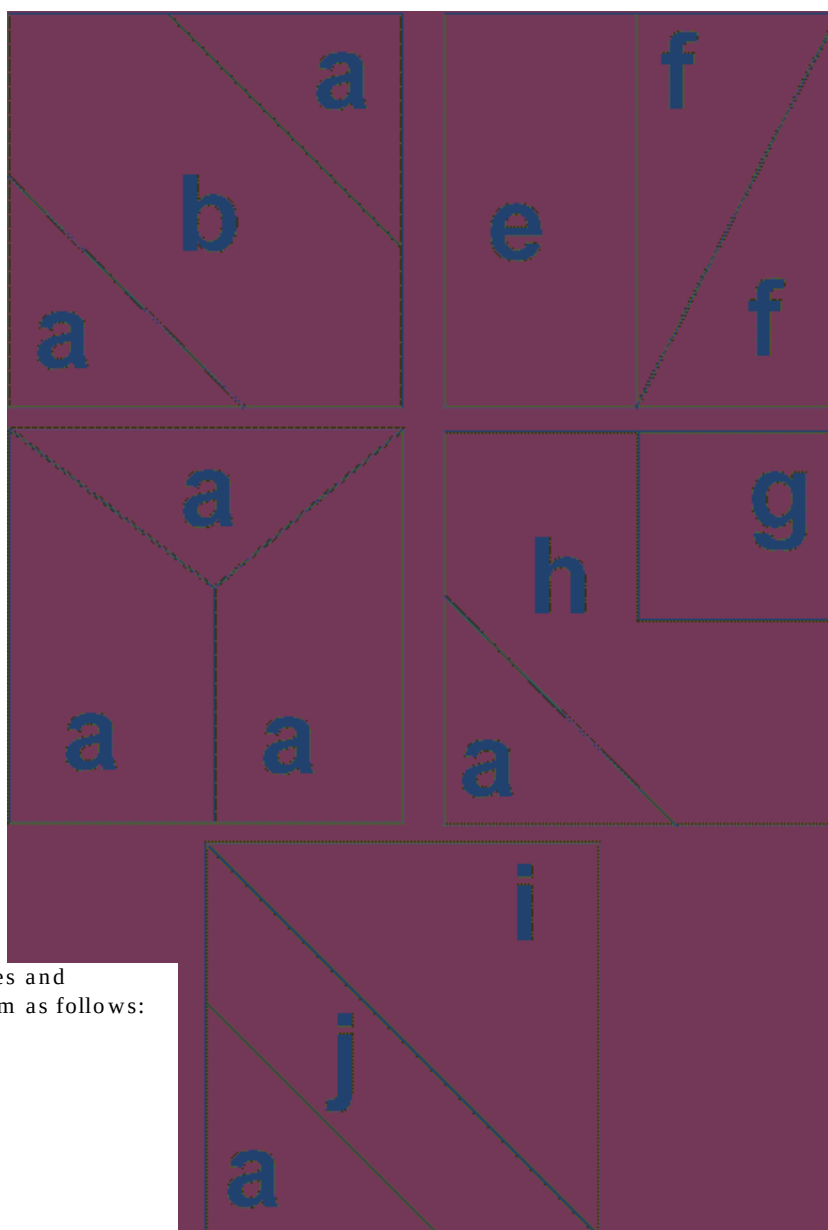
- Last Updated: 11/00*
5. You must work in total silence (and that means no body language) until your group has completed five identical squares.
 6. After the game, the referee will share what they observed happening in the group.
 7. Discuss what happened. Were some people competing? Were some cooperating? What factors intensified the competition (time limit, another group, and nature of instructions)? Is it normal for people to be cooperative or competitive?



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Puzzle Set

These instructions are for a complete puzzle set for one group of six Wardens. Use plain cardboard. Cut five squares measuring 6" X 6" (or 15 cm X 15 cm.) Cut each square according to the five patterns shown below. Do NOT put letters on the pieces, they are there to assist you in scrambling the pieces.



Take five small envelopes and put puzzle pieces in them as follows:

- Envelope #1 - e, h, I
- Envelope #2 - a, a, a, c
- Envelope #3 - a, j
- Envelope #4 - d, f
- Envelope #5 - b, c, f, g



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Trust Activities

Blind Caterpillar

Wardens form groups of four or five and place their hands on the hips of the person in front of them. The leader has eyes open and takes them for a walk. At intervals, the leader calls "Change" and the person in front goes to the back. This activity is designed to produce feelings of trust. Wardens process how they feel as the leader and the follower.

Circle of friends

Teammates form a circle. One person stands in the center with eyes closed. The center person leans back with feet glued to the ground and is gently rolled around the circle. At least two people in the circle maintain contact with the center person at all times. The movement should be slow and deliberate since creating a gentle feeling of support is the object of the exercise.

Human Springs

Participants stand facing each other, palm to palm, arms length distance apart. Keep the palms forward and open. With feet firmly planted, rock into each other. Stop each other with palms, and then spring each other back to standing position. As confidence and cooperation build, increase the distance between the partners.

Team Building Activities

Magic Number 11

Wardens form a circle with each person holding out a clenched hand. Everyone shakes their clenched hand up and down three times and chants, "One, two, three." On the count of three, each person puts out a number of fingers. The purpose is to have all the fingers add up to the number 11. No talking is allowed. When you finish that one, try adding fingers to 12.

Community Circle

Make a ritual of the community circle. Make a circle to take care of administrative and housekeeping needs such as attendance, notices, clean up assignments. Review the meeting schedule so everyone knows the planned activities. Ask a question of the day; (see next page for some ideas). Have Wardens respond in turn to the question and allow time at the end for those who have passed to respond if they want.



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Some Suggestions for Question of the Day

- ☐ How do you feel today?
- ☐ How does the rain make you feel?
- ☐ What is the biggest thing in the world?
- ☐ What is your favorite food and why?
- ☐ What is your favorite song?
- ☐ What do you want to be when you grow up?

Camp Set-up

Have the group set-up camp without talking and only using one hand per person. This should go on for a specified period of time or until some event, for example, tarp set-up, has been completed. For safety, all stove and fire activities will be performed using two hands, minimal talking is permitted.

Back Rubs

In pairs, a line or a circle, gently work the kinks out of your neighbours back. Remind group members that people have different tolerances for how hard and soft a back rub they prefer.

Crevasse Practice

Tie a rope around the waist of each member of the group with each person about 5 metres apart. You may need to have several ropes with several people per rope. Have the group break camp in the morning, while roped up.

Mountain Survival Problem

Your charter flight from Vancouver to Edmonton has just crashed in the National Park in the Rocky Mountains. It's mid-January, approximately noon. The twin engine, ten-passenger plane, containing the bodies of the pilot and one passenger, has completely burned. Only the airframe remains. No one in your group has been seriously injured.

The pilot was unable to notify anyone of your position before the plane crashed in a blinding snowstorm. Just before the crash, you noted that the plane's altimeter registered about 1,500 metres. The crash site is in a rugged and heavily wooded area just below the timberline. You are dressed in medium-weight clothing and each of you has an overcoat. You have nothing in your pockets.

Before the plane caught fire, your group was able to salvage 15 items. They are listed below. Your task is to rank the items according to their importance to your survival. Write a 1 next to the most important, 2 beside the second most important and so on to 15.



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You have five minutes to complete this task. Work alone. When through, discuss with the group your reasoning behind your rankings.

Rank	Item
_____	four wool blankets
_____	sectional air map
_____	one flashlight with four batteries
_____	one rifle with ammunition
_____	one pair of skis
_____	two-fifths of liquor
_____	one cosmetic mirror
_____	one jack knife
_____	four pairs of sunglasses
_____	three books of matches
_____	one metal coffee pot
_____	one first aid kit
_____	12 small packages of cocktail nuts
_____	one clear plastic tarp measuring 3m x 4m
_____	one large gift-wrapped decorative candle

Cooperative Games

Team Juggling

Find different objects safe enough to toss. Form a circle. Step one is to establish a pattern. Person one throws the object to person two who throws to person three and so on. Everyone must remember who threw to them and whom they are throwing to. Step two, now throw in another object and continuing throwing to each other. Step three, throw in the third ball and continue. See how many objects can be going at once around the circle.



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Crostic Team

Give each person a piece of paper and ask them to print their names in the middle of the page in block letters about 2 cm high. When you give a signal, the participants should move around the room, adding their name to the letters that fit the name on the sheet of another person. If the name doesn't fit, go to someone else and return later when you have more letters. Try to get all the names connected. Below is one made from nine names.

```

      T I M
      A
      Y O L A N D A
    E A R L
      L O
J O A N N E R
O N X
H E N R Y
N A
```

Puzzling People

You'll need a picture from a magazine for every person. Tell each person to tear the picture into four pieces. Have them mill around the room and trade pieces, one piece per person. Let them solve the puzzle by grouping with the others who hold up pieces of the same picture. New teams of four are formed this way. Another variation to this idea is to use four lines from a familiar poem or proverb.

Clap Game

Organize the Wardens into teams. One person from each team steps out of the room. The teammates agree on an object in the room that the teammate must touch. All the teammates return and together begin to search for the object. The teammates clap, clapping louder as their team member approaches the object they previously agreed on. When the team member touches the object, the team stands up, gives a cheer, and invites the teammate back to the team.

Initiative Tasks

All Aboard

You will need a large stump or a 60 X 60-cm platform. The object is to see how many people can get on the platform at one time. To be counted as being on the platform, each person must have both feet off the ground and the whole group must be able to hold their balance for five seconds.



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An average group can get about 12 to 15 people on the platform. If your group is smaller, make the platform smaller; you have flexibility regarding its size.

Remember that one of your responsibilities, as a group leader is to encourage safety procedures. Try to avoid the group doing the "pig pile", one person piled on top of another.

Touch the Can

You need a clean, empty pop can. The object for the group of 12 to 15 people is to make physical contact with an empty pop can without making physical contact with one another.

Human Knot

You need 10 to 16 people with two hands. Ask everyone to face one another in a tight circle. Have everyone holds their right hand out and grabs another hand as if they are shaking hands. Next, everyone extends his or her left hands and grasps the hand of someone else. Check to see that everyone is hold the hands of two different people.

The challenge is to try and unwind themselves from this human knot without breaking contact with the hands. You'll see them stepping over hands, turning inside out. It's fun to watch a group solve this. There is no one right answer; you may end up with two intertwining circles, a big circle with some people facing in and out. In a large group you may have to administer Knot First Aid where you will separate one or two hand contacts and re-grip their hands. Don't be a rush to administer First Aid. Most groups like to work through the problem.

When you do Knots with younger Wardens, start with a group of eight kids. Increase the group size as their communication skills, cooperation and problem solving abilities increase.

Mouse Hunt

Define a rectangular area approximately 2 X 4 metres with string or marked on the ground. Fill the area with toys and about 12 mousetraps, of course. Rattraps would sound better! These are the dangers! Have people in partners, one with a blindfold. One set of partners goes to each end of the area. The object is for the sighted partners (who are outside the defines area) to verbally guide the blindfolded partner through the maze of obstacles on the group without touching the dangers, setting off the mouse traps or touching each other as they pass. Get through the maze safely, rearrange the objects, re-set traps if necessary and change roles.



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Electric fence

Object:

To transport the group over an "electric fence" using only themselves and a conductive beam.

Rules:

1. If a person touches the fence (rope) that person is dead and must attempt the crossing again.
2. If the conductor beam touches the wire, all those in contact are dead and must try again.
3. An "electric field" extends from the wire to the ground and cannot be penetrated.
4. The corner supports, which hold the wire, cannot be safely touched so cannot help in solving the problem.

Safety

Be careful not to let the most enthusiastic person throw other people over the rope. Someone will get hurt. Do not let the last person dive head first over the wire.

Construction

The "electric wire" can be nylon rope tied off in a triangle shape, each side of the triangle is 3 to 4 metres (10 to 15 feet). The rope should be 1.5 metres (5 feet) high. In gym use net supports for the corner supports, surround the area with mats. The conductor beam is a log about 2.5 metres (8 feet) long with an 8-cm (3-inch) diameter. If you are doing this at camp, use trees as the supports for the electric wire.

Find Your Feet

Have everyone in the group sit in a circle blindfolded and without talking. Each person must take off two items (shoes, shirt, hat, etc.) and place them in the middle of the circle. Mix up all the items. Then everyone must find their own things and get someone to put them back on them. Without seeing and talking.



The Diminishing Load Problem

Last Updated: 11/00

Object:

To move the group across an open field as quickly as possible. The distance will vary with the estimated strength of the group. The length of a basketball court is average. Have groups competing against each other.

Rules:

1. Carry a member of the team across the field.
2. The carrier must return and be carried himself.
3. The only person allowed to run or walk across the open area is the last person.
4. If the carried person touches the ground while being transported, both members must return to the start.
5. The number of people being carried and carrying can vary with the strength and/or imagination of the group, for example, one-to-one is not the only way.

Variations:

The object can be to move the entire group across the distance in as few trips as possible. This will change the emphasis from speed to efficiency. To include more of a trust factor, require that everyone wear blindfolds. Have at least three people available as spotters.



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Survival Kit

Do this exercise by yourself first. When everyone has finished, work together as a group and agree on the final rating.

Scenario:

You are hiking through the woods and suddenly fall down a steep slope, twisting your ankle. Your backpack is now too heavy for you to carry all your supplies in and some things will have to be left behind. To decide what you are going to leave behind, you must think about the uses of each item and rank them according to the importance they will have to you for the rest of your journey.

Begin with number one as being the most important to number 17 as being the least important.

Group Rating

My Rating

_____	matches
_____	compass
_____	glasses
_____	plastic
_____	knife
_____	snakebite kit
_____	fishing gear
_____	insect repellent
_____	paper and pencil
_____	flashlight
_____	whistle
_____	water purification tablets
_____	cord and wire
_____	soap
_____	food rations
_____	needle and thread
_____	medical kit



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Energizers

Applause

Wardens simply applaud for about 15 to 20 seconds non-stop.

Bees

All group members mimic the sound of bees (zzzzzzzz) beginning very softly and gradually increasing in loudness.

Bumpity-Bump-Bump

Form a circle standing up with one Warden who is "It" in the center. "It" walks up, stands in front of you and says one of the following:

"Center, bumpety-bump-bump"

"Self, bumpety-bump-bump"

"Right, bumpety-bump-bump"

"Left, bumpety-bump-bump"

You must say her/his name, your name, or the person's name to the right or left of you before "It" completes saying "bumpety-bump-bump," otherwise you become "It."

ZAP!

Participants stand in a circle, facing in, shoulder to shoulder. Start producing a little energy by rubbing hands together as if you are cold. Ask everyone to take three deep breaths, breathing in through the nose, holding the breath for a moment, then exhaling out through the mouth. The leader then says, "We are going to count to three together and on the count of three, we will point our fingers into the middle of the circle and say, ZAP!"

Jug Band

Collect materials that can be used as instruments, for example, comb and paper for kazoo, tins and spoons, drums, rocks hitting together, coconuts halves on a table, spoons, popcorn or rice in a can, etc. If there are not enough instruments for everyone, then have the Wardens without instruments make sounds, which imitate instruments. Have Wardens practice. Appoint a conductor and select a simple tune to play. Plug your ears and have fun!

APPENDIX



II



Working with the Media

APPENDIX



Introduction

The role of the media (newspapers, radio and television) is to educate and inform the public. When you have opportunities to plan community events, you should be contacting the media to publicize your event and be available for interviews when the event is actually happening.

Major Media

- Newspaper - Generally only one or two dailies cover an area. They have a need for pictures and details. Deadlines are tight.
- Radio - Most areas have a number of stations that provide immediate coverage. They are interested in a verbal report from the organizers for maximum impact.
- Television - Generally there are two or three stations in an area. Their needs are for short visual clips of the event for coverage on the noon or evening news.

Below are some tips that you may find useful for your JFW Club:

1. Designate one person to be the media contact. This person talks to the radio and television people. You may also have a committee
2. Be prepared. Be ready with your spiel and remember that you represent the Junior Forest Wardens organization. Take a deep breath and smile.
3. Tour the media around the event to highlight the important message you want to communicate.
4. Take advantage of the opportunity. Remember that you are the expert and media people represent the uninformed public. Talk to them and practice your communication skills.
5. If you do not know the answer to a question, "I don't know" is the best answer. That doesn't make for exciting news, so don't worry, it won't make it to television.
6. Be yourself. Do not try to change your voice or sound different. Don't play act or try to be someone else. You have done very well as the person you are.
7. Be clear and to the point.
8. Your attitude should be open, friendly and helpful.

Television

Television leans towards action and entertainment. It's a more intimate medium than newspaper and radio. Television is an emotional medium, not an intellectual one. Viewers often forget the content of your message but remember your style, how you looked, how you behaved and the quality of your voice.





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Check your appearance and then forget it. Now, concentrate on the questions being asked. Look straight ahead and try not to look up or down. The best advice when preparing for a TV interview of any kind is as follows:

1. Know the subject. Do your homework. Make certain you know as much about the subject as anyone.
2. Consider one, two, or maybe three basic points that you wish to convey during the interview. Make certain you can relate them in brief, clear sentences. Keep steering the conversation around those points. Don't be afraid to repeat your message(s) in different ways. Use examples and analogies that provides the viewer with mental images.
3. Try to smile, relax, and consider the experience as a conversation.

Your objective is to appear natural. You want to be comfortable, in control, confident, open and friendly. Reporters are short-term experts who have simply taken some time to prepare a few direct questions.

Newspapers

Community newspapers want news that directly affects the community. Newspapers translate complex ideas better than radio and television. If possible, have a previously written short article about the event. If it's good it may get published as it is. Or the reporter may use parts of what you've written. That's good because the information is accurate.

Radio

Radio tends to be casual and personal. Radio programs often use stories about people. When you get a telephone call from the radio station, have your message in point form by the phone. They will usually tell you that you are being recorded, take a deep breath and try not to speak too quickly.

For the record, establish whom you are talking to and how the information will be used, i.e. specials segment. Record all the media contacts for future reference.



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How to Publicize Your Event or Project

Getting Started

Someone in the club should be assigned the job of making a list of the contacts in the local radio, television and cable stations that will be contacted to help promote your event. Get the names and telephone numbers of the Program Directors. Keep the list updated for future events.

Write a Media Release

It's not as hard as it sounds. Remember the 5Ws: Who, What, Where, When, and How. Write a one-page, double-spaced media release stating the name of your group, age, the number of people involved in the project or event and a description of the event. The most important information goes in the first paragraph. Add a contact name and phone number at the bottom of the page. The Media Release should be delivered to the editor of a local newspaper, and to radio and television station program directors. Follow up one week later with a telephone call.

Organize a Publicity Event

Hold a kickoff celebration to bring exposure to the project. For example, have the mayor or another dignitary plant a tree for wildlife to kick off a major tree-planting project. Ask the media and other members of the community to attend and participate. If a photographer or TV camera crew is expected to show up, plan some visually stimulating activities.

Write Your Own Story

Plan ahead by writing your own story just in case the media does not show up at your event. Submit a photograph and a story to the newspaper after the event. You may also consider writing a story before the event just to stimulate interest in the community before the big event.

Write a PSA - Public Service Announcement

This is a shorter version of a media release. This is written as an announcement so a radio host can read it on the radio or it can go as a small announcement in a newspaper column. In the top left corner of the page, write the contact name and phone number. In the top right corner of the page write the date when you would like the media to make the announcement and for how long, for example, Run: June 9-10, 1998.

Contact Person

Assign someone to be the contact person. The name will be on Media Releases and Public Service Announcements. This person should be someone who will not freeze up on camera or in front of a microphone. The person must be prepared to talk about the club, the project or event, its purpose and so on.



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Network

You may decide to plan your event so that it is part of a larger public event such as Wildlife Week, Arbor Day or Environment Week. Your event may also be promoted in some already existing networks such as a school newsletter, club newsletter or small neighborhood community newsletters. You may also ask for assistance, expertise or materials through those contacts.

Timing is Everything

Plan your event, if possible, between 9:30 and 11:00 a.m. This is the best time to attract media attention and will help ensure that your event is covered in the early evening newscast.

Remind Everyone

Two Weeks Before - Phone the media before the event and briefly tell them about your plans. Specify the date and the activity. Tell them you will follow up with a media release.

One Week Before - Deliver the media release by hand to the person spoken to on the telephone.

Day Before - Phone the media contacts to remind them of the event. However, for a Monday event call on Friday.

Follow Up

Send a thank you letter to editors, Program directors and all those who helped promote your event. Thank-you notes make everyone feel good about being involved.



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Write an Effective Letter to the Editor

Surveys show that the Letters Section of any newspaper or magazine has one of the highest readership ratings of any portion of the publication. Writing an effective letter to the editor is a great way to share your views and news with the general public. Here are some simple tips to help you get your thought published.

1. **Make it legible.** Type your letters if possible, using double spaces. Use only one side of a sheet of paper.
2. **Keep it simple.** Be as brief as possible while still long enough to make your case. Focus on a basic idea in the first sentence or two so the editor can quickly determine why you are writing. Letters between 150 and 200 words are most likely to get printed, and least likely to get edited. Look at the letter pages of the newspaper you are writing to so you can get an idea of the typical length of published letters. Sometimes the editor will have it printed near the letters column.
3. **Make it readable.** Give specific examples to support your points. Use personal experiences when possible. Use short sentences. Avoid long paragraphs.
4. **Make it timely.** If you are responding to a news story, or someone else's letter, try to mail your letter within three days. Refer to the article in your letter in your first sentence.
5. **Identify yourself.** If you are writing on your own, identify yourself with a short introduction that explains why you are knowledgeable on this topic. If you are writing on behalf of the Junior Forest Warden Club, include that information at the beginning. At the end, sign your name, give an address, and phone number. The phone number is important because if a decision is made to print your letter, someone often will call to verify that you wrote the letter.
6. **Address it properly.** Use the following both for the address at the top of your letter and as the address on the envelope. Letters to the Editor, Name of Newspaper, Address of Newspaper.
7. **Keep a copy.** If your letter gets printed, you will want to compare your original with how the newspaper published it. That allows you to make sure the intent of your letter were not changed by editing and that no crucial point was eliminated. It also will help you write a better letter next time.
8. **Be persistent.** If you send a letter and it does not get printed, don't get discouraged. Review the letters that did get printed. Especially on the same topic. You'll probably see how you could have made yours more effective.

APPENDIX



III



Making Presentations

APPENDIX

Making Presentations

Your job when making a presentation is to convey information effectively.

Prepare Well

1. You must above all else know what you are talking about. Do your research and know the subject well.
2. Know your audience. Find out whom you are talking to. What level of knowledge do they have? The presentation should not be too basic or too hard.
3. Include a specific beginning, middle and end. The beginning should introduce what you will be talking about, the middle has the "meat and potatoes" of the presentation and the ending should summarize the talk.
4. Make a written outline of what you want to say. Answer the six Ws: Who you are, what you'll be doing, how you'll be doing it, when, where and why.
5. Practice. Practice. Practice.



Introduce Yourself

Introduce yourself if you are in an informal setting. Have the group members introduce themselves too. This will break the ice and make everyone more comfortable and receptive to what you have to say.

Be Flexible

What do you do when you are leading a nature walk with younger Wardens and suddenly their attention is drawn to something else that is completely off the topic? Well, have some spontaneity, go with the flow but gradually bring their attention back to the topic. Take advantage of those teachable moments.



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Empower

○ Yourself

Honor the importance of what you are doing. Your position as a speaker and as a presenter may be the only opportunity the group has to hear what you have to offer. Excite them so they are able to pursue the subject on their own.

○ The Listeners

Never talk down to your audience. Never think that you are superior because of what you know. The challenge is to have the audience excited because of what they are learning--not for the authority they have given you. Allow them to ask you questions.

Provide a Summary

If you have a lot of points for people to remember, it's a good idea to hand out a written summary. Listener's can go back and look up a point they missed.

Settle Those Nerves

Nervousness is usually the culprit affecting the quality of our voices. There are three ways to relax and upgrade your voice:

1. Slow down. Control is easier at slower speeds.
2. Relax the upper body. Take a breath, rotate your shoulders, and relax your neck. All these actions will create more relaxed vocal chords and make your voice sound deeper and more pleasant.
3. Take breath from your stomach, not your chest. Short breaths reduce vocal quality. Breathing deeply from the diaphragm allows a more relaxed sound.

Dry Mouth Syndrome

A dry mouth hinders good voice quality and is a direct result of nervousness. Here are three ways to minimize the dry mouth:

1. Take a hot drink instead of a cold drink, which tend to tighten the vocal chords.
2. Try to force a yawn. Yawning tends to stimulate salivary glands and relieve that dryness.
3. There is a liquid spray solution that creates artificial saliva, which can provide temporary relief.



The Bs of Good Speaking

- Be prepared
- Be clear
- Be simple
- Be vivid
- Be natural

Gestures

When you know your subject and believe in it with your heart, gestures will become automatic. You can videotape one of your presentations and study yourself. Sort out the weak gestures from the strong ones. You'll see them, don't worry.

Here are some examples of weak gestures:

- frequently clearing throat
- using any single gesture over and over again.
- Playing with a pen or paper clip.
- Fiddling with glasses.
- Reaching in your pocket and unconsciously jingling the change.
- Repeated patting your hair, scratching your head, pulling on an ear, buttoning and unbuttoning a coat.

Which Audio-visual Medium to Use

Following is a list of the standard choices among audio-visual methods, along with the pros and cons of each.

We learn 7% by hearing.
We learn 87% by seeing.
The remaining 6% are learned by taste, touch and smell.

Chalkboard/Whiteboard

Pros

Best for casual presentations.
Good when audience participation desired.
Inexpensive materials.
No problems with breakdowns.
Mistakes can easily be erased.

Cons

Slow because you produce words and graphics by hand.
Little or no glamour.
Presenter must work harder to keep audience interested.
Handwriting may be difficult to read.
Ink markers can be messy and unreliable.
Difficult to preserve and store results.



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Flipcharts

Pros

- Easy to produce.
- Reusable.
- Easily transportable
- Inexpensive.
- Good audience participation.

Cons

- Poor for large audiences.
- Flipping pages can be slow and cumbersome and pages tear easily.
- Requires some artistic skill to produce each page.

Overhead Projector

Pros

- Easy to use.
- Transparencies made cheaply and quickly.
- Colors and overlays can be used.
- Room lights need not be dimmed.
- Audience can see to take notes.
- Allows on-screen editing and audience participation.
- Computer-generated visuals can produce nice transparencies.
- Other new technology allows display of 3-D figures and "live" computer data.

Cons

- Poor for large audience (> 100 people)
- Changing transparencies becomes distracting.
- The speaker and projector can block view of the screen.
- Light bulb can burn out in mid-presentation.

35-mm Slides

Pros

- Better for larger, more formal presentations.
- Visuals advance smoothly.
- Photographic clarity gives a quality image.
- Slides are small, durable and transportable.
- Projectors are readily available.
- become Professionalism enhanced by using two or more projectors.

Cons

- Slides can be expensive to produce.
- Room must be darkened.
- Inhibits note taking and audience participation.
- Slides can be put in upside-down or stuck.

Videotapes

Pros

- Color, motion and sound combine for top professionalism.
- Best for explaining complicated subjects or processes.
- Best for impact.
- Best for large audiences on large screens.

Cons

- Shifts focus from presenter.
- Projection equipment cumbersome and expensive.



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Electronic Presentations

Pros

Visuals produced are sent electronically to a special projection unit for large-screen viewing.

Slides/transparencies/overheads need not be produced.

Easily produced fades, wipes, dissolves and other effects.

Cons

Cost of projection equipment is high.

Training technician usually required to advance visuals.

Clarity of visual not as good as slides.

Designing Visual Aids

Choosing exactly the right medium for your presentation is important and so is the design of your visuals. Here are some general rules for designing effective visuals.

1. Write the words first. Develop your message and your outline with its key points. Then consider which points in your outline need special emphasis. Graphics are to a talk what music is to lyrics. They complement and reinforce one another.
2. Use the KISS Method. This is an acronym for Keep It Short and Simple. Design no more than one main idea per visual.
3. Use the KILL Method. Keep It Large and Legible.
4. Use descriptive titles. Titles on your visuals summarize whatever point you are trying to make. A good title can also help bring temporarily distracted audience members back into the presentation quickly.
5. Decide on a basic design. This means using the same colors throughout, the same font styles, the same cartoon character, whatever it takes to show a continuing relationship between slides. Keep the design clear and standardize it.
6. Proof, proof, proof. Have someone else look over your work. Don't let a misspelling make you appear sloppy.
7. Allow enough time. Give yourself ample time to prepare visuals to rehearse with them thoroughly.
8. Use visuals sparingly. If something can be stated simply, don't show it. Flipping through a lot of miscellaneous visuals dilutes the impact of those that are important.



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Presentation Evaluation

Presenter's name (optional): _____ Date: _____

Presentation Topic _____ Group: _____

Circle Yes or No

Within time limits	Yes	No	Audience asked questions	Yes	No

Rate the speaker. Give an example to justify your decision.

1 = Disagree 4 = Agree

Words were clearly spoken	1	2	3	4
Voice was loud enough	1	2	3	4
Good eye contact with audience	1	2	3	4
Information was well explained	1	2	3	4
Prop or visual aid was used effectively	1	2	3	4
Audience participation	1	2	3	4
Calm and relaxed (no fidgeting)	1	2	3	4
Moved smoothly through presentation	1	2	3	4

☐ What was the best part of the presentation?

☐ How could this presentation be improved?

Overall rating of speaker:

Excellent	Good	OK	Needs Improvement

APPENDIX

IV



Leadership Skills Checklist for Adventurers

Adventurers
JUNIOR FOREST GARDENS

APPENDIX



Last Updated: 11/00

Leadership Skills Checklist for Adventurers

Name of Warden: _____

Years of program: Adventurer Year 1 _____

Adventurer Year 2 _____

Adventurer Year 3 _____

Check off the following skills and abilities the Warden has demonstrated. Write the date and details of the skills/abilities demonstrated. Include which leadership skills were practiced and which of the other modules and program objectives (Forestry, Ecology, and Woodstravel). Use another sheet of paper to keep a record of each Warden's achievements. Initial beside the skills on the Warden's copy of their own checklist in his/her manual.

- ☐ Listed Characteristics of a good leader.
- ☐ 10-minute presentation to younger wardens Topic: _____
- ☐ Conduct a special event or outtrip.
- ☐ Evaluate a special event or outtrip.
- ☐ Demonstrated effective communication skills while leading an event, activity or outtrip.
- ☐ Planned and delivered six activities of choice:
 - 1. _____
 - 2. _____
 - 3. _____
 - 4. _____
 - 5. _____
 - 6. _____
- ☐ Signed Leadership Contract
- ☐ Lead a brainstorming session.
- ☐ Coached peers or younger wardens to improve their skills and abilities.
- ☐ Demonstrated one problem solving technique.



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Leadership Skills Checklist

Adventurer's Name: _____

- ☐ Shows cooperation in club meetings and outtrips.
- ☐ Goal Setting
- ☐ Completed a Personal Equipment Locator
- ☐ Completed Group Equipment Locator
- ☐ Planned and coordinated two activities to support JFW program to younger Wardens.
 - 1. _____
 - 2. _____
- ☐ Conducted ice breakers and cooperative games session.
- ☐ Participated in determining strengths of group.
- ☐ Assisted a daytrip for younger Wardens.



Adventurer Leadership Skills

Certificate of Achievement

Presented to Warden:

Congratulations for successfully completing the
leadership skills required for the
Adventurer Leadership Module
in the

Junior Forest Wardens program.

We hope that you will continue to further
develop your
positive attitude and leadership skills.

Date

Leader



Alberta
ENVIRONMENT



**Produced by the Alberta Junior
Forest Warden Association**