
ENVIROKIDS
INVESTIGATE
FOREST
HEALTH
Alberta

YOUR BRIEFING

P.S. Keep in mind there are other problems to solve, little brain push-ups to keep your mind sharp!

Congratulations, you are a potential member of the EnviroKids Club. Your goal is to solve the clues about the health of Alberta's forests. Each time you solve a case in this book, you move closer to becoming a member of the EnviroKids Club. Sound interesting?

There are four cases to solve. As you read through this booklet, use the clues and information to help you. Each time you have solved a case, write the answers on page 27. Solve all four cases and you become an official member.

Now, put on your thinking hat, make sure you have a pencil or a pen and get ready to start. Good luck.

THIS CASEBOOK BELONGS TO POTENTIAL ENVIROKID CLUB MEMBER

_____

EVERYONE ELSE KEEP OUT!!

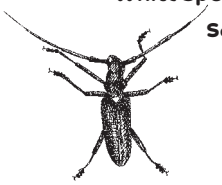
Ah, you are an observant one aren't you? See if you can spot one of these four insects hidden in the booklet. Answers on page 28.

Warren root-collar weevil

root feeder

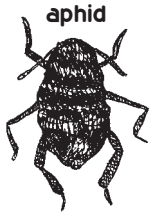
Cooley spruce gall adelgid

gall maker



whitespotted sawyer beetle

wood borer



aphid

sucking insect

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EnviroKids Investigate Forest Health is one booklet in the "EnviroKids" series. A Teacher's Guide accompanies this booklet. Both booklets are available on the web site at: www.srd.gov.ab.ca/forests/health/p_posters.html. Other titles in the series: *EnviroKids Find Out About Fish*; *EnviroKids Celebrate the Environment*.

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And for the inquisitive, investigate the web site:
www.srd.gov.ab.ca/forests/health

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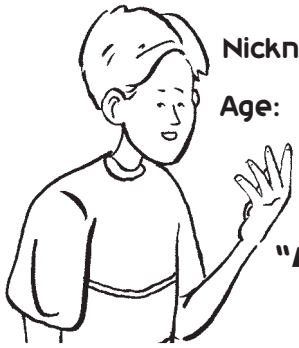
MEET THE ENVIROKIDS

OUR MISSION

We want to learn more about Alberta's forests. This summer we are going to build a clubhouse in the forest for our meetings and activities.

TAYLOR



Nickname: Tay

Age: 11

Favourite Activities: swimming, biking, surfing the web

"RESPECT THE ENVIRONMENT."

ALEX

Nickname: X

Age: 13

Favourite Activities: reading detective stories, skateboarding

"EVERYTHING HAPPENS FOR A REASON."

RYAN

Nickname: Spyin' Ryan

Age: 12

Favourite Activities: detective work, talking to real detectives, soccer

"SHH. LOOK, LISTEN, AND THINK!"

VICTORIA

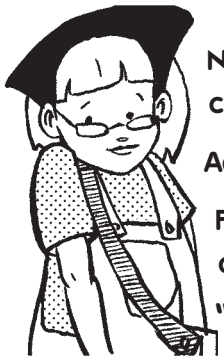
Nickname: Vic

Age: 11

Favourite Activities: piano, choir, friends, hiking

"LET'S WORK TOGETHER."

JUSTINE



Nickname: Gadget (because she always carries gadgets)

Age: 12

Favourite Activities: animal watching, computers, rollerblading

"NO CASE IS TOO BIG TO BE SOLVED."

WHERE OH WHERE WILL OUR CLUB HOUSE GO?

BUT WHAT KIND OF TREES?

Challenge 1

Identify the tree each EnviroKid is thinking about. Write the name of the EnviroKid beside the tree in the space below.

- ❑ Balsam poplar _____
- ❑ Lodgepole pine _____
- ❑ Tamarack _____
- ❑ Trembling aspen _____
- ❑ White spruce _____

For hints, try this logic challenge:

If Gadget's trees are also called larch; Spyin' Ryan's trees seem nervous; Vic wants to build a lodge; and if X thought his were popular; then which tree species is Tay thinking about?

Words you should know!

Foliage:
Leaves or needles that grow on a tree's branches. Photosynthesis occurs in the foliage.

Broadleaf:
Trees with wide, flat surfaced leaves. Most are **deciduous**, which means that they lose their foliage every year.
Examples of broadleaf trees: trembling aspen, balsam poplar, white birch.

Conifers:
Coniferous trees have needles and usually produce cones. Most conifers keep their needles all year round and are called **evergreens**.
Examples of coniferous trees: white spruce, lodgepole pine, balsam fir.

Did you know: Tamarack (larch) is a conifer and a deciduous tree!

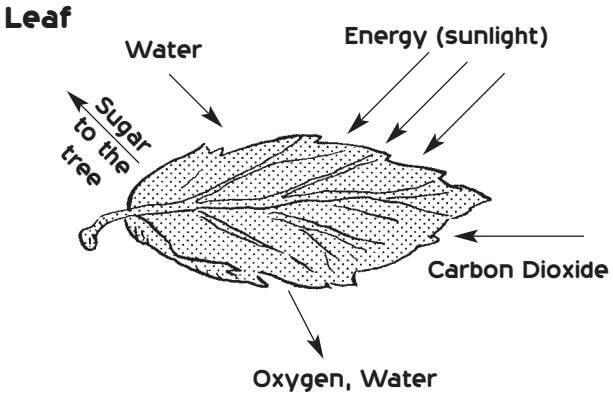
TREE WORKS

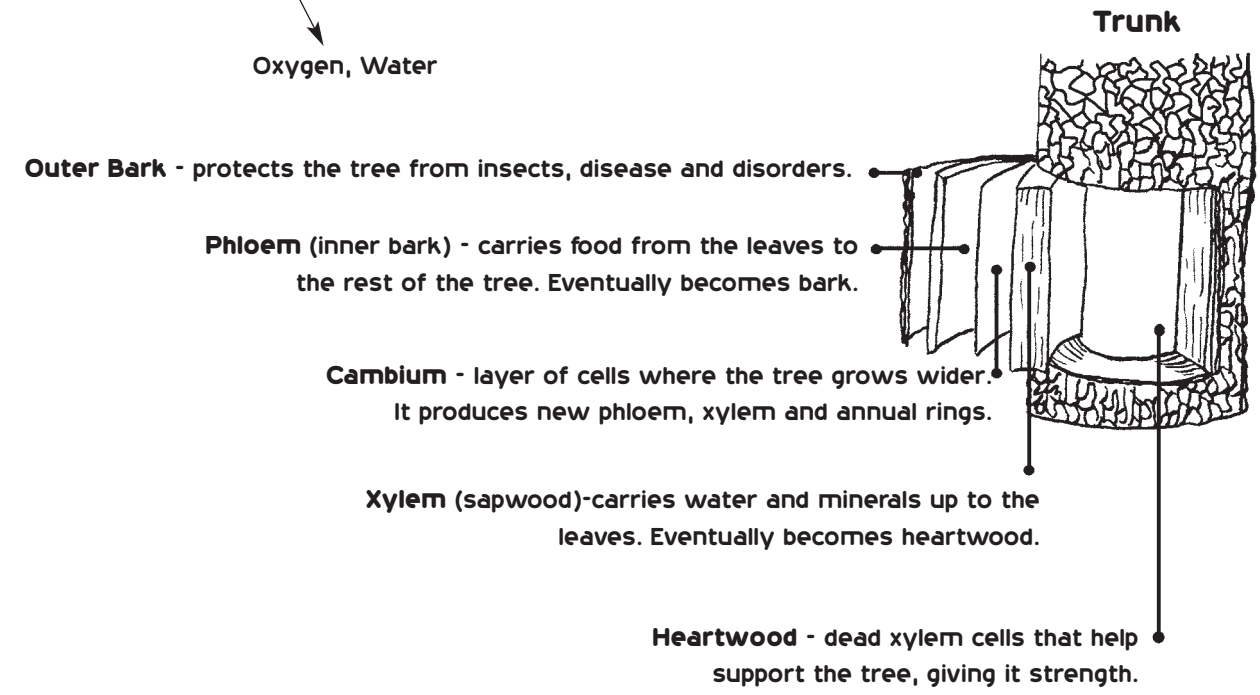
Have you ever been told that trees are extremely important? Do you know why?

Trees are important for many reasons. They provide habitat for wildlife, supply people with resources for wood products, provide shade and help to store carbon dioxide that could enter our atmosphere, affecting global warming. But most importantly, trees help to produce the oxygen in the air we breathe.

How do trees produce oxygen?

Trees release oxygen from their leaves as a by-product during their production of food. This process of food production is called **photosynthesis**. Within the leaves, sunlight, carbon dioxide (which we breathe out), water and nutrients are combined to produce sugar and oxygen. Trees use the sugar as food, and oxygen is given off as a gas and released into the atmosphere. Can you imagine how much oxygen a forest full of trees produces? No wonder forests are known as the lungs of the planet!

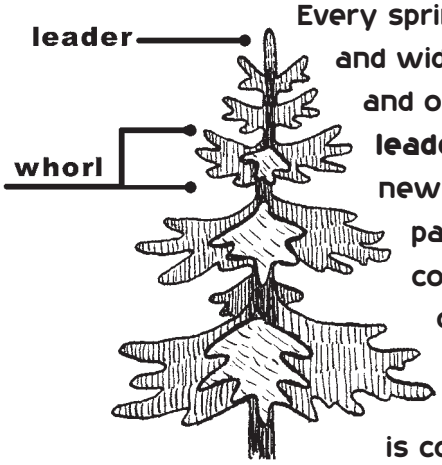




Girdle

A girdle is not always what you think! When it comes to trees, **girdling** is the term used to describe the damage done to the phloem layer (inner bark) around a tree. For example, a beaver may chew around the entire base of a tree but not cut it down. Girdled trees will often die because the flow of nutrients and water is broken between the leaves and the other parts of the tree, such as the roots.

Whorls



Every spring and summer, coniferous trees grow taller and wider. New buds grow at the end of each branch, and one new bud grows straight up, called the **leader**. After the leader reaches a certain height, new branches grow around the tree's stem. This pattern of branches is called a **whorl**. A maturing coniferous tree will have many whorls, each representing one year's growth. As the years pass, each whorl will develop more branches and become wider. To tell the approximate age of a coniferous tree, all you need to do is count the whorls!

Case #1: The Case of the Life Savers

Unscramble these five mixed up words. Place one letter in each square to form words related to trees.

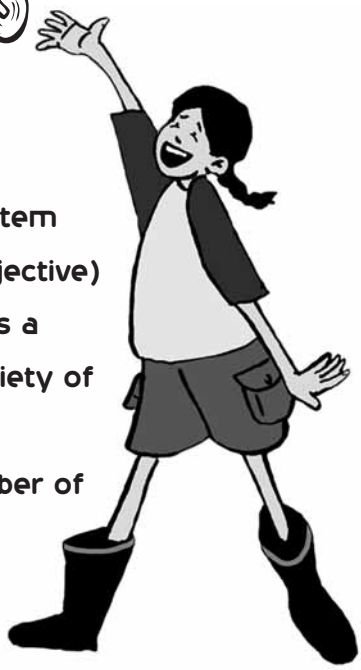
E D L I R G	◯ □ □ □ □ □
E H L M O P	□ □ □ ◯ □ □
A E R T W	□ □ □ ◯ □
S D E E N L E	◯ □ □ □ □ □ □
E L M X Y	◯ ◯ □ □ □

Now arrange the circled letters to form the surprise answer of why trees are so important to all living organisms.

Answer: _____ !*

*Remember to put your answer on page 27

All About Forests



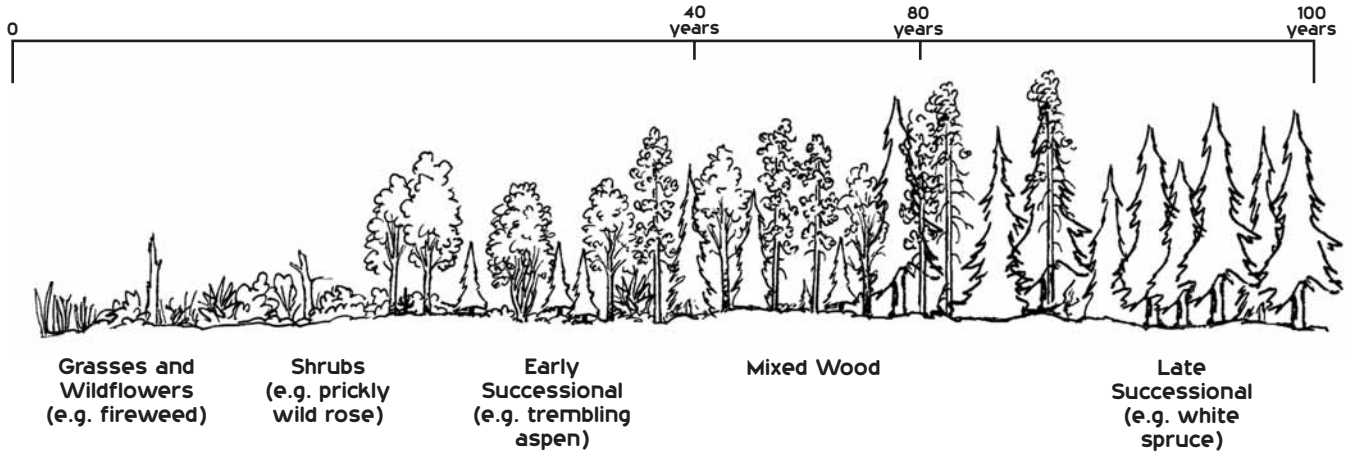
What's Missing?

A forest is more than ___*trees*___ (noun). It _____ (verb) a living system called an _____ (noun) where _____ (adjective) and _____ (adjective) things _____ (verb). It is a _____ (adjective) _____ (noun) with a variety of _____ (noun). The forest is in a constant state of _____ (noun) where a _____ (adjective) number of organisms interact in a _____ (noun).

Nouns	Verbs	Adjectives
change	interact	complex
community	is	countless
ecosystem		living
food web		non-living
habitats		
~~trees~~		

Forest Succession

A forest goes through a series of stages over time. It starts from bare ground then grasses grow and seedlings develop into mature trees, which eventually die. The cycle a forest takes from birth to maturity and death, to beginning again is called **succession**. Fire, insect, and disease outbreaks are also part of the changes in a forest.



Fire
Friend or Foe?

Fire can be a creator and a destroyer of forests. It is a force in nature as natural as rain or sunshine. A forest fire can be a major disaster capable of destroying thousands of hectares of forests. One of Alberta's largest forest fires happened in 1998, in Virginia Hills, 30 km north-west of Whitecourt. It burned 163,138 hectares of forests, which is about three-quarters the size of Prince Edward Island!

In Alberta, a direct lightning strike is the most common way a forest fire starts. Each year there can be over 400,000 lightning strikes in the province. Another major cause of forest fires is human carelessness. Even after 100 years of educating people about fire prevention, human activities start about half of Alberta's forest fires.

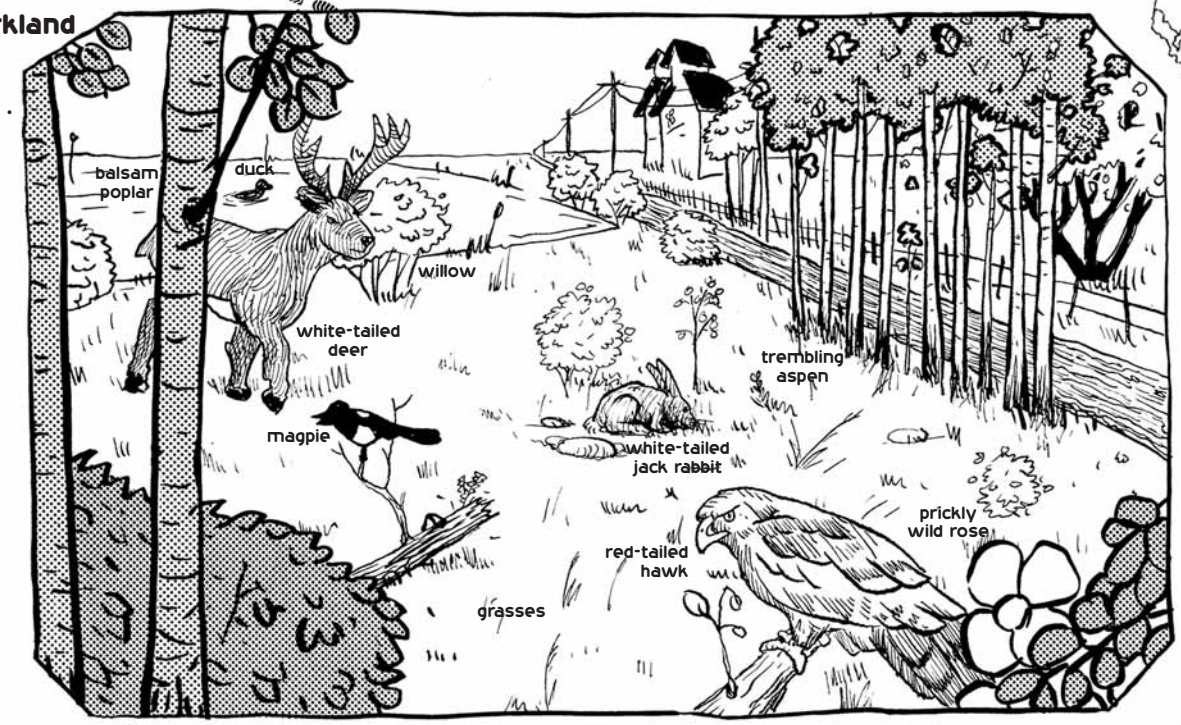
If you see smoke in a forested area, call 310-FIRE or dial #FIRE on the Telus Mobility Network.

Although a wildfire can destroy many trees, it does not kill a forest. Fire changes habitats, causing a patchwork of new life to erupt. Seeds carried by the wind land in the burned area and develop into wildflowers (like fireweed) and grasses. In Alberta, fast growing trembling aspen or lodgepole pine trees are often the first species to develop after a fire. Eventually other trees, such as white spruce, will grow under the shade of these fast growing trees. Fire is a natural and necessary process in the forest ecosystem.

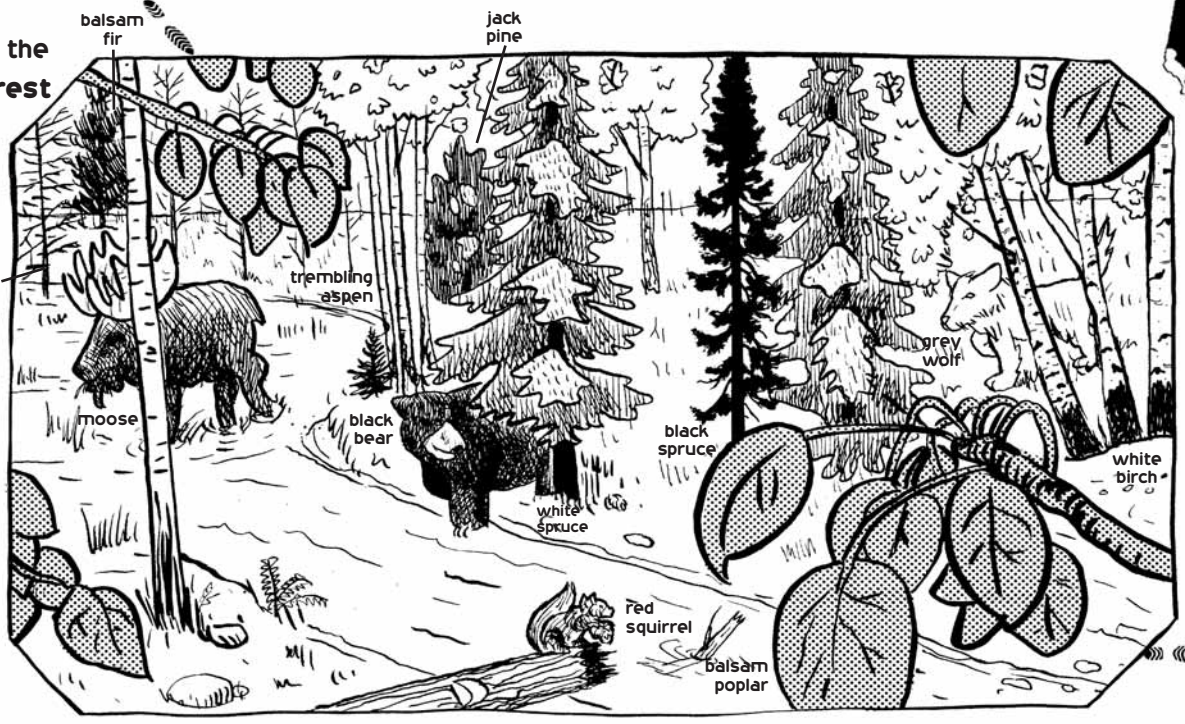
TAKE A SCENIC TOUR OF ALBERTA'S FORESTS

Throughout Alberta, there are four different types of forests with unique tree species, animals, climate, soil, landscape and altitude. Join the EnviroKids on a scenic tour of Alberta's natural forested regions.

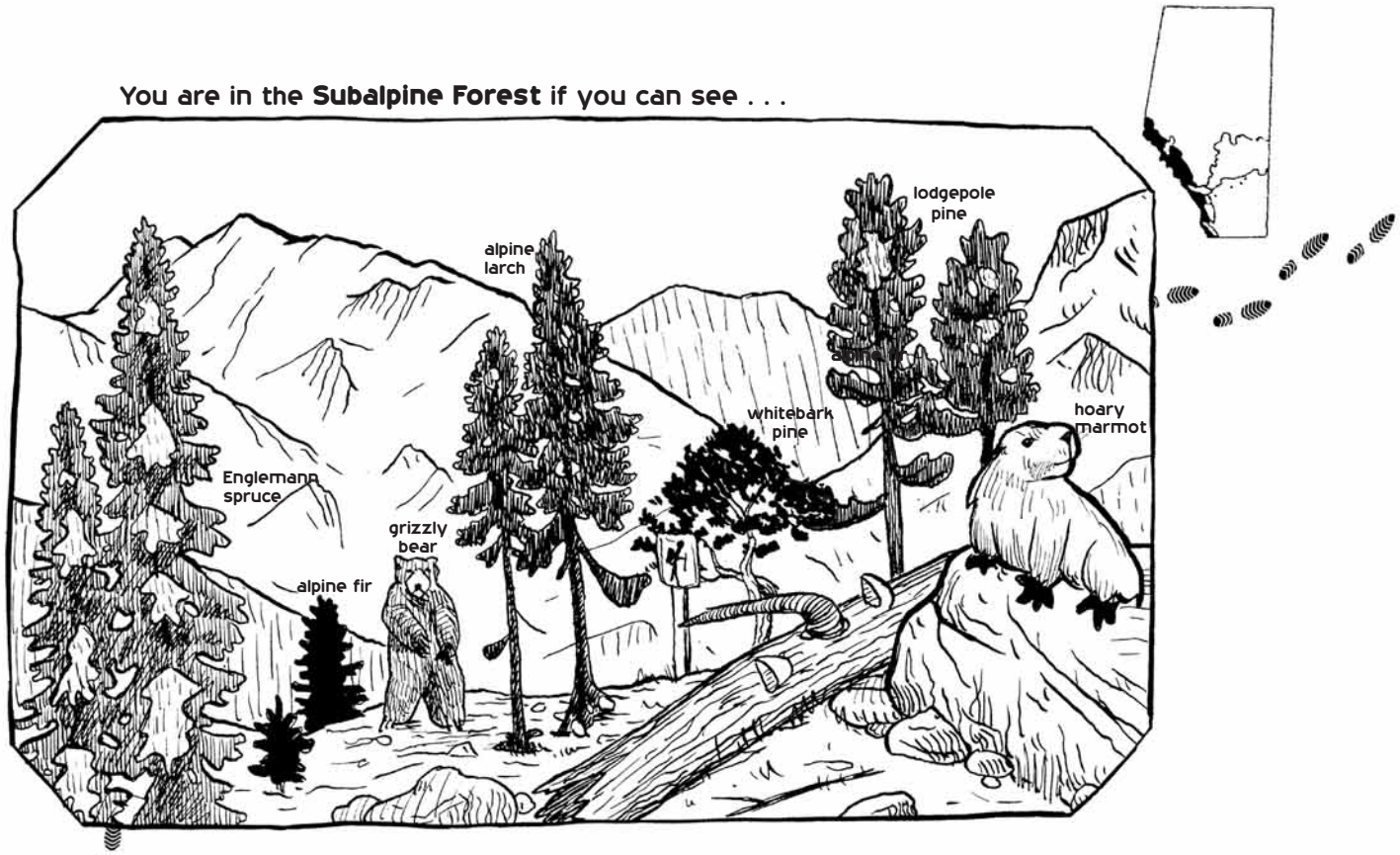
You are in the **Aspen Parkland** if you can see . . .



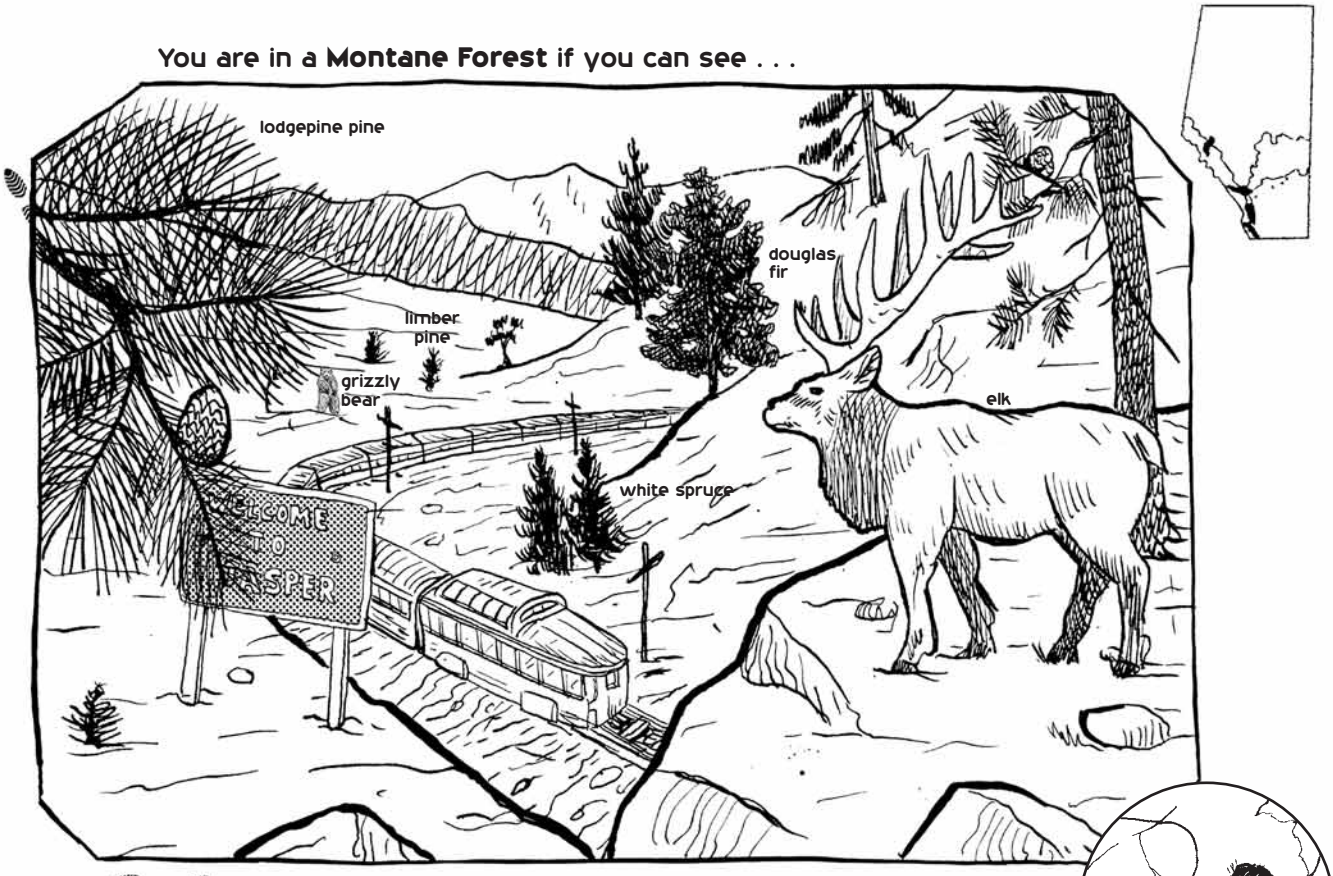
You are in the **Boreal Forest** if you can see . .



You are in the **Subalpine Forest** if you can see . . .



You are in a **Montane Forest** if you can see . . .



THE ENVIROKIDS DECIDE TO BUILD THEIR CLUBHOUSE IN THE...

A forest has both living (biotic) and non-living (abiotic) things. In the list below, put "a" by the non-living and "b" beside the living things found in the forest ecosystem:

air _____ soil _____ rain _____ squirrel _____

tree _____ sapsucker (woodpecker) _____ sun _____ butterfly _____

Challenge 2

All organisms, even small ones like insects, are important in the forest ecosystem. Can you list some insects and their roles in the forests?

_____

_____

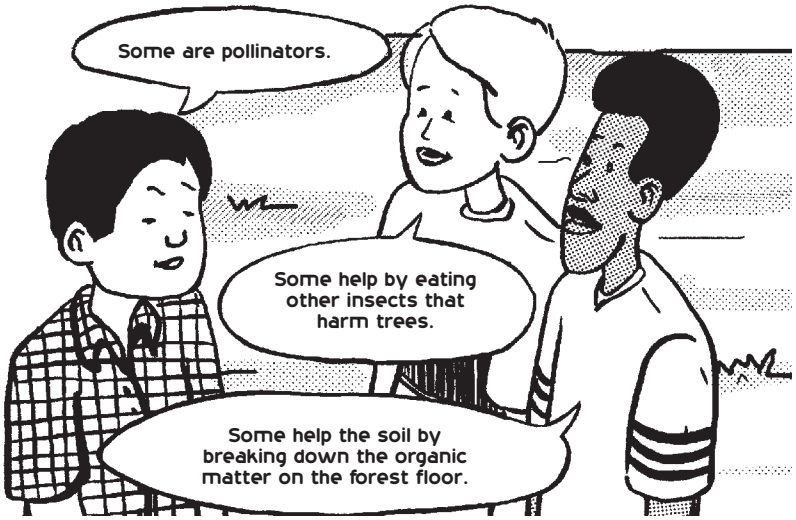
_____

_____

_____

_____

→ Read and see if the guys are giving you hints.



Hey, we are not the only ones here!

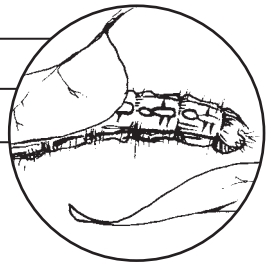
Challenge 3

Make a list of the many users of Alberta's forests.

Look at the picture to get ideas.

Silviculture

Pronounced sil-vi-cull-cher, is the science of planting, tending and caring for trees in the forest. How many three, four and over four-lettered words can you make out of the word "silviculture." You can use the same letters more than once.



Canadian Tree Products

SEARCH WORD

There are more than 5,000 things made from trees. Forest products are all around us. Some examples are listed below. They may appear horizontally, vertically, diagonally and even backwards. Find them and circle the letters only, not the words. Write down the leftover letters from the top to the bottom going left to right to spell out part of a message.

S	P	O	R	T	I	N	G	G	O	O	D	S	S (R)
T	P	M	U	E	L	O	N	I	L	R	S	E	K (E)
O	I	A	U	N	P	A	I	N	T	S	E	S	C (P)
T	N	E	R	I	B	N	D	E	S	K	V	A	I (A)
E	S	T	U	T	R	E	D	I	C	M	I	C	P (P)
M	U	G	G	N	I	W	E	H	C	L	S	O	H (S)
P	L	N	R	E	Q	C	B	A	L	I	O	N	T (W)
O	A	I	O	P	U	S	L	R	R	F	L	T	O (E)
L	T	R	X	R	E	Y	A	E	E	O	P	A	O (N)
E	I	O	Y	U	T	R	M	N	B	T	X	I	T	I
U	O	O	G	T	T	U	I	O	M	O	E	N	B	N
F	N	L	E	E	E	P	N	Y	U	H	A	E	O	N
S	O	F	N	U	S	R	A	A	L	P	C	R	X	A
E	S	S	W	E	P	H	C	R	U	H	C	S	D	T
E	N	A	H	P	O	L	L	E	C	A	S	K	E	T

animal bedding
box
briquettes
casket
cellophane
chewing gum
church pews
cider
containers
desk
explosives
flooring
fuel
insulation
linoleum
lumber
~~newspaper~~
oxygen
paints
particle board
photo film
rayon
sporting goods
syrup
tannin
toothpicks
totem pole
turpentine

Complete the Message: (fill in the blanks with the left over letters from above)

When you _____ (5 letters) a forest product, you are helping to preserve one of Alberta's _____ (7 letters) _____ (9 letters).

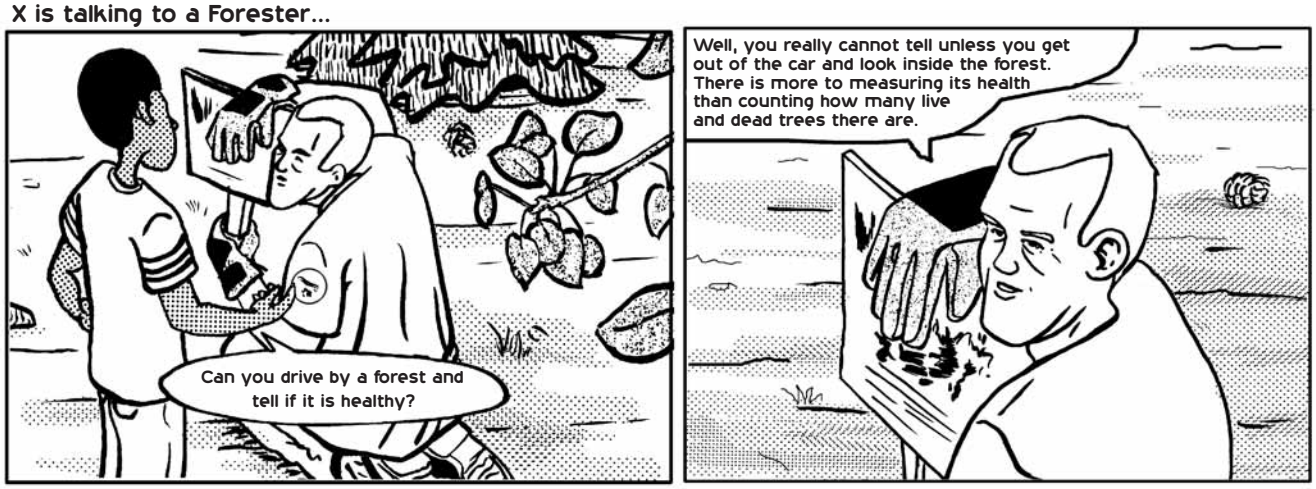
WANTED:

A healthy forest has a variety of living organisms that play a role in how it develops, grows and lives. Healthy forest ecosystems support the economy in many communities; provide habitat for wildlife and fish; provide food and products for our use; and give us a place to enjoy nature and learn more about our world.

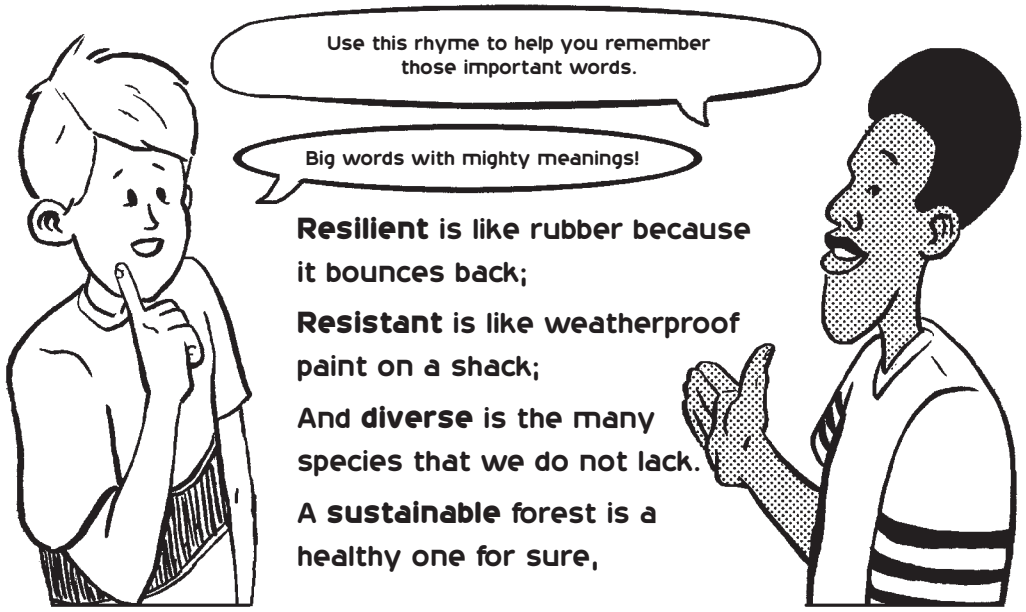
A HEALTHY FOREST

REWARD: A WORLD RICH IN BIODIVERSITY

X is talking to a Forester...



A healthy forest is **resilient** enough to recover after a natural disturbance such as a forest fire, insect or disease outbreak. It is **resistant** to extreme change, like weather, and **diverse** enough to support a variety of plant and animal species. A healthy forest supports some **sustainable** level of economic and social uses by people. We want our forests to last forever.



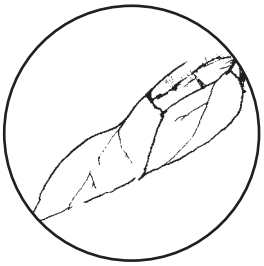
Resilient is like rubber because it bounces back;

Resistant is like weatherproof paint on a shack;

And **diverse** is the many species that we do not lack.

A **sustainable** forest is a healthy one for sure,

And with all these together, the forest will endure.



What does a HEALTHY FOREST Mean to You?

"We interviewed many people as we walked through the forest by our club house. Unfortunately, we forgot to write it all down."

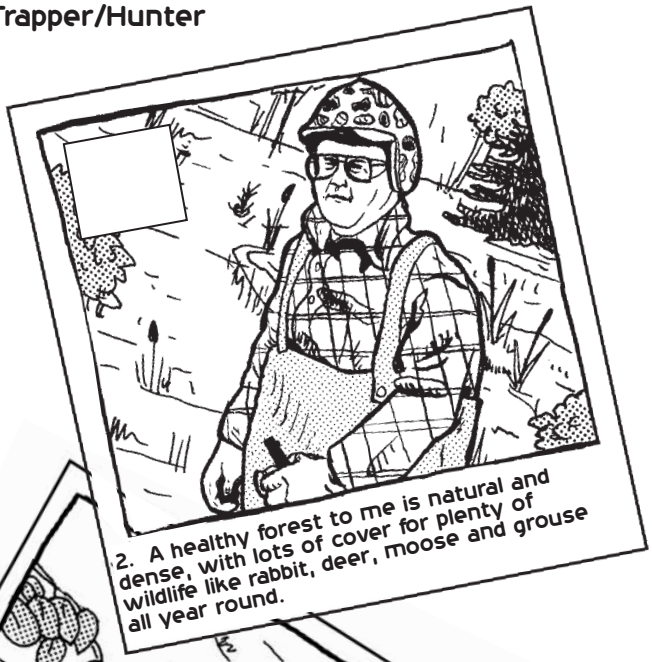
Challenge 4

Can you help us figure out who said what? Match the following pictures with the names listed below.

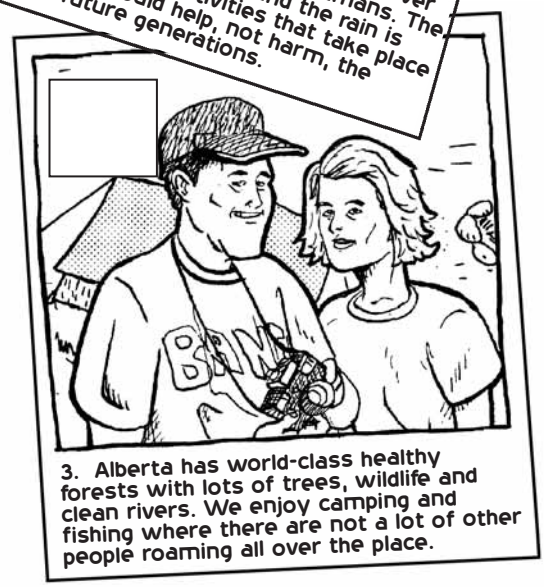
A. Biologist
B. Environmentalist
C. First Nations
D. Forester
E. Government Officials
F. Forest Industry Worker
G. Oil and Gas Worker
H. Park Ranger (Conservation Officer)
I. Camper
J. Trapper/Hunter

→ Find out what is important to each speaker.

1. For me, a healthy forest can live forever without any intervention from humans. The streams are clean for fish and the rain is pure for roots. The activities that take place in the forest should help, not harm, the forest for future generations.



2. A healthy forest to me is natural and dense, with lots of cover for plenty of wildlife like rabbit, deer, moose and grouse all year round.



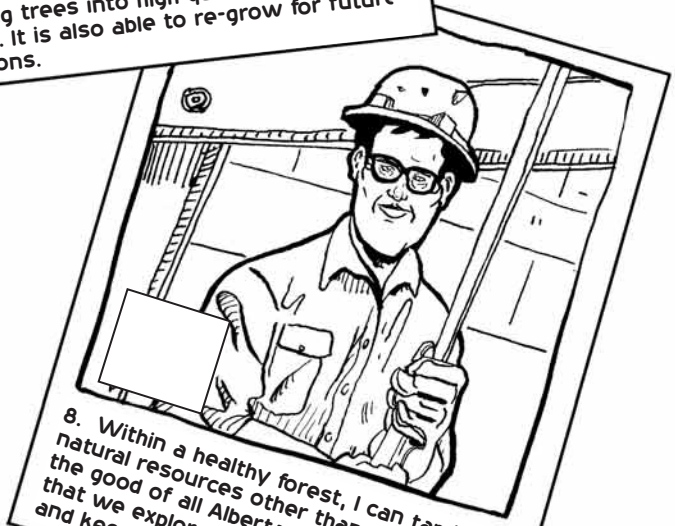
3. Alberta has world-class healthy forests with lots of trees, wildlife and clean rivers. We enjoy camping and fishing where there are not a lot of other people roaming all over the place.

4. A healthy forest has trees that grow well with minimal insect, disease or fire damage and is able to support the harvesting of trees. A healthy forest benefits all the people who use its resources.

5. A healthy forest allows us to maintain a traditional way of life which includes hunting, fishing and trapping. Forests are part of our community living.

6. A healthy forest allows me to earn a living by turning trees into high quality wood products. It is also able to re-grow for future generations.

7. Many protected areas contain forests. Ensuring these areas are healthy is important to all organisms that live within them. It is my job to make sure the actions of people do not impact the health of the forest.

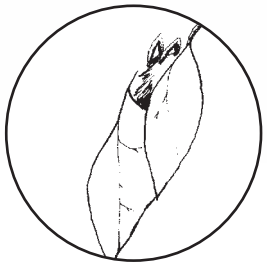


8. Within a healthy forest, I can tap into natural resources other than trees for the good of all Albertans. It is important that we explore these resources wisely and keep our forests healthy.

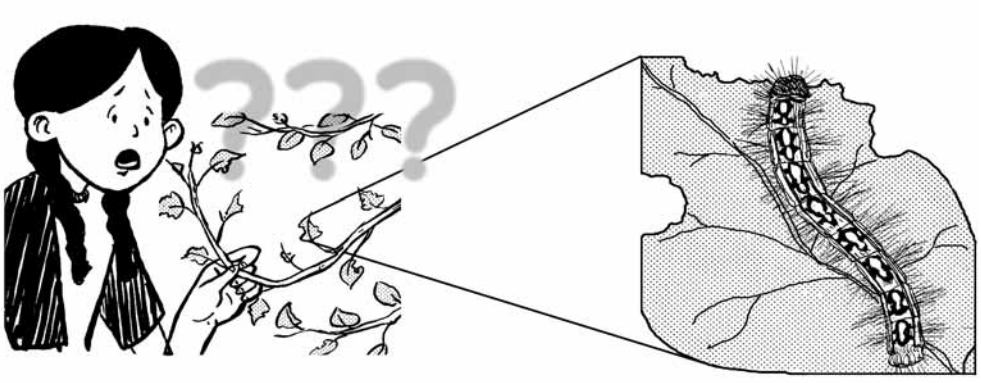
9. A healthy forest can sustain itself while providing for Alberta's economic, social and environmental needs today and in the future. Our policies and guidelines help keep the forests healthy to meet the needs of all Albertans.

10. A healthy forest to me provides habitat for many different plants and animals. Even standing dead trees become nests for birds like woodpeckers. Dead trees on the ground are full of a variety of insects, fungi and bacteria.

I did not know a healthy forest could mean so many different things to so many different people!



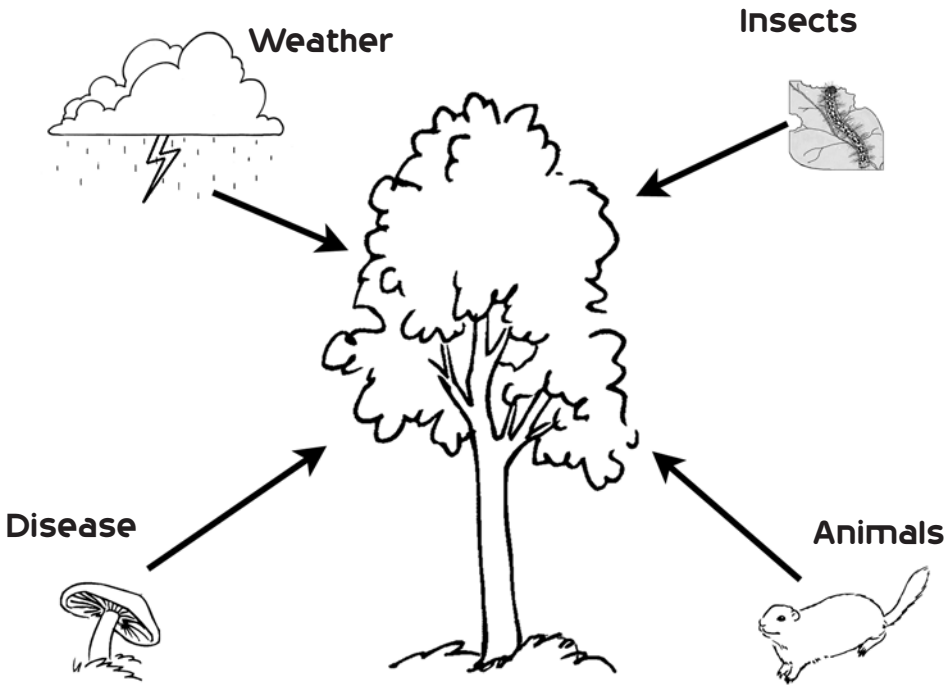
What is Forest Health



Forest health is a desired condition of the forest, as viewed by the users, with a focus on the health of the trees. Some insects, other animals, diseases and weather threaten the health of the forest by damaging trees that people think are valuable. People sometimes call them "pests."

Did you know:
Endemic means there is a normal insect population native to the area that is kept in check by natural factors.

Epidemic is a temporary, large-scale outbreak.



Case #2: The Case of the Exploding Bugs

What do you call an insect population that goes from endemic to epidemic?

15	21	20	2	18	5	1	11

(To figure this out, write out the alphabet and number the letters starting with "A" as number"1".)

*Remember to put your answer on page 27

What is Buggin' the Forest?

Most insects do not harm the forest. Some insects however, can cause serious damage to trees.

Did you know:
A gall is an irregular growth or swelling on a tree.

Challenge 5

These insects can be grouped by the damage they cause. Can you match them up?"

Pay attention to the part of the tree damaged.

1. **Defoliators** - These insects can strip a broadleaf or conifer tree of all of its foliage. They feed on all or parts of the foliage and buds, mostly in their larval stages. e.g. Forest tent caterpillar

2. **Sucking Insects** - These insects feed with tube-like mouthparts inserted into the foliage to remove nutrients. These trees become weak and the foliage wilts or discolours. Some cover the leaves with a sticky honeydew coating. e.g. Aphids

3. **Gall-makers** - They cause the shoots or branches of a tree to produce an abnormal growth called a gall, which shelters the young as they develop. e.g. Cooley spruce gall adelgid

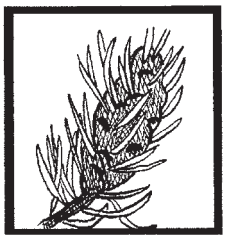
4. **Bark Beetles** - The bark beetle larvae and female adults make galleries that look like tiny tunnels under the bark. The larvae may eventually kill the tree by girdling and fungal infection. e.g. Mountain pine beetle

5. **Stem and Wood Borers** - The larvae of these insects tunnel into the wood, making wormholes. Some carry a fungus that decays the wood. Some attack live trees, while others attack dying or dead trees. e.g. Whitespotted sawyer beetle

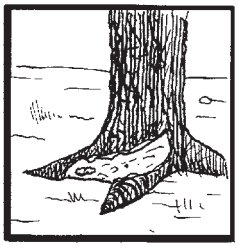
6. **Root-feeders** - The larvae tunnel the bark, girdling the roots and lower stem. This in turn, causes entry points for organisms that will decay the roots and stem. e.g. Warren rootcollar weevil

B. ☐

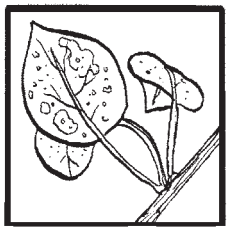
D. ☐



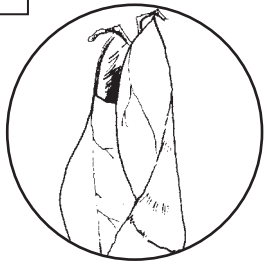
C. ☐



F. ☐



E. ☐



Name: Mountain Pine Beetle

Record No. SRD AB 135/79

Alias: *Dendroctonus ponderosae*

Birth Places: montane and subalpine regions

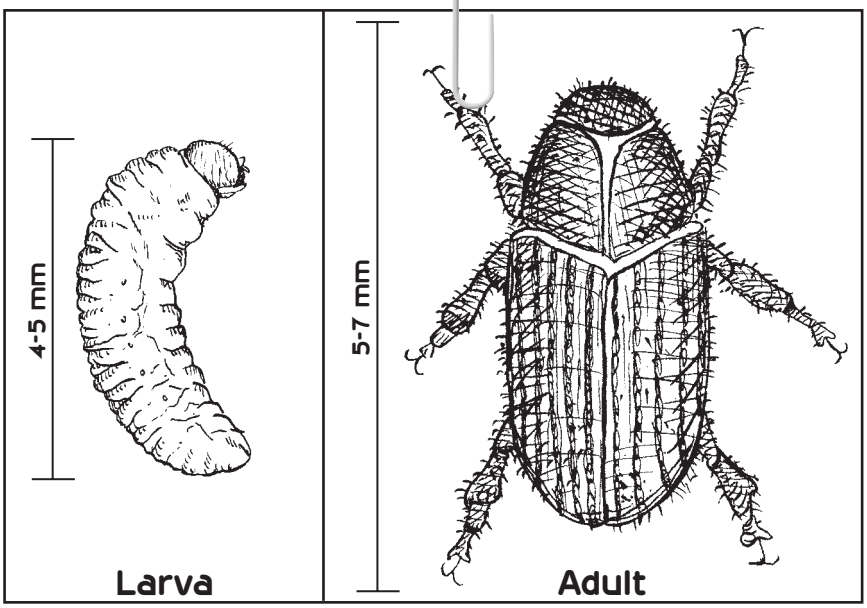
Primary Host: lodgepole pine trees

Found: under the bark

Life Cycle: usually completed in one year - egg, larva, pupa, adult beetle

Larval Disguise: small white grubs with brown heads

Adult Disguise: small black beetles, about 5 - 7 mm long



Mountain Pine Beetle

Charge

This insect is a serious enemy of lodgepole pine forests because it conflicts with people's use of the forest by killing many trees. It is the most destructive insect of mature lodgepole pine forests in western North America. An outbreak caused by the mountain pine beetle will kill most stands of mature lodgepole pine, destroying millions of trees and many wildlife habitats in a single year. Standing dead trees can be a safety hazard to people using the forest and can increase the severity of wildfires.

Plan of Attack

Mountain pine beetles prefer large lodgepole pine trees older than 80 years. Adult females bore tunnels called galleries under the bark and lay 60 to 80 eggs along the **galleries**. Larvae hatch and feed in the phloem. They develop into pupae, then into adults which fly to other host trees. The adult beetles can carry fungal spores in their mouth pockets. The fungi and the feeding larvae can kill the tree by cutting off the flow of nutrients and water between the roots and the rest of the tree.

Operative Signs

In trees successfully attacked by the mountain pine beetle, you may find:

- ❑ small holes in the bark
- ❑ globs of resin (called pitch tubes) outside these holes
- ❑ sawdust at the base of the tree
- ❑ woodpecker damage
- ❑ galleries or tunnels under bark
- ❑ yellow to reddish-brown needles

Niche (its role in the forest)

This insect is eaten by woodpeckers and plays a role in forest succession by killing overmature pine trees.

Method of Control

Tree defences: A healthy tree will increase resin flow to flush out the beetles.

Natural enemies: Woodpeckers and other birds eat the beetles and larvae.

Infested tree removal: At the beginning of an outbreak, attacked trees can be cut before beetles emerge. These trees can then be either burned or processed. This can help reduce new attacks.

Preventative methods: People can also make the forest less attractive to the mountain pine beetle by removing host trees in high risk stands, by either intentionally setting controlled fires (prescribed fire) or harvesting.

Daily Tribune

A Small Alberta Newspaper with Big News — Tuesday, May 8

Alberta bans import of pine logs with bark

The Minister of Sustainable Resource Development announced a suspension on the import of all pine logs and forest products with bark still attached. The ban is part of the government's plan to prevent the spread of the mountain pine beetle during the time when it is able to fly and attack nearby trees. Mountain pine beetles can kill a mature pine in less than one year.

The suspension came as a result of major infestations to Alberta's neighbours, British Columbia and Montana.

Alberta is working closely with authorities in British Columbia, the United States and the Federal Government to monitor the spread of the infestation. "We have already seen some infestations in Alberta's National Parks and the department decided to take action," said the Minister.

All commercial loads of pine logs coming into Alberta with bark attached will be turned away at the border between June 1 and September 30. "This is only part of the solution," said the Minister.

This ban is also extended to Albertans. "Like Dutch elm disease, mountain pine beetle can be transported in firewood brought back from camping trips. It is important to remind Albertans to avoid bringing back pine firewood this summer from anywhere outside Alberta."

The Alberta government removes affected trees from the forest and burns them, with the beetles inside, to limit the extent of the damage. This is usually done in the late spring before the beetles enter their flying season and in the early fall after flying season is over.

Did you know: There are enough mountain pine beetles emerging from one tree to attack as many as 15 more trees!

Case #3: The Case of the Secret Message

Attention Future EnviroKids, you have a message to solve. Can you figure it out? Each of the letters below must go into one of the empty squares directly above it. A black square indicates the end of a word. When you have placed all the letters in their correct squares, you will be able to read the message from left to right. A couple of words are started for you.

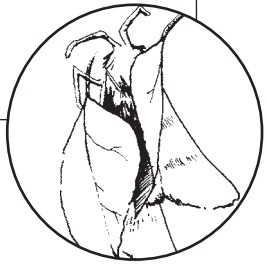
A	L									F										
B	L	B	O	R	K	A	T	O	A	F	E	E	E	S	T	O	H	E	E	
A	E	L	T	N	G	E		S		T	H	R	O	F	E	S	P	L	M	
			E	A	T			C		R	O			P		T				

Bonus:

The government acts on behalf of the people to ensure the forests will be healthy for future generations. Unscramble and insert the letters from the above shaded boxes into the solution below to discover how this is done.

L _ _ I _ _ _ _ I _ N

*Remember to put your answer on page 27



Name: **Forest Tent Caterpillar** Record No. **SRD AB 123/45**

Alias: *Malacosoma disstria*

Birth Places: boreal and aspen parkland regions

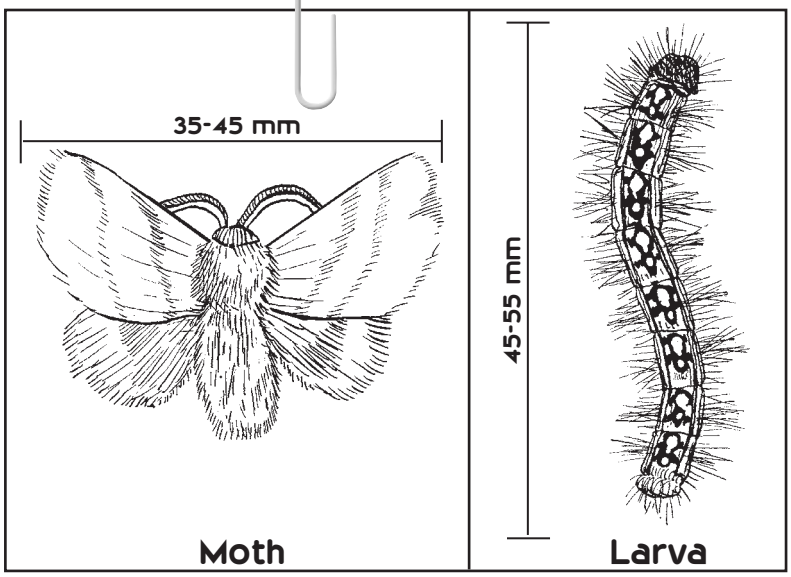
Primary Host: trembling aspen, balsam poplar trees

Found: on leaves

Life Cycle: complete in one year-egg, larva (caterpillar), pupa, moth

Larval Disguise: large and hairy about 44-55 mm long; long blue bands and orange lines along the sides; white coloured keyhole-shaped markings on their backs.

Adult Disguise: light yellow to brown coloured moths with parallel dark bands on front wings; wing span of 35-44 mm; stout body.



Forest Tent Caterpillar

Charge

The forest tent caterpillar is the most serious defoliator of trembling aspen throughout most of Alberta. Attacked trees can survive and refoliate again but are weakened and may be at higher risk to other insects, diseases and disorders. The forest tent caterpillar can reduce tree growth and if there are many years of severe defoliation, trees can be killed. Forest tent caterpillar outbreaks occur every 10 to 20 years. When there is an outbreak, masses of these migrating caterpillars become a nuisance in recreational areas. As well, they will cover roads and can be a driving hazard, especially when stopping (the caterpillars make the road surface slippery).

Plan of Attack

A female moth deposits between 150 to 200 eggs in a band around a small twig. She covers them with a frothy substance called **spumaline**, for protection, which turns silvery to dark brown in colour. They develop into larvae in about a month but do not emerge until the following spring. After the larvae emerge, they will feed on the leaves of the host trees for five to six weeks. Once all the leaves of the host trees are eaten, they will move to nearby shrubs and other plants. When the larvae are mature, they form white, silken cocoons spun between leaves. Moths emerge 10 days later. They live only for a few days, long enough to mate and lay more eggs for the following year.

Operative Signs

Look for the following signs and symptoms of forest tent caterpillars:

- ❑ a lot of chewed poplar leaves and buds
- ❑ large groups of larvae on the trunk and branches
- ❑ white cocoons spun between leaves

Niche (its role in the forest)

This insect is food for birds and small animals, and can play a major role in forest succession by allowing the sunlight to reach young trees and ground vegetation. Droppings from feeding larvae return nutrients to the forest floor.

Method of Control

Tree defences: Attacked trees will try to protect themselves by increasing the number of leaves.

Natural enemies: Birds eat the caterpillars and moths.

B.t.: People can use a biological agent to kill the larvae in an outbreak situation. It is based on a soil bacterium, called B.t., which is also used to kill spruce budworm and gypsy moth larvae. The larvae eat B.t. and within a few hours they stop feeding and eventual die.

Invisible Enemies

Trees are similar to people because they can both get diseases. Tree diseases are invisible enemies of the forest. **Diseases** are contagious, spread easily and are caused by living organisms. Infected trees may appear healthy because the spread of most diseases happens slowly and over long periods of time.

Trees can also be affected by disorders, which are non-contagious. **Disorders** are caused by the non-living elements of the environment, such as weather.

Challenge 6

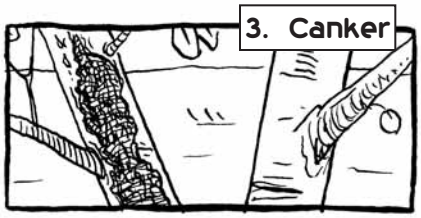
As your next challenge, can you correctly identify which images are diseases and which ones are disorders? Write "Di" for Diseases or "Do" for Disorders in the box beside each picture.

Remember! Diseases (contagious) Disorders (non-contagious)

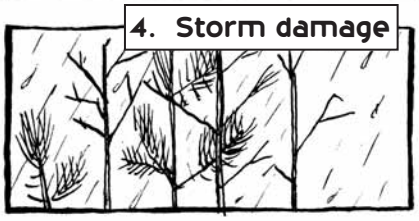
1. Western gall rust

2. *Armillaria* root disease

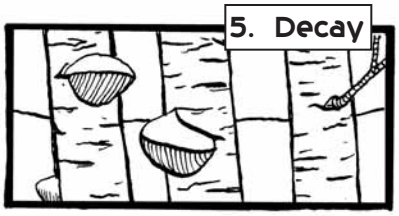
3. Canker



4. Storm damage

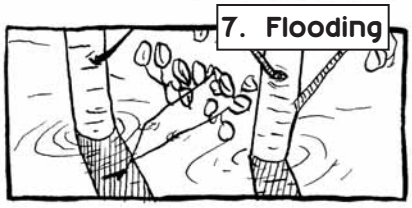


5. Decay

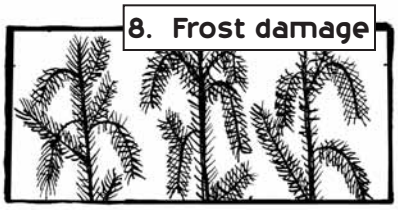


6. Dwarf mistletoe

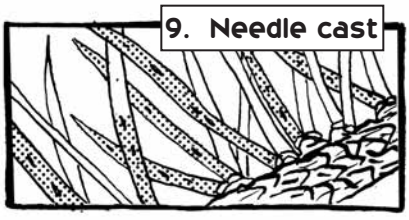
7. Flooding



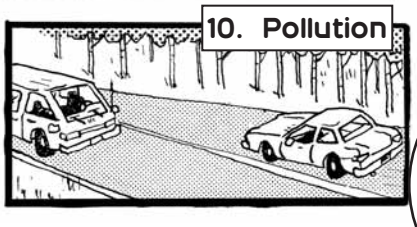
8. Frost damage



9. Needle cast



10. Pollution



Name: Dwarf Mistletoe

Record No. SRD AB 246/80

Alias: *Arceuthobium americanum*

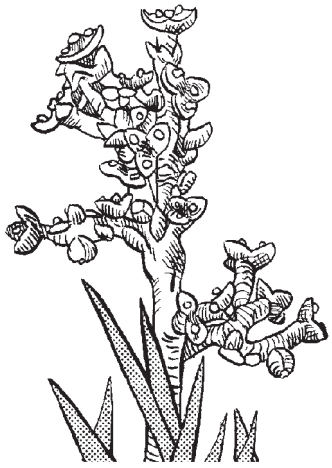
Birth Places:
boreal, montane and subalpine regions

Primary Host:
lodgepole pine and jack pine trees

Life Cycle: may take up to seven years to complete-seed, plant (aerial shoots), flower.

Disguise: a parasitic flowering plant with greenish-yellow shoots, scalelike leaves, 8-10 cm long.

Infected branch



Flowers

Dwarf Mistletoe

Charge

Dwarf mistletoe is charged with deforming and killing many pine trees that people think are valuable. It interrupts the normal growth of branches and stems. Infected trees will often concentrate growth on the witches' broom rather than on the rest of the tree. Ultimately, dwarf mistletoe reduces tree growth and gives infected trees an unattractive appearance.

Plan of Attack

This plant can only survive on a living tree. Seeds are released in mid-August/September. After winter, the seeds germinate in May or June and penetrate a living host tree. Young twigs are more at risk. It takes three to five years to produce shoots. Flower and seed production begins one to two years after shoots first appear.

Operative Signs

If a tree has been infected with dwarf mistletoe, you may find:

- ❑ clumps of tangled pine branches that looks like a witches' brooms
- ❑ twisted branches with spindle-shaped swellings
- ❑ greenish-yellow plants on the branches

Niche (its role in the forest)

Birds and other animals nest in the witches' brooms or use them for resting and hiding places. Dwarf mistletoe can play a role in forest succession by removing weakened trees.

Method of Control

Preventative methods: To control this disease, people remove heavily infected trees. Sometimes a whole stand may be harvested and replanted to prevent spread of this disease. Leaving a buffer between the replanted stand and nearby infected stands can prevent re-infection.

Did you know:
A single, large seed in a green berry is forcefully discharged, as far as 18 metres at high speed. The seed is covered by a sticky material, called **viscin**, which allows it to stick on the surface where it lands.

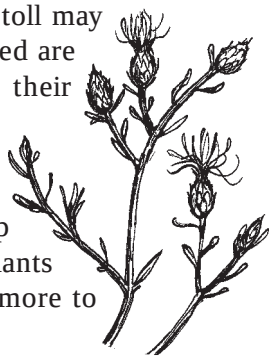
Thursday, June 28

Organisms are Spreading to New Places

Some organisms are spreading to new places - places where they do not belong. Thousands of species, including plants, animals, fungi, viruses and bacteria have spread throughout the world. These organisms go by many names such as **exotic pests**, **alien invaders**, **non-indigenous** or **introduced species**. Some species seem to have very little impact on their new environment. For example, the maple tree is not a native species in Alberta, yet it is planted as an ornamental tree with little effect on the ecosystem. Other exotics can be invasive and become local, national and even global disasters. Purple loosestrife was believed to have started its spread throughout Alberta from your friendly neighborhood garden. This beautiful flower now threatens Alberta's wetlands by spreading rapidly and choking out native plants. Another example is the spotted knapweed. This weed came to North America from Europe. It produces a natural chemical herbicide that kills other plants nearby and is a serious threat in Alberta.

As more exotic species invade Alberta and other parts of the world, we cannot predict the effects they will have on our health, economy and environment. The heaviest toll may be on Alberta's biodiversity. The natural species most at risk of being eliminated are those that do not compete well with exotics and cannot naturally combat their effects.

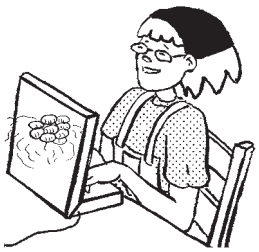
There is no simple solution to the problem of biological invasions. Even as we put our energy into stopping invasions, some species will continue to slip through our inspections, quarantines and other defences. By not moving plants (including seeds) or animals from one place to another, Albertans can do far more to slow the spread of exotic species and limit their damage.



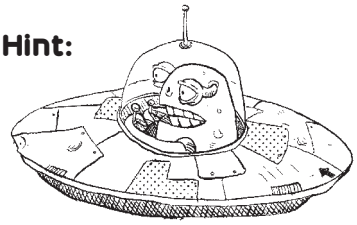
spotted knapweed

Challenge 7

What do you call living organisms that intrude and spread to new places?



Hint:



+ (another word for intruders)

_____

Who Dunnit

The forest provides habitat for a variety of animals and other plants. Animals leave evidence of their movements and feeding activities in their habitat.

Challenge B

In the space provided, see if you can write the letter of the animal and the number of its matching activity.

Think about how the animal damages the tree.

1. This animal will mark its territory by clawing a tree trunk as high as it can reach while standing on its hind legs. It will also strip off a tree's bark and leave claw and teeth marks on the exposed sapwood.

   _____ _____

2. You will probably hear this animal when you walk though a forest. It clips off branches from the tops of coniferous trees and then removes the cones for food and storage.

   _____ _____

3. During the winter, the height of the snow helps this animal reach the branches so it can snip off the buds at a clean 45° angle with its sharp teeth.

   _____ _____

4. This slow moving mammal will sit on a tree limb and gnaw off patches of bark right down to the sapwood. It will often return year after year to eat the callused tissue.

   _____ _____

5. These large mammals will tear buds off branches. You may also see where it rubs the velvet off its antlers. The bark will be shredded off young trees.

   _____ _____

6. This animal is the only one that cuts down a whole tree. You will find cone-shaped stumps with teeth marks on it. Wood chips will be left at the base.

   _____ _____

7. This animal drills rows of holes through the bark on young trees down to the sapwood. It will return to the tree to feed on the sap that has oozed out of the holes and the insects attracted to the sap.

   _____ _____

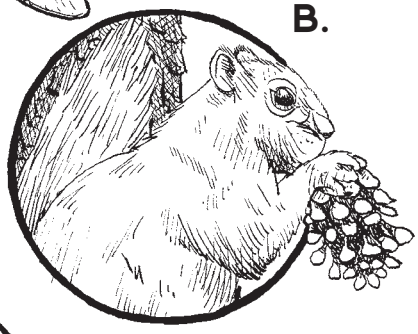
What Happens to Animals during a Forest Fire?

If a fire does not spread too quickly, large mammals such as bears, elk, moose and deer can simply run away from the fire. Birds usually fly to safety and even snakes have time to flee. Burrowing animals are not usually harmed as the fire passes overhead. When animals die, it is usually from smoke inhalation rather than the flames. Often, coyotes and predatory birds will hunt at the edge of forest watching for fleeing mice and voles.

A.

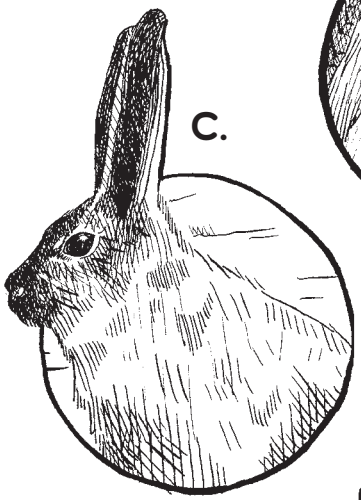
beaver

B.



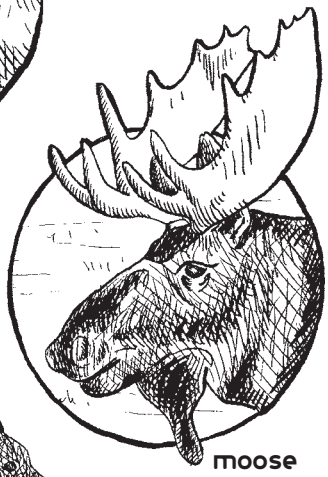
squirrel

C.



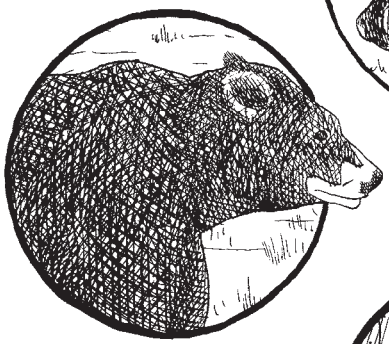
hare

D.



moose

E.



bear

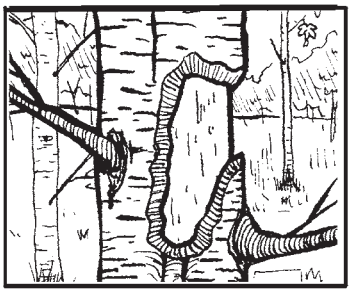
F.

sapsucker

G.

porcupine

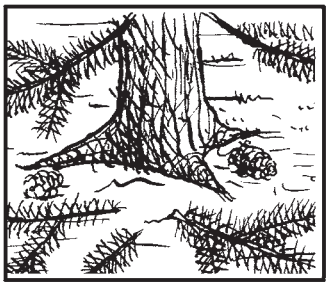
i.



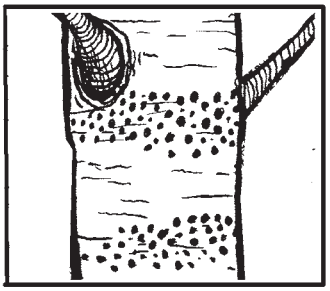
ii.

iii.

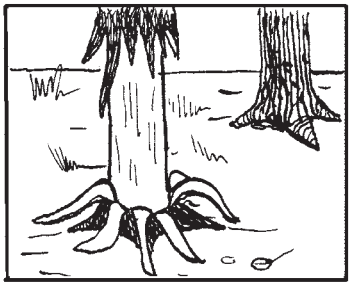
iv.



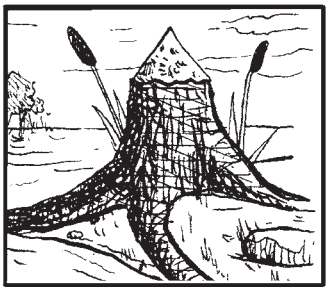
v.



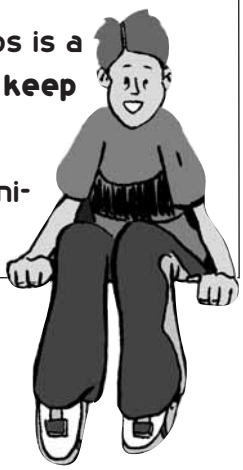
vi.



vii.



Case #4: The Final Case - Putting It All Together



Looking after the forest so it can be used and shared by many interest groups is a challenge. **What are the three big categories that forest managers must keep in mind to maintain a healthy forest for all to share?**

Prove how much you have learned and solve this case by answering the definitions below. When you are finished, read down the squares for the solution.

1. An annoying thing. __ __ ☐ __
2. It is more than just trees. __ ☐ __ __ __ __
3. This bird likes the sap of trees. __ __ __ __ __ ☐ __ __ __
4. Variety of living things. __ __ __ __ ☐ __ __ __ __ __ __ __
5. Invisible enemies of the forest. __ __ __ __ ☐ __ __ __
6. To damage the inner bark around a tree's trunk. __ __ __ __ ☐ __

---

7. A temporary large-scale outbreak. ☐ __ __ __ __ __ __ __
8. How a forest grows and changes over time. __ __ __ ☐ __ __ __ __ __ __
9. This pine is one of the first to grow after a fire. __ __ __ __ __ __ ☐ __ __ __ __ __ __
10. A group of organisms that produce mushrooms. __ __ ☐ __ __
11. Trees release this gas that we breathe. ☐ __ __ __ __ __
12. An adult form of a caterpillar. ☐ __ __ __
13. A "hot" threat to the forest that can also be beneficial. __ ☐ __ __
14. A species of coniferous tree (rhymes with goose). __ __ __ __ ☐ __

---

15. Purple loosestrife is an _____ species in Alberta. ☐ __ __ __ __ __
16. During this season, snow will cause some trees to fall over. __ __ ☐ __ __ __
17. We want our forests to last for_____. __ ☐ __ __
18. The needles and leaves of trees are also called _____. __ __ __ ☐ __ __ __
19. From the mythological Greek word Boreas, a god associated with the north wind __ __ ☐ __ __ __
20. This insect group girdles the root. __ __ ☐ __ - __ __ __ __ __ __ __
21. Trees that produce cones are... __ __ ☐ __ __ __ __ __
22. What soil organisms do to breakdown organic matter. __ __ __ __ ☐ __ __ __ __
23. Most _____ trees have broad leaves. __ ☐ __ __ __ __ __ __ __
24. The ecoregion located south of the boreal forest. __ __ __ __ ☐ __ __ __ __ __ __ __ __ __
25. A desired condition of the forest. __ __ __ __ __ ☐ __ __ __ __ __ __ __
26. Another term for non-living things in a forest. ☐ __ __ __ __ __ __
27. The science of tending the trees in a forest. __ __ __ __ __ __ __ ☐ __ __ __ __

The solution is to remember and include the following factors when caring for Alberta's forests:

_____ , _____ , and _____

*Remember to put your answer on page 27

Cases 1-4

Cases Solved (Write your solutions below.)

Case #1: The Case of the Life Savers - page 5

Case #2: The Case of the Exploding Bugs - page 16

Case #3: The Case of the Secret Message - page 19

Case #4: The Final Case-Putting It All Together - page 26

Bonus (for EnviroKids only!)

Name three threats to Alberta's Forests.

1. _____
2. _____
3. _____

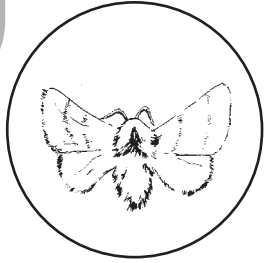
ENVIROKIDS CLUB

Congratulations

You have earned your membership into the Envirokids Club.

_____
print your name

Continue your mission to learn more about Alberta's natural environment.



Official Membership

Answers and Solutions to Challenges and Cases

Read the answers from a mirror. Hold a mirror at the right-hand side of the words.

Inside Cover, Flicks-bottom right-hand corner see the lifecycle of the forest tent caterpillar (defoliator).

Throughout whole booklet-location of 4 insects - Whitespotted sawyer beetle - page 2, Warren rootcollar weevil - page 10, aphid - page 14, Cooley spruce gall adelgid - page 23

Page 3, Challenge 1-Where Oh Where Will Our Club House Go: Balsam poplar - X, Lodgepole pine - Vic, Tamarack - Gadget, Trembling aspen - Spyin' Ryan, White spruce - Tay

Page 5, Case # 1- The Case of the Life Savers: girdle, phloem, water, needles, xylem Why trees are so important? Answer: oxygen

Page 6, All About Forests: What's Missing: A forest is more than trees. It is a living system called an ecosystem where living and non-living things interact. It is a complex community with a variety of habitats. The forest is in a constant state of change where a countless number of organisms interact in a food web.

Page 10, air-a, soil-a, rain-a, squirrel-b, tree-b, sapsucker-b, sun-a, butterfly-b

Page 10, Challenge 2-Insects and Their Roles: Here are a few examples of insects and their roles: bees-make honey, which other organisms eat, and pollinate flowers; ants-loosen soil, are food for other organisms and help take care of aphids; butterflies-pollinate flowers; beetles- are food for other organisms, some eat other insects and some help break down plant material; mosquitoes-are food for birds and can help spread diseases.

Page 11, Challenge 3-Hey We Are Not the Only Ones Here: Other users and activities in the forest are campers, cottage owners, people fishing, hikers, forest industry, oil and gas companies, tourists, wildlife like owls, deer, squirrels, fish, beavers, woodpeckers

Page 11, Silviculture Words: 3-letters: sit, ill, lie, tic, sir; 4-letters: cult, true, sure, lure(s), ever, cure(s), live(s), vile, sill, vice, lice, tile, list, evil, leer, trill, test, lies, sits, sire, tire (s), less, rile; More than 4 letters: lecture, culture, vulture, suture, silver, liver (s), sieve, civic, civil, sliver, lesser, evict, sever, clever, lesser

Page 12, Canadian Tree Products Word Search-Complete the Message: When You reuse a forest product, You are helping to preserve one of Alberta's natural resources.

Page 14-15, Challenge 4-What Does a Healthy Forest Mean to You: 1.B, 2.J, 3.I, 4.D, 5.C, 6.F, 7.H, 8.G, 9.E, 10.A

Page 16, Case # 2-The Case of the Exploding Bugs: outbreak

Page 17, Challenge 5-What is Bugin' the Forest: A.5, B.4, C.3, D.1, E.2, F.6

Page 19, Case # 3-The Case of the Secret Message: Alberta's forests belong to the people. Take care of them.
Bonus Answer: legislation

Page 21, Challenge 6-Invisible Enemies: 1.Di, 2.Di, 3.Di, 4.Do, 5.Di, 6.Di, 7.Do, 8.Do, 9.Di, 10.Do

Page 23, Challenge 7-Pests From Away: Alien invaders

Page 24-25, Challenge 8-Who Dunnit: 1.E vi, 2.B iv, 3.C ii, 4.G i, 5.D iii, 6.A vii, 7.F v

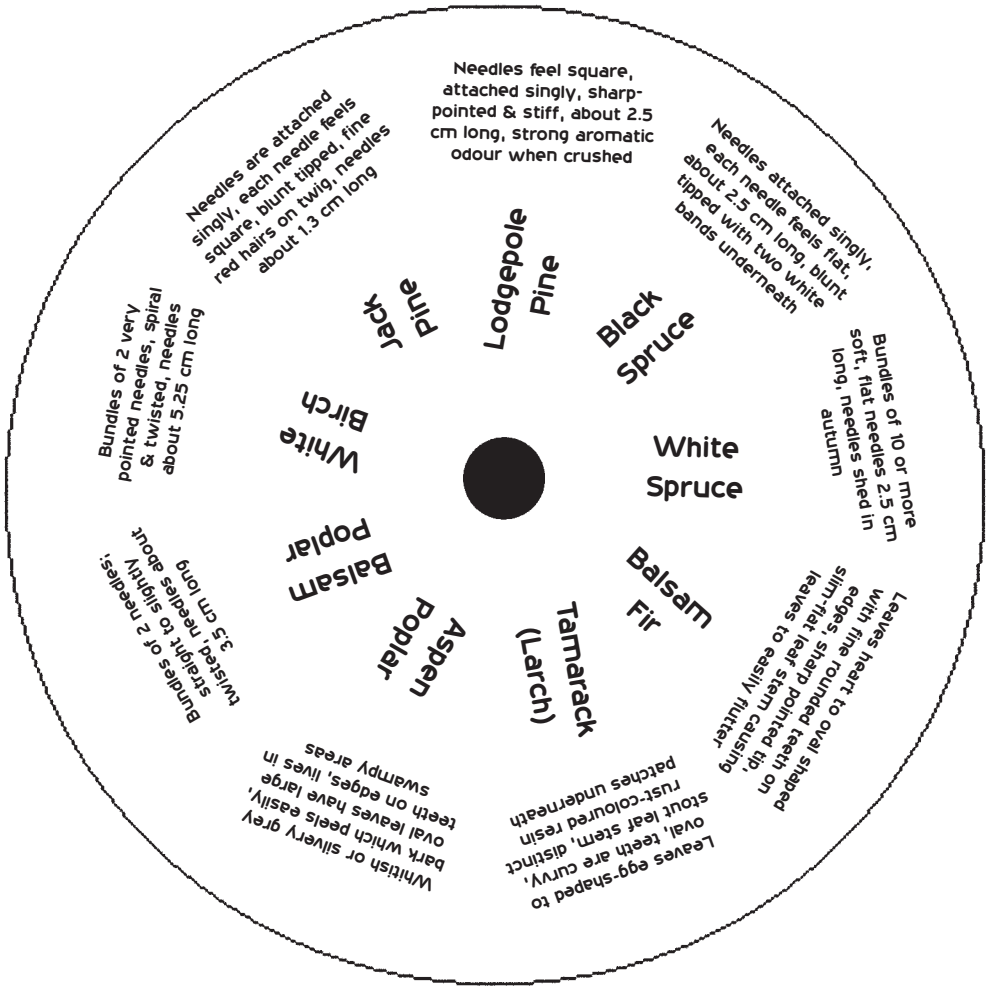
Page 26, Case # 4-The Final Case- Putting It All Together: 1-pest, 2-forest, 3-sapsucker, 4-biodiversity, 5-diseases, 6-girdle, 7-epidemic, 8- succession, 9- lodgepole pine, 10-fungi, 11-oxygen, 12-moth, 13-fire, 14-spruce, 15-exotic, 16-winter, 17-ever, 18-foliage, 19-boreal, 20-root-feeders, 21-conifers, 22-decompose, 23- deciduous, 24-aspen parkland, 25-forest health, 26- abiotic, and 27- silviculture. The final solution: social, economic, environmental

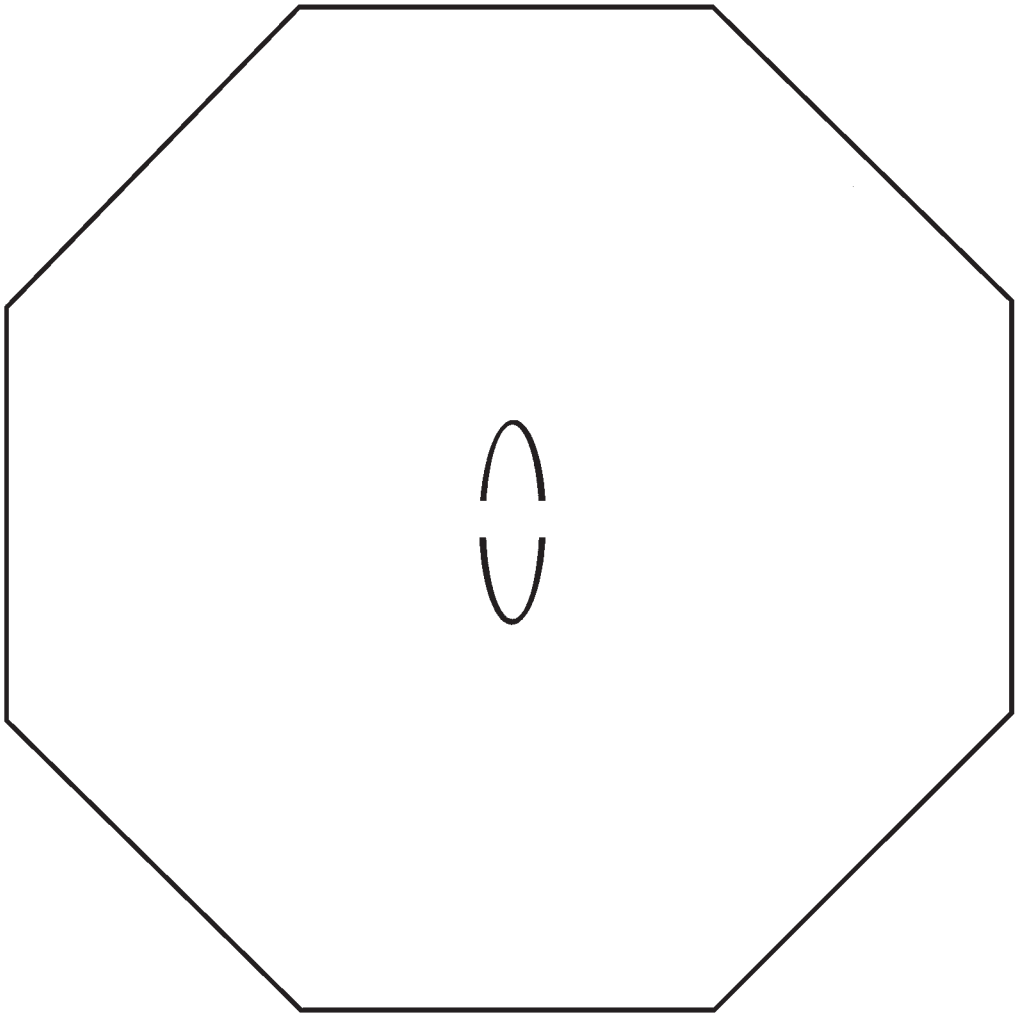
Page 27, Bonus (for EnviroKids only!) Your answer could include: fire, insects, diseases, animals, weather or humans.

EnviroKid's Wheel of Forests

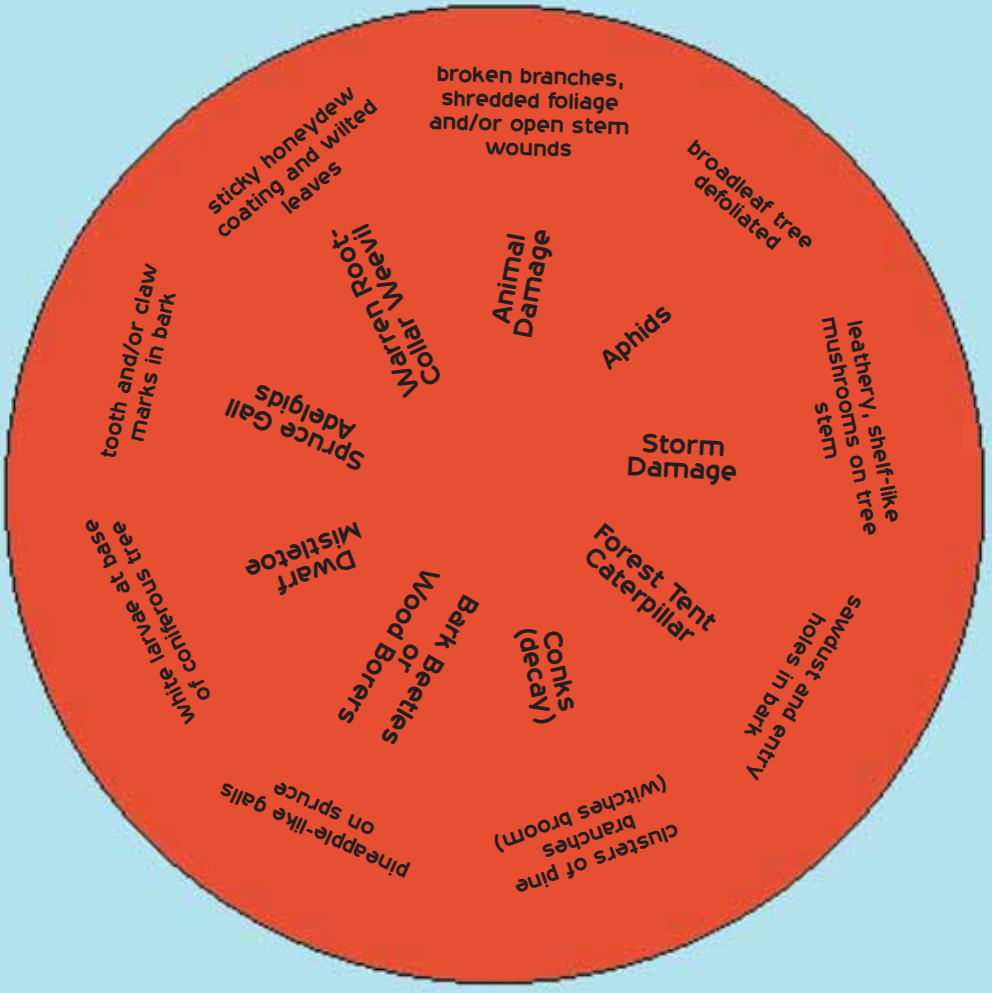
Make a wheel key to help you identify nine tree species and nine kinds of insects, diseases and disorders that damage the trees. It is easy to put together and all you need are a pair of scissors and some clear sticky tape.

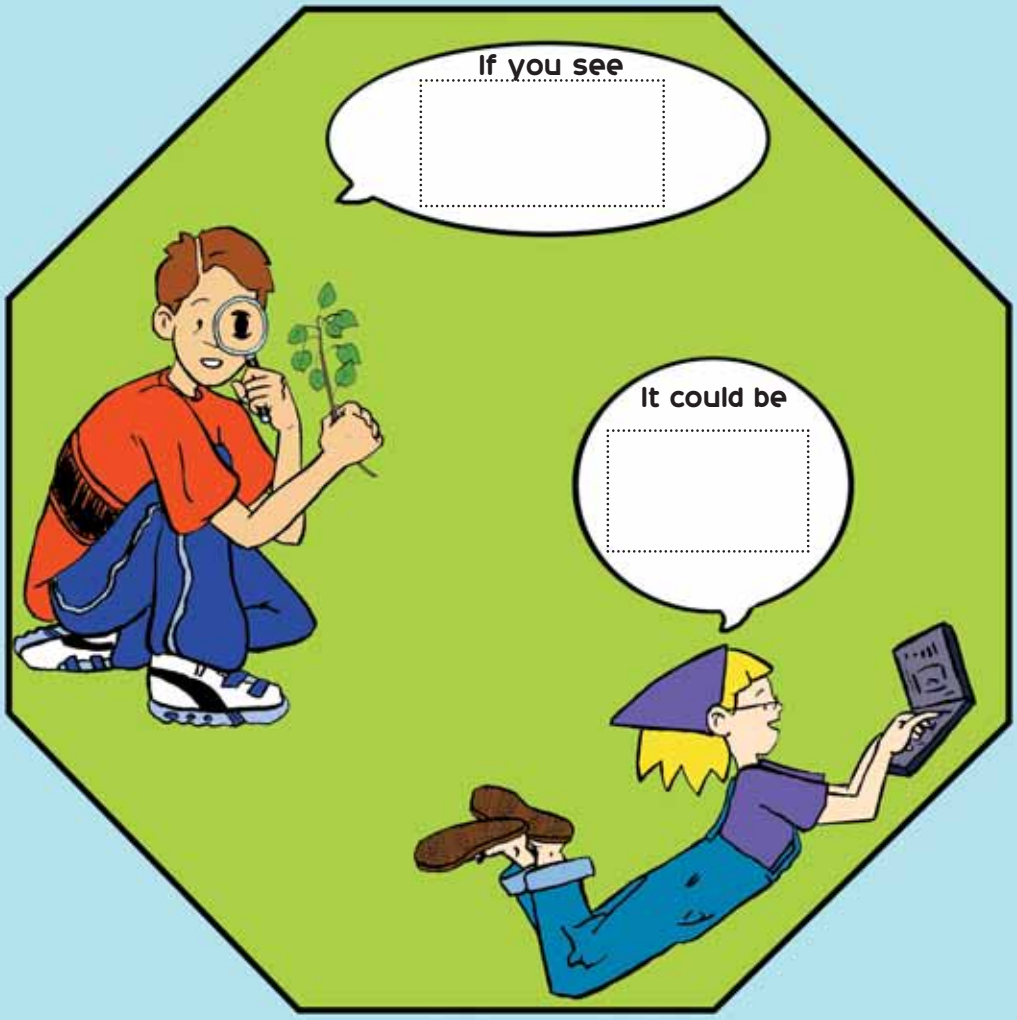
1. Cut out the hexagon and the circle shapes. (Information is printed on both sides.)
2. Cut out the small hole in the centre of the circle and the two rectangles on the hexagon.
3. Carefully cut along the two curved lines (tabs) in the centre of the hexagon. Tip: Tape the back of the tabs for reinforcement before cutting.
4. To assemble, gently bend the centre tabs of the hexagon in and through the centre of the circle. Now flatten out the tabs. Both will stay attached by the tabs.
5. You can easily rotate the wheel to read in the "If you see. . ." and the "It could be . . ." windows. Use this wheel to identify trees, insects, diseases and disorders on your next walk in the forest.





EXPLORE THE FORESTS





If you want to be an effective detective in the outdoors, it helps to have the appropriate skills, attitude and gear.

Skills - Sharpen your observational abilities and carefully look for anything unusual. Use magnifiers to help you see in more detail. Listen to the sounds of a living forest. Use your senses to get a good feel for where you are.

Attitude - Be patient while learning about nature. You may have to take many hikes before you begin to notice something. Observe, gather clues and enjoy.

Gear - Use a notebook and pencil to keep a record of your observations. Some people draw pictures of plants or take pictures, others use a tape recorder to record bird songs, and some use binoculars. Keep notes about nature so you can later solve the mysteries you noticed. Gather clues and record your observations. Put your gear into a backpack. Don't forget a map, your camera, a bottle of water, whistle and a snack.

Safety Rules!

- ❑ Always tell an adult where you are going.
- ❑ Go with someone else and stay together.