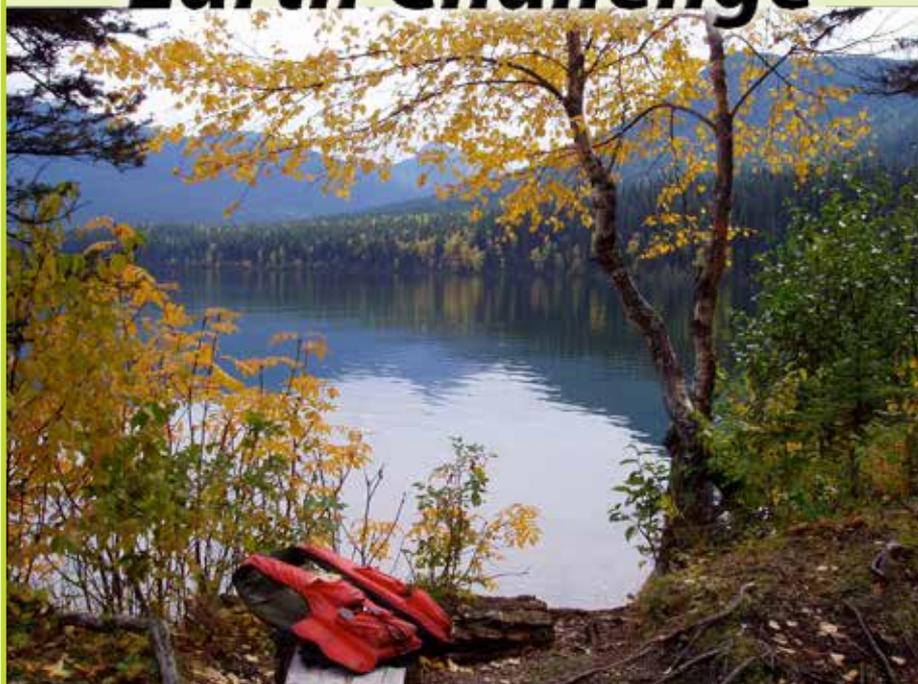


# ***Earth Challenge***



***"For all the Earth Days to come,  
a challenge to make a difference".***

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Prepared for staff and students of  
**the Cariboo Chilcotin**



**School District No. 27**  
**(Cariboo-Chilcotin)**



Information brought to you by: the **Water Wise** and **Waste Wise** programs of the Cariboo Chilcotin Conservation Society, **Ecosystems and Air**, by the Scout Island Nature Centre, 250-398-8532 [[www.scoutislandnaturecentre.ca](http://www.scoutislandnaturecentre.ca)], Williams Lake Field Naturalists [[www.williamslakefieldnaturalists.ca](http://www.williamslakefieldnaturalists.ca)], and **Air and Air Quality** [[www.breatheasywilliamslake.org](http://www.breatheasywilliamslake.org)], WL Air Quality Roundtable and **Invasive Plants** by the Cariboo Chilcotin Coast Invasive Plant Committee [[www.cccipc.ca](http://www.cccipc.ca)].

In partnership with the **City of Williams Lake** and the **Cariboo Regional District**.

Cover photo by Don Olesiuk of a lake within the Bowron Lake Provincial Park.

# Waste Talking Trash



## Vocabulary

**Aerobic** - an environment with air (eg. a compost pile).

**Anaerobic** - an environment without air (eg. garbage buried in a landfill).

**Biodegradable** - to break down into very small particles after being exposed to sun, soil, water or air.

**Compost** - a mixture of decayed organic matter including leaves, fruit, and vegetable scraps, used to improve soil and provide nutrients for plants.

**Digester** - a semi-subterranean composter designed for meat and dairy organics.

**Downcycle** - used materials that cannot be used to make the same product again, instead making a succession of different products until they cannot be recycled again.

**EPR** - Extended Producer Responsibility, where the company that makes the product pays to have it recycled when it is no longer used (eg. batteries, tires and paint.)

**Fermenter** - an anaerobic composter that breaks down meat and dairy organics.

**Leachate** - the liquid created from garbage breaking down in landfills.

**Methane** - a potent greenhouse gas generated by anaerobic decomposition of organic matter, as well as the burning of fossil fuels and livestock farming.

**MMBC** - Multi Materials British Columbia, the EPR program for paper and printed packaging.

**Microorganisms** - small organisms like bacteria and fungi that help break down organic waste.

**Organics** - biodegradable waste from plants or animals, which are primary ingredients in compost production.

**Reduce** - buying or using less, in order to make something last longer.

**Reuse** - to use more than once.

**Recycle** - used materials changed to make a new product.

**Repair** - fix something instead of throwing it in the landfill.

**Refuse** - refuse to buy things that create waste. Be aware about its full life cycle - is it or its packaging recyclable?

**Re-think** - to reconsider your choices and behaviours differently than you have in the past.

**Repurpose** - use something again by changing it for a new purpose.

**Vermicomposting** - composting with worms. One pound of worms can eat a pound of junk mail and veggie waste every two days and produce 1 pail of nutrient rich casting 11 times more powerful than regular compost for every 40 pails of waste.

**Zero Waste** - where all products are reused and nothing is burned or sent to landfills.



**Have questions? Call the Recycling Council of British Columbia  
Recycling Hotline 1 800 667 4321**

Waste  Recycle

**Recycling Saves Resources**

Recycling saves valuable resources but, unlike Reducing and Reusing, recycling requires resources like water and energy to make something new from something else. Collecting, sorting, and transporting recyclables requires people, equipment and buildings in communities. All of these requirements involve some degree of pollution.



*80% of the 40,000 scrap tires collected each year are recycled into new products with the remainder being used as a fuel supplement.*

**Recycling: is it worth it?**

- A littered aluminum can takes **500 years** to disintegrate.
- It takes **100 years** to dissolve tin cans.
- Paper takes **80 years** to break down.
- Glass would take **1 millions years** to break down naturally.
- Plastic takes **1 million years** to break down.



About 70% of heavy metals (including lead, mercury and cadmium) found in our landfills are from electronic waste (e-waste). Recycle your nose hair trimmers, old game systems and computers at MICA Ventures (formerly known as BEE-LINE Courier) on Mackenzie Avenue in Williams Lake at 405 Mackenzie Avenue across from Cariboo GM.



**When Water Tastes Weird ..**

At room temperature, toxic phthalates leech out of #1 plastic bottles into drinks making them taste old or stale. Drinking from the tap is safer and much cheaper - about 2,000 times cheaper! If you do have #1 plastic bottles, never reuse them, recycle them at your local Return-It Centre (Amanda Enterprises in Williams Lake).

**Remember this rhyme:**

Plastic #4, 5 and 2. All the rest are bad for you.



Polypropylene



Polyethylene Terephthalate



Polyvinyl Chloride (new car smell!)



Polystyrene (trade name: Styrofoam)



High Density Polyethylene



Low Density Polyethylene



Other (beware of BPA!)

**Waste Waste Wise**



**Ways to be Waste Wise:**

1. **Get Garbage Smart.** Call the recycling hotline with any questions or use the Recyclapedia APP on your smart device.
2. **Compost!** 40% of the waste in our landfills is compostable organic matter.
3. **Buy Second Hand.** Besides saving you money, previously loved goods don't come with packaging
4. **DIY** Do it yourself - impress yourself and your pocket with how affordable and fun it is to make anything from bread to laundry soap.
5. **Check packaging before you buy it.** Go for pure packaging like glass or metal instead of composites like juice boxes that are energy expensive to recycle.
6. **Have an Eat Me First bin** in your fridge to stop good food from going in the compost.
7. **Stop using plastic bags.** You can use cotton or mesh bags for produce as well.
8. **Take your own take out containers.** If you leave home without a lunch, grab a container and some cutlery. Keep a "to go kit" in your locker or family car with your fabric shopping bags.
9. **Buy Local.** Small stores can quickly get what you want. Reduce shipping and travel costs by walking to the shops you love.
10. **Recycle everything you can.** Call the Recycling Hotline, Cariboo Regional District or Central Cariboo Disposal with any questions you might have. Every little bit helps.
11. **Set up recycling in a convenient place.** Don't be afraid to put it out in the open. People are more likely to ask you about your system and you can share your recycling knowledge.
12. **Buy durable products,** so you don't need to replace them so often.
13. **Buying food, products and services that are grown or produced as close to your home as possible.**
14. **Support the Share Sheds.** Often other people's trash is just the treasure you were looking for.
15. **Share or trade your stuff with others.** Use the library, rent movies and video games or have a clothing swap.



**Your drain is not a garbage can!**

Especially products with these symbols:



Choose cleaners that are good to go down the drain for your laundry, bath, car wash and dishwasher; choose phosphate-free soaps and check the ingredients to avoid Sulphates and Parabens.



Do not flush medications either.



Never burn garbage like marshmallow bags, plastic bottles, cereal boxes or styrofoam in a campfire. Burning garbage is illegal. Burning garbage releases nasty chemicals that can contaminate water and plant surfaces, eventually making their way up the food chain.

Waste  Food Waste



### Expiry Dates

Expiry dates are only legally required in Canada on baby food and old people food (nutritional drinks). 60% of food is trashed before it gets to the store and of what we do buy and bring home, 25% goes in the trash.



### Expiry Date Detector

Use the expiry date detector you were born with: your face.

**Smell it:** is it stinky? Don't eat it.

**Look at it:** is it green like broccoli but was once bread? Don't eat that.

**Taste it:** did you gag? Spit it out (not on the floor, your mother taught you better than that!)

### Food Saving Tips:

- Share food with neighbors
- Freeze Food
- Do not shop while hungry
- Store food correctly

 **LOVE**  
**FOOD**  
hate waste



### How to Make a Garbage-Free Lunch:

#### Do include:

- sandwiches or salads in reusable containers
- whole fruits without packaging
- drinks in reusable containers, like a thermos or in a recyclable one, like a can, glass or tetra pak
- snacks, purchased in bulk and brought in reusable containers
- cloth napkins, reusable spoons and forks
- take compost material home or use a worm composter

#### Don't include:

- Individually wrapped snacks
- Plastic baggies that are not reusable
- Disposable forks and spoons
- Straws

**Waste Zero Waste**



**Zero Waste**

Zero Waste is a goal to guide people in changing the way they live to copy natural cycles, where all discarded materials are designed to become resources for others to use. Zero Waste means designing products to avoid waste, conserve and recover all resources, and not burn or bury them. Being Zero Waste means not using land, water or air as a garbage can and protecting our planet, plant, animal and human health.



*Williams Lake Share Shed*



*Big Lake Share Shed*

**Share Sheds**

The Cariboo Regional District is a leader in BC for creative zero waste projects. Share sheds are found throughout our region and divert a huge amount of waste from the landfill. New in 2015 is the “Wood Waste Scavenging Permit” which can be obtained at the CRD office or Frizzi Road scale house and allows people to collect useful wood that has been thrown away. One person’s trash is another’s treasure!

**Zero Waste Products are Designed to:**

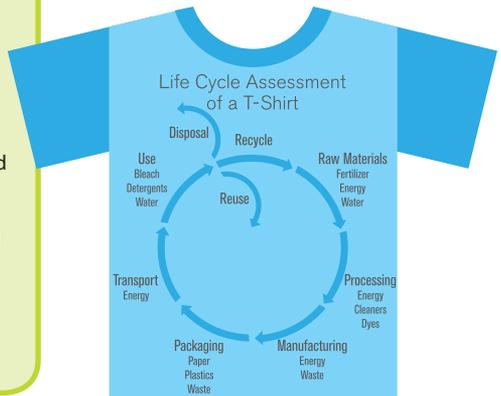
- use recycled material
- use fewer toxic materials
- be repaired easily
- use fewer raw materials
- last longer
- be taken apart easily
- reuse as many parts as possible and recycle the rest



**Did you know?**

“Cradle to Grave” is the lifecycle most products follow from raw materials. “Cradle” through manufacturing, packaging, transportation, consumption, recycling and disposal “grave”. Each stage of the lifecycle has unique environmental impacts.

**Product Life Cycle**



Waste Compost



**Compost it!**

If you don't compost, find someone who does and share!  
Or you could check with Waste Wise for options in your area ([www.cconserv.org](http://www.cconserv.org)). You could leave your grass clippings on your lawn to retain moisture, or use it as a mulch (protection layer) in the yard or garden.



**The Potato House**

Williams Lake is home to Canada's only Drive In community composting program. Located beside Cariboo Ski and behind the Gecko Tree, the Potato House accepts all veggie waste and bagged leaves. No dairy, elastics, sticks, compostable bags or meat please.

**Compostable Conundrum!**

Bags, cups and cutlery that are plastic and say "compostable" do not break down in your backyard or community systems! They are meant for industrial composting systems and machines not found currently in Williams Lake. They are also not recyclable!



If you want a truly compostable container, use a paper bag and wooden cutlery.

**Knickknack, paddy wack, please don't give your dog the bones!**

Dogs are great digestors for all your leftover and meat scraps but all kinds of bones can be very dangerous for their digestion by splintering and poking holes in their stomachs.

Instead use a "Green Cone" digester as it can take all the bones you can throw at it! Other great composting companions include chickens, pigs, goats and teenagers!



Leaves are an important source of carbon for composting. They're abundant and readily available in the fall, so be sure to save a year's supply to add to your compost all year long.

Waste  Compost

To Good Health

By adding compost to soil we provide vital nutrients that encourage abundant, nutrient-rich crops with resistance to common diseases eliminating the need for chemical fertilizers, herbicides and pesticides.



Think of the soil as a living entity, a home for billions of micro-organisms (bacteria and fungi) and macro-organisms (worms and insects). They thrive and multiply by digesting carbon (browns) and nitrogen (greens) giving them the necessary nutrients to survive. These creatures are the key players in composting - The Decomposers.

micro-organisms



macro-organisms



Waste Climate Change

What is Climate Change?

Climate Change is the variation in the Earth's climate over time, which can be from both natural and human-induced changes. Human activities alter the chemical composition of the atmosphere through the increase of greenhouse gases (GHG). GHG trap heat and reflect it back to the earth's surface. The result is changes in our climate, including a rise in global temperature and more frequent extreme weather events.

GHG are emitted as waste decomposes in landfills.



Waste prevention and recycling divert materials from landfills, lowering GHG emissions.

INCREASE GHG  
DECREASE GHG

Manufacturing new products releases GHG during processing as it expends energy.



Making products from recycled materials requires less energy.

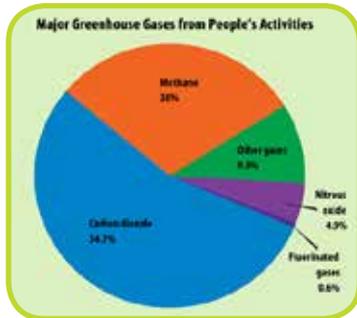
INCREASE GHG  
DECREASE GHG

Harvesting trees, extracting ores and oil, and transporting raw materials emit GHG.



Waste prevention and recycling delay the need to extract raw materials, lowering GHG emissions.

The Williams Lake landfill is located at Gibraltar Mine near McLeese Lake. Carefully designed and built on top of the land it isolates the garbage from the surrounding environment with a bottom liner and daily covering of soil. 40% of waste going to the landfill is compostable, when organic material enters the landfill it produces the potent greenhouse gas Methane and a toxic liquid called Leachate. The Gibraltar landfill will be completely full by 2041.



Gas	Atmospheric Concentration		Atmospheric lifetime (Years)	100 Year Global Warming Potential (GWP)
	Pre-industrial (1000-1750)	Recent (1998)		
Carbon dioxide (CO <sub>2</sub> )	280 ppm	365 ppm	50-200	1
Methane (CH <sub>4</sub> )	0.7 ppm	1.745 ppm	12	23
Nitrous oxide (N <sub>2</sub> O)	0.270 ppm	0.314 ppm	114	296
Perfluoromethane (CF <sub>4</sub> )	40 ppt	80 ppt	>50,000	5700
Sulfur hexafluoride (SF <sub>6</sub> )	0	4.2 ppt	3200	22,200

ppm = parts per million  
ppt = parts per trillion

Source: U.S. Environmental Protection Agency website  
Epa Information Agency (DOE): Emissions of Greenhouse Gases in the United States 2000, December 2008

# Water



To survive, every living thing needs water.

In Canada, we can turn the tap and our needs for safe drinking water are met.

At times, when we use more than usual and there's a lack of rainfall, we're asked to use less. Conserving water doesn't mean we stop drinking water. It means using less for everything else. While we focus on conserving, 20 per cent of the world's population has no drinking water.

For everyone in Canada, and the rest of the world, water supply is affected by pollution, change in climate and demand from increasing population and lifestyles.

## Water Availability

Available drinking water makes up less than 1% of the world's total water supply. In the raindrop image, the tiny white triangle at the top of it represents the small percentage of potable water.



## How is water used in Canada?

60%	Hydroelectric power generation
18.5%	Manufacturing
9.5%	Municipalities
8%	Agriculture
4%	Mining

## How does water use compare?

On average, per person daily use (in litres):

African	10
German	115
Americans	360
Canadians	274
British Columbians	350

## Typical Indoor Water Use

At home, we don't just use water for drinking. We use water to cook, flush toilets, take showers and baths, wash clothes and dishes.

35%	Showers and baths
30%	Toilet flushing
20%	Laundry
10%	Kitchen and drinking
5%	Brushing teeth and washing hands

Most of the 1.1 billion people lacking access to clean water use just 5 litres of unsafe water each day – less than what we use to flush a toilet.

## Vocabulary

**Aquifer** - an underground source of water. Water can be found by drilling a well into the ground and installing a pump.

**Hydrological cycle** - also known as the water cycle. Water moves continuously on, above and below the surface of the Earth. It moves in liquid, vapour, and ice forms.

**Impervious surfaces** - a surface that prevents water from soaking or seeping through it, e.g. pavement.

**Irrigation** - water that is added to soil to help grow crops when there is not enough rain.

**Potable water** - water that is safe for drinking.

**Precipitation** - water (in any form of solid, liquid or gas) that falls to the Earth.

**Storm drain pollution** - water that flows along roads and other paved areas carry pollutants into storm drains. This polluted water usually travels untreated to local streams and rivers.

**Surface runoff** - water that flows along the ground that is not absorbed because either the soil is saturated or the surface is impervious (e.g. concrete).

**Watershed** - an area of land where all the water within it flows into a particular river or set of rivers.

**Water conservation** - using less water by reducing waste.

**Water sustainability** - using water in a way that helps ensure future water needs are met and its quality is protected.



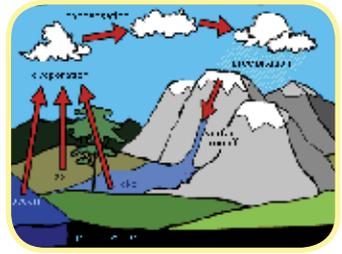
### Water



The water we depend on today is the same water that living things used in the past and others will depend on in the future. By caring for water, we help protect it for plants and animals of the future.

When enough heat (or energy) is added to ice, it melts. When enough heat is added to water, it evaporates. Evaporation turns liquid water into a gas, called water vapour.

When water vapour cools enough, the water condenses. Condensation turns water vapour into a liquid. When liquid water cools enough it freezes to become ice. The movement of water from one form to another is part of the water cycle (hydrologic cycle).



Water from oceans, lakes, swamps, rivers, plants, and even the water within you, can evaporate. When water vapour condenses, clouds form. Precipitation comes from clouds as rain, snow or hail and is either absorbed into the ground or runs off into rivers.

About 97% of the world's water is salt water from oceans. 2% is freshwater that is locked up in glaciers and icecaps, while the remaining 1% is freshwater found mostly under ground and a small fraction of this is found in lakes and rivers.

Some water in the ground is used by plants. Plants lose some water vapour that enters the atmosphere. Rivers, ponds, lakes, or oceans also contribute water to the atmosphere through evaporation.

As a cycle, water moves through different places in different forms, and at different rates.

Ground water is a part of the water cycle, even though it can't be seen as easily as rivers, lakes, and clouds. This water flows through spaces in soil and rock through underground lakes and rivers while some eventually seeps to the surface into streams, lakes, and oceans.

Ground water can be reached by digging a well and is a great source of drinking water for many communities and cities. In Williams Lake there are several wells into the aquifer to provide enough water for the City. Most of these wells are located at Scout Island.

In Canada, outdoor use can more than double water demand. In Williams Lake, average summer water use is well over twice the winter use. The water supply and the pipes to carry it need to be built big enough to meet this demand, even though it's only for a few short weeks in the summer.

Lawns use more water than we do. A typical sprinkler uses 1,300 litres of water per HOUR! That's as much water as one Canadian, on average, uses for drinking, bathing and toilet flushing in about a week. While only a fraction of water is used for drinking, it is all treated to drinking water standards, even if it is used to water lawns.

Lawns only need 2.5 cm of water (including rain) a week to stay green. Keep the grass a little longer (at least 6 cm) to shade roots and reduce evaporation. Or, you can choose to let your lawn go "golden" over the hot spells as another way to be green!

## Water



### Watersheds

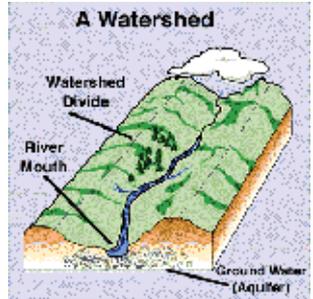
No matter where you live, work or play, you are ALWAYS in a watershed.

A watershed includes all of the water (ponds, lakes, rivers, streams, wetlands, and groundwater) and all of the land that drains into a common area. For example, all the land that surrounds a creek (mountains, houses, forests, farms, businesses, etc.) and all of the creeks and ponds that contribute water to this creek are part of its watershed.

Watersheds supply water, drinking water, a place to live, habitat for wildlife and aquatic life, irrigation, industry, recreation, and beauty.

You don't see all the water in a watershed. A large portion of water is stored in the ground. Wells allow people to access groundwater. Rain and water from lakes and rivers flows into the ground recharging lost groundwater.

The area where groundwater is stored is called the water table. In wet areas the water table will be closer to the surface and in dry areas it will generally be further from the surface and harder to access.



The main use of water in Canada is for hydroelectric power generation. We have diverted more water by damming rivers for hydro than any other country, with massive effects on ecosystems and communities.

85 per cent of the drainage basins in the Boreal Shield have been altered by hydroelectric development one way or another with major dams, reservoirs and rivers with flows that are either higher or lower than they would be otherwise.

About 60% of Canada's freshwater drains north, while 84% of our population lives within 300 kilometres of our southern border.

### What are those yellow fish on the road for?

Yellow fish painted by storm drains are to remind people that these drains flow directly into local waterways. In many towns, there is no treatment of this water before it reaches a creek. In Williams Lake, road run-off goes down drains and collects in specially built ponds in the Williams Lake river valley. These ponds are planted with marsh plants to help filter and clean the water before it returns into the watershed.



### Reduce storm drain pollution

- Limit the use of household hazardous products.
- dispose of harmful products properly.
- Repair fluid leaks on vehicles.
- Reduce or eliminate the use of fertilizers and pesticides.
- Wash vehicles on grass or gravel, rather than on pavement or use a car wash, (where water is treated).



## **Wetlands**

Water is used to grow fruits, vegetable and crops to feed farm animals.

Only a small portion of the water in our lakes and aquifers is renewed each year from rainfall and snow melt.

Fresh water wetlands are found all over the world in lowland areas or along rivers, lakes and streams.

Some wetlands are temporary and seasonal. They occur for a few weeks at a time and then disappear until they are refilled with water. Other wetlands are always under water.

Almost 25 percent of the world's wetlands are found in Canada, and nearly 70 percent have vanished already.

## **How are wetlands important?**

**Wetlands are among the most fertile and productive ecosystems on earth. They provide:**

- habitat for fish and wildlife,
- spawning and nursery areas for young fish,
- improvements to the quality of water for aquatic species in nearby lakes and rivers,
- hundreds of species of birds, especially waterfowl and other water birds with a place unavailable elsewhere for part of their life cycles,
- surface water with the ability to filter pollutants,
- flood control by storing large amounts of melting snow and runoff,
- erosion control as plants, called emergents, are able to slow the flow of water,
- a water source for agriculture, especially livestock producers,
- economic activities such as hunting and trapping activities for rural and remote areas,
- carbon 'sinks' for climate change by reducing impact of greenhouse gas emissions.



In Canada, found only in British Columbia, mainly in the Okanagan Valley, the Great Basin Spadefoot Toad is at risk because of the loss of wetlands from urbanization, agriculture and a reduced water table.



**Water sustainability is being impacted by Climate Change.**

As global temperatures go up, BC’s growing season will be longer and dryer while our winter season will be wetter. This means that the water is not available when it is needed most, during the long hot summers months.

It also means that water storage levels will be replaced earlier by snow melt or rainfall, when water storage levels are usually already high.

**Sustainable Action**

**WHAT CAN WE DO TO CONSERVE & PROTECT WATER**

The key to water sustainability includes ensuring we value water, today and for future generations. Solutions include: planting drought tolerant crops, irrigating efficiently, and choosing water efficient appliances. Every drop we save means more available for us and the environment when it is needed.

There are a number of things we can do to take care of our watersheds and be more water-smart.

Quite simply: use less water!

This involved things such as:

- turning off taps,
- having short showers instead of baths,
- capturing rain water to use in your garden,
- installing low-flow shower heads and toilets.

But where is it that we could really save the most water? When thinking about water conservation we need to look at the difference between water that we NEED (like drinking and bathing), and water that we WANT, but don’t need (like hot tubs, swimming pools, and green lawns).

Other ideas for taking action on water conservation:

- Plant (native) trees near streams – they help hold banks in place, and keep water running clean.
- Don’t put anything toxic down your drains – it all leads to our watersheds and oceans.
- Lobby government for sewage treatment, water management, and safe drinking water.
- Drink your tap water! Bottled water uses more resources (packaging and shipping) and it isn’t any safer than what comes out of your tap!

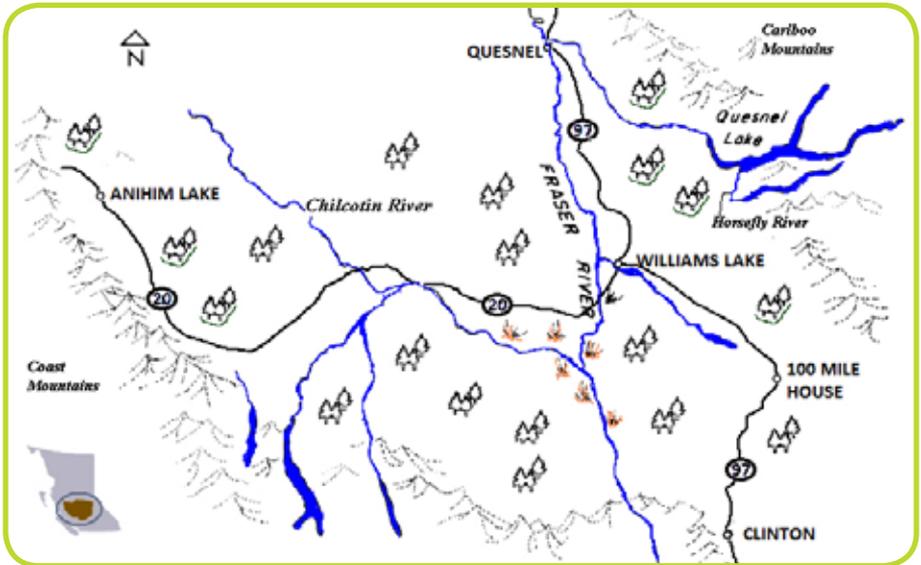
# Ecosystems



## Cariboo Chilcotin--Understanding Ecosystems

### Do You Know Where You Live?

You live in the region called the Cariboo-Chilcotin. It is a very large area (8 million hectares) in the central interior of British Columbia. It is home to four main types of land ecosystems (Dry Forests, Wet Forests, Grasslands, and Mountain Tops). There are also two main types of aquatic ecosystems (rivers and wetlands).



### Key

Wet forest 

Dry forest 

Grassland 

### What is an Ecosystem?

Ecosystem = a community of living organisms (plants, animals, fungi, and microbes) together with the non living parts of community (air, water, mineral soil, sunlight, and climate) + how all of these interact. Living organisms can be part of more than one ecosystem. For example, grizzly bears are found in all of the ecosystems in the Cariboo Chilcotin and pine trees in all of the land ecosystems.

## Ecosystems



### And In Each Ecosystem are Habitats

The survival needs for each plant or wildlife in a habitat are:

- Food
- Water
- Shelter
- Space
- Air
- Sunlight

A habitat is like a neighborhood and there are many neighborhoods in an ecosystem. One of the habitats in the Dry Forest Ecosystem is the City of Williams Lake. This is not a natural habitat. People have changed it so it is a home that is comfortable for humans. Usually, plants and animals do not change the habitat to suit them, but instead over a long time have evolved to live in that habitat because they can find all their survival needs. But think of beavers. They do alter habitat to fit their needs.

### What can we do sustain the Cariboo Chilcotin Ecosystems and Habitats and keep them Healthy for All?

People take resources from all parts of an ecosystems (water, land and below the earth) like trees for lumber, copper for wires, water for irrigation, grasses to feed cattle, and much more. Being careful not to take too much is very important. You can help by:

- When you go exploring, hiking, skiing, etc take nothing but pictures and leave nothing but footprints!
- Join an organization that is helping to protect and restore wild areas like Nature Kids or a group at your school
- Reduce (don't buy it unless you need it) and reuse everything you can so that we can leave more of the ecosystems natural



### Forest Habitat Vocabulary

**Canopy** includes the tallest plants in that habitat. In the forest that usually means tall trees. In grasslands it will be bushes.

**Understory includes:**

- Bushes and short young trees
- Grasses
- Herbs (non woody plants that are not grass, like asters and golden rod)

**Ground cover includes:**

- tiny plants just beginning to grow and ground hugging plants like bunch berry mosses, and lichens

**Litter includes:**

- dead plants and animals that cover the bare soil

**All forests have these habitats but this is how a dry forest looks—easy to walk through.**



## The Land Ecosystems

### Dry Forests

Douglas fir forests with a mix of pine and aspen trees are the most common trees in these forests. The large **Douglas fir** trees have thick grooved bark and long heavy branches glowing with **chartreuse wolf lichen**. The habitats range from open forest with bright Pine grass and little ground cover to closed forest with more shrubs and mixed grass and moss/lichen ground cover. The moss is not thick. Wetlands are also common. Because of the diversity of habitats in this ecosystem, more species of vertebrate wildlife are supported than in any other BC ecosystem. These forests look park like. You can easily walk through them and the ground feels dry and firm. There are sunny openings. These forests have warm, dry summers, a fairly long growing season, and cool winters and not much snow. **Wildfires** are a natural occurrence in these forests and the **Douglas fir** are fire tolerant.

### Wet Forests

Spruce trees (several types) are common in wet forests. Over time these forests have seen many fires and **lodgepole pines** are the first to grow up after fire. Because of clear cut logging and replanting with **pine**, vast sections of the **spruce forest** is now **pine forest**. There are also large areas of **aspen forest**.

Around Quesnel Lake there are temperate rain forests where the most common trees are **western red cedar** and **western hemlock**. This is a **temperate rain forest**. This means it is a rain forest with winter so no tropical plants or animals.

In both types of wet forest, the understory has many types of bushes and extensive ground covers of herbs like bunch berry and mosses. Walking is not easy in these forests because of the amount of groundcover. The mosses are thick and soft. Wetlands are very common in poorly drained depressions and along rivers, and this means lots of bugs in the summer. These forests have long cold winters with heavy snows, a short growing season, and wet summers.



### Grasslands

Grasslands are open areas where grasses or grass-like plants are the dominant vegetation and where there are few trees. **Bunch grasses** dominate over trees, because they are better able to thrive in hot, dry climates where spring and summer rain is sparse.

**Bunch Grasses** have many long, fine roots to search for water. The blades of grass plants curve inward to capture rain drops and direct them into the centre of the plant, where they are absorbed by the roots. By mid-July in British Columbia, grasses have gone to seed and the plants are drying out. A crust of mosses and lichens on the ground between the grasses shade the ground from summer heat and from wind, thus preventing evaporation of precious water from the root zone below.

**Ecosystems**



The rolling landscape of grasslands includes hills, river valleys, canyons and cliffs. Water runs over the landscape in the form of rivers, streams and small creeks, collecting in low areas to form lakes, ponds, wetlands and moist ground. The lower grasslands are the hottest and driest and **big sagebrush** is found here along with the bunch grasses. Middle and upper grasslands are cooler and have more moisture and you will even find pockets of Douglas fir and Aspens growing here. Grasslands have hot dry summers and cold dry winters with little snow.



**Mountain Tops**

As you hike up any mountain in the Cariboo Chilcotin, you will pass through some amazing habitats. The lowest one is called the **sub alpine parkland**. This is the area between the forest and the treeline. This parkland has spectacular flower meadows full of **purple lupine, red paint brush** and many more. A bit higher you reach the tree line where upright trees can no longer grow because the summer is too cool and short and the winds too strong. Here you find **krummholz trees** (stunted spruce and fir trees that are short enough to be covered by snow in the winter). Finally you are in the treeless alpine zone. After the snow pack is gone, there is little water available and this combined with intense sunshine, dry winds, cold temperatures and a very short growing season means only small plants specially adapted (**deep roots, succulent leaves, silvery leaves, hairy leaves**) to these conditions can survive.

**Take A Plant Challenge**

**Can you recognize each of these and tell what type of plant it is (tree, bush, grass, herb)?**

Lodgepole Pine  
Interior Douglas Fir  
Spruce  
Cedar  
Aspens  
Paper Birch

Rocky Mountain Juniper  
Saskatoon  
Prairie Rose  
Oregon Grape  
Twinberry  
Soo-polallie

Choke Cherry  
Wood Strawberry  
Kinnikinnick  
Showy Daisy  
Can you recognize a lichen and a moss?

Good reference - "Stepping into Nature, A Guide to the Williams Lake River Valley"

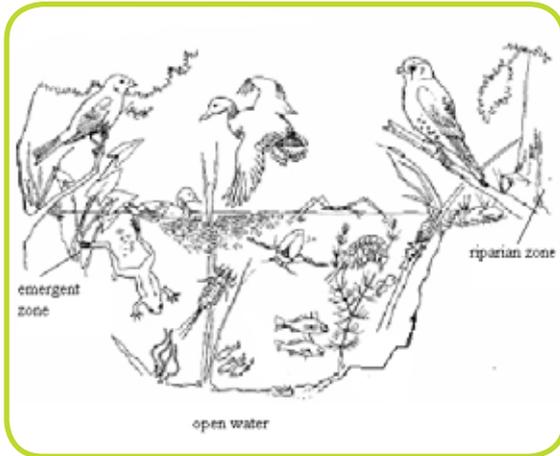
# Ecosystems



## The Aquatic Ecosystems

Across the Cariboo Chilcotin are wetlands (marshes, fens, lakes, and ponds) and large and small rivers—aquatic ecosystems. Wetlands are aquatic ecosystems of various depths where the water is moving very slowly. Rivers and streams move water quickly down hill. Aquatic ecosystems transport, filter and store water and nutrients for all of life in the Cariboo Chilcotin. At the edge of all of them is the *Riparian Zone*, the rich zone where water and land meet. Special plants grow that can tolerate being flooded for part of the year (they have “snorkels”) and almost all wildlife visits this area regularly.

### Wetland Habitats



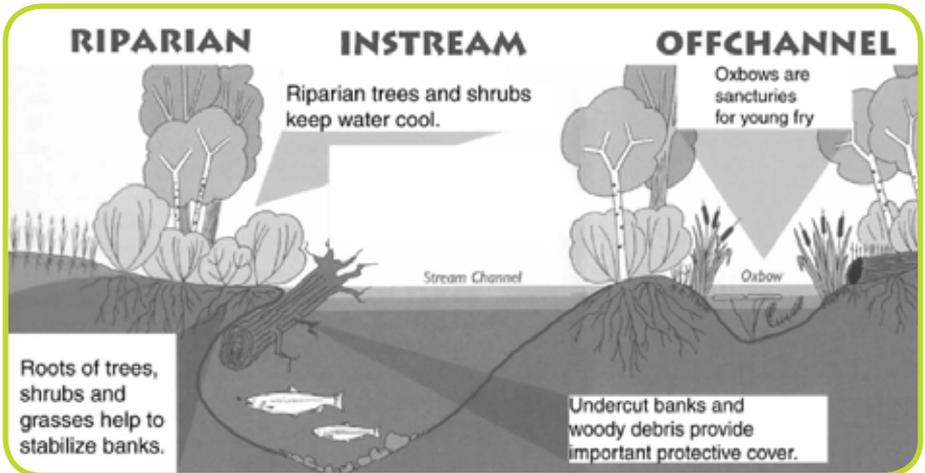
### Aquatic Plant Challenge

Can you recognize these plants with snorkels?

- Willow
- Bull Rush
- Cat Tail
- Cottonwood

How is each habitat important?  
What animals and plants live in each habitat?

### River and Stream Habitats



## Ecosystems



### Cariboo Chilcotin Wildlife

#### Take the Challenge

#### Learn Who Shares Your Ecosystems

The many ecosystems and variety of habitats in the Cariboo Chilcotin are the reasons we have so many different animals living here with us. Each type of wildlife can be found in more than one ecosystem. It is fun and important for you to know this wildlife and what you can do to protect their habitats.

#### Animal Challenges

Choose 5 species in each category to become an expert on. You should be able to:

- Recognize it
- Explain its habitat needs
- Tell what food it eats and what eats it
- Tell how it adapts to survive winter

Good reference - "Stepping into Nature, A Guide to the Williams Lake River Valley"

These websites can help you.

<http://www.allaboutbirds.org/guide/>

search birds

<http://www.geog.ubc.ca/biodiversity/>

search for plants and animals

<http://www.fishbase.org>

you can search for fish by common name

#### Fish

- Sockeye Salmon
- Rainbow Trout
- Redside Shiner
- Sucker
- White Sturgeon
- Chinook Salmon

#### Invertebrates

- Dragonflies
- Mourning Cloak Butterfly
- Bumble Bees
- Lady Beetles
- Pine Beetles
- Sow Bugs

#### Mammals

- Mule Deer
- Black Bear
- Muskrat
- Big Horn Sheep
- Coyote
- Meadow Vole
- Red Squirrel
- Big Brown Bat
- Otter
- Fisher

#### Birds

- Northern Flicker
- Red-winged Blackbird
- Dark-eyed Junco
- Cedar Waxwing
- Saw Whet Owl
- Downey Woodpecker
- Sharp-tailed Grouse
- Osprey
- Mallard
- Mountain Bluebird

#### Reptiles and Amphibians

- Painted Turtles
- Common Garter Snake
- Wood Frog
- Pacific Tree Frog
- Spotted Frog
- Western Toad
- Long Toed Salamander
- Rattle Snake

# Air & Air Quality



Air is a gas that has no colour, smell or taste and is a precious resource that most of us take for granted; unlike food or water without air we would die within minutes. People, animals and plants need to breathe air to stay alive so it's important to keep the air clean. Clean air consists of about 78% nitrogen, 21% oxygen, and less than 1% of argon, carbon dioxide, and other gases, as well as varying amounts of water vapour. The average person takes about 20,000 breaths a day-- that's ~15 000 litres passing through your lungs every day. Air quality is affected by weather (wind, rain, temperature, etc.) and topography (mountains & valleys). Poor air quality results from natural and human caused pollutants in the air.

## Williams Lake Airshed

The Williams Lake Airshed refers to the mass of air contained in Williams Lake and the immediate surrounding communities of the Cariboo Regional District, and particularly that air mass contained and affected by the natural topographic features of the Williams Lake valley. To view the Williams Lake airshed see: <http://www.breatheasywilliamslake.org/about.html>

## Respiratory System

The respiratory system consists of the nose, mouth, trachea, and the lungs. When you breathe, **oxygen** moves from the air to your lungs and into your blood and is carried throughout your body through the action of your pumping heart. When your body burns oxygen it makes another gas, **carbon dioxide**, which it doesn't need and it gets rid of it when you exhale.

You have probably noticed that when

you're exercising, your heart beats more quickly. That's so that the blood can carry oxygen to your cells faster. Your **heart and lungs work together** to make sure every cell in your body gets enough oxygen.

Lung power is called **lung capacity**. A larger lung capacity provides more oxygen to your blood. This helps you to be more physically active for longer periods of time. A smaller lung capacity means you can tire more quickly and be vulnerable to illness. Regular exercise can help you to increase your lung capacity, especially endurance activities that help work your heart and lungs - activities like running, jumping, skipping, cycling, dancing and swimming.

Watch an animated video showing how your lungs work and how specific pollutants affect them:

<http://www.airinonow.com/html/lungattack/lungplay.htm>

## Asthma

Asthma is a breathing disease of the lungs. When people have asthma, the airways in their lungs get inflamed (red and swollen). It causes shortness of breath, tightness in the chest, coughing and wheezing. Asthma is triggered by things like dust, air pollution and mould and is the *most common cause of medical emergencies in children*.



## Air & Air Quality



### Air Pollution

Air pollution is a way to describe air that is dirty with chemicals or particles that harm people, plants and animals. Many air pollutants occur as gases or vapours, but some are very tiny solid particles like dust, smoke or soot. Sometimes we can see air pollution and sometimes it's so small we can't see it.

**Common pollutants and the ones that are the most important in BC are wood smoke, ground-level ozone and particulate matter.** One of the biggest causes of air pollution is cars and trucks. Air pollution can make people's eyes burn, their throats itch, bother their nose and lungs and make it harder to breathe. Air pollution can trap certain gases in the air around the earth (atmosphere) that can raise the temperature of the earth and contribute to **climate change**.



### Fossil Fuel

Fossil fuels are natural resources such as coal, oil and natural gas, formed from the remains of ancient plant and animal life. Most of our transportation choices are powered by fossil fuels. When fossil fuels are burned (like in a car engine) they give off **emissions**, including pollutants that harm the air, soil and water and contribute to **climate change**. **Driving vehicles creates more pollution**

**than any other human activity.** Because vehicles are driven so close to where we live and play, they can have a big impact on our health, especially if we have asthma or an illness that makes us weak.

Cut down on your car trips, use active transportation!  
Calculate your emissions using the Active Travel and Emissions Calculator at <http://www.hastebc.org>

The **major sources of fossil fuel burning** are motor vehicles, marine vessels and airplanes; power plants (generation of electricity); factories; space heating (oil and gas furnaces); gas-powered yard and garden tools. When we waste energy we are burning fossil fuels that cause air pollution. Using less electricity from fossil fuels helps keep the air and the planet healthy. Electricity that is made from natural things like the sun and wind helps keep the air clean.



For real time Air Quality readings for Williams Lake see: <http://www.breatheasywilliamslake.org>

**Air & Air Quality**



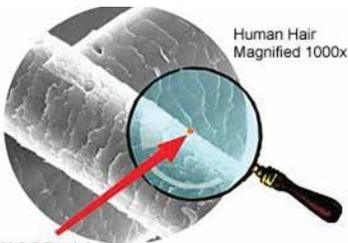
**Particulate Matter (PM)**

Particulate matter is tiny solid or liquid particles such as dust, dirt, soot and smoke that float in the air which affect our health and the air we breathe.

*Particulate matter is the air pollutant of greatest concern in our region.*

Some particles are large or dark enough to be seen, others are so small that they can only be detected with a powerful microscope.

Airborne dust with a diameter of 10 micrometers is commonly referred to as **PM10** and is easily inhaled and trapped irritating the nose, throat and upper respiratory tract.



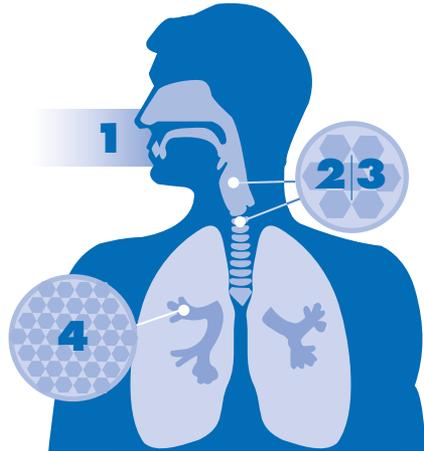
PM 2.5 Particle

Fine Particulate Matter (**PM2.5**) is especially harmful as it is so small it easily travels deep into the lungs and becomes lodged there, causing illness.

Coughing and wheezing are two of the mild problems associated with inhaling PM2.5. However, this type of air pollution can cause or worsen serious illnesses such as asthma, heart disease, chronic bronchitis, emphysema and pneumonia. Sometimes it can even lead to death.

Particulate matter is produced from a wide variety of natural and human-caused sources. Sources include car & truck emissions, factories & mills, backyard burning, woodstove smoke, road & construction dust, pollen, mould, forest fires, and cigarette smoke.

**How Particulate Matter Enters Our Body**



**1** Particulate matter enters our respiratory (lung) system through the nose and throat.

**2 | 3** The larger particulate matter (PM10) is eliminated through coughing, sneezing and swallowing.

**4** PM2.5 can penetrate deep into the lungs. It can travel all the way to the alveoli, causing lung and heart problems and delivering harmful chemicals to the blood system.

## Air & Air Quality



### Be Idle Free

Idling is when an engine is running but the vehicle or equipment is not moving. *Idling is a major contributor to air pollution and is one of the easiest behaviours to stop in order to improve air quality.* Why do people idle? Usually people leave their car running when they don't think they'll be there very long, like when someone comes to school to pick you up. But even 60 seconds of idling is bad for the environment and for us. It's more gas-effective to turn off your vehicle and restart it when it's time to drive off.

*Children are especially impacted by idling* because they breathe faster than adults and they breathe 50% more air per kilogram of body weight. Many schools are going IDLE FREE which means that school bus drivers and parents have to turn off their vehicles' engines when they're picking up students. The Cariboo Chilcotin School District and the City of Williams Lake both have anti idling of engine policies for buses and equipment. Do you have **Idle Free** signs at your school?



### Wind Energy

Wind energy is really just another form of solar energy. Sunlight falling on oceans and continents causes air to warm and rise, which in turn generates surface winds. In some places, especially along coastlines and in mountains, wind provides a highly reliable source of energy. Humans have invented many things that can harness the energy of the wind like sails for sailboats and sailboards, and windmills. In the past, windmills were common on farmsteads across Canada. They were often used to pump water from wells to watering troughs for animals and to generate electricity at the farmhouse.

#### Wind as a Renewable Energy Resource

The two most common forms of energy we use everyday are heat and electricity. Much of our energy supply comes from coal, oil, natural gas, (fossil fuels) or radioactive elements which are considered **non-renewable** because once they are removed from the ground and used, they are not immediately replaced. When fossil fuels are burned, they release carbon dioxide which contributes to **climate change** and **air pollution**.

**Renewable energy** on the other hand quickly replaces itself and is usually always available such as sunlight, wind, or water. With the help of special collectors, we can capture some of this energy and put it to use in our homes and businesses. *The great advantage of using renewable energy in place of fossil fuels is that renewable energy adds very few pollutants to the environment.*

One of the most popular uses of the wind turbine today is to generate electricity.

Electricity is now being generated at large installations called "wind farms" around the world. Wind farms consist of rows of towers, sometimes 90 metres high, equipped with giant wind turbines for producing electricity. In Canada, the first commercial wind farm was built in southern Alberta. Some companies are now installing wind farms in shallow waters near coastlines. These "offshore wind farms" are a promising new source of electricity.



### Active Transportation

Human powered modes of travel such as walking, cycling, rolling (skateboarding etc.) can get you to school and anywhere you need to go. Active transportation is

pollution free and good for your health too! Start a walking school bus and bike train at your school, find out more at: <http://www.hastebc.org/>

Smart neighbourhood designs now consider walking, bicycling and transit as important aspects of a transportation system.



## Air & Air Quality



### Take Action--Small Choices Make A Big Difference

When electricity is used to make the things we buy, it adds more pollution to the air. We can take actions to reduce the amount of greenhouse gases and particulate matter that is released into the atmosphere. When you don't buy things you don't need, or when you reuse the things that you have, our air stays cleaner.

### Every small choice we make to stop air pollution will make a difference.

Here are some things that everyone can do:

One bus can hold all these people, taking their cars off the road.



use active transportation like walking and biking rather than vehicles

form car pools with the people who live near you

take a bus or train whenever possible

be Idle Free-- it saves gas and the air quality

use good wood burning practices in woodstoves

use manual rather than gas powered equipment in yards and gardens

conserve electricity- remember to shut off lights and appliances when not in use

## Vocabulary

**Emissions** - The release of substances (pollutants) into the atmosphere from natural or human sources e.g. vehicles, factories, gas powered garden and lawn equipment, decaying vegetation etc. Calculate your emissions: <http://www.hastebc.org/>

**Greenhouse Effect / Greenhouse Gases** - A natural system known as the greenhouse effect regulates the temperature on earth maintaining the life-friendly +15°C average temperature of Earth. Greenhouse gases including water vapour, carbon dioxide, nitrous oxide and methane thicken the atmosphere providing a protective insulation, without which the average temperature on earth would be a chilly -18° Celsius.

**Carbon Dioxide** - Carbon dioxide is the most important greenhouse gas released by human activities. It has no colour or smell. It is produced when we burn fossil fuels, like coal, gas and oil. It is also released from forest fires, rotting plants, volcanic eruptions, and when we breathe.

**Enhanced Greenhouse Effect** - The enhanced greenhouse effect is most certainly caused by human activities – especially the burning of fossil fuels – that are increasing greenhouse gas concentrations in the atmosphere. This is making the atmosphere warm beyond its natural level.

**Climate Change** - The change in the average weather that a given region experiences. When we talk about global climate change, we are referring to changes in the climate of the entire planet. Different areas of the globe will have different changes, including higher or lower temperatures, increased rainfall, more storm activity, or extended drought periods.

# Invasive Plants



Invasive species are known to be the 2nd greatest threat to biodiversity after habitat loss. Invasive plants are a big problem in Canada, and the rest of the world. They can be found almost anywhere including roads, grasslands, forests, swamps, parks, and gardens. You might even have some growing in your backyard and not even know it! Invasive plants grow quickly, have deep or creeping root systems, produce hundreds to thousands of seeds per plant, are not readily eaten by wildlife or livestock and have no natural enemies



*Young spruce trees surrounded by an expanding invasive Orange Hawkweed infestation*

## How do invasive plants spread?

**Nature** – spreads seeds by wind and water.

**Animals** – spread seeds that stick to their fur and feet, and through droppings that may contain seeds.

**Gardening** – many invasive plants are beautiful so people accidentally plant them in home gardens.

**Vehicles** – spread seeds that hitchhike on cars, trucks, bikes, trailers, ATVs, tractors, snowmobiles, trains and boats.

**Agriculture** – spreads invasive plants that can hide in hay, feed or seed mixtures.

In summary, humans are the most common spreaders of invasive plants.

## Why do they spread so quickly?

Invasive plants have features that help them “win” the competition for water, nutrients and sunlight.

- Very deep or far-reaching roots that help suck up all the water from the soil.
- Ability to make hundreds or even thousands of seeds from just one single plant!
- Production of seeds that can stay alive in the soil for tens or hundreds of years.
- Ability to release toxins (poison) into the soil that prevents other plants from growing.
- Sprout earlier and grow faster before native plants even have a chance to grow.
- Ability to grow a whole new plant from just a little piece of root (also known as Asexual reproduction).
- Often taste bad or have big thorns, so wildlife and livestock leave them alone.
- Have no natural predators or diseases here (because they are from far away).

Have you seen these 10 Common Invasive Plants in the Cariboo Chilcotin?



Dalmatian Toadflax



Field Scabious



Sulphur Cinquefoil

## Invasive Plants



### How are invasive plants controlled?

**Prevention** – not spreading them in the first place.

**Mechanical/Physical** – hand pulling and using tools.

**Chemical** – using sprays (only trained adults).

**Biological** – introduction of a natural enemy (usually insects) like in the picture above where the WEEVIL is eating the Dalmatian Toadflax leaves. Insects used for this purpose are called *bio agents*.



Hector should have heeded Mrs. Gustavson's warning about planting invasive species.

### What can you do to help stop the spread of invasive plants?

The best way to help is to prevent them from spreading by:

- Learn to identify invasive plants in the Cariboo – visit [www.cccipc.ca](http://www.cccipc.ca) for a complete list of over 30 plants



- Play Clean Go:** [PlayCleanGo.org](http://PlayCleanGo.org)

Check your clothes, footwear, gear and vehicles (including bikes, ATV's, campers, boats, snow mobiles and skis) and remove any plants, seeds and mud (that might have seeds) before you leave to prevent any invasive "hitchhikers". Remember to check your pets too! Visit [www.playlengo.org](http://www.playlengo.org)



- Stay on designated roads and trails and try not to disturb the surrounding vegetation
- Don't pick wildflowers from the side of the road, or grow invasive plants in your garden (find **GROW ME INSTEAD** brochure at [www.bcinvasives.ca](http://www.bcinvasives.ca) for a list of popular alternatives)
- Hand pull any invasive plants you see, seal them in a plastic bag and then put in the garbage (don't compost them!). **Report infestations to the CRD at 1-800-665-1636**
- Teach others about invasive plants!



Visit [www.cccipc.ca](http://www.cccipc.ca) for the complete list of over 30 local invasive plants.



Orange Hawkweed



Yellow Hawkweed



Marsh Plume Thistle

## Invasive Plants



### Why are invasive plants destructive?

Invasive Plants have detrimental social, economic and environmental impacts that affect us all!

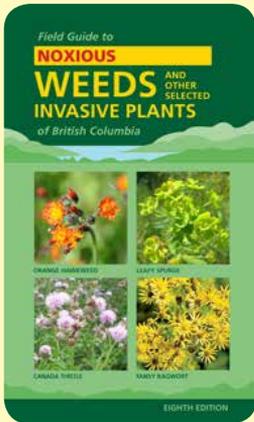
- They crowd out native plants
- They threaten the biodiversity of our local ecosystems
- Disrupt natural food webs for wildlife and livestock
- Can be toxic to both humans and animals
- Cost the Canadian economy billions each year
- Are spread unintentionally usually through human behavior

### Did you know cows eat weeds too?

Many invasive plants are toxic to wildlife and livestock, but *some* are not. Because cows have tough stomachs they can be trained to eat some weeds including invasive spotted knapweed that has a comparable level of nutrition to alfalfa.



*"Hmm, it tastes pretty good once you get used to it!"*



Each of your classrooms has been given a copy of this book which lists all the priority invasive plants in BC.



**Invasive plants can cause significant physical harm to people and animals.**



To the left is 1) a picture of a horse with it's mane completely covered in Burdock burrs, 2) a picture of hands suffering from Giant Hogweed rash, and 3) a picture of "Ellie the Great Dane" from the UK whose face blistered badly after stumbling nose first into a Giant Hogweed patch.



Spotted Knapweed



Himalayan Balsam



Oxeye Daisy



Blueweed

## Invasive Plants



In addition to plants, there are other invasive species such as the Zebra & Quagga mussels, Largemouth Bass and the European fire ant.

Learn more about these species on the Invasive Species Council of BC website at [www.bcinvvasives.ca](http://www.bcinvvasives.ca)



## Vocabulary

**Native Plants** – plants that have grown in nature in this part of the world for a long time. They are eaten by local animals and insects. Many types of native plants grow together in one place.

**Invasive Plants** – plants from other parts of the world (usually Europe and Asia) that have no natural enemies (such as animals or insects) to keep them from taking over local ecosystems. Some invasive plants arrived in Canada as seeds stuck to people or animals from other countries, or on ships, trains or planes. Some were brought here on purpose as garden ornamentals or flower arrangements.

**Weeds** – common term for an unwanted plant, even if it's not invasive.

**Biodiversity** – the amount of different species living together in one area. Biodiversity is high when there is a large number of species living together.

**Bio Agents** – bugs used to control invasive plants

**Monoculture** – vegetation composed of a single species.

## Students in Action

Does your class want to sign-up for a **Community Weed Pull** with the Cariboo Regional District?

As a thank-you, the CRD will provide your group with a \$250 honorarium, gifts and refreshments! **If you are interested, please call 1-800-665-1636**



The CCCIPC gratefully acknowledges the Province of British Columbia for its funding support.

**For more information on conservation in the Cariboo Chilcotin,  
check out:**



The **Cariboo Chilcotin Conservation Society** website has much more on our regions ecosystems, wildlife and species at risk, wildflowers and invasive plants, Parks and protected areas. [www.ccconserv.org](http://www.ccconserv.org)  
Email [sustain@ccconserv.org](mailto:sustain@ccconserv.org)  
Phone 250.398.7929



**Water Wise**, a Cariboo Chilcotin Conservation Society program, in partnership with the City of Williams Lake and Fisheries and Oceans Canada. [www.ccconserv.org](http://www.ccconserv.org) follow the Water Wise link.



**Waste Wise**, a Cariboo Chilcotin Conservation Society program, in partnership with the City of Williams Lake and Cariboo Regional District. [www.ccconserv.org](http://www.ccconserv.org) follow the Waste Wise link.

*"Never doubt that a small group of thoughtful,  
committed people can change the world.  
Indeed, it is the only thing that ever has!"*

*~ Margaret Mead, Cultural Anthropologist*