

What is an ecosystem?

An **ecosystem** consists of all living things (animals, plants, fungi, bacteria, and other microorganisms) that interact with each other and the environment in which they live (air, water, and soil).

- Ecosystems can range from tiny to large: a drop of pond water, rotting log, river, patch of old growth forest, and a range of mountains can all be considered ecosystems. Small ones can fit inside larger ones, and boundaries tend to overlap with neighbouring ecosystems. e.g.- a rotting log can be found in a cottonwood forest which is growing there because there is a river next to it.
- Resource managers are moving away from managing landscapes for only one or two species (e.g.- creating lots of browse for deer and moose after logging), to addressing the needs of the broader ecosystem (e.g.- making sure there is habitat available for most wild creatures in an area).
- To aid in research, management and communication of ecosystems in B.C. a biogeoclimatic (BGC) ecosystem classification system has been developed. The system uses climate, soil, vegetation to group ecosystems at regional and local levels. Fourteen large ecological zones are recognized in B.C. In the Columbia Basin the following BGC's are represented: Interior Cedar Hemlock, Interior Douglas-fir, Ponderosa Pine, Montane Spruce, Engelmann Spruce-Subalpine Fir and Alpine Tundra.
- Ecosystems are constantly changing affected by natural disturbances such as fire, insect attack, windstorms, landslides or logging. Disturbance can return an ecosystem to its beginning. Succession involves changes in plants, animals and conditions as the new ecosystem develops from infancy to mature and old age.

Wetland Ecosystem

A **wetland** is an area that is waterlogged for all or part of the year so that the soil remains soggy, and water-loving plants and creatures that are adapted to these conditions live there. They are among the most fertile and productive ecosystems on Earth.

- Wetlands make up 3% of British Columbia's total area. Much of the province and Columbia Basin is mountainous so most water occurs as fast flowing creeks or rivers. Wetlands can occur in wet areas where the level of the land flattens out and water moves slowly or not at all.
- British Columbia is said to have 2% of Canada's wetlands. Most are located in the northeast quadrant of the province. In the 1980's it was estimated that wetlands covered about 14 % of Canada.



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Kinds of Wetlands

Non-peatlands (mineral soil)	Peatlands (organic soil)
<ol style="list-style-type: none">1. Marsh – the lushest of wetlands, marshes have lots of emergent plants like cattails, and are flooded regularly by standing or slowly moving water2. Pond – shallow open water less than 2m deep with little to no emergent plants, but floating and submerged plants instead.3. Swamp – forested wetlands that are flooded seasonally and are dominated by trees and shrubs.4. Wet Meadow – often connected to marshes and streams, they look like large grassy/sedgy areas that are moist after spring runoff and rain storms, but tend to dry up in summer.5. Shrub-carr – found in hummocky areas where the soil is soggy enough to prevent trees from growing but allows for the growth of willow as well as grasses and sedges.	<ol style="list-style-type: none">1. Bog – acidic, nutrient-poor wetland that receives most of its water from rain or snow. Sphagnum moss and a few acid-tolerant plants grow and accumulate there faster than they decompose.2. Fen – supplied by nutrient-rich and less acidic groundwater so a wider variety of plants grow and accumulate than in bogs.

Where to find wetlands in the Columbia Basin?

The Columbia River wetlands stretch 180 km between Invermere and Donald and are the longest, pristine wetlands in North America! In the Creston Valley, 7000 hectares of lush wetland habitat stretches from the south end of Kootenay Lake to the USA border. Other smaller wetlands occur in the Columbia Basin and are home to a huge variety of plants and animals too.



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Indicators of Healthy Wetlands

Healthy wetlands are unpolluted and have natural, seasonal water levels, i.e. - have not been drained or filled. They contain and are surrounded by a wide variety of native, moisture-loving plants, animals, bacteria, and other microorganisms, and perform important functions like capturing, filtering, and regulating water (often giving rise to those gassy wetland smells!).

I: Wetland Characteristics

Zones:

- **Aquatic Zone**

- the area below the high water mark where two different types of aquatic plants grow:
 1. **Emergent Plants** – are rooted in soil under water but have leaves that grow above the water surface. They include cattails, rushes, and aquatic sedges.
 2. **Submerged Plants** – can both be rooted in soil or free-floating under water, and grow on or below the water surface. They include pondweeds, coontail, and water lilies.

- **Riparian Zone**

- the lush fringe of moisture-loving rushes, grasses, sedges, leafy plants, shrubs and trees that surrounds a wetland and is a transition between the aquatic zone and the drier upland. Soils are not waterlogged and the plants can stand only a little flooding. Trees provide shade for wetlands, fallen leaves add nutrients, and roots stabilize the shore. Riparian Zones also occur along rivers, creeks, and lakes.

Functions:

- **Flood Control**

- wetlands act like giant sponges by collecting runoff from melting snow and rain storms and then slowly releasing that water back into the surrounding ground and streams over time. Without wetlands, flood water would rush into streams and rivers and cause much erosion and flooding.

- **Mechanical Filtration**

- by slowing down the speed that runoff travels at, wetlands cause the dirt suspended in it to settle out. Then only clean water enters any waterways nearby.

- **Biological Filtration**

- cattails and bulrushes transport oxygen into their roots where micro organisms use it to break down fertilizers and other harmful chemical compounds into less harmful forms. While these microbes are at work cleaning the water, they release gases that create that telltale wetland aroma.



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II: Associated Plants and Animals

Emergent Plants Common Cattail Water Sedge Great Bulrush Mare's-tail Swamp Horsetail Submerged Plants Common Duckweed Coontail Greater Bladderwort Yellow Water lily Sago Pondweed Water Smartweed Fish * Bull Trout Northern Pike Minnow Prickly Sculpin Invertebrates Leeches Water Fleas	Riparian Plants Baltic Rush Common Horsetail Red-osier Dogwood Dwarf Birch Water Birch Willow Black Cottonwood Birds * Western Grebe Mallard Hooded Merganser Great-blue Heron Scuds Crayfish Mayflies Dragonflies Diving Beetles Caddis flies Midges	Northern Harrier Red-winged Blackbird Yellow Warbler Mammals Beaver Muskrat Mink Moose Reptiles and Amphibians * Western Painted Turtle Common Garter Snake Spotted Frog ** Northern Leopard Frog Water Striders Snails
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Rarity ranked as: *Blue or **Red listed in B.C.



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III: Some Examples of Animal and Plant Adaptations

- **Water Striders** are insect predators with sharp, pointy beaks and a special ability to skate on the surface of water. The force of the surface tension of the water holds them up and waxy hairs on their feet allow them to move gracefully. Their long, thin legs allow them to spread their weight over the water surface, which also helps to hold them up. Ripples set off by struggling insects caught in the surface film tell water striders where to find their prey. Those pointy beaks inject digestive juices into victims and suck out the resulting insect soup.
- **Predacious Diving Beetles** are streamlined, waxy insects that vary in size from small to huge and spend both their larval and adult periods of life underwater. The larvae, often called Water Tigers, are predators of insects and other aquatic creatures, as are the adults. Adult beetles have long, hairy back legs that move together at the same time to make them strong swimmers. Adults also have the ability to trap air from above the surface as air bubbles under their wings. These SCUBA tanks let them cruise underwater in pursuit of prey that they grab with sharp mandibles and gobble down.
- **Western Painted Turtles** are specialized at life in wetlands and shallow lakes. They have flippers for swimming, sharp claws and a beak for ripping and tearing food like fish, plants, invertebrates and dead animals, and an ability to hold their breath for a long time underwater while they dive. Dark shells act like solar panels as they bask on logs and rocks to warm up. They spend nights and winters quietly in the mud underwater where they cool right down and their heart beats very slowly. They are able to absorb enough oxygen through their skin in this inactive state. Western Painted Turtles are vulnerable and sensitive to disturbance and are on B.C.'s Blue List.
- **Water Fleas** are not really fleas at all, but tiny crustaceans that are related to crayfish. They swim with a large pair of second antennae, and eat algae and microscopic animals that they sweep into their mouths with a current of water they create by quickly waving their legs in the water. They are an important source of food for fish and water birds.
- **Pondweeds** are submerged aquatic plants that are adapted to life underwater. Seeds sprout in the wetland muck and grow into leafy, green plants below the water surface. New plants can also grow out of fleshy roots, or tubers, that over winter in the muck. Pondweeds can even flower underwater. The large seeds, tender leaves, and starchy tubers of pondweeds are important food for water birds, moose, muskrat, and beaver. Fish, reptiles, amphibians, insects, snails, and other invertebrates also use these plants for food and finding hiding places in.



Threats to Wetlands

- Wetlands have been heavily impacted in the Columbia Basin over the last 50 years. Hundreds of kilometers of river systems along the Kootenay and Columbia Rivers were **flooded by reservoirs**. In many communities water courses have been diked and channelled to avoid flooding.
- Riparian forests that once ribboned through the Basin along creeks and rivers have been **disturbed or replaced by roads, rail lines, and power lines or cleared for urban and commercial development**.
- Wetlands continue to be threatened with **being filled, drained, or polluted**. 70% of wetlands that originally existed near Canada's major cities and towns have already been destroyed. These habitats have routinely been given up in order to make room for more urban developments, agricultural land, roads, and industry.
- **Purple Loosestrife** is a noxious weed that has been introduced to North America from Europe. When let loose in the wild, it is extremely invasive and bullies the plants that are native to wetlands. Being so aggressive and able to produce thousands of seeds each, Purple Loosestrife can take over entire wetlands. This means that the native plants and all of the organisms that depend on those native species die out. Noxious weeds are a real threat to biodiversity throughout the Columbia Basin.

More recently, however, people have begun to have a better understanding about the value of wetlands, both because of the important functions wetlands perform (flood control, water filtration, etc.) and life support they provide to a vast variety and volume of living things.

Tips for Wetland Wanderers

- Bring along “bug” juice. To discourage mosquitoes and other biting insects wear long pants and long sleeved t-shirts.
- Be prepared to get your feet wet. Old boots, gum boots or tie-up runners are required. Be sure to bring along an extra pair of shoes and socks to change into.



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References for Further Research

British Columbia: A Natural History

By Richard Cannings and Sydney Cannings. Published by Greystone Books, Vancouver, 1996.

Available in bookstores, your local library or through inter-library loan.

An excellent, easy to read review of physical and natural environments in British Columbia

Pond Life: A Guide to Common Plants and Animals of North American Ponds and Lakes

By George K. Reid. Published by Golden Press, Racine, Washington, 1987.

Often available at nature centre bookstores, your local library or through inter-library loan.

A superb pocket guide of plants and animals commonly found in wetland communities.

Understanding Wetlands: A Wetland Handbook for British Columbia's Interior

By Bruno Delesalle. Published by Ducks Unlimited Canada, Kelowna, 1998.

Available by phoning 250-828-5141.

A readable, user-friendly, educational handbook providing information about Interior wetland and riparian systems and the plants and animals that live in them.

The Wetland Keeper's Handbook: A Practical Guide to Wetland Care

published by the B.C. Wildlife Federation, Vancouver, 1996.

Available from the B.C. Wildlife Federation, #303, 19292 60th Avenue, Surrey, B.C. V3S 8E5.

A program for people interested in looking after wetlands that aims to raise public awareness of wetland values and foster a conservation ethic.

Living Landscapes: Columbia Basin Website; www.livingbasin.com

a partnership project between the Columbia Basin Trust and Royal British Columbia Museum

An excellent source if up to date information about many aspects of the natural and cultural history of the Columbia Basin.



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