

The Myth of Abundance

Glossary

agriculture: the occupation, business, or science of cultivating the land, producing crops, and raising livestock.

aquifer: any rock or sediment that yields a useful amount of water through wells and springs.

atmospheric water: the water that exists in the atmosphere (air), either as water vapour or precipitation before reaching the earth's surface.

Basin: this is the land that drains all precipitation received as runoff or groundwater into the six main lakes and associated tributaries in the Okanagan Basin. The Okanagan Basin eventually drains into the Okanagan River near Osoyoos and then crosses the border into the United States.

Boil Water Advisory: public notice from water providers or Interior Health indicating a drop in water quality that requires users to boil their water before drinking or cooking with it.

canal: an artificial waterway constructed for use for irrigation, or for recreational use; also known as a diversion canal.

chlorine (Cl): a gaseous, poisonous, corrosive, greenish-yellow chemical element that combines with nearly every other element. It is widely used to purify water and as a disinfectant.

cistern: an underground tank for storing rainwater.

condensation: tiny drops of water that form on a cold surface such as a window when warmer air comes into contact with it. The process where a vapour loses heat and changes into a liquid.

contaminant: a substance, such as a toxin or chemical, that leaches into the ground, polluting it and possibly the groundwater and drinking water.

continental divide: a massive area of high ground in the interior of a continent, from either side of which a continent's river systems flow in different directions.

contour interval: the interval between contour lines on a map, or the altitude the interval represents.

contour line: a line on a map connecting points on a land surface that are the same elevation above sea level.

dam: a barrier that is built across a river or stream block, control, or redirect the flow of water (diversion dam), especially in order to create a reservoir.

desalinization: the process of removing salt from water, usually seawater, to produce potable water.

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dissolved oxygen: the amount of oxygen dissolved in water, in parts per million (ppm) by weight, or in milligrams per litre (mg/l). Low levels of dissolved oxygen can be disastrous for local fish and ecosystems.

drought: a long period of extremely dry weather when there is not enough rain for the successful growing crops or the replenishment of water supplies.

dugout: a depression excavated to collect rainwater and/or water from a neighbouring stream as a water supply for livestock; a common practice amongst farmers in the prairies.

effluent: liquid waste discharged from a sewage system.

evaporation: a process where water is changed from a liquid to a vapour.

evapotranspiration: the return of moisture to the through both evaporation from the soil and transpiration by plants.

fecal coliform: rod-shaped bacteria normally found in the colons of humans and animals and can become a serious contaminant when found in the food or water supply (e.g. E. coli).

flow rate: the volume of water that flows in a given amount of time, for example: m³/s (cubic metres second).

freshwater: inland waters, such as, rivers, ponds, wetlands, and lakes, with little or no salt content.

glacier: a large mass of ice formed on land by the compaction and recrystallization of snow creeping downwards due to the stress of its own weight, and surviving from year to year.

global warming: an increase in the world's temperatures, believed to be caused in part by the greenhouse effect and depletion of the ozone layer.

groundwater: the water (rain and snow) that infiltrates the ground, filling the cracks and pores within the underlying rock and sediment. This 'under ground' water completely fills the spaces within the rock and soil below the water table.

headwaters: the streams that make up the beginnings of a river.

habitat: the natural environment in which a plant or animal lives; such as a forest, prairies or wetlands.

hydroelectric (hydro) power: electrical energy generated by means of a power generator coupled to a turbine through which water passes.

icefield: an extensive area of interconnected glaciers in a mountain region; for example, Columbia Icefield.

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infiltration: the movement of water, into soil or porous rock.

irrigation: when the land is too dry to sustain an agricultural industry, water is moved from local creek and rivers through a system of canals and storage reservoirs, to supply water to farmers.

lake: a large body of water, in a depression, surrounded by land.

leaching: when water dissolves soluble, potentially hazardous, material and transports it into the ground and risking water supply contamination.

mountains: any part of the Earth's crust higher than a hill, generally projecting at least 300 m (1000 ft) above the surrounding land; for example, the Coast Range Mountains.

nitrate: a compound used as fertilizer that may consist of sodium nitrate, potassium nitrate or ammonium nitrate. Nitrate levels can be measured in soil and water.

pH: a measure of the acidity (pH<7) or alkalinity (pH>7) of a solution, such as vinegar, or a damp substance, such as soil.

phosphate: any salt formed by the reaction of a metal with phosphoric acid. Once found in detergents but phosphates are now more regulated due to the negative impact on water ecosystems.

plant transpiration: loss of water vapour through a plant's surface, especially through minute surface pores (stomata).

plume: referring to a pipe-like body of contaminant that has leached into the earth, possibly reaching the water table and contaminating the groundwater and potable water supply.

potable water: water that is safe and palatable for human use.

precipitation: rain, snow, or hail formed by condensation of moisture in the atmosphere that falls to the ground.

rain shadow: a very dry region on the side of a mountain range facing away from the wind (leeward side), where rainfall is noticeably less than on the windward side. The rain shadow falls just east of the Rocky Mountains onto the prairies, leaving the leeward hills and valleys relatively dry.

raw sewage: human and domestic waste matter from buildings, especially houses, that is carried away through sewers to be treated at special treatment facilities.

reservoirs: a large natural or artificial lake used for collecting and storing water for human consumption or agricultural use, such as the McKinley Landing /Glenmore Reservoir Kelowna

retention pond: a wetland created to store and filter runoff during rainstorms and rapid snowmelt.

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riparian area (green zones): parts of the landscape strongly influenced by water, flood plains adjacent to streams and rivers, where water-loving plants grow. Riparian areas are sensitive ecosystems that need to be managed carefully to prevent erosion.

river: a natural formation in which fresh water forms a wide stream that runs across the land until it reaches the sea or another area of water, such as, another river or lake.

saltwater: ocean or sea water with noticeable levels of salt (non-potable).

sewage (waste) treatment plant: a facility where sewage or waste water is collected, and cleaned before returning to a river and heading downstream .The Okanagan has many water treatment plants .

headworks: screens that remove large material from wastewater

primary clarifiers: used for settling and skimming

Bioreactors: good bugs that use sewage for nutrients

secondary clarifiers: removal of good bugs

digesters: anaerobic decomposition of sewage (i.e. bacteria)

disinfection UV: makes any remaining microorganisms sterile so they cannot reproduce and phases out chlorine

treated effluent: cleaned water returned to Okanagan Lake

sludge: biosolids in a slurry sent to settle

Ogogrow: takes treated biosolids to mix with yard waste and chipping end products to make a rich top dressing for lawns and gardens.

snowmelt: runoff produced when snow melts.

snowpack: The fresh snow deposited yearly that contributes to the melt waters leading to streams and rivers.

soil porosity: referring to the minute spaces within soil that enables it to absorb water.

stormwater: refers to all forms of precipitation (rain, snow, sleet) which becomes runoff or enters the earth as groundwater. People are encouraged to make better use of rooftop stormwater by collecting it in rain barrels or redirecting it directly onto gardens.

surface water: the part of precipitation appearing on the surface as runoff.

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transpiration: the loss of water vapour from a plant's surface through minute surface pores called stomata.

treated sewage: raw sewage treated at special treatment facilities. Experimental use of treated sewage to fertilize farmland is currently underway.

tributary: any stream that contributes water to another stream.

water conservation: the practice of protecting the current water supply by reduction of water consumption within the home, at work, in agriculture, or in industry (e.g. water-efficient appliances, toilets, irrigation systems, water-wise gardens).

water cycle: the constant circulation of water between atmosphere, land, and sea by evaporation, condensation, precipitation, and percolation through soils and rocks as groundwater.

water quality: The fitness of water for use, being affected by physical, chemical and biological factors. The quality of tap water in the Okanagan is directly linked to the water purveyors in each region

water table: the surface between the zone of water saturation or groundwater (below) and the zone of aeration (above).

water tower: a tower for water storage.

water treatment plant: a facility where water is collected, cleaned and made potable by a municipality for human consumption treatment before human use .

water well: a well that extracts groundwater for surface use, either for irrigation, industrial use or as a potable water source.

watershed: another name for a drainage basin where water drains and collects into a series of tributaries feeding into a common river.

wetland: a marsh, swamp or other area of land where the soil near the surface is saturated or covered with water, especially one that forms a habitat for wildlife.

Appendix: Activity Support

Okanagan Basin Natural History



R. Turner

Okanagan Lake and Peace Arch

Geological Survey of Canada Miscellaneous Report 93

Landscape and Natural Features

Deep river valleys and high forested plateaus with a multitude of lakes, ponds, and wetlands create the landscape of the Okanagan Basin. Okanagan Lake, at 120 kilometers long, dominates the Basin and provides an ice-free haven for a multitude of waterfowl in winter. The wonderful variety of habitats found in the Basin provides the largest range of wildlife species found anywhere in the province.

Origins of the Landscape

The rocks that lie under the Basin include examples of many of the rock formations of the interior of the province, developing over a period of 200 million years. The basic form of the present landscape was completed when the last major basalts poured out 1 million years ago.

The rolling landscape we see today was created by the actions of huge ice sheets that covered the area at least four times. The last ice sheet to cover the ancient land surface developed about 15,000 years ago and was as much as 1000 metres thick. Only the highest mountain peaks showed above the sea of ice.

Temperatures started to warm up about 12,000 years ago and the ice gradually melted away. Huge quantities of melt water washed over and through the ice, moving boulders, rocks, and gravel and depositing them under and beyond the edge of the ice. Many valleys that had been deepened by the grinding of the ice were scoured out by water. The ancient land surface was transformed forever.

By about 10,000 years ago most of the ice was gone leaving a rolling landscape of hills, deep valleys, rocky outcrops and lakes. In many places large blocks of ice filled the valleys and till-laden rivers and streams worked their way around them. Many of the gently sloping terraces found along many valley sides were deposited by these post-glacial rivers. X., Y, Z * are remnants of the ancient landscape. *Need some local examples – will find

- Glacial till, varying from fine sand to coarse gravels, and from 1m to 15m thick, was left behind by the ice and water and forms the base on which our soils have developed.
- Drumlins are egg-shaped mounds of till that formed behind a large object, slowing its progress.
- Eskers are long, winding ridges of rocks and gravels deposited by rivers that ran under the ice.
- Kettle holes developed as blocks of ice left in depressions melted on site, creating many of our lakes, ponds, and wetlands.
- Silt bluffs are the remains of the fine deposits that poured from rivers and streams into ice-dammed lakes towards the end of the glacial period. Thick springtime deposits can be seen along with thinner fall deposits.

The Okanagan Basin is shaped like a deep, elongated bowl with the highest points in the Monashee Mountains of the northeast (over 3,000m) and the lowest point at Osoyoos Lake (300 m). The main drainage is southward from the divide near Armstrong through the mainstem lakes including Okanagan, Skaha, Vaseux and Osoyoos Lakes. The major tributaries of Okanagan Lake, listed in order of decreasing annual discharge are Mission, Vernon, Trout, Penticton, Equisis, Kelowna, Peachland and Powers Creeks.

Climate of the Basin

We live in the driest part of the province. Warm summers with fairly low humidity and relatively mild winters provide an attractive environment for a wide variety of plants.

The moist Pacific air that brings our weather drops most of its moisture on the west side of the Coast Mountains, bringing only 28 inches to the western portion of the Basin compared to 40 inches in the northeast area. Most of our precipitation comes in the form of winter rain and snow or short, heavy thunderstorms in summer.

In the valley bottom precipitation increases from south to north with Oliver having an annual average of only 10.7 inches compared to 17 inches for Armstrong. In the high plateau region near Kelowna, the average annual precipitation as measured at McCulloch, is 27 inches.

Conversely, mean air temperature, length of growing season, frost-free period, and the total degree-days during the growing season decreases from south to north.

The hot, very dry air of summer, is characteristic of the Okanagan Valley. Even the continental polar air, which invades the valley from the north during the winter is usually warmed during its movement into more southerly latitudes, and as a result, the Okanagan Valley does not undergo long periods of continuous cold such as occur in the more northerly parts of the province.

The difference in average temperature in the South Okanagan between the warmest month (July) and the coldest month (January) is about 35° to 45 F. while the northern area, (from Westbank to Grindrod) and the mountainous plateau surface as represented by McCulloch are about five degrees cooler. January mean temperatures are typically from 25° to 28° F. for the South Okanagan and from 21° to 26° F for the rest of the Valley.

Occasional irruptions of hot dry air from the Great Basin, to the south, in the summer. They bring clear skies and very warm temperatures. In winter and early spring there are frequent outbreaks of cold, dense Arctic air because there is no effective barrier in the north. However, such events are less frequent than on the plateaus further north.

Soils in the Basin

As outlined in an earlier section moist soils in the Okanagan basin originated from glacial deposits. As a result of the influence of organic matter, topography, climate and time, this glacial till has many places formed cultivable soils. It is estimated that there are 77,000 acres of arable land in the Okanagan Basin.

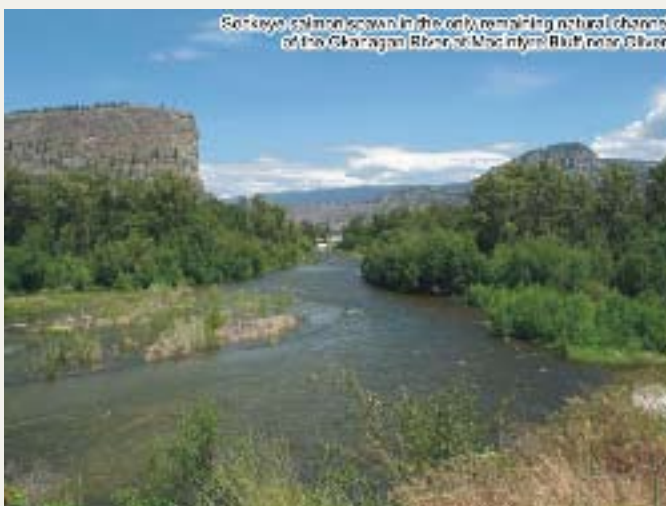
Five major soil groups exist within the Okanagan Basin—namely, brown, Dark Brown, Black, Brown Podzolic-Grey Wooded and Ground Water soils.

Vegetation and Wildlife in the Basin

Vegetation changes as the combination of climate, geology, soils and topography changes. Four distinct forested zones are identified and two non-forested zones.

Grasslands

Grasslands are found in the lowest elevations in areas that have too little precipitation for trees to grow. Grasses came to dominate over other species, such as trees, because they are better able to thrive in the hot, dry climate of the interior. They take advantage of moisture in the soil in spring and have long roots to search for water well below the surface. Interspersed between the plants is a thin fragile layer of lichens and mosses called cryptogamic crust that helps protect the soil from erosion. Aspect, topography and soils play an important role in the distribution of plant species throughout the grasslands.



R. Turner

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Away from the cooling influence of the ocean, the Basin has hot summers, especially in the valley bottoms. This means that, at the lower elevations, soils dry out very early in the summer and only plants that have adapted to the hot dry conditions are able to thrive. Grasses with deep root systems and other similarly drought-adapted flowers and shrubs grow in the grasslands. At the lowest elevation, common rabbit brush, Sandberg's bluegrass, non-native needle-and-thread grass, pasture sage, brittle prickly-pear cactus and low pussy toes are common in distributed areas. Plants such as sagebrush, buttercup and yellow bells come into bloom even as the snow is melting in the spring and all plants have flowered and dried by early June. Higher up the slopes, arrow-leaved balsamroot, nodding onion, Thompson's paintbrush, mariposa lily are found, while such drought-loving plants as prickly-pear cactus may occur on drier sights. Aspen copse patches occur on moister soils and giant wild rye on moist seepage sites.

Wildlife

California bighorn sheep, yellow-bellied marmot and mountain bluebirds, Great Basin Spadefoot toad, Raptors and a multitude of butterflies are only some of the species to be seen. Mule deer are the most abundant large ungulate, although the white-tailed deer has been extending its range westward. California bighorn sheep occur on the rugged grasslands throughout the Okanagan Valley. Characteristic small mammals include spotted bats, Nuttall's cottontails, white-tailed jack rabbits, Great Basin pocket mice and western harvest mice. This has the greatest diversity of birds in the interior of British Columbia and the most breeding species; it holds 74% of all bird species known to occur and 70% of those species known to breed in the province. It is the centre of breeding abundance in the province for Swainson's Hawk, California Quail, Mourning dove, Burrowing Owl, Long-eared owl, White-throated Swift, Lewis' Woodpecker, Williamsons's Sapsucker, Pygmy Nuthatch, Western Kingbird, Yellow-breasted chat and Lark Sparrow. Some species breed nowhere else in British Columbia; Ferruginous Hawk, Prairie Falcon, Gray Partridge (introduced), Chukar (introduced), California Gull, Flammulated Owl, common Poorwill, Black-chinned Hummingbird and white-headed Woodpecker; others breed nowhere else in Canada; Canyon Wren, Sage thrasher and Gray Flycatcher.



Geological Survey of Canada
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The Racer and Western Rattlesnake are characteristic reptiles. Tiger Salamanders and Great Basin Spadefoot Toads are found nowhere else in the province. Anadromous and freshwater fish as well as anadromous species including, Pacific Lamprey, Steelhead, Chinook Salmon, Sockeye Salmon and White Sturgeon. Freshwater fish include, Rainbow Trout (both native and wide transplanted populations), Brook Trout (introduced), Dolly Varden, Mountain Whitefish, Lake Chub, Redside Shiner and Northern Squawfish.

Hot, dry summers and warm winters create ideal conditions in the southern end of the Okanagan for species normally found much further south. The area is the Canadian hotspot for red and blue listed species. Many are associated with the ever-dwindling antelope-brush ecosystems south of Skaha Lake. Brewer's Sparrows, Sage Thrashers, American Badger, Scorpions and insect rarities may be seen.

Dry Forests

Higher annual precipitation, (10-20 inches) broadly separates the Dry forests from the Grasslands. Ponderosa Pine grows in the lower elevations as individual trees or in open stands, usually with an understory of bunch grasses, shrubs and other plants. Douglas Fir grows in the higher elevations, changing to Lodgepole Pine, both with an understory of Pinegrass and other shrubs. Paper Birch, Trembling Aspen and Alder are often found on moist sites on valley bottoms or near lake shores. Spring blooming plants are abundant when the winter snows have melted.

Most of the lakes, ponds and wetlands are found in the grasslands and dry forests, adding variety to the landscape and the vegetation. A diversity of water-influences plant communities and areas of wetlands that provide habitat for nesting waterfowl.

The forested plateaus to the west and east of Okanagan Lake are dotted with lakes and wetlands. Ponderosa Pine and Douglas Fir forests of the valley bottom give way to extensive areas of Lodgepole Pine and in places Western Larch. Lush Spruce fir forests are found in the higher elevations to the east, where rain and snowfall are plentiful. Mule Deer, Ground Squirrels, Pikas and occasionally Mountain Caribou and a Wolverine can be seen in the high mountain areas.

The highest elevation forests, the Sub-Alpine where Lodgepole, Alpine Larch and Whitebark Pine are the dominant tree species. It is typically associated with the plateau surface and mountain slopes on both sides of the valley. Cooler temperatures and 20-30 inches of precipitation are characteristic. It is typically forested with open grassland found scattered patches on drier south-facing slopes.

Englemann Spruce and Alpine Fir are the most common variety of trees between 4,000 and 6,000 feet elevation.

Burned or logged-over areas are frequently characterized by extensive stands of sub-dominant Lodgepole Pine. The forest undergrowth consists mostly of grasses and shrubs.

Although not extensive in the basin. The Alpine Tundra zone occurs in some areas above 6,000 feet where sub-alpine species such as Heather, Dwarf Juniper, Willow etc. grow.

Appendix: The Water Cycle, Panel 6
 Climate Change Station 1
 DRAFT

Temperature: Change in Annual Temperature (°C)



Change in Maximum and Minimum Temperature, 1895-1995 (°C per century)

[BC Ministry of Environment](http://www.env.gov.bc.ca/air/climate/indicat/maxmin_ata1.html)

http://www.env.gov.bc.ca/air/climate/indicat/maxmin_ata1.html

Night-time minimum temperatures in most regions of B.C. are warmer on average than they were a century ago, particularly in spring and summer. Higher minimum temperatures in spring may increase the length of the frost-free season. In summer they may prevent buildings from cooling down during the night.

Key Concept: The Water Cycle, Panel 6
 Climate Change Appendix ?

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BC Ministry of Environment
http://www.env.gov.bc.ca/air/climate/indicat/temp_id1.html
 e-mail: jpp@mail.qp.gov.bc.ca
 fax: 250-356-0846
ATTACHED

Appendix: The Water Cycle, Panel 6 Climate Change Station 2

Water Supply

The Okanagan's Changing Climate

Observations show the valley's climate is changing. It appears there is a definite shift to a warmer and wetter climate, making it more rainfall-dominated. Some monitoring stations have registered significant winter and spring temperature increases. Daily maximum temperatures have increased, however, daily minimum temperatures are rising more rapidly. During the last century, the number of frost-free days has increased by about 3.1 days per decade. Regional scenarios developed using different Global Climate Models show that winter and summer mean temperatures will increase by two to four degrees Celsius in the coming decades.

Precipitation patterns are also changing. Previous decades have seen an increase in spring and summer rainfall. Monitoring stations at lower elevations have shown a lower percentage of precipitation falling as snow, and the snow water equivalent was reduced in previous decades. Snowmelt also seems to be occurring earlier than previously observed. Scenarios suggest that mean winter precipitation will increase by five to 25 percent. Summer mean amounts are projected to decrease by five to 20 percent or perhaps even more.

[Water Centric Planning, December 2005](http://www.waterbucket.ca/wcp/index.asp?sid=49&id=24&type=single)

<http://www.waterbucket.ca/wcp/index.asp?sid=49&id=24&type=single>



Key Concept: The Water Cycle, Panel 6
Climate Change Appendix ?

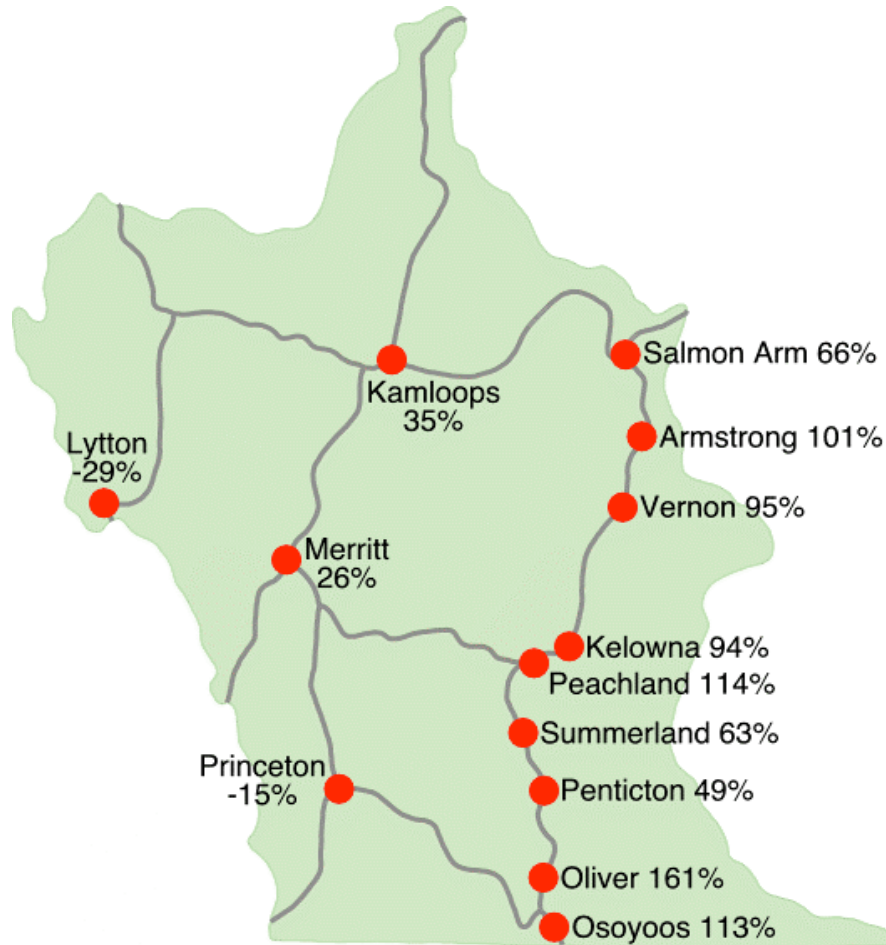
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WaterBucket.ca
Program Coordinator (Kim
Stephens) for the Water
Sustainability Action Plan for
British Columbia, at
sustainabilitycoordinator@shaw.ca

Appendix: The Water Cycle, Panel 6
Climate Change Station 3

Water Demand: Population Growth

Almost 80 % of the population of British Columbians live in urban areas. Many of these residents of British Columbia reside in the lower mainland, southern Vancouver Island, and the Okanagan Valley. All of these areas are growing quite rapidly. Between the years 1976 and 2003, the growth rate of Kelowna, the largest urban center in the Thompson-Okanagan, was 94 %.



In the Thompson-Okanagan, the highest urban population growth is occurring in the Okanagan Valley. The illustration above shows growth rates for this region of British Columbia between 1976 and 2003 for select urban centers. During this same period, the total population of Canada increased by 35 %.

[Living Landscapes](http://www.livinglandscapes.bc.ca/thomp-ok/env-changes/land/ch4.html)

<http://www.livinglandscapes.bc.ca/thomp-ok/env-changes/land/ch4.html>

Key Concept: The Water Cycle, Panel 6

Climate Change Appendix ?

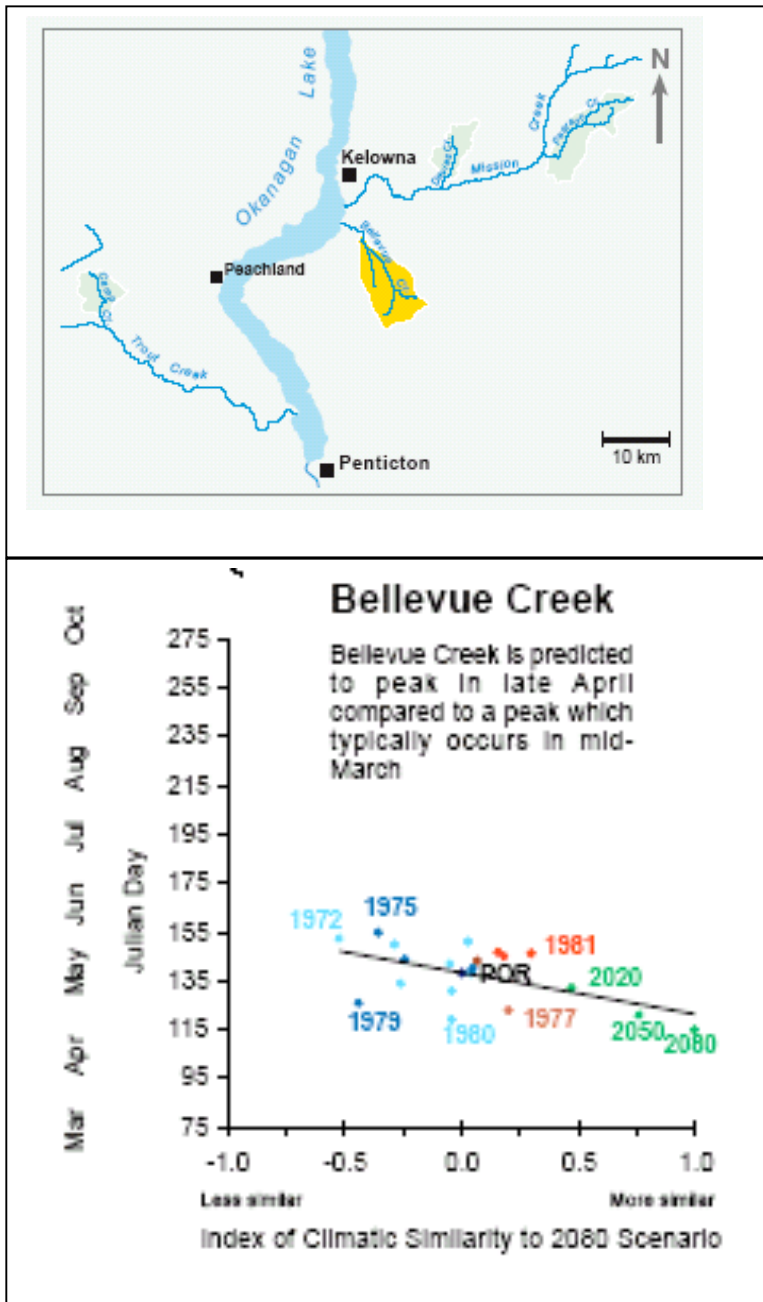
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Appendix: The Water Cycle, Panel 6 Climate Change Station 4

Stream Flow: Bellevue Creek



Bellevue Creek near Okanagan Mission (WSC station id 08NM035) is a tributary to Okanagan Lake South of Kelowna. The gauged catchment area is 77.2 km². This is a very steep catchment with a range of elevation from 700 to 2200m.

[Water Management and Climate Change in the Okanagan Basin
http://adaptation.nrcan.gc.ca/projdb/pdf/46_e.pdf](http://adaptation.nrcan.gc.ca/projdb/pdf/46_e.pdf)

Key Concept: The Water Cycle, Panel 6
Climate Change Appendix ?

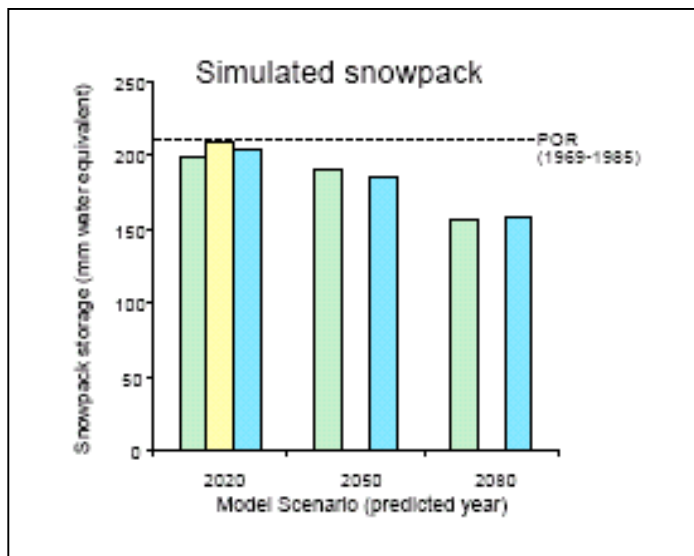
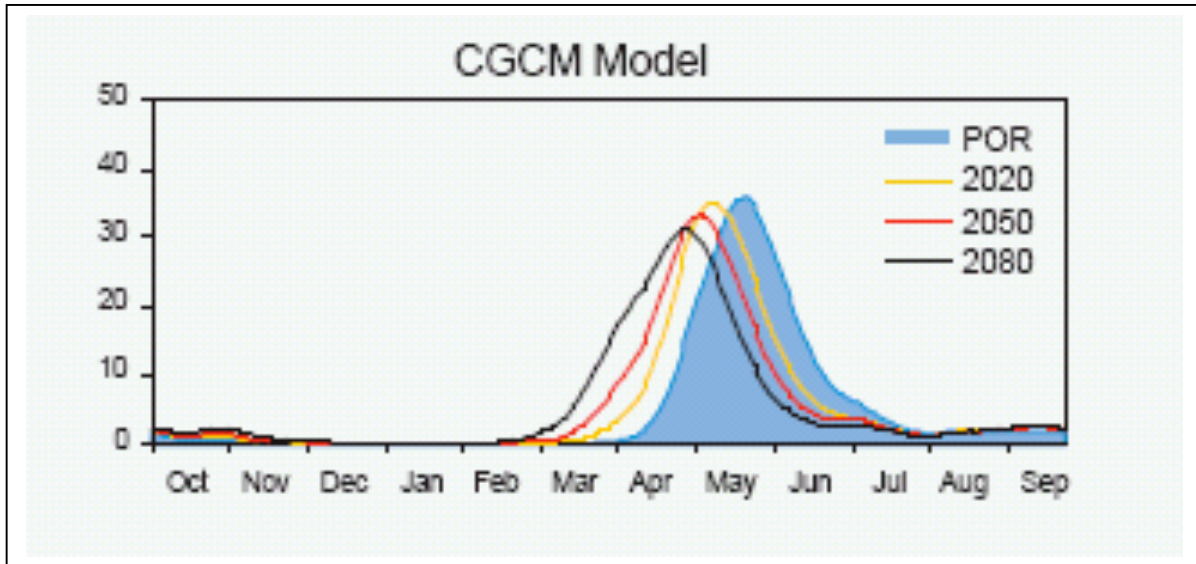
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[Water Management and Climate Change
in the Okanagan Basin
http://adaptation.nrcan.gc.ca/projdb/pdf/46_e.pdf](http://adaptation.nrcan.gc.ca/projdb/pdf/46_e.pdf)
Edited by Stewart Cohen & Tanuja Kulkarni, 2001
Data from pages 54 & 68, Bellevue Creek
For further information, please contact Stewart Cohen at: scohen@sdri.ubc.ca

Appendix: The Water Cycle, Panel 6
Climate Change Station 4

Stream Flow: Bellevue Creek

Predicted Changes in Annual Stream Flow
(POR = Period of Record, 1990)



[Water Management and Climate Change in the Okanagan Basin](http://adaptation.nrcan.gc.ca/projdb/pdf/46_e.pdf)
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Data from pages 54 & 68, Bellevue Creek
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Appendix: The Water Cycle, Panel 6 Animal Habitat Station 5

Threatened and Endangered Species of the Thompson-Okanagan

Mammals

There are numerous mammal species in the Okanagan either classified as threatened or endangered. Some of these species cannot be found anywhere else in British Columbia and some cannot be found anywhere else in Canada.

- a) **Pallid Bat** (*Antrozous pallidus*)
- b) **Spotted Bat** (*Euderma maculatum*)
- c) **Badgers** (*Taxidia taxus*)
- d) **Nuttall's Cottontail** (*Sylvagus nuttalli*)
- e) **Western Harvest Mouse** (*Reithrodontomys megalotis*)
- f) **White Tailed Jackrabbits** (*Lepus townsendii*)

Birds

Bird populations in the Okanagan region are primarily effected by urbanization and agricultural practices. The riparian habitat, especially that along creeks that drain into the lakes or Okanagan River is a popular farming area and development site that affects the breeding habitat for many birds. Birds in the Thompson Okanagan region that are presently classified as threatened or endangered include:

- a) **Western Screech Owl** (*Otus kennicotti*)
- b) **Lewis' Woodpeckers** (*Melanerpes lewis*)
- c) **Burrowing Owl** (*Athene cunicularia*)
- d) **Flammulated Owl** (*Otus flmmeolus*)
- e) **Peregrine Falcons** (*Falco peregrinus anatum*)
- f) **Grasshopper Sparrow** (*Ammodramus savannarum*)
- g) **Prairie Falcon** (*Falco mexicanus*)
- h) **Sage Thrasher** (*Oreoscoptes montanus*)
- i) **Yellow Breasted Chat** (*Icteria virens*)

Reptiles

The Thompson Okanagan area has the highest reptilian species density for British Columbia. Some biologists believe that the region south of Penticton is the most likely place for the discovery of a reptile species new to the province. Reptiles at risk in the Okanagan include:

- a) **Short-horned Lizard** (*Phrynosoma douglasii*) :
- b) **Nightsnake** (*Hypsiglena torquata*)
- c) **Short-Horned Lizard** (*Phrynosoma douglasii*)
- d) **Western Rattlesnake** (*Crotalus viridis*)

Amphibians

While amphibians are generally associated with damp, aquatic ecosystems there are some species that survive in the dry valley of the province's southern interior. Amphibians at risk in the Okanagan Valley are mainly of this type:

- a) **Great Basin Spadefoot Toad** (*Scaphiopus intermontanus*)
- b) **Tiger Salamander** (*Ambystoma tigrinum*)

[Living Landscapes](http://www.livinglandscapes.bc.ca/thomp-ok/env-changes/land/ch4.html)

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Key Concept: The Water Cycle, Panel 6

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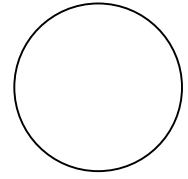
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Wetlands - Glenmore Highlands, Kelowna

**Appendix: The Water Cycle, Panel 6
Forests Station 6**

Forests circle from
poster



Forests are vital to watershed health and wildlife needs. Most of our country's freshwater supply originates in forests. Protecting the water running through the land, and the wildlife living on it, is critical. In 42 percent of Canada's large forested watersheds, development activities are taking place in over half the watershed area. Some development activities are evident in approximately 95 percent of Canada's watersheds.



Appendix: The Water Cycle, Panel 6 Forests Station 6

Beetle scenario chilling

Source: Kelowna Daily Courier, Oct 2005 By Don Plant The Okanagan Sunday

KELOWNA -- Imagine the Central Okanagan as a barren grassland without ponderosa pines. An environmental group is raising that scenario as the western pine beetle destroys more urban forests and threatens to defoliate the region over the next few years. Like its northern cousin, the mountain pine beetle, the western variety has eaten its way into parks, Crown forests and people's yards. Environmental consultant Richard Drinnan says if all levels of government, industry and landowners don't take on the problem this winter, the beetle could ravage the Central Okanagan landscape to the same extent as in Prince George, where 90 per cent of the trees are dead or dying

"If we don't hit it hard by next spring, it will be out of control," Drinnan said Friday. "I believe the western pine beetle has the potential to defoliate 80 to 90 per cent of the trees in the lower Valley bottom of the Central Okanagan

"Without those trees, our area will turn into a grassland ecosystem similar to the Osoyoos or Wenatchee area." If that happens, the economic impact could be huge. Tourism is a major engine of Kelowna's economy. The value of the landscape will drop as the city's prominent tree species withers away. The green winter landscape will turn brown, leaving scrub and a few fir trees

"Do tourists want to see a brown winter landscape all year round?" Drinnan asked

The loss of trees would affect the city's air quality because the pines recycle oxygen. People with breathing problems would suffer because they'd inhale more dust and particulates. Banks would erode because the tree roots provide stability.



Key Concept: [The Water Cycle, Panel 6](#)
[Climate Change Appendix ?](#)

Okanagan Basin Waterscape Poster – Middle School Teacher's Guide

Byline: Don Plant, Source: The Okanagan Sunday
Page: A1 / FRONT, Edition: Final
Okanagan Weekender - Sun, Oct 16, 2005

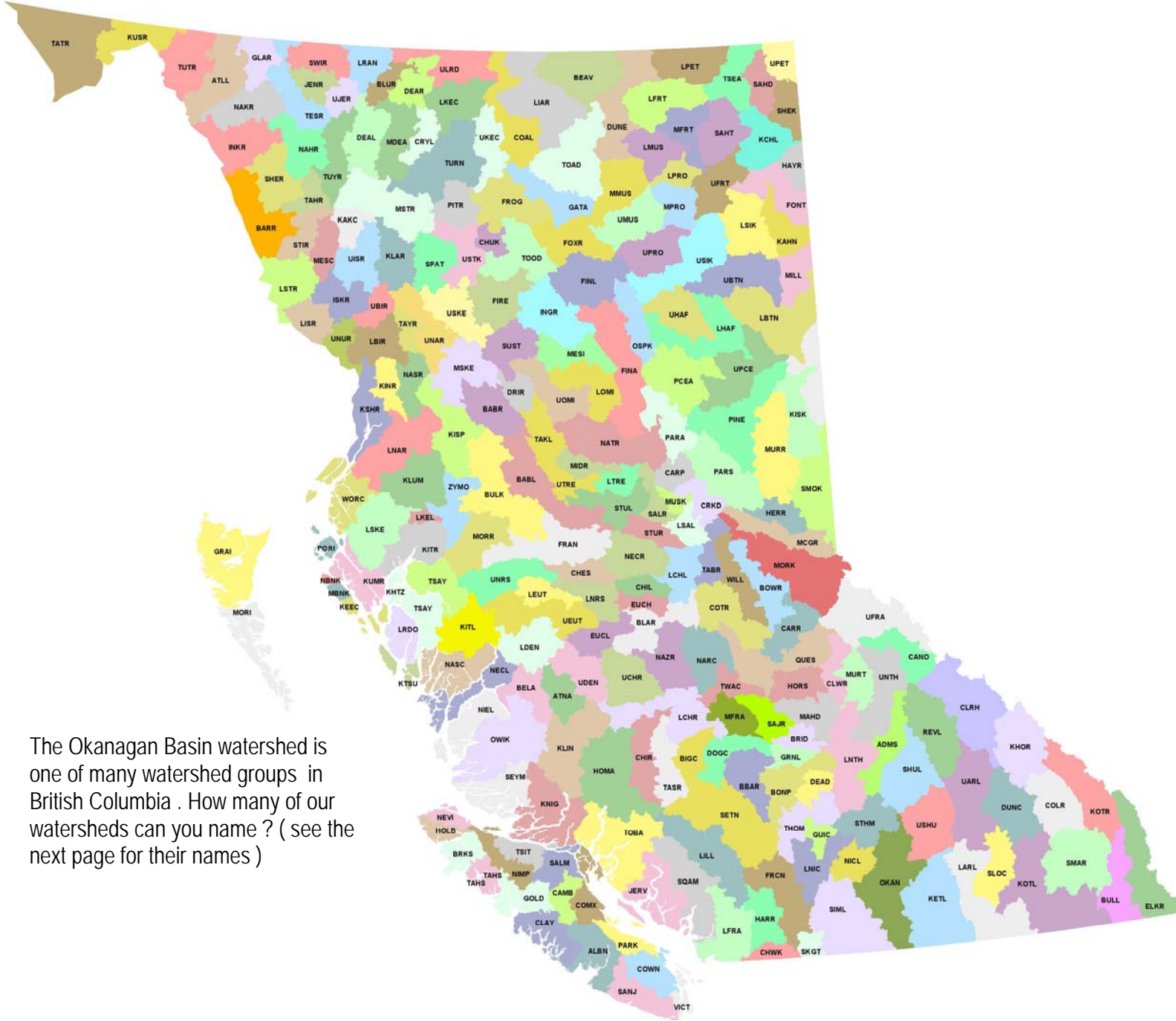
Alison Yesilcimen - Publisher -
Alison.Yesilcimen@ok.bc.ca
(250) 470-0785

Water log

How many times each day

WHAT YOU DO	1	2	3	4	5	6	7	Total times	Average	Actual	Total
In the Bathroom 65%											
<input type="checkbox"/> toilet flushes									x 18 L		
<input type="checkbox"/> showers									x 100 L		
<input type="checkbox"/> baths									x 60 L		
<input type="checkbox"/> teeth brushing									x 10 L		
<input type="checkbox"/> shaving									x 20 L		
In the Kitchen 10%											
<input type="checkbox"/> cooking									x 20 L		
<input type="checkbox"/> dishes by hand									x 35 L		
<input type="checkbox"/> dishwasher									x 30 L		
In the Laundry Room 20%											
<input type="checkbox"/> washing									x 225 L		
In the Outdoors											
<input type="checkbox"/> Car washes									x 400 L		
<input type="checkbox"/> Gardens/ lawn watering <small>(record number of minutes)</small>									x 35 L/min		
Other											
<input type="checkbox"/> _____									estimate		
								Total Weekly			

Watershed Groups in BC



The Okanagan Basin watershed is one of many watershed groups in British Columbia . How many of our watersheds can you name ? (see the next page for their names)

Watershed Group Name Key

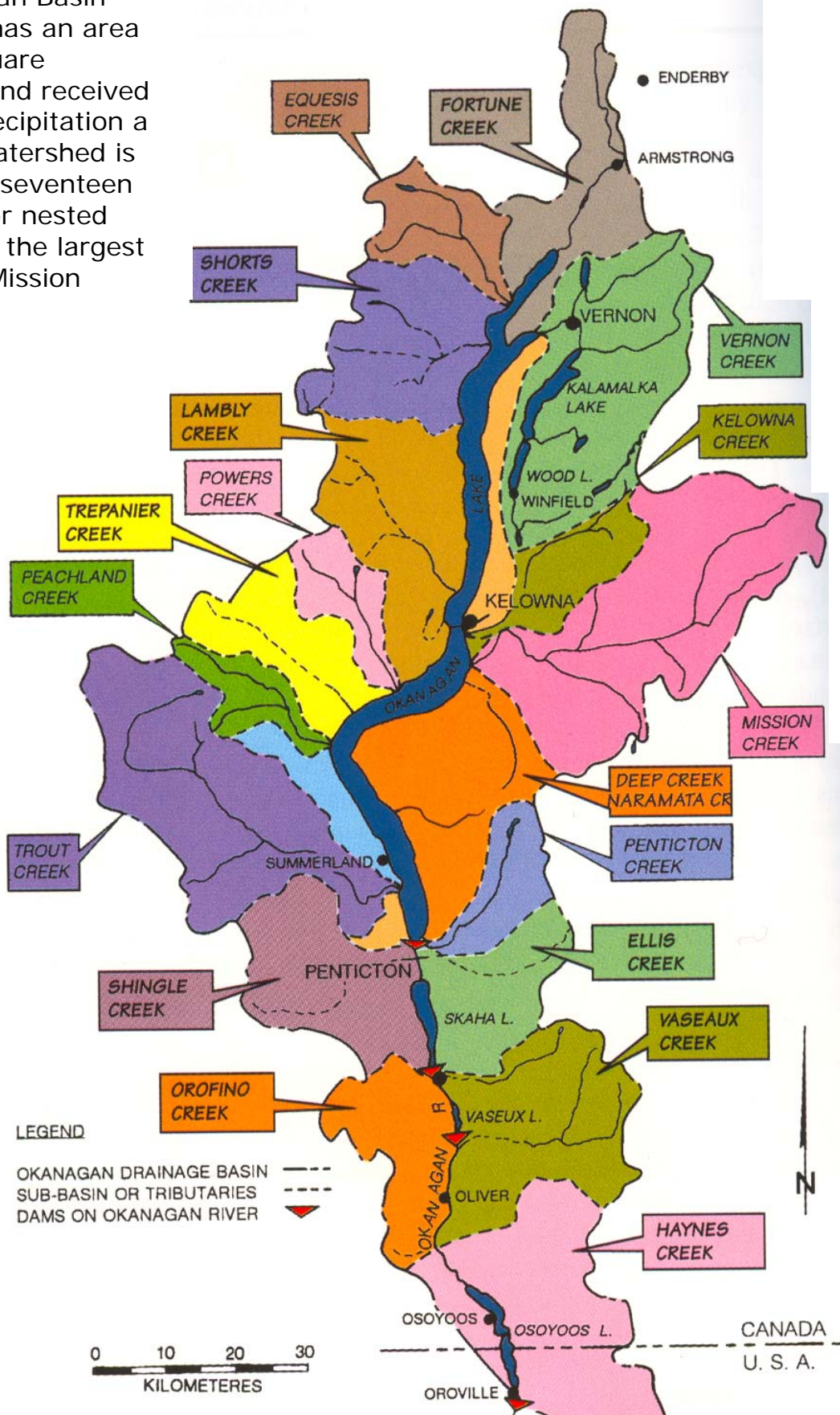
ADMS - ADAMS RIVER	GUIC - GUICHON CREEK	LSKE - LOWER SKEENA RIVER	SLOC - SLOCAN RIVER
ALBN - ALBERNI INLET	HARR - HARRISON RIVER	LSTR - LOWER STIKINE RIVER	SMAR - ST. MARY RIVER
ATLL - ATLIN LAKE	HAYR - HAY RIVER	LTRE - LOWER TREMBLEUR LAKE	SMOK - SMOKY RIVER
ATNA - ATNARKO RIVER	HERR - HERRICK CREEK	MAHD - MAHOOD LAKE	SPAT - SPATZIZI RIVER
BABL - BABINE LAKE	HOLB - HOLBERG	MBNK - MIDDLE BANKS ISLAND	SQAM - SQUAMISH
BABR - BABINE RIVER	HOMA - HOMATHCO RIVER	MCGR - MCGREGOR RIVER	STHM - SOUTH THOMPSON RIVER
BARR - BARRINGTON RIVER	HORS - HORSEFLY RIVER	MDEA - MIDDLE DEASE RIVER	STIR - STIKINE RIVER
BBAR - BIG BAR CREEK	INGR - INGENIKA RIVER	MESC - MESS CREEK	STUL - STUART LAKE
BEAV - BEAVER RIVER	INKR - INKLIN RIVER	MESI - MESILINKA RIVER	STUR - STUART RIVER
BELA - BELLA COOLA RIVER	ISKR - ISKUT RIVER	MFRA - MIDDLE FRASER	SUST - SUSTUT RIVER
BIGC - BIG CREEK	JENR - JENNINGS RIVER	MFRT - MIDDLEW FORT NELSON RIVER	SWIR - SWIFT RIVER
BLAR - BLACKWATER RIVER	JERV - JERVIS INLET	MIDR - MIDDLE RIVER	TABR - TABOR RIVER
BLUR - BLUE RIVER	KAHN - KAHNTAH RIVER	MILL - MILLIGAN CREEK	TAHR - TAHLTAN RIVER
BONP - BONAPARTE RIVER	KAKC - KAKIDDI CREEK	MMUS - MIDDLE MUSKWA RIVER	TAHS - TAHSIS
BOWR - BOWRON	KCHL - KOTCHO LAKE	MORI - MORSBY ISLAND	TAKL - TAKLA LAKE
BRID - BRIDGE CREEK	KEEC - KEECHA CREEK	MORK - MORKILL RIVER	TASR - TASEKO RIVER
BRKS - BROOKS PENINSULA	KETL - KETTLE RIVER	MORR - MORICE RIVER	TATR - TATSHENSHINI RIVER
BULK - BULKLEY RIVER	KHOR - KICKING HORSE RIVER	MPRO - MIDDLE PROPHET RIVER	TAYR - TAYLOR RIVER
BULL - BULL RIVER	KHTZ - KHUTZE RIVER	MSKE - MIDDLE SKEENA RIVER	TESR - TESLIN RIVER
CAMB - CAMPBELL RIVER	KINR - KINSKUCH RIVER	MSTR - MIDDLE STIKINE RIVER	THOM - THOMPSON RIVER
CANO - CANOE REACH	KISK - KISKATINAW RIVER	MURR - MURRAY RIVER	TOAD - TOAD RIVER
CARP - CARP LAKE	KISP - KISPIOX RIVER	MURT - MURTLE LAKE	TOBA - TOBA INLET
CARR - CARIBOO RIVER	KITL - KITLOPE RIVER	MUSK - MUSKEG RIVER	TOOD - TOODOGGONE RIVER
CHES - CHESLATTA RIVER	KITR - KITIMAT RIVER	NAHR - NAHLIN RIVER	TSAY - TSAYTIS RIVER
CHIL - CHILAKO RIVER	KLAR - KLAPPAN RIVER	NAKR - NAKINA RIVER	TSEA - TSEA RIVER
CHIR - CHILKO RIVER	KLIN - KLINAKLINI RIVER	NARC - NARCOSLI CREEK	TSIT - TSITIKA RIVER
CHUK - CHUKACHIDA RIVER	KLUM - KALUM RIVER	NASC - NASCALL RIVER	TURN - TURNAGAIN RIVER
CHWK - CHILLIWACK RIVER	KNIG - KNIGHT INLET	NASR - NASS RIVER	TUTR - TUTSHI RIVER
CLAY - CLAYOQUOT	KOTL - KOOTENAY LAKE	NATR - NATION RIVER	TUYR - TUYA RIVER
CLRH - COLUMBIA REACH	KOTR - KOOTENAY RIVER	NAZR - NAZKO RIVER	TWAC - TWAN CREEK
CLWR - CLEARWATER RIVER	KSHR - KSHWAN RIVER	NBNK - NORTH BANKS ISLAND	UARL - UPPER ARROW LAKE
COAL - COAL RIVER	KTSU - KITASU BAY	NECL - NECLEETSCONNAY RIVER	UBIR - UPPER BELL-IRVING RIVER
COLR - COLUMBIA RIVER	KUMR - KUMOWDAH RIVER	NECR - NECHAKO RIVER	UBTN - UPPER BEATTON RIVER
COMX - COMOX	KUSR - KUSAWA RIVER	NEVI - NORTHEAST VANCOUVER ISLAND	UCHR - UPPER CHILCOTIN RIVER
COTR - COTTONWOOD RIVER	LARL - LOWER ARROW LAKE	NICL - NICOLA RIVER	UDEN - UPPER DEAN RIVER
COWN - COWICHAN	LBIR - LOWER BELL-IRVING RIVER	NIEL - NIEL CREEK	UEUT - UPPER EUTSUK LAKE
CRKD - CROOKED RIVER	LBTN - LOWER BEATTON RIVER	NIMP - NIMP KISH RIVER	UFRA - UPPER FRASER RIVER
CRYL - CRY LAKE	LCHL - LOWER CHILAKO RIVER	OKAN - OKANAGAN RIVER	UFRT - UPPER FORT NELSON RIVER
DEAD - DEADMAN RIVER	LCHR - LOWER CHILCOTIN RIVER	OSPK - OSPIKA RIVER	UHAF - UPPER HALFWAY RIVER
DEAL - DEASE LAKE	LDEN - LOWER DEAN RIVER	OWIK - OWIKENO LAKE	UISR - UPPER ISKUT RIVER
DEAR - DEASE RIVER	LEUT - LOWER EUTSUK LAKE	PARA - PARSNIPI ARM	UJER - UPPER JENNINGS RIVER
DOGC - DOG CREEK	LFRA - LOWER FRASER	PARK - PARKSVILLE	UKEC - UPPER KECHIKAR RIVER
DRIR - DRIFTWOOD RIVER	LFRT - LOWER FORT NELSON RIVER	PARS - PARSNIPI RIVER	ULRD - UPPER LIARD RIVER
DUNC - DUNCAN LAKE	LHAF - LOWER HALFWAY RIVER	PCEA - PEACE ARM	UMUS - UPPER MUSKWA RIVER
DUNE - DUNEDIN RIVER	LIAR - LIARD RIVER	PINE - PINE RIVER	UNAR - UPPER NASS RIVER
ELKR - ELK RIVER	LILL - LILLOET	PITR - PITMAN RIVER	UNRS - UPPER NECHAKO RESERVOIR
EUCH - EUCHINIKO RIVER	LISR - LOWER ISKUT RIVER	PORI - PORCHER ISLAND	UNTH - UPPER NORTH THOMPSON RIVER
EUCL - EUCHINIKO LAKE	LKEC - LOWER KECHIKA RIVER	QUES - QUESNEL RIVER	UNUR - UNUK RIVER
FINA - FINLAY ARM	LKEL - LAKELSE	REVL - REVELSTOKE LAKE	UOMI - UPPER OMINECA RIVER
FINL - FINLAY RIVER	LMUS - LOWER MUSKWA RIVER	SAHD - SAHDOANAH CREEK	UPCE - UPPER PEACE RIVER
FIRE - FIRESTEEL RIVER	LNAR - LOWER NASS RIVER	SAHT - SAHTANEH RIVER	UPET - UPPER PETITOT RIVER
FONT - FONTAS RIVER	LNIC - LOWER NICOLAR RIVER	SAJR - SAN JOSE RIVER	UPRO - UPPER PROPHET RIVER
FOXR - FOX RIVER	LNRS - LOWER NECHAKO RESERVOIR	SALM - SALMON RIVER	USHU - UPPER SHUSWAP
FRAN - FRANCOIS LAKE	LNTH - LOWER NORTH THOMPSON RIVER	SALR - SALMON RIVER	USIK - UPPER SIKANNI CHIEF RIVER
FRCN - FRASER CANYON	LOMI - LOWER OMINECA RIVER	SANJ - SAN JUAN RIVER	USKE - UPPER SKEENA RIVER
FROG - FROG RIVER	LPCE - LOWER PEACE RIVER	SETN - SETON LAKE	USTK - UPPER STIKINE RIVER
GATA - GATAGA RIVER	LPET - LOWER PETITOT RIVER	SEYM - SEYMOUR INLET	UTRE - UPPER TREMBLEUR LAKE
GLAR - GLADYS RIVER	LPRO - LOWER PROPHET RIVER	SHEK - SHEKILIE RIVER	VICT - VICTORIA
GOLD - GOLD RIVER	LRAN - LITTLE RANCHERIA RIVER	SHER - SHESLAY RIVER	WILL - WILLOW RIVER
GRAI - GRAHAM ISLAND	LRDO - LAREDO INLET	SHUL - SHUSWAP LAKE	WORC - WORK CHANNEL
GRNL - GREEN LAKE	LSAL - LOWER SALMON RIVER	SIML - SIMILKAMEEN RIVER	ZYMO - ZYMOETZ RIVER
	LSIK - LOWER SIKANNI CHIEF RIVER	SKGT - SKAGIT RIVER	

Okanagan Basin Watershed



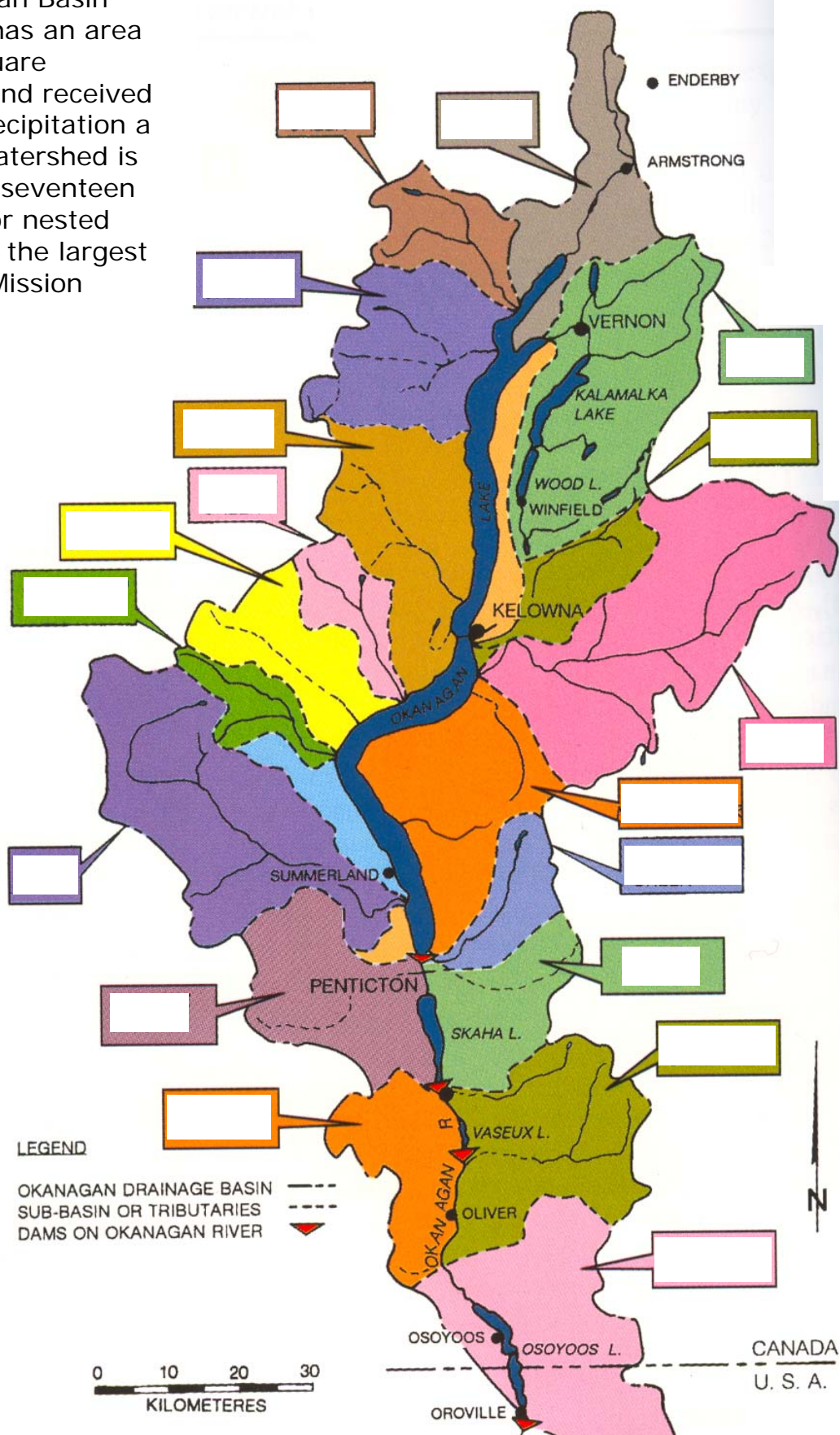
Source: Okanagan Basin Waterscape; Geological Survey of Canada, Miscellaneous Report 93.

The Okanagan Basin Watershed has an area of 6,187 square kilometers and received 55 cm of precipitation a year. The watershed is divided into seventeen sub basins or nested watersheds, the largest of which is Mission Creek.



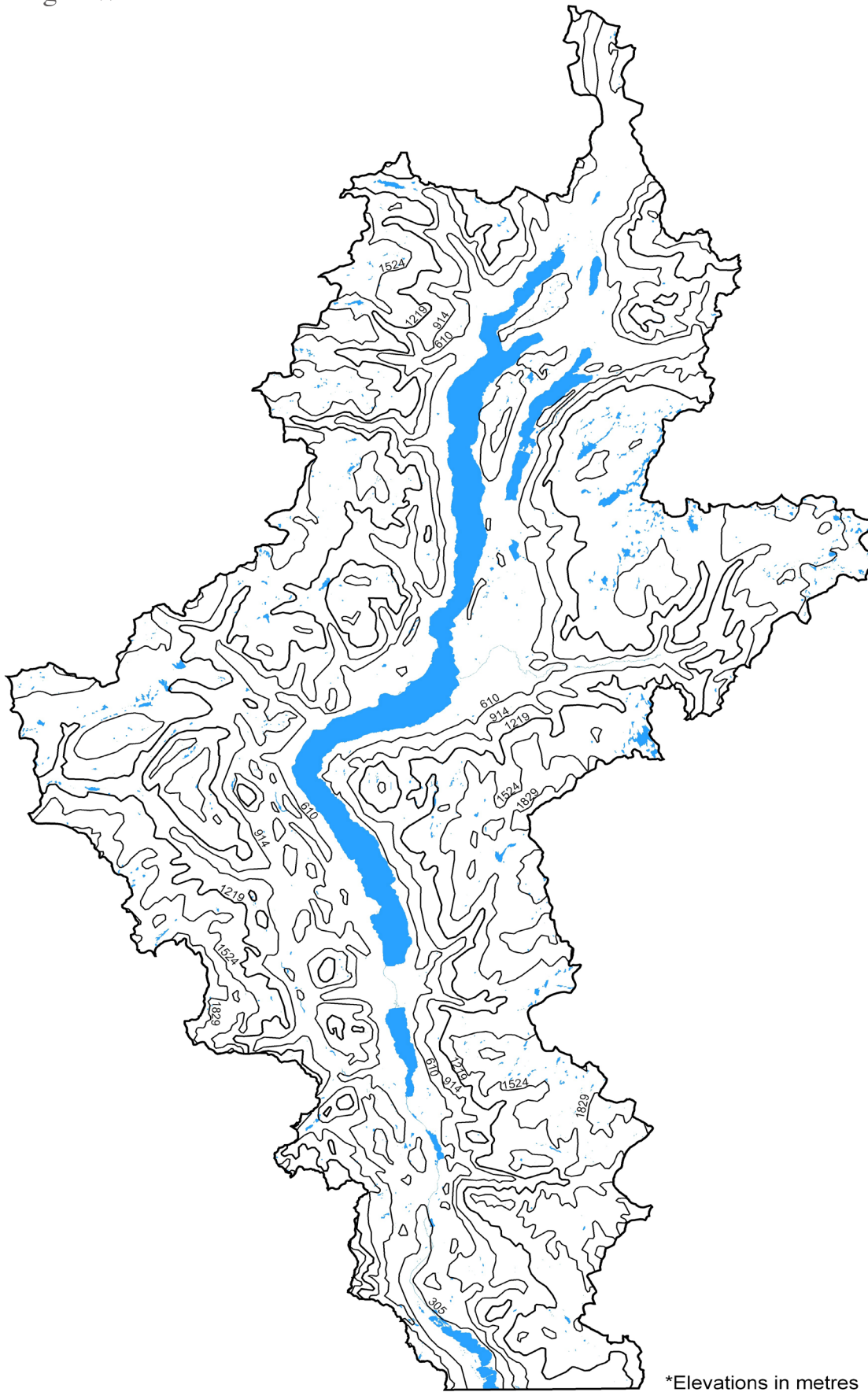
Source: Okanagan Geology . Kelowna Geology Committee editors. Murray Roed and John Greenough, 1995

The Okanagan Basin Watershed has an area of 6,187 square kilometers and received 55 cm of precipitation a year. The watershed is divided into seventeen sub basins or nested watersheds, the largest of which is Mission Creek.

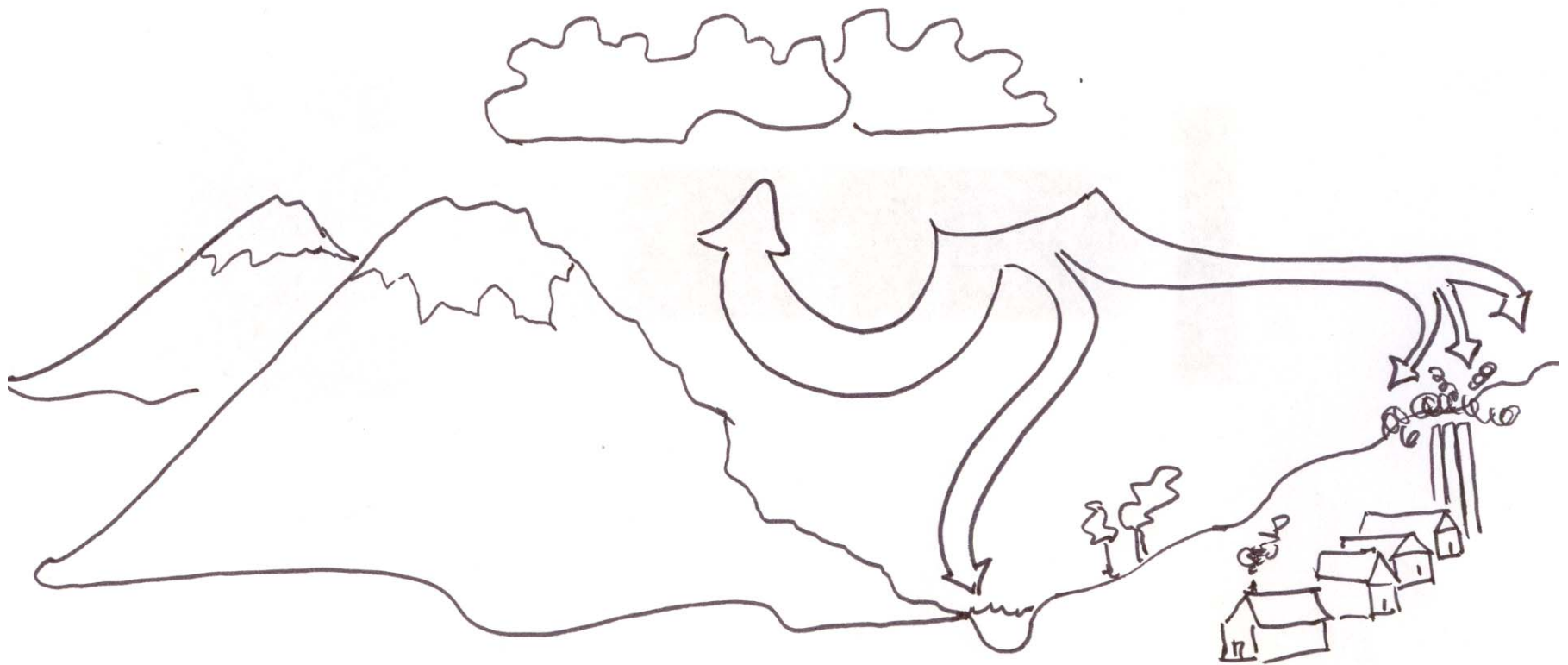


Source: Okanagan Geology . Kelowna Geology Committee editors. Murray Roed and John Greenough, 1995

Contour Map of the Okanagan Water Basin

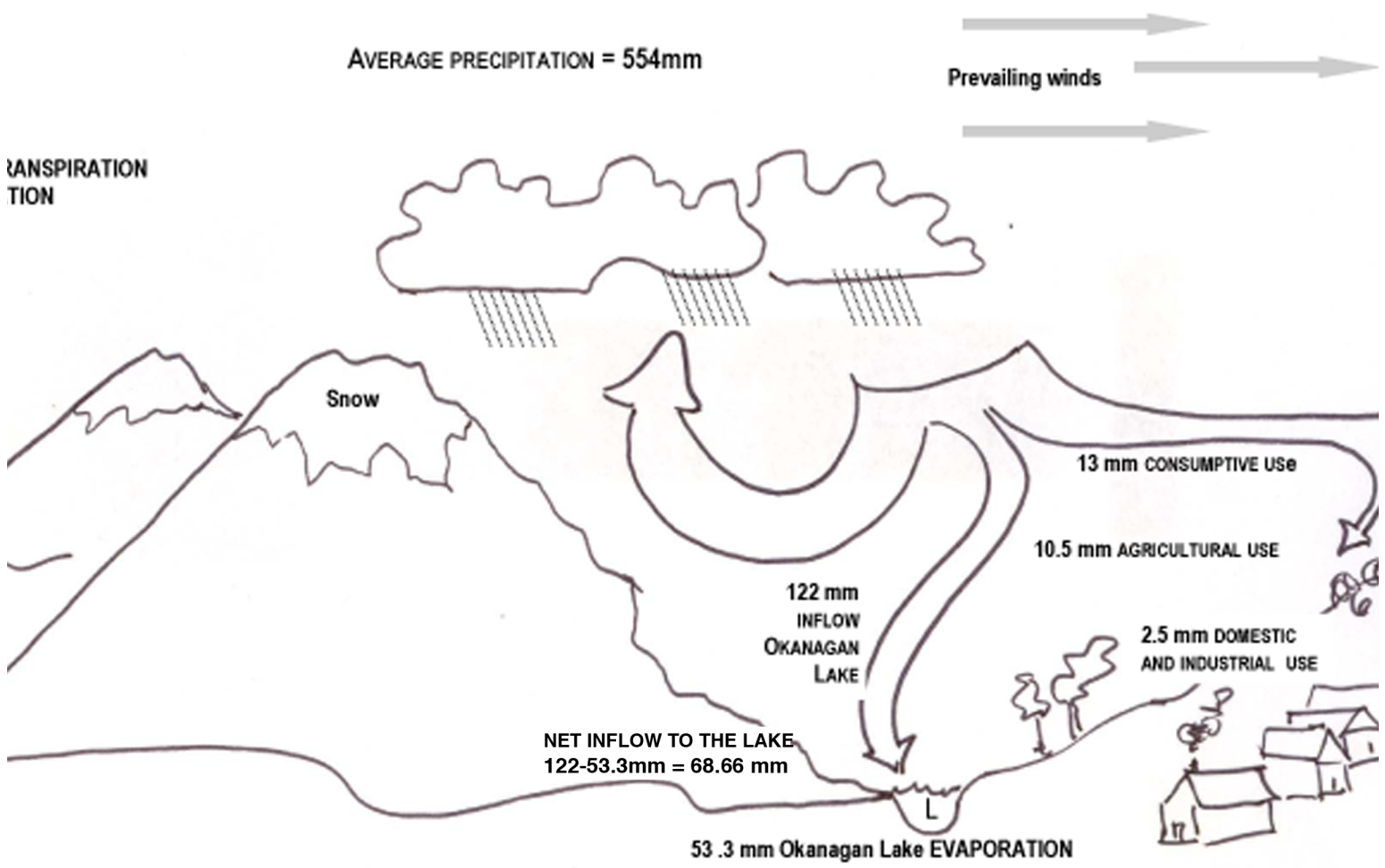


Source: Geological Survey of Canada, Natural Resources Canada



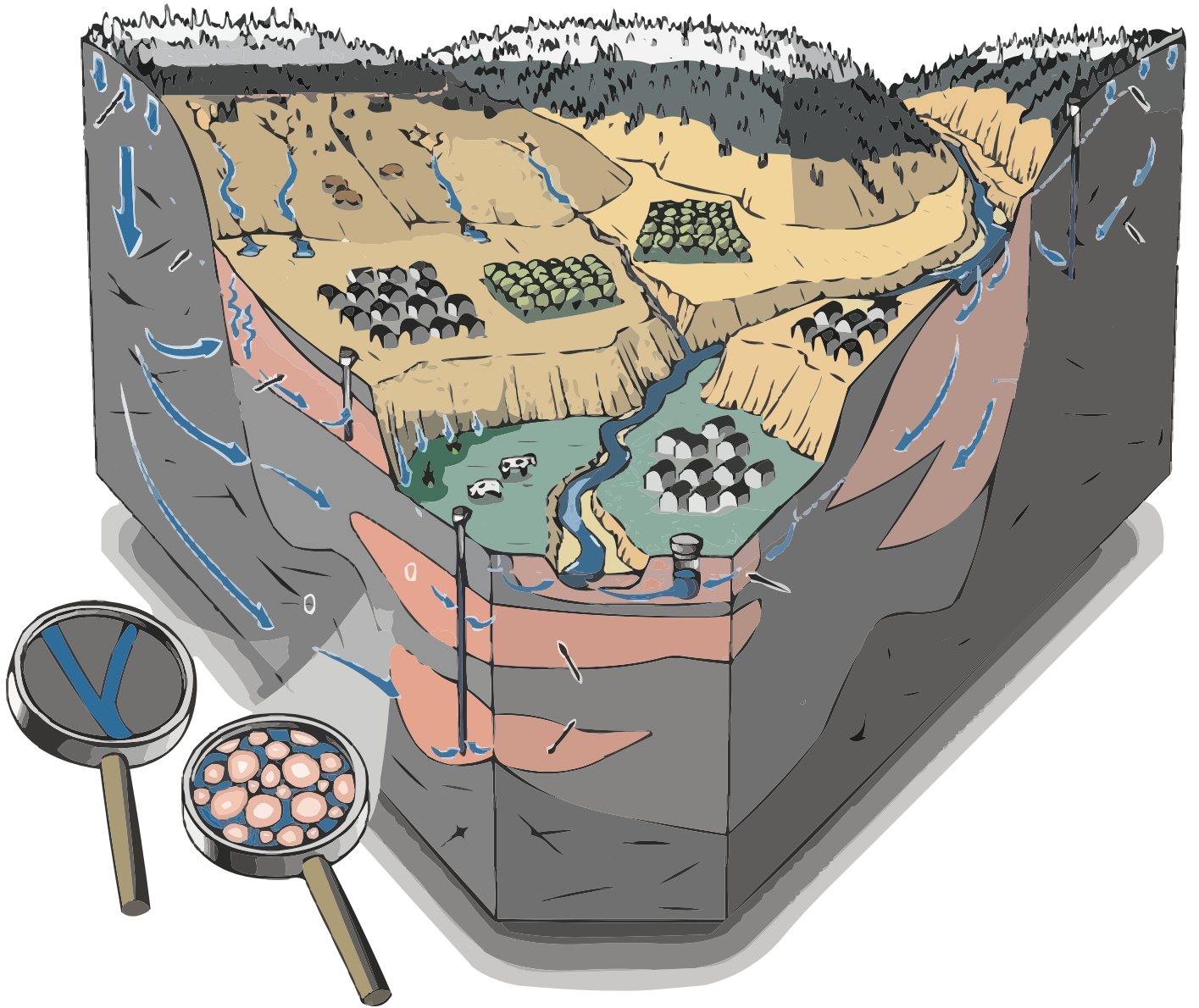
Key Concept: The Water Cycle

Elementary and Middle School Guides

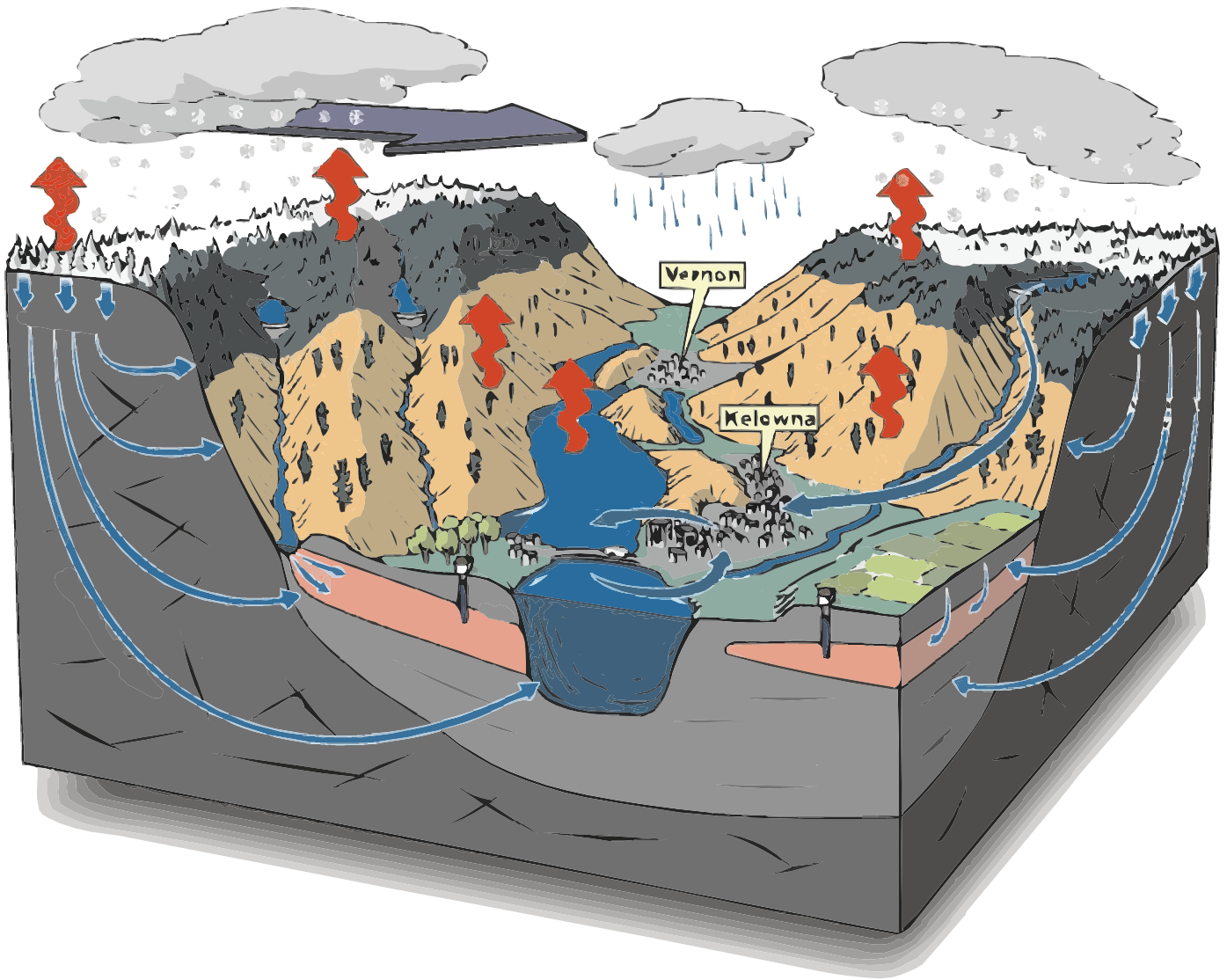


Traveling the Myth : where the water goes in the Okanagan Basin

Based on figure from Okanagan Geology by the Okanagan Geology Com



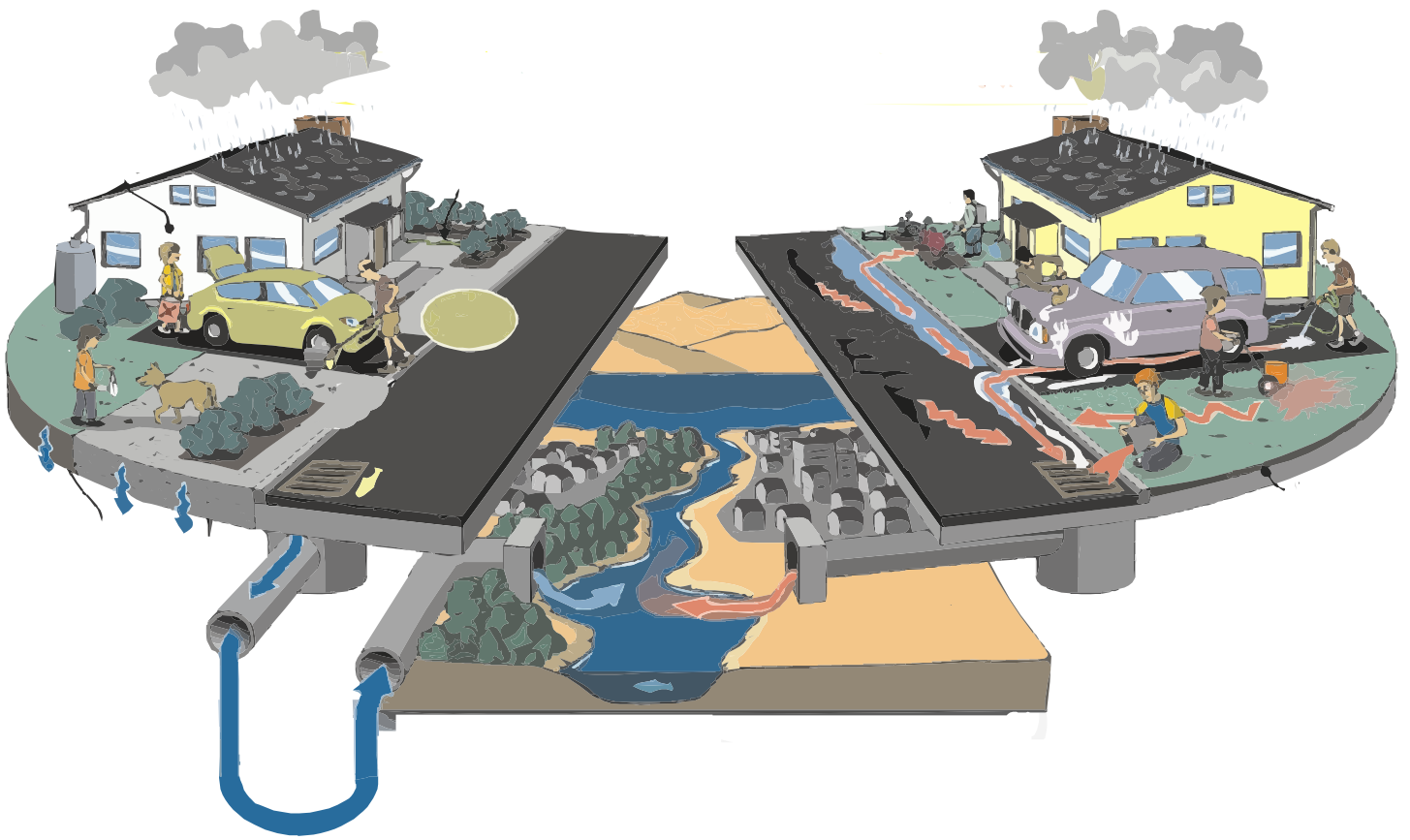
Groundwater



Okanagan Water Cycle



Healthy Streams



Okanagan Outdoor Use of Water

Appendix Web Connections and Resources

Note from Project Coordinator July 15, 2007 *The following websites are currently alive and well and are highly recommended as additional resources for this guide . You can use control click on the titles or you can cut and paste these web links into your browser.*

[Water in Canada from Environment Canada](http://www.ec.gc.ca/water/en/info/pubs/primer/e_prim06.htm) http://www.ec.gc.ca/water/en/info/pubs/primer/e_prim06.htm

Great graphics and very comprehensive specifically the pages on
[Water How We Share it](http://www.ec.gc.ca/water/en/info/pubs/primer/e_prim07.htm) http://www.ec.gc.ca/water/en/info/pubs/primer/e_prim07.htm

[The Okanagan Basin water Board](http://www.obwb.ca/) <http://www.obwb.ca/>

<http://www.obwb.ca/rdco/#eeco> to see a description of our project on the OBWB site

To order the Okanagan waterscape poster : http://www.obwb.ca/okanagan_waterscapes/ at the Okanagan basin Water Board

[Geoscape Canada](http://geoscape.nrcan.gc.ca/index_e.php) http://geoscape.nrcan.gc.ca/index_e.php *The momentum for the poster series came from the Natural Resources Canada and this site explains the related initiatives*

Download high res poster images from the NRCan site.

http://www.geoscape.nrcan.gc.ca/h2o/okanagan/index_e.php

Bowen Island Waterscape Initiative The poster is at <http://www.bowenisland.info/waterscapes/default.htm> or [Waterscape Bowen Island](#) Teachers guide is in the works

Bow Valley Waterscape The teachers guide:

http://www.calgary.ca/docgallery/bu/water_services/youth_education/river_basin_elementary_teachers_guide.pdf

The US Environmental Protection Agency has free clip art [clip art for use with watershed education](http://www.epa.gov/owow/watershed/outreach/activitypixnonjs.html)
<http://www.epa.gov/owow/watershed/outreach/activitypixnonjs.html>

Visual Tools for Watershed education (US) but does have a long list of links if you have time or need to search for more <http://www.neetf.org/pubs/watershedfinal.pdf>

[Wild BC](http://www.hctf.ca/wild.htm) *a program of environmental education workshops and resources at* <http://www.hctf.ca/wild.htm>

Wild BC offers Project WET a key environmental education resource not to be confused with

[Canadian Wildlife federation](http://www.wildeducation.org/more_education.asp) http://www.wildeducation.org/more_education.asp *From The Mountains To The Sea: A Journey in Environmental Citizenship Site you can visit for more information on Water Use*

[Ducks Unlimited](http://www.ducks.ca/resource/general/index.html) <http://www.ducks.ca/resource/general/index.html>

Water connected Games for kids From Ontario <http://www.water4tomorrow.com/activities.html>

Good game for computer users and lab explorations at school

Global access to water <http://www.cbc.ca/news/features/water/> Still active on July 15 2007 Oct 13 2006

[The Water barons from the Centre for Public integrity](http://www.publicintegrity.org/water/) *has a vast array of resources and on line sites*
<http://www.publicintegrity.org/water/>

[Canada: Maud Barlow Blue Gold](http://www.thirdworldtraveler.com/Water/Blue_Gold.html) http://www.thirdworldtraveler.com/Water/Blue_Gold.html BC access to water and water Issues

Appendix Web Connections and Resources

[Waterfootprint.org: Water footprint and virtual water](http://www.waterfootprint.org/) *This website is maintained by the UNESCO-IHE Institute for Water Education in collaboration with the University of Twente, the Netherlands*

[The Water Bucket](http://www.waterbucket.ca/waterbucket/) can be found at <http://www.waterbucket.ca/waterbucket/> "*waterbucket.ca is a resource-rich, highly interactive 'destination location' for timely and provocative information about water sustainability in BC.*" submitted by Joanne Dervires from the Waterbucket website staff

[Kidfish](http://www.kidfish.bc.ca/frames.html) can be found at <http://www.kidfish.bc.ca/frames.html> *This site will help students and teachers learn more about our landscape, our environment, our fish and including the craft of fly fishing with children. In this site, we have limited our scope to lakes in the central and southern British Columbia, and northern Washington State.*

<http://www.ilec.or.jp/database/nam/nam-51.html> www.ilec.or.jp/database/nam/nam-51.html *Okanagan Lake from a Database of world lakes*

[Freshwater Website: Publications - From the Mountains to the Sea: A Journey in Environmental Citizenship](http://www.ec.gc.ca/water/en/info/pubs/mountain/e_contnt.htm)
http://www.ec.gc.ca/water/en/info/pubs/mountain/e_contnt.htm

More from Environment Canada [Freshwater Website: Informational Resources and Services \(Teacher's Corner\)](http://www.ec.gc.ca/water/en/info/pubs/e_teach.htm)
http://www.ec.gc.ca/water/en/info/pubs/e_teach.htm

All about topographic maps This is a website from UBC about Topographic or contour maps Active July 15 2007 <http://www.physicalgeography.net/fundamentals/2d.html>

Capital News writer Judy Steeves and her employer the Kelowna Capital News have kindly agreed to allow us to include several news articles for use by teachers in *Unraveling the Myth: A Teachers Guide to the Okanagan Waterscape Poster*. Judy stresses that readers need to understand that *Trail Mix* is an Opinion column while the balance of the articles are written as journalist reporting.

Some of these articles were written five years ago but the content is still significant and current and the themes and topics are timely throughout our valley. The guide authors have made clear connections to specific activities in *Unraveling the Myth* wherever possible in the footers of this appendix. Teachers may photocopy these for the use of their students as needed. *The nature of writing for a community newspaper makes it readable and suitable for use with students in Elementary and Middle School*

*The following is an organizational tool for the author(s)
Contents of the readings appendix*

Opinion versus news reporting	page 1
Trail mix opinion column item one Water for Fish Sept 12 2002	page 2
Reservoir versus recreational lake item 2 Jan 2003	page 4
Water for Recreation or Drink March 2 2003 item 3	page 6
Snow pack Low news report Item 4 April 2003	page 7
Wasteful water use Item 5 Aug 2004	page 9
Trail mix opinion column what we like to do with water item 6 March 2003	page 11
Not an Endless supply of water April 2003 Item 8	page 13
Ground water down too item 9 Sept 2003	page 18
Water supply is like gold in the Okanagan Item 10	page 20
Nevada model of water Use Item 11	page 22

Item 1

Kelowna Capital News
Sept. 12, 2002

trail mix column

By Judie Steeves

Despite legislation, there's hope for fish habitat in the Okanagan

Gazing out over Okanagan Lake, it's hard to believe we don't have ample water, but the truth is, we're nearly desert, despite the appearance of plenty.

Some summers the fact we're in a dry climate doesn't make any difference to creatures of either land or water.

Other summers, it becomes quite apparent as autumn approaches, that this is no coastal rainforest.

This has been a particularly dry summer, and the result is a lack of water in some streams for kokanee returning to the river of their birth to lay their eggs before dying.

It's no fault of the fish, and in most instances, it's not a historic lack of water.

It's recent.

In the past decade the population of the Central Okanagan has doubled, and all those people want water too.

People don't share very well.

Instead, historically, they've written legislation that didn't take other creatures into account.

Which is why, this fall, the kokanee trying to enter Middle Vernon Creek near the northern boundary of Kelowna and Lake Country, may find their voyage home to spawn difficult later this month.

That could easily be changed, but it would require the voluntary cooperation of human water users, since the provincial government has no intention of enforcing the Fisheries Act and taking the side of fish over farmers.

The Water Act doesn't mention the needs of fish, even though they were here first, and their habitat is water.

Although the official attitude has finally changed, in years past, the needs of aquatic creatures such as fish were not considered in the granting of water licenses under the Water Act.

Worst of all, most Okanagan watercourses now have more licences for water use than water, and many lakes have more than would be sustainable if each licence was fully used.

For instance, even Okanagan Lake must only be licensed for the amount of water that comes into it each year, or it will begin to drain, and the amount flowing in has been dropping as more licenses are approved for inflow streams.

The crunch comes in a year like this, with no precipitation most of the summer, and lots of water use to irrigate water-thirsty crops.

Man's meddling often is without adequate consideration and usually leads to problems down the line.

That's obviously the case with little Middle Vernon Creek.

Its banks have been modified and are eroding and its water is taken for a variety of uses, both with and without licenses, by people all along its length.

When the Hiram Walker Distillery operated in that area, a million gallons of water a day were diverted from Okanagan Lake into Duck Lake, from which Middle Vernon Creek flows.

With its closure eight or nine years ago, water licenses issued based on those flows should have been revoked.

Apparently, they weren't issued conditional on the continued diversion of that water, so nothing can be done about changing their terms.

A run of kokanee could be the victims of that decision today.

Middle Vernon Creek is not the only valley stream in that plight this year, and this won't be the last year we suffer a dry summer and tax our water resources past their limit.

Unless we stand up and make our objections known, and work out a solution to the current situation of over-licensed waterways and fish as victims, it will happen again and again.

In the case of Middle Vernon Creek, it's a particular shame if something can't be done this year, because thousands of dollars and untold volunteer hours have been spent, and continue to be paid on rehabilitation of that waterway and restoration of the kokanee run.

Through the efforts of the Oceola Fish and Game Club, the run was brought up from 1,000 kokanee in 1998 to a high of 30,000 spawning fish since then.

People like restoration chairman Ron Taylor have put their hearts and souls as well as their ingenuity and brawn into improving the lot of that creek's inhabitants.

The good news is that more water is flowing in that creek today than two weeks ago, though no one seems certain just why.

So, perhaps some of that run of kokanee will have more success this year than it looked like earlier this month.

But, a long-term solution must be found to the fluctuation in water levels and the habitat degradation by human neighbours on all the streams in the Okanagan.

Otherwise, our children will be deprived of the opportunity to be part of miracles of nature such as watching the red-flushed kokanee return to spawn each fall. *Judie Steeves writes about outdoor issues for the Capital News.*

Item 2

Kelowna Capital News
January, 2003

By Judie Steeves staff reporter

Lake Country Mayor Rollie Hein is in Victoria today explaining to Stan Hagen the difference between a reservoir and a recreational lake.

As Minister of Sustainable Resource Management, Hagen is responsible for Land and Water B.C., the Crown corporation charged with managing Crown lands, and the body currently offering leased lots on reservoirs, for sale.

It's a move that is vociferously opposed by civic officials, health authorities and water managers throughout the Okanagan Valley, and has been for at least the past two decades.

Yet, LWBC is adamant that 156 Crown lots on 18 upland lakes in the valley's watersheds be sold rather than leased.

At Tuesday's monthly meeting of the Okanagan Basin Water Board, the valley's opposition was reiterated with a motion for Hein to take to Hagen: that the province not sell recreational leases on reservoirs, and further that existing leases on reservoirs not be renewed.

With three representatives from each of the valley's three regional districts sitting on the board, the motion was passed unanimously.

Central Okanagan Regional Board chair Robert Hobson noted not only would the sales endanger the quality of water, such development could also endanger the quantity. Water users would not only have to buy out the improvements on leased land, but the land itself in order to raise the level of a reservoir to increase the amount of water available for domestic needs.

Existing development on shoreline lots would likely be more permanent and more expensive if the lots were owned rather than leased, and the property-owners could insist on improved road access and other services which no authority exists to provide, he noted.

Hein noted that Lake Country is particularly affected by the LWBC decision since many of the lots are on the reservoirs it created, many nearly a century ago. They're now known as Beaver, Crooked, Dee, Island, Deer and Oyama Lakes.

Hein estimated the return to the government for the sales will not be more than \$2 million, and he said it will cost water managers 10 times that in future when they need to raise the level of the dams on their reservoirs.

He also envisioned a need in future to fence reservoirs just as Vancouver already does to protect the quality of water.

He pointed to a recent study of the impacts of recreation on water quality, in which E coli was tested in watersheds for its origin. Humans and domestic animals accounted for at least 27 per cent, while cattle

accounted for slightly more, and wildlife accounted for about 32 per cent.

New drinking water protection legislation strongly recommends source to tap protection, and the best opportunity is at the source, noted Hein, so less treatment is needed down the line.

This move by LWBC goes directly against that legislation, he noted.

Hobson has also requested a meeting with Okanagan Westside MLA Rick Thorpe since he is a proponent of the shoreline sales of leased lots, and he suggested the water board chair should also attend.

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Item 3

Kelowna Capital News
March 2, 2003

Water for recreation or to drink?

By Judie Steeves

Many people don't even know where the water that comes out of their tap originates.

They may have been fishing Sunday in Bear Lake and not realized when they turn on their tap at home in Westbank—if not for a few filters in-between—that fishing lure they lost might pop out.

The 4x4ers at McCulloch lake who got stuck in the mud may not know that the fuel and anti-freeze that leaked from their vehicle will taint the water they drink out of their tap in Kelowna.

The Okanagan is surrounded completely by domestic watersheds. Watersheds that are also used by loggers, miners and cattle, anglers and boaters, hikers and campers, bikers and motorcyclists.

There's plenty of access and plenty of people who use these watersheds for a variety of activities, many of which impact the water that runs off into domestic water reservoirs which double as recreational lakes.

Provincial legislation currently being formulated will put an increased emphasis on protecting our drinking water where it originates, so water managers will be scrambling to gain some control over their watersheds.

At the same time, the province is talking about selling waterfront lots which are currently just leased on those same reservoirs in the Okanagan.

Reporter Judie Steeves takes a closer look at what's happening up there and what the issues are.

Item 4

Kelowna Capital News
April, 2003

Snowpack low

by Judie Steeves, staff reporter

The west side is the dry side of the Okanagan Valley this spring.

In fact, water managers are concerned about how little precipitation fell over winter on the Westside.

In the Okanagan's dry climate residents rely on the accumulation of snow to fill reservoirs during spring runoff where water can be stored for use during the dry summer months.

However, some reservoirs might not even fill this spring, including Okanagan Lake, and if dry conditions continue, depletion of reservoirs may have to begin earlier than normal.

Brian Symonds, from water management in the Water, Land and Air Protection Ministry regional office, says from Summerland to Fintry, the amount of accumulated snow is from 54 to 65 per cent of normal.

Overall in the valley there's 82 per cent of the normal amount of snow in the hills above the valley according to measurements taken at the beginning of April.

At the height of the Mission Creek drainage area there's 97 per cent of the normal amount of accumulated snow, up from 78 per cent of normal measured at the beginning of March.

Measurements taken at lower elevation snow courses this month are unreliable because there's already been some melting, Symonds explained.

Brian Jamieson, manager of the Westbank Irrigation District says he's doing a raindance to try and encourage a bit more precipitation this spring.

A paltry 54 per cent of the normal amount of snow was measured at Islaht Lake, one of the chain of lakes used to store water for the Westbank and Glenrosa areas.

However, he's confident Lambly (Bear) Lake, the main reservoir, will fill, partly due to the Powers Creek diversion pipe constructed last year which allows the transfer of water from the high elevation Tadpole Lake, as well as Dobbins and Islaht, to Lambly.

The WID stores 2,800 acre-feet of water in Lambly and 2,000 in Tadpole, which is usually enough to satisfy the needs of the district's customers.

Currently, the district is taking water directly from Powers Creek rather than using any stored water, and it's still winter at the higher elevation storage lakes.

However, there's no options if the district runs out of water in those storage reservoirs, he notes.

There's an application in to Land and Water B.C. to raise the level of Lambly Lake to provide additional storage, but such a project is years down the road, he adds.

Ted Jeffrey, manager of the adjacent Lakeview Irrigation District says they may have to put restrictions on water use for the first time this year.

"Nearly every other jurisdiction already has them," notes Jeffery.

"People need to be more aware of how much water they're using. They need to be educated. Meters might help," he adds.

The LID is currently talking to engineers to re-calculate volumes, and try to see how they could use water more efficiently.

The district's long range plan calls for one more dam to be added to the system, but first they would look at raising the dam on the Big Horn, a reservoir built in 1993, says Jeffrey.

Although at present it's 1.5 m below that he expects Rose Valley Lake to fill, as well as the Big Horn and Esperon Lake.

The Esperon snow course was 58 per cent of normal in this month's measurement, and Jeffrey notes last summer and fall were the second driest he can remember.

"It's always a bit unnerving in a dry year," he admits.

There's been a lot of development in that district recently too, and it continues.

Although Lakeview hasn't instituted water regulations in the past, customers in the WID annually have to comply with water regulations prohibiting watering of lawns and gardens between 11 a.m. and 6 p.m. daily from June 1 to Sept. 30

As well, automatic sprinkling systems must be approved by the district and must only operate between 11 p.m. and 6 a.m.

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Item 5

Kelowna Capital News
August, 2003

Wasteful water use curtailed too late

Trail Mix Column
By Judie Steeves

There are a lot of highly-paid, top administrators of water systems around the Okanagan who are guilty of closing the barn door after the horses have bolted.

They've had years of warnings that there's limited water available in this semi-arid climate, and lots of time to have begun imposing restrictions and enforcement of them on their users.

Yet, many have waited until this year, when there's a severe shortage of water available in many districts, to restrict the use of water on driveways that won't turn green and grow, water that flows unused down the sink when people brush their teeth or grimace in their mirrors, or down the sewer unnecessarily when we flush the toilet.

On the agricultural side, not all farmers use water judiciously, watering only when it's needed at the root level to make crops grow, or in the occasional overhead shower to cool and protect tree fruits from sun scald. Those that don't should have been educated long ago.

Now, I admit the fault is often not that of the administrators themselves but of the political masters they serve; masters who often speak with more than one voice; and whose voices echo the voices of those who would prefer not to have to restrict their water use.

There are also areas of the Okanagan where there is no shortage this year, despite the record-setting heat and length of days without measurable precipitation, and in those areas there still are no restrictions, and no sense of urgency about using water wisely.

Although they may have thought ahead more carefully when it came to constructing storage facilities or infrastructure to carry that water to users, they're not thinking ahead now by not beginning that education process with users and setting up the legislation now that will prevent having to construct more storage in the near future.

Because that's largely what it comes down to. The Central Okanagan, in particular, has grown by leaps and bounds in the last decade or so, and it's not likely to stop growing soon. Admitting that fact means we have to plan on a valley-wide basis for the management of our meager water resources in a way that will accommodate that growth without putting other water users at risk.

That's exactly what we've done this year. Creatures who were here first, and who depend on an aquatic habitat, are losing out to human users this year.

In areas such as Middle Vernon Creek where the Ocoela Fish and Game Club put thousands of dollars and untold volunteer hours into raising funds and actually getting out there in the mud to do the work, they already lost

out this year.
It's dry.

The loss is so frustrating for the club members, Bill Bosch says they voted last week not to continue the \$30,000 in enhancement work planned this year and to not do any more until they can be guaranteed the work they do won't be undone by a lack of water. In the past 18 years, they've built up that run of kokanee from 800 when they began, to a high of 30,000 a few years ago, but when those fish return this fall, they won't be able to get back into the creek to lay their eggs.

Ditto in Trout Creek, which has historically been an important trout and kokanee rearing stream, but which today has no water in it because the City of Summerland has inadequate storage for a dry year, and hasn't imposed enough restrictions in the past on human use of the small amount of stored water they have available.

That city's council voted two weeks ago to turn off the water the Fisheries Act requires they permit to go by to keep Trout Creek a viable aquatic habitat for fish, despite the penalties they could face.

I am betting they'll get away with it too.

Now, it's easy and truthful to say Trout Creek has already suffered so much degradation at human hands that it's not even worthwhile to consider wasting water people could be using to grow crops or water lawns on that stream bed.

It's been straightened so the water rushes through a virtual chute every spring to Okanagan Lake, along with the gravel needed for spawning beds and eggs; and it's been stripped of vegetation along its banks so the water heats up to lethal levels for aquatic creatures every summer, providing no cover from predators, nor nourishment from insect life.

However, there was hope in the wings for that stream as the Summerland Sportsmen's Association planned an enhancement project which would have seen new plantings and other work to begin to bring that waterway back to a more-natural creek.

So, here we are, on the one hand trying to repair past wreckage and on the other hand continuing that wreckage, like a couple of kids fighting over a special toy.

Let's all work together to try and manage the water we have available in a sensible and mature way so everyone has enough for their needs.

Item 6

Kelowna Capital News
March, 2003

trail mix column

By Judie Steeves

We like to live within sight of it, camp beside it, fish in it, ski on it and dump liquid waste into it, but it's also a daily essential to keep our bodies alive.

Water is almost as important to us as it is to fish and wildlife.

The difficulty is: can we maintain both its quality and quantity while putting it to so many different uses, or, with a rapidly growing population, must we begin to modify or limit some of our uses?

I have delightful memories of going fishing with my Dad to lakes like Headwaters, which is the headwaters for Summerland's drinking water, and spending the day catching frogs and fish.

It was usually a family outing with Mom and her mosquitoes, Dad and his damselflies, me and my net.

We'd usually trek home at the end of the day with some mosquito bites, a tadpole or frog, a limp lily or lupine, a blush of sunburn and sometimes a fish or two.

At the time it never occurred to me we were having our fun in someone else's drinking water. I began to feel differently about it when I discovered that most of the little lakes I frequented were someone's tapwater.

It didn't stop me, I must confess, but I always felt a bit funny throwing a dirty old worm into the water. But then, they live all around the water anyway, and the bottom of the lake is dirt, and fish and frogs must do their business in it and it's a long way from the tap, so somehow it must get cleaned up before it gets to a tap, I figured.

I guess I was partly right about all of that.

Years later, I was affronted that I had to get a special permit to fish in the Seymour watershed on Vancouver's north shore, just because it provided the Lower Mainland's drinking water.

Now that I have to pay for the treatment of water from such little lakes on my taxes and utility bills every year, my concern is more practical: how to reduce the quantity of treatment needed so the cost doesn't skyrocket.

Here in the Okanagan Valley both quantity and quality are serious issues.

Our drainage basins are not protected by big fences and locked gates preventing access to those who want to work and play in them.

Cattle graze on the hills around our reservoirs; roads are built across them to access timber; heavy machinery tears out mature trees; people work and play in, on and around those reservoirs.

Is this okay?

That's a decision we'll have to make in the coming months as we wrestle with the issues of source protection of our domestic water supplies and whether or not to sell the Crown land around those reservoirs.

The most sensible answers probably lie somewhere in between the positions taken by sides so far in the debate, but there needs to be public discussion that involves everyone before decisions are made.

Let's hope the provincial government, which announced late last week it will commission an independent study into water quality issues before selling leased lakeshore lots on reservoir lakes, will involve local politicians, health authorities, water purveyors and residents before making its decision.

And then, in this semi-arid climate, there's the whole question of water quantity...

Judie Steeves writes about outdoor issues for the Capital News.

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Item 8

Kelowna Capital News
April, 2003

By Judie Steeves

The Okanagan is being warned this year not to expect an endless supply of water.

Growing human demands on that resource are straining storage capacity, but more expensive than that, they're putting pressure on the infrastructure that carries it from storage reservoirs to people's homes.

The experts tell us if we don't begin to conserve water we'll find ourselves paying big money for increased capacity in pipes and treatment facilities, just to hose down a car or over-water a lawn.

Brian Symonds at the provincial water management branch suggests that people think twice this year before watering, just to make sure the lawn or garden really needs it.

There is a finite amount of water. It varies from year to year, but we'll mine into it if we continue to use it at a wasteful rate, he warns.

Ironically, Okanagan residents are not very efficient users of water.

Yet, we're almost entirely dependent on spring runoff, since there's very little rainfall in this climate.

Conserving water doesn't have to produce ugly gray and brown landscapes.

Reporter Judie Steeves talks to some people who are full of expert advice about easy ways to be water-wise.
By Judie Steeves staff reporter

Whether it's chasing frogs through the shallows in the sun or being chased by wildlife through the shadowy underbrush, experiences in the wild are often life-changing.

The memories from such childhood experiences remain reference points for adults decades later.

Even the satisfaction of watching your own children at carefree outdoor play or the call of the loon echoing over a placid lake in the evening or can generate a peace that helps difficult decisions to be made back in the busy world of the city.

Such memories and experiences of outdoor adventures are often still clear in later life. They can bind a family together and keep it healthy.

For Ian Cameron and his sister Heather Grassick, such precious childhood memories are locked carefully away inside for leisurely perusal at will.

They're so important to them, both have been diligent about providing the same opportunities for their children to experience the outdoors.

This has been made easy for them by the thoughtful planning and hard work of their father Bill Cameron who first purchased the plywood shack on Beaver Lake in 1955 for \$1,500 and paid \$30 for the annual lease on the Crown-owned lot.

Cameron remembers as a kid growing up on Guisachan Farm building a log play place out of the cottonwoods that grew there, not realizing that many decades later he would craft a full-size holiday home from logs for his family and their families' recreation.

Today he's passed that comfortable cabin in the wilds on to his children so they will always have a place to take their children and grandchildren for family holidays in future.

At 12, his grandchild Sophie Grassick is already aware that she's glad he did.

Protesting quickly that she'd never hurt them, she admits to chasing frogs through the weeds at the edge of Beaver Lake and getting wetter than if she'd gone swimming in the lake. Now, I have hip waders, she adds proudly.

She's also learned a lot about the dark. Up there it's not like city dark. It's really black at night, she points out.

The stars are incredible.

Cameron is gratified his children and grandchildren appreciate the vacation retreat he's created for them, but he would be happier if he could purchase the lot outright so that he would know his great-grandchildren would also benefit from his legacy.

He's just applied to renew his 20-year lease on the lot with Land and Water B.C.

LWBC has said it intends to offer 156 current leases for sale to lessees in the Okanagan, so he's hopeful he might have an opportunity to buy it.

However, the move by LWBC is being solidly opposed by every regional district in the valley, water purveyors up and down the valley, and Dr. Bill Moorehead, medical health officer for the Okanagan health service area.

He points out cabin owners would find themselves sitting a muddy mile from a swamp or pond without the dam that created a lake out of a wet place between a couple of hills.

These are man-made reservoirs, he points out.

He suggests the Crown corporation consider its priorities, whether a few vacation cottagers or a city full of people requiring drinking water should have higher priority.

Naturally, once the lots are sold, he anticipates owners wanting to change their vacation spot into a year-round residence, then a waterfront palace, and he has concerns about the impact such development would have on

drinking water quality.

While admitting that multiple use of watersheds is inevitable in the Okanagan, unlike Vancouver and Victoria which have secure watersheds from which the public are excluded, he feels we must maintain a high degree of security in the immediate area of reservoirs.

He's also concerned once the current leases are sold, that new lots might be created on reservoirs for sale as well.

In light of the new Drinking Water Protection Act, for which regulations are expected to be released this spring, he noted it's even more urgent that water managers have more control over land use in the immediate vicinity of reservoirs.

"How can they take responsibility for source protection of drinking water when they have no jurisdiction at the source?" he asked.

What was okay in watersheds decades ago is no longer acceptable, he added. "The world has changed. We need to be smarter now," he said.

One pit toilet probably wouldn't make much difference set near a reservoir, but the sum of a cluster of them is quite a different matter.

Moorehead points out that drinking water is the limiting factor in this valley, and we are not very good custodians of it, in terms of either its quality or quantity.

Toby Pike is vice-chair of the Water Supply Association of B.C. and is adamant that recreational activity in watersheds has an adverse impact on drinking water quality, and he has current, local studies to prove it.

He believes LWBC's move to sell 156 leased Crown recreational lots on just over a dozen reservoirs in the Okanagan violates the spirit of the new Drinking Water Protection Act.

"We should all be pulling in the same direction," he says.

"At first we thought it was some kind of mistake," he adds.

Historically, many of the local water systems were created to provide irrigation water to grow fruit trees, but today more and more of their water is used on the latest crop: single family homes.

As manager of the South East Kelowna Irrigation District, Pike admits quite frankly he'd like to see all recreational use of watersheds banned, but he quickly adds, he doesn't think that's practical now.

Instead a study should be done into what has the most impact on pathogen loads in the water systems at the source, so only those activities can be curtailed.

Local hydrologist Don Dobson has his own company in Kelowna now, but his experience includes many years working for water management for the provincial government.

He points out that in many cases the consumers of water are also the users of watersheds for other purposes.

"So, if you want to pee in your own bed, go ahead, but we'll pay for our sins," he warns.

Pristine watersheds are a myth, but on the other hand, we shouldn't be encouraging settlement in them, either, he says.

"If we make leased lots private land it's the thin edge of the wedge, and seasonal becomes permanent. It's progressive," he warns.

He's concerned that society treats water as valueless when it should be treated as priceless.

Since the percentage of water actually used for drinking is miniscule compared to the total amount that goes through treatment plants, he suggests instead, we consider home treatment only for drinking water.

Since safe maintenance of such systems is a concern, it needs to be accessible for maintenance just like a public utility.

"Perhaps we could build a water treatment box on the side of the house where it could be maintained by a municipal employee," he suggests.

Right now, we spend millions on treatment of water that is sprayed on crops.

Brian Jamieson is the new manager of the Westbank Irrigation District and he's concerned not only about protection of the source of his customers' drinking water, but also about the quantity of it for future customers.

With that in mind, his district has already applied to LWBC to increase the capacity of its main reservoir, Bear (Lambly) Lake to take in an additional 52 hectares.

There's only one Crown lease on the lake and the district has a letter of understanding with the owner of the fishing resort that they'll need to agree on a purchase price at some time in the future.

There's also a Forest Service Recreation Site on the lake, but Jamieson says they'd rather not see it reconstructed when flooding obliterates it.

As an avid angler and boater, Jamieson says personally he wouldn't fish in a reservoir.

"Reservoirs are at a high risk for contamination if they're used for recreation as well," he says emphatically. More than anything, though, he feels it's important people be educated about watersheds and about how best to protect their source of drinking water.

Lake Country has also applied to raise the height of its dam on Beaver Lake another metre says Mayor Rolly Hein. "We need to hold more of the spring freshet back," he explains.

The municipality may have to dredge Beaver Lake in order to increase storage as well, he says. Hein has been at the forefront of a tide of objections from Okanagan civic officials and water purveyors to

LWBC's plan to sell leased recreational lots, and there are a large number of them in his watershed.

He's been lobbying his MLA John Weisbeck to put a stop to the move to sell publicly-owned land around reservoirs.

Central Okanagan Regional District chair Robert Hobson has written to all local MLAs opposing the sale, and has arranged a meeting with Okanagan-Westside MLA Rick Thorpe to discuss the issue further.

Kelowna-Mission MLA Sindi Hawkins doesn't understand why there's so much opposition.

"I don't know what different protection there would be if the lots were leased rather than sold," she commented.

"We have waterfront homes on all kinds of water in the Okanagan, including Okanagan Lake (which is also a drinking water reservoir). We have standards, and we'll have to enforce them," she said.

Some residents don't rely on water brought directly from the upper watersheds, but from Okanagan Lake instead.

In fact, the City of Kelowna operates the third largest water utility in the province, supplying 55,000 customers with 17,000 connections.

Manager Don Degen is also vice-president of B.C. Water and Waste, the association that educates and trains the industry, which has 3,500 members, mostly in municipalities.

One facet of the new regulations will deal with operator competence, system sampling and monitoring, cross-connection control and such technical matters.

The Interior Health Authority has been proactive in ensuring the large water purveyors in its jurisdiction comply with pretty high standards, said Degen. Recently a series of new conditions were added to the permits to operate for all those large systems in the South Okanagan.

Kelowna already complies with them all, but Degen says, "We're fortunate because we have a pretty high quality, stable source of water.

It also has the advantage of being a system that was set up as a domestic water supply, not designed as an irrigation system like many of the others in the Central Okanagan.

However, its safety also relies on the protection of water high up in the Okanagan's watersheds just as the upper watershed reservoirs do.

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Item 9

Kelowna Capital News
September, 2003

Groundwater down too

By Judie Steeves staff reporter

This year's shortage of water in the Okanagan is not limited to surface water.

Although it likely will be some years before this year's drought will have a significant impact on groundwater sources of water that supply wells, levels are already dropping.

Bruce Wilson, manager of Kelowna's Rutland Waterworks which is dependent on a series of wells, says there's been a two foot drop in the static water level over last year.

While that's not significant, he noted it's often the third year after a drought before declines are reflected in groundwater levels, he said. There are plans in place for dealing with future drops in the water level, he said. About 12,000 people with 4,000 connections use the system of semi artesian wells, nearly all residential. The area it serves is from Mission Creek to Leathead Road; the foot of the McKenzie bench to Mill Creek.

Remi Allard, a hydro geologist and groundwater engineer who is a director of the B.C. Groundwater Association, says he has heard reports of bedrock wells in the Central Okanagan dropping more than 100 feet. He notes that such wells don't have much storage capacity, so in consecutive dry years they're the first to drop in level.

On the other hand, wells in sand or gravel close to lakes and rivers don't suffer as much, he noted.

Different kinds of aquifers supply different types of wells, he explained.

Although there is knowledge about some wells and aquifers in the province, many are unmapped.

"We lag behind other jurisdictions in North America. In Washington and Alberta permits are needed to drill a well," he noted.

There's also little legislation governing groundwater like there is for surface supplies. For instance water licences govern the amount of water a user can take from the surface water source that's licensed, whether it's a lake or creek.

Yet, there's no law preventing groundwater users from intruding upslope on another groundwater user's supply from the aquifer, for instance.

Neither drillers nor owners of wells need to register their wells with the province.

Although Kelowna's Joint Water Committee is looking at what's happening with groundwater in this area, often groundwater recharge is outside their area of control, noted Allard.

In order to exert some kind of control over land use in areas outside civic jurisdiction that level of government has to communicate with a different level of government, so control over areas where groundwater is recharged is often not simple.

The committee, chaired by Wilson, includes all five water systems in the city, the two city systems, plus Glenmore-Ellison, Black Mountain and South East Kelowna Irrigation Districts.
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Item # 10**Water supply is like gold in the Okanagan Valley**

By Judie Steeves staff reporter
Jun 17 2007

Water management officials from Kelowna, Vernon and Penticton agree that a common approach to sustainability of the resource across the valley should be a priority for the Okanagan Water Stewardship Council.

Efforts are underway to institute a coordinated water conservation plan for the Okanagan Valley.

Currently, a wide variety of water conservation initiatives are in place in the 13 municipalities in the valley, but the Okanagan Water Stewardship Council is moving ahead to collaborate on initiatives to use less water.

The three largest cities made presentations to the council at last week's meeting on their current efforts to reduce water consumption.

At the conclusion, council chair Tom Siddon questioned whether we would get a bigger bang for our buck by consolidating efforts.

Kelowna's water manager Don Degen noted there is an appetite currently to have a common approach toward sustainability.

He suggested something like a charter endorsing certain principles which councils around the valley could endorse, with a sample of what sort of principles could result.

After hearing the presentations from Renee Clark, of Greater Vernon Services, and Carolyn Stewart, from Penticton, Degen noted there is already a baseline which could be built on with a coordinated effort.

"People have to recognize water is like gold or a diamond. People have to value it so they don't waste it," Stewart noted.

Degen added it's important when development occurs that it is done responsibly.

Council member Peter Dill commented, "If we conserve water I want it to be for more than just to build another house."

Degen and Neal Klassen, with the Water Smart program, told council members Kelowna is an irrigation oasis.

"People have a love affair with green lush growth," Degen acknowledged.

A huge percentage of the water used in the city goes on the ground, he said.

The city began with metering, then instituted a user-pay system and embarked on an education program.

Most jurisdictions in the valley are now either planning to install meters, or are in the process, and many already require low flow fixtures be installed in new construction.

Most do not yet have permanent water conservation staff who manage demand daily, but most do have general water restrictions.

Drought planning is either underway or done in many, but water use plans are not in place in any jurisdictions except Summerland.

Many areas are instituting or investigating initiatives to encourage or require xeriscaping, including installing demonstration gardens on public land.

Some sort of educational program is in place in most jurisdictions, but water recycling is only done in some areas.

This year, Kelowna is aiming for a further 15 per cent reduction in water use, and they're looking at regulations regarding landscaping.

"We want to set attainable standards," Degen told the council members.

It would include ensuring adequate soils are used, along with appropriate plants, efficient irrigation and landscaping that requires less fertilizer and pesticides.

The Kelowna Joint Water Committee is made up of the managers of all five utilities in Kelowna and it meets twice a month to discuss conservation issues, he said.

Stewart said in Penticton, the water system is split so agricultural water is not treated. Domestic users have been metered for decades.

This year, she said the rates have gone up by 22 per cent.

"Water conservation doesn't mean doing without, it means using water more wisely," she said.

Stewart said water use was skyrocketing when she began with the city in 2003. Now, it's decreasing.

"We can get more done if we collaborate," she agreed.

Clark explained that three utilities were amalgamated in the Vernon area in 2003 and a drought management plan was completed.

Permanent water restrictions are in place and there's a volunteer public stewardship group involved as well, she said.

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Item 11

Nevada sets harsh example

By Judie Steeves
staff reporter

Jun 17 2007

Instead of brown lawns in drought-stricken southern Nevada, no new lawns are permitted.

In fact, rebates are provided to home owners who convert their existing water-hungry lawns to water smart landscapes.

There's no agricultural use of water in the region, explains Doug Bennett, conservation manager for the Southern Nevada Water Authority, because "even when you put water on it, nothing grows because of the soil."

Bennett was speaking to the 27 members of the Okanagan Water Stewardship Council this week on coordinated water conservation through a teleconference call and video presentation at the UBC Okanagan meeting site.

The Colorado River is the source of 90 per cent of the water used in the SNWA, which combines three fast-growing centres, including Las Vegas.

The river is primarily consumed by landscape and for cooling purposes, with indoor use negligible.

The authority was formed in the early 1990s because there was no coordinated conservation plan for the area.

At the time, he said there were often different laws on different sides of the same street, which made it confusing for developers and landscapers as well as residents.

Under the SNWA, they began to change their thinking; to plan together, out into the future, he said.

"Drought changed our views on future water supplies," he commented.

Because it's a hot, dry, desert climate, 60 per cent of their water is lost to evaporation.

For a lawn to survive, it requires 73 gallons per square foot, but when landscaping is changed, only 17 gallons are required, a 75 per cent saving, he said.

He notes that the top 10 per cent of water users use as much as the remaining 50 per cent of users, and most of it goes on landscaping, so changing people's planting habits can have a significant impact on water use.

"Ornamental turf is our enemy," stated Bennett.

"We permit so little turf that no new golf courses can be built," he added.

The golf industry responded well, and it has converted non-functional turf to water wise landscaping, he said.

Principal regulatory tools used by the SNWA are a restrictive summer watering schedule, landscape development restrictions, golf course water budgets, water waste penalties and ornamental water feature restrictions, he said.

Investigators go out and ticket water wasters when they find water being permitted to go off the property line by an errant sprinkler or overflow.

"There are few complaints because people don't want to admit they're water wasters," he noted.

Nonetheless, Lake Mead, which is the largest man-made body of water in the U.S., at 250 square miles, has been significantly affected by the drought.

The reservoir, formed by the Hoover Dam on the Colorado River 75 years ago, is located 48 kilometres southeast of Las Vegas and had a 100-foot bathtub ring around it in 2000 because of drought conditions.

Today, that's grown to 113 feet, and it's dropping a foot a week now according to Bennett. Docks are sometimes far from the water and beaches consist of what used to be lake bed, broken bottles and all.

"It's a pretty severe situation," says Bennett.

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RANT

by WENDY WRIGHT

Drinking water: bottles blow

Who do we think we are?

We live in modern, clean urban and rural environments with better than average access to free, hygienic drinking water, yet we continually spend money to drink it out of plastic bottles.

In 2001 Canadians spent more than half a billion dollars on 700 million litres of water labeled with striking mountain vistas to lure us in; yet there are citizens in many countries drinking water that we wouldn't dare wash our cars with.

Yes I know.

Admittedly, in the past, some municipal water systems have failed motivating us to purchase bottled water out of fear or necessity. Seriously though, there isn't a difference between regulations for tap water or bottled water. Bottled water companies will tell you that their product, in its pristine sealed container, is considered a food product and therefore must meet the fed's guidelines under food and drug legislation.

But any scientist will gladly remind you of the higher regulations for tap water; in fact each distribution system for municipal water has to be tested on a regular basis – some

daily.

According to Organic Consumers Association, "the US EPA sets more rigorous quality standards for tap water than the FDA

does for bottled beverages."

The cold wet facts. Forty per cent of bottled water is plain old tap water. Stop and think about who produces Dasani the



purified water' and question the source.

"Members of the United Nations have recently estimated that if the world took half of the \$100 billion annual bottled water costs and re-invested it in proper water infrastructure and treatment then everyone in the world could have access to clean drinking water."

Plastic blows.

According to the Container Recycling Institute only 14% of plastic water bottles are recycled and a water bottle in landfill or litter on the ground will take over 1,000 years to biodegrade. Plus it takes 1.5 billion barrels of oil to produce the darn things in the first place. Never mind the health risks of constantly drinking and eating out of plastic – but that's another story.

Suck it up.

I happily tipple tap water out of my Nalgene bottle daily, take it everywhere and fill it as many times as possible.

Perhaps drinking out of Nalgene isn't perfect but I feel great about my smaller environmental footprint.

- "Water separates the people of the world; wine unites them."

Water treatment After We Use it City of Kelowna

Ogogrow Production

Biosolids used in the creation of Ogogrow are derived from the wastewater treatment process. The name "biosolids" is given to the solid waste remaining once the wastewater treatment process has been completed; biosolids contain macronutrients and organic matter needed to replenish soil and retain moisture.

Each day four or five truckloads of dewatered biosolids arrive at the Ogogrow Production Facility in Winfield from the City's Wastewater Treatment Facility on Raymer Avenue. The biosolids are then mixed with enough wood waste (wood chips or hog fuel) to create an environment where aerobic bacteria can flourish.



The resulting mix is piled into numbered windrows where perforated pipes attached to blowers distribute air to promote effective decomposition. As aerobic bacteria move and multiply, the piles heat up often exceeding 60 degrees Celsius. The heat kills pathogens making the material safe to handle after three days.

Rapid decomposition continues for 21 days at which time the compost is then repiled and allowed to continue composting for another 60 - 90 days. As the compost matures it gets darker and takes on an earthy smell.

The compost is then screened to remove excess wood waste which in turn is used again in the initial mixing process. Testing is conducted for pathogens, nutrient value, moisture, PH and metals content. Test results are submitted to the provincial Environment Ministry for approval.

Ogogrow is distributed in bulk to retail outlets, landscapers, orchardists and nurseries. The City sold 12,250 cubic yards of Ogogrow in 2005 for \$142,495 as well as 2,180 cubic yards of Glenmore Grow for \$55,030. Total compost sales generated \$197,525.



Water Provision in the Central Okanagan

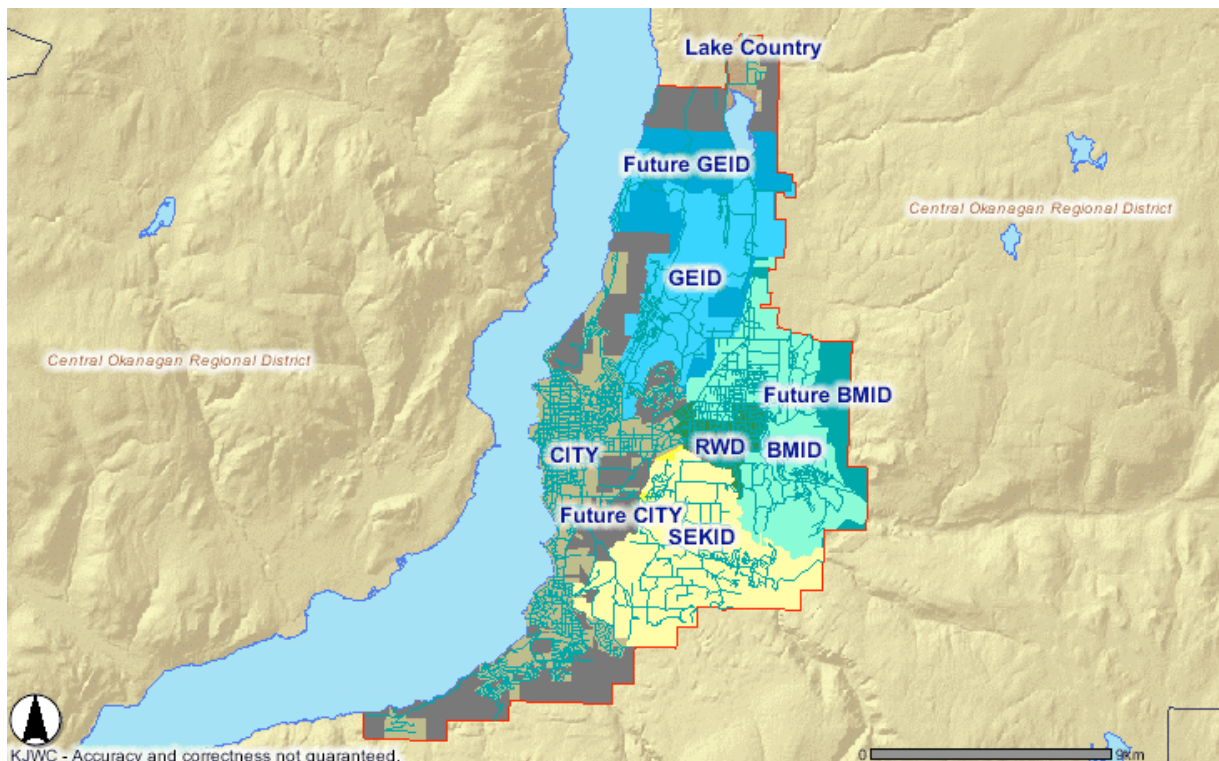
In the Okanagan basin water is provided, managed and treated in many different ways. Irrigation districts, city water supplies, private and subdivision wells, back yard septic systems, single home water treatment plants, reservoirs and irrigation districts have a diverse set of strategies for water treatment.

Water needs treatment at both ends of the system, before it is used and after it is used. Water districts or Irrigation Districts collect and provide water often according to watersheds or geographic regions. In the City of Kelowna water is taken from the lake, treated and then circulated to households. Likewise the city waste water is collected and treated again at facilities such as the City of Kelowna waste water treatment plant. In locations outside the Cities rural property owners have to handle their own waste water and ensure that pollution does not occur .

Water treatment before use varies according to each water provider . In Kelowna five suppliers provide water, the City of Kelowna, The Glenmore Ellison Irrigation District,(GEID) The Black Mountain Irrigation District,(BMID) the South East Kelowna Irrigation District (SEKID) , the Rutland Water District (RWD) Providing water for residential domestic use and agricultural use is challenging and requires that households that do use irrigation district water and do not have their own filtering systems, are vigilant about their own drinking water consumption.

In many cases irrigation water and water for household use do come from the same supply. Therefore *water advisories* can be announced in spring or other times of the year with heavy rains when a heavy sediment is being carried and the water quality deteriorates . Households bear the responsibility of ensuring they personally stay current about their own personal water needs and us by listening to radio broadcasts, going on line, watching the print media or signing up for an electronic notification of water advisories through the Kelowna Joint water Committee at <http://www.kjwc.org/register.php>

Water Suppliers in the central Okanagan From the web page
http://www.kelowna.ca/website/iKJWC_Map_Viewor/viewer.cfm June 10 2007



NewScientist



Special Report **Earth**

Climate change: A guide for the perplexed

17:00 16 May 2007
NewScientist.com news service
Michael Le Page

Our planet's climate is anything but simple. All kinds of factors influence it, from massive events on the Sun to the growth of microscopic creatures in the oceans, and there are subtle interactions between many of these factors.

Yet despite all the complexities, a firm and ever-growing body of evidence points to a clear picture: the world is warming, this warming is due to human activity increasing levels of greenhouse gases in the atmosphere, and if emissions continue unabated the warming will too, with increasingly serious consequences.

Yes, there are still big uncertainties in some predictions, but these swing both ways. For example, the response of clouds could slow the warming or speed it up.

With so much at stake, it is right that climate science is subjected to the most intense scrutiny. What does not help is for the real issues to be muddled by discredited arguments or wild theories.

So for those who are not sure what to believe, here is our round-up of the 26 most common climate myths and misconceptions.

There is also a guide to [assessing the evidence](#). In the articles we've included lots of links to primary research and major reports for those who want to follow through to the original sources.

- [Human CO₂ emissions are too tiny to matter](#)
- [We can't do anything about climate change](#)
- [The 'hockey stick' graph has been proven wrong](#)
- [Chaotic systems are not predictable](#)
- [We can't trust computer models of climate](#)
- [They predicted global cooling in the 1970s](#)

- It's been far warmer in the past, what's the big deal?
- It's too cold where I live - warming will be great
- Global warming is down to the Sun, not humans
- It's all down to cosmic rays
- CO₂ isn't the most important greenhouse gas
- The lower atmosphere is cooling, not warming
- Antarctica is getting cooler, not warmer, disproving global warming
- The oceans are cooling
- The cooling after 1940 shows CO₂ does not cause warming
- It was warmer during the Medieval period, with vineyards in England
- We are simply recovering from the Little Ice Age
- Warming will cause an ice age in Europe
- Ice cores show CO₂ increases lag behind temperature rises, disproving the link to global warming
- Ice cores show CO₂ rising as temperatures fell
- Mars and Pluto are warming too
- Many leading scientists question climate change
- It's all a conspiracy
- Hurricane Katrina was caused by global warming
- Higher CO₂ levels will boost plant growth and food production
- Polar bear numbers are increasing

If you would like to comment on this article, visit our blog.

For further reading, see the weblinks below.

Web Links

[Climate myths special, New Scientist](#)
[Intergovernmental Panel on Climate Change \(IPCC\)](#)
[FAQs, IPCC \(pdf\)](#)
[RealClimate.org](#)
[How to talk to a climate skeptic, Grist](#)
[Common arguments by climate sceptics, Logical Science](#)



Greenhouse gases, global warming, Kyoto Protocol, melting ice, heat waves

Energy and Fuels



Electricity, climate change, wind turbine, oil, hydrogen, natural gas

From an interview with Maud Barlow, National Chairperson of Council of Canadians and co-author of *Blue Gold, The global water crisis and the commodification of the world's water supply*.

http://www.motherjones.com/news/ga/2005/01/maude_barlow.html

In 1995, a vice president of the World Bank famously declared that, as the wars of the 20th century were fought over oil, so the wars of the 21st would be fought over water. In the decade since, potable water, scarce even then, has become even more so thanks to pollution, industrial development in nations like China -- and especially the process whereby giant firms like Vivendi, Suez and Bechtel increasingly buy up impoverished nations' water supplies, taking sorely needed water and selling it at a profit, all with the blessing of transnational organizations like the World Bank and World Trade Organization.

As Maude Barlow explains, this process isn't sustainable. Barlow is national chairperson of [The Council of Canadians](#), a nonpartisan public watchdog group working to fight against global trends in privatization and deregulation, and co-founder of the organization's Blue Planet Project. She's also the co-author, with Tony Clarke, of *Blue Gold*, a 2002 international best-seller about the world's growing water crisis. While in San Francisco recently, Barlow spoke with MotherJones.com about how governments are ceding control of their water supplies to the private sector and what can be done before the public's water supply dries up for good.

MotherJones.com: How have international trade agreements encouraged the privatization and commercialization of the world's water?

Maude Barlow: Water was included, as a good and later as an investment, in the very first trade agreement in the world, when Canada and the U.S. signed a free-trade agreement that later morphed into NAFTA. The GATT definition of a good includes water. There's now negotiations to put water, as a *service*, into the General Agreement on Trade and Services, which is a proposed international agreement on services. So the World Trade Organization and NAFTA -- and bilateral agreements, because water is also included in a lot of bilateral agreements -- are ways to enforce a corporate discipline, if you will, over governments that want to maintain public control of their water. Basically, once you privatize it, it's very, very hard to turn back. And once you've started the sale of commercial water, both the receiving country -- if it's in a trade agreement with you -- and

the corporations involved have inherent rights in these agreements that don't exist if you don't sign them.

MJ.com: Besides trade agreements, what other factors caused commercialization to grow so rapidly?

MB: Well, I think the reality of the scarcity and the pollution of the world's surface water has just suddenly become real to people. And whereas 20 years ago you couldn't imagine getting most of your water from bottles, it's just become an accepted part of people's lives now. On planes, in restaurants, everybody drinks bottled water; you carry it around in your pocket. So it came first from scarcity, people needing access to clean water in their lives. And then the view that it was an okay thing to start commodifying water and using it in this way. Of course, behind all this are the big corporations. They've been aggressively promoting and marketing their water as better, as cleaner, as purer, as safer -- which it is not. And it is to their advantage to let the public systems of the world's water deteriorate while they get to make huge amounts of money off people's need for clean water.

MJ.com: Historically, how were corporations able to change the perception of water from a basic right to a commodity?

MB: This started with the privatization of municipal water services. It was encouraged when water was declared a commodity or a good in the trade agreements. It started to be considered and talked about as a good and a need -- not a human right -- by the World Water Council when it was founded in 1997. The World Water Council is basically the World Bank, the other regional development banks and the development agencies of the northern governments. It set itself up as a global high command of water existing for its own benefit, to commercialize and commodify water. They have a big forum every three years, where they invite governments to come and observe, and the governments pick up this language of water as a commodity, such that governments really didn't think about this language 10 or 20 years ago, now they're getting together and saying, "There's this U.N. millennium plan and we have to be helping the developing countries bring on water, and how do we do that?" They're all buying into this commodification notion, which is all very new and has happened very quickly -- and, I believe, has been driven by corporate interests. It's important to remember that it's a very small, incestuous circle -- these water companies, the World Water Council, the World Bank, the World Trade Organization, the

IMF. There's a lot of money to be made from the commodification of water, and these people know that whoever controls water is going to be both very rich and very powerful.

MJ.com: So why do governments cede control to this privatization system instead of, say, selling their water to the public themselves?

MB: Really, the same reasons that governments have bought into the whole concept of neoliberalism. Governments that used to protect their citizens and provide them with health care and water services and education no longer are allowed to do that if they're poor and owe a debt to the developed world. Through structural adjustment programs, the IMF and the World Bank basically forced developing countries to abandon those relationships with their people, whether it's health care or energy or state enterprises, because the funding was going to be cut if they didn't. It's been to the advantage of the powerful in northern countries, who are more and more controlled by their own big-business communities, to adopt this language. So it didn't start with water, but water just kind of fell in there when they started talking about everything as a commodity. When you start commodifying things like social services, energy, forests, fish and even air -- because you're now trading air-pollution credits and so on -- it's not a big step to say "why is water different?" One of the first questions I often get asked in hostile interviews is why water is different than forests or fish. And one of my answers is well, actually, we should be protecting our forests and fish, too. However, we can restock fish, we can find alternatives to energy, and we can even replant trees. But there's only so much water, and the more we destroy, the less access we have to potable water and the more desperate the situation becomes.

MJ.com: How does third-world debt play into this conflict?

MB: Of course, if the third-world countries didn't have a debt to the north -- and as you know, they send more as debt payment to the north than we send them in trade and aid together -- they would be in a position to start delivering not-for-profit services, including water, health care and other services. But as long as they remain in that desperate situation, having to pay even just the interest on the debt payment, they are totally at the mercy of the IMF, the World Bank, the United States, Canada and Europe. A few years ago, the World Bank was [merely] encouraging water privatization, but now they're saying it's a condition of any aid that you privatize water, and we're going to negotiate the agreement and tell you the company you're going to use. So countries are forced to take the conditions under which they can get the money to deliver water to their people.

MJ.com: Would eliminating third-world debt necessarily solve this problem?

MB: It would be a huge step toward it, either canceling or at least seriously renegotiating the debt. If the first world was really interested in delivering water to the poor of the world, we would also have a tax on financial speculation. If the World Bank can afford to pay these great big water companies to come in and run a water service -- because it's their money; the companies aren't investing -- if they can afford to bring a private company in to do this, they can afford to train public-sector workers to deliver water on a not-for-profit basis.

I look at Japan and the Philippines. Japan has a highly skilled public workforce delivering clean water, on an island, to millions of people. Tokyo itself is nearly the population of Canada, so it's amazing what they do. But the World Bank goes to the Philippines, so close to Japan, and says, "You're going to have to take these private companies" instead of saying, "Let's bring a bloc of these wonderful public-sector experts from Japan over and transfer this technology on a not-for-profit basis." It would be cheaper. It would have a longer-lasting effect. It would mean water would get delivered to everyone on a not-for-profit basis, which means you could deliver it to way more people. And we could start to really move toward solving the world's crisis. Then that extra money could go into rebuilding infrastructure, because 90 percent of all the wastewater in the developing world goes untreated into rivers and lakes and streams and wetlands. So the infrastructure to stop that pollution is desperately needed.

MJ.com: What are some examples of governments in the developing world that have tried to break free from this system?

MB: Well, Uruguay's a good example. A country that just had an election, brought in a center-left government, and just had a vote Oct. 31 about their water. They voted two-thirds to say that water is a fundamental human right, which requires a constitutional amendment. Their government's position now is that it's required to deliver water on a not-for-profit basis, but they've got these corporations there. So this is going to be a really interesting test of what they can do. Will they kick the company out, as Bolivia did when they kicked Bechtel out? You get governments like that of South Africa, where when they amended the constitution after apartheid ended, they brought water in as a basic human right. But then they brought Suez [a private firm] in to deliver it, so it was only a human right if you could pay for it. I think the government there is under tremendous pressure now

to reconcile their constitutional amendment that says it's a basic right and the fact they were forced to bring in a for-profit company.

There are other governments, Suharto's in Indonesia was one of them, that worked very closely with some private water companies to skim off money from the people the way the water companies did. There's no question there's collusion. But let's face it, it's often collusion that's watched and condoned by the World Bank, by the American government, by our government in Canada. Certainly by the government of France, which promotes its water companies in the most outrageous venues and situations. So there's no question that there's sometimes a symbiotic relationship between corrupt governments, these companies and the World Bank.

MJ.com: We've talked about the developing world, but how much control do the governments of industrialized countries-- the U.S., Canada, Europe -- have over their own water supplies?

MB: Much less than they think they do. For one thing, the pollution is taking place at such an accelerated rate that we're all mining our groundwater, and the actual water systems are being mined far faster than they can be replenished. Our prairies are going to be experiencing really deep drought, as are yours, within the next 10-20 years; a permanent kind of drought, so our scientists tell us. So it's not just a so-called third-world problem. Confronted with this reality, our governments are starting to ask questions about who should have access to water and who should pay for it and all that. They've bought into the ideology of neoliberalism or economic globalization or market capitalism.

When you take a new problem -- you always had all the air and water you needed; it was never a problem -- and suddenly you're confronted with a water-scarcity problem, and the thinking and ideology you already have starts to fit itself around this. So I don't think it's a big jump for governments in industrialized countries to start to see reasons to commodify and privatize water. And as soon as you take water out of its natural state -- bidding on it, trading it for commercial purposes or selling it -- it is then a commodity clearly defined under these trade agreements and that's it -- you've lost control over it. So governments in the developing world have been forced into privatization by the World Bank, regional development banks and the IMF. Countries in the northern, industrialized world are coming at it through another door. I've always said free trade is to the north what structural adjustment is to the south, and water is getting caught in that web.

MJ.com: Are there positive steps the industrialized nations could take at this stage that could then spread to the rest of the world?

MB: Absolutely. We're calling in Canada for a national water act, which would outline the protections needed environmentally, really put limits on the use and abuse of our water from industry, remove water from the trade agreements and exempt water from all future trade agreements. We also believe that if we can get water defined as a human right -- which it is, but if we can get it recognized -- in some kind of binding treaty at the United Nations, it would be a strong challenge to the existing situation in these trade agreements.

It would be a very powerful tool for people to be able to say to their governments, "You've signed an agreement saying that water is our human right, so therefore you can't charge us." It's not a semantic question, this human need or human right. If it's a human need, it can be delivered by the private sector on a for-profit basis. If it's a human right, that's different. You can't really charge for a human right; you can't trade it or deny it to someone because they don't have money. And we need laws at every level of government, from the most local to international, on the current abuse of water. All of us are going to have to change our relationship with water.

Jeff Fleischer is an editorial fellow at MotherJones.com.

~ Passage to India ~



*A Report on the People's World Water Forum
and the World Social Forum*

*By Maude Barlow
January 26, 2004*

I have just returned from a moving, exhilarating and exhausting two-week trip to India and want to share my reflections with you while the images and memories are still so fresh. Colleagues Bill Moore-Kilgannon and Anil Naidoo from The Council of Canadians accompanied me, and we teamed up with friends from the Polaris Institute, Kairos and Development and Peace from Canada, as well as Public Citizen and other friends from the U.S., to make a strong North American contingent.

Part One: The People's World Water Forum in New Delhi, January 12-14

In New Delhi, India's capital, water activists from over 60 countries gathered at the India International Center for the first People's World Water Forum. Plans for this forum started at the 2003 World Social Forum in Brazil, became more solid at the World Water Forum in Kyoto last March, and finalized in meetings in Cancun during the September ministerial of the World Trade Organization (WTO). It became clear to the many "water warriors" in Kyoto that the World Bank and the big water companies behind the World Water Council intend to continue to promote the commodification of water and deny that water is a fundamental human right. So we realized that there was some urgency for us to come together as a more formal international movement to counter this "global high command of water," as Ricardo Petrella has so aptly named the World Water Council. Knowing that many water activists would be coming to India for the World Social Forum, we decided to hold our water forum in New Delhi just days before the big gathering.



Our tireless hosts were Vandana Shiva and her wonderful staff from the Research Foundation for Science, Technology and Ecology. It was a hard-working two and a half days, with information and strategy sessions on bottled water, privatization of water services, dams and river linking, the World Bank, WTO and the General Agreement on Trade in Services (GATS), pollution and conservation, and water as a

human right. Not surprisingly, as the forum was held in India, there was an emphasis on the struggles in that country, including the attempt by the transnational corporation Suez to privatize New Delhi's water and the aggressive invasion of Coke and Pepsi into many parts of rural India. We were thrilled to learn of the fight back by the water workers of New Delhi against Suez, the formation of local activist groups against the bottled water companies, as well as the creation of a national network against Coke and Pepsi. You won't be surprised to learn that we were infiltrated by "experts" in the workshops who were clearly paid by Coke to assure us that the drying up of water tables in the communities in which Coke operates is entirely coincidental and has nothing to do with the millions of litres being removed every day from these sites.

The forum ended with a unanimous vote to create a new network called the People's World Water Movement and the adoption a declaration ([see attached](#)). For me, there were three highlights of our joint strategy that stand out and serve to guide our international water work in the coming years. The first is the need for a formal United Nations Convention on Water as a Human Right. It is time the people of the world had this guarantee locked into an international convention, which can then be used at the national and local level in our struggles against water theft. The second is the need to intensify our fight against the GATS, a deal that will be used as a weapon against local struggles if water is ever included as a service in this agreement.

The third clear goal is a very bold one: we decided to target two companies for upgraded fights – Coca-Cola and Suez. We chose these two companies not only because they are so flagrantly destructive of local communities and environments, but also because there are already on the ground struggles going on around the world against them. Coke, for instance, is being resisted for its terrible labour practices in Colombia and other places, its exploitation of groundwater in India and Latin America, and its invasion of schools all over North America. The goal now is to better link these campaigns and to set some common targets and strategies.



Part Two: The World Social Forum in Mumbai, January 16-20

How to describe this event? I guess I would have to start with the city itself. Mumbai – formerly Bombay – has a population of 18 million people, 60 per cent of whom are living in slums or directly on the streets. If current trends of de-population of the rural communities due to WTO agriculture policies persist, in ten years time the number of people living in slums in Mumbai will rise to 80 per cent of the population. The current Indian government is quickly adopting economic globalization and with it is coming the growth of a wealthy entrepreneurial class with money to burn, and the entrenchment of the “underclass” – already present in India from the caste system, which is still very much alive.

I have been to other Third World cities, including Mexico and Manila, but have never witnessed the sheer massive volume of destitute people eking out some kind of existence on the streets. For example, if your car is stopped in traffic, it is quickly surrounded by dozens of street children, with babies in arms, begging for a little money. As well, the exponential explosion in the number of cars on the streets, many of them very old and dirty, plus the almost total lack of garbage collection or basic sanitation for the people on the streets, makes Mumbai the most polluted city I have ever seen, or smelled.



At the same time, there is a tremendous energy to the city, indeed to the entire country, which was mirrored at the World Social Forum (WSF). The event, which was held at a huge abandoned warehouse site, brought together more than 100,000 people from all over the world (including several hundred Canadians) to sing, dance, protest, talk, listen, strategize and give each other hope. Keynote speakers included Indian writer Arundhati Roy, anti-dam activist Medha Paktar, French farmer Jose Bove (with whom I shared a panel) and many more great activists and thinkers from around the world. Hundreds of workshops on every aspect of economic globalization and alternatives to it were filled to capacity. I participated in quite a few, including workshops or panels on water and food security, trade agreements, and reforming the UN. Activists from the People's World Water Movement spread the word

around the WSF and had a powerful impact on the gathering.

More than any other memory, I will remember the demonstrations of the poor and powerless at the 4th WSF. Dalits (formerly “untouchables”), disabled street children, displaced dam refugees, Tibetan and Burmese human rights activists, women against domestic violence, and many, many more, marched up and down the dusty roads of the site, chanting, dancing, singing, shouting and celebrating their common humanity and new found sense of power. At times, the din was so loud, you could not hear the speeches, even with the powerful sound systems.



As I watched and listened to these amazing street demonstrations, I felt a surge of hope and knew in my heart that the politics and policies of neo-liberalism will never be able to dampen the human spirit or destroy the sense of social justice so clearly alive among the people. The words “Asia Rising” kept coming into my mind. Some criticized the event as chaotic; what I saw, however, was an outpouring of amazingly organized grassroots activism and a milestone in a movement whose time has come.

Part Three: Solidarity Tour to Kerala, January 21-23

After the World Social Forum, I participated in a trip to two water-bottling plants where local protest is growing. This trip, for me, was the most important of my two weeks in India.

The southern state of Kerala has had progressive government for years and it shows. There are not the great disparities between rich and poor that characterize Mumbai and New Delhi. Everyone has work to do and life in the towns and villages of this beautiful agrarian state is very much like it was decades ago. However, in Plachimada, a small community in the interior of Kerala, a grim struggle has grown between the local tribal people (Dalits and Adivasis) and the Hindustan Coca-Cola Company. Coke and Pepsi use satellite imagery to locate reservoirs of groundwater in India, and have set up dozens of controversial bottling sites in poor rural communities around the country.

The Plachimada project is located on 38 acres of former rice paddies and extracts up to 1.5 million litres of water every day to be made into Coke, Fanta, Sprite, Thumbs Up, and other products. Every day, 85 trucks, each containing 600 cases of 24 bottles, leave the plant, exporting local water far away. Within a year after the plant opened, local water sources started to dry up, putting hundreds of farm families out of business. All 260-bore wells installed by public authorities have gone dry. As well, the soil, water and air around the plant have become contaminated from the sludge by-product, which includes cadmium and other trace metals. What is left of the water is not fit for bathing or cooking, so high are the chlorides from wastewater pumping from the plant.

For almost two years now, the local women have staged a daily sit-in directly across from the Coke plant (see cover photo). All day, every day, in rain or shine, old women, young women and babies, occupy a low-set straw shelter and sit impassively staring at the trucks coming and going from the plant, surrounded by hundreds of private security guards the company has hired. Coke sued the women, demanding that their picket be dismantled. The local people fought back in court and won a lower court ruling that allowed them to continue to picket and limited the amount of water that the company can extract. The company is now appealing that ruling and it is likely to go to the highest court in India.



Maude Barlow, Vandana Shiva, Jose Bové lead march with local women protesters to Coke plant gates

The "World Water Conference – 2004" was held in a huge outside stage, set up directly across from the plant and equipped with loud-speakers so powerful that everyone in the Coke plant heard every word of the two-day event. The local activists, backed by M.P. Veerendrakumar, the head of a major newspaper publishing company who opposes the Coke plant, put on a wonderful event, filled with fiery speeches, moving theatre and music, and graced by every major political figure in the region. At the public rally on the second evening, there were easily 5,000 people in attendance.

Significantly, the World Water Conference also adopted the Plachimada Declaration, [see attached](#).

I sat with the women protesters for several hours, sharing stories of grandchildren (through an interpreter) and even borrowing some for much-needed hugs. A favourite memory of this time was asking a group of beautiful young schoolgirls, dressed in white uniforms, "Who wants to be Vandana Shiva when they grow up?" and seeing every hand reach in the air instantly! We were invited in to the Coke plant, where we met with officials who assured us that there was plenty of water in the region and the farmers' dried up wells had nothing to do with them. We emerged from the plant to a bank of television cameras and denounced the company in no uncertain terms.



On the last day of the trip, vans and buses took us to a nearby community that is fighting a Pepsi plant causing similar devastation on the local people. Here we read out the Plachimada Declaration promising our support and calling for a boycott of Coke and Pepsi – something I have long wanted to do. I left India feeling a very deep commitment to help the people of these rural communities fight the theft of their water by these unscrupulous companies and to build an international movement to reclaim water for people and nature.



On February 18, the Kerala State Government ordered the Coke plant to be shut down for 4 months because of its effect on the water in the area. Coke is now trying desperately trying to sell the plant. This is a clear victory but we must continue to work with our friends to ensure that the plant is permanently closed.

Victory in Uruguay!

by **Maude Barlow**



On October 31, the people of Uruguay, a small South American country of just 3 million people, went to the polls. Not only did they elect a new centre-left government that day, but they also made history by being the first people in the world to vote on the human right to water.

By an almost two-thirds majority, the people of Uruguay voted to amend their constitution to ensure not only that access to piped water and sanitation is a fundamental human right available to everyone, but also that in the creation of water policies social considerations take precedence over economic considerations. Further, the constitution must now reflect that the “public service of water supply for human consumption will be served exclusively and directly by state legal persons” – that is to say, not by for-profit companies.

This referendum is a historic development and will form the basis of a campaign for a United Nations treaty on the right to water. Only two other countries have attempted to reflect the right to water in a legal framework. When apartheid was defeated in South Africa and Nelson Mandela became President, he amended the constitution to define water as a human right. However, the amendment was silent on how this new “right” would be delivered. Before long, the World Bank convinced the African

National Congress to let Suez, the big French water transnational, come in and run the water systems on a for-profit basis. As a result, over 10 million South Africans have had their water access cut in the last several years due to their inability to pay.

The other country to recently pass legislation is the Netherlands, which in 2003 passed a law allowing only “qualified legal persons” - that is, entities that are 100 per cent public or publicly owned - to deliver drinking water. While this law is important, particularly as the European Union is trying so hard to have water included in the General Agreement on Trade in Services (GATS) to the benefit of its water corporations, it does not affirm the human right to water. The referendum in Uruguay is historic precisely because it includes the best of the legislation from both the Netherlands and South Africa and because the people actually voted directly for it.

The referendum in Uruguay was the result of a two-year grassroots fight led by a network called the National Commission for the Defence of Water and Life. It was composed of the main trade unions, human rights groups, and environmental organizations, including Friends of the Earth Uruguay. However, this fight also brought unprecedented support from the international civil society water movement, which provided funding, resource materials, a massive number of e-mails and letters of support, and visiting delegations who then took the story of this struggle back to their home countries.



I had the privilege of visiting twice, first in January 2003 and again in early October 2004, just before the referendum was held. I found a team of people inspired by their fight, even as many are personally reeling from the aftermath of the two-year-old currency crisis that destroyed much of the middle class of Latin America.

At the volunteer centre where the heart of this campaign was fought, people were crammed six or eight to a room, sharing one or two computers held together by duct tape. Everywhere there was the easy laughter and the obvious love for one another that comes from people sharing a common struggle. I looked around at my friends - Alberto, Maria Selva, Adrianna and so many more - and remembered why I chose a life of activism. Referendum posters were everywhere throughout the city. There was an excitement in the air and great

pride when I told the mayor and the provincial assembly (all supporting the referendum) that they were being watched around the world and that the vote they were about to hold would be historic.



When I was in Montevideo, I also met one of my heroes - the great Latin American poet and writer, Eduardo Galeano, who was a fierce supporter of the referendum and helped the local committee greatly. We exchanged books and hugs.

The night before I left I spoke to hundreds of people at a big public forum, assuring them that their work had been worth it and that we would take their constitutional amendment and use it as the basis of an international campaign. But the standing ovation and tears came when I ended my speech with the words affirming that on October 31 "todos somos Uruguayanas" - we are all Uruguayans.

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www.blueplanetproject.net



Climate Change: Effects on your Lifestyle

Subjects

Geography 12

Time

- 5 minutes to outline activity and brainstorm in class.
- 15 minutes to work in groups of 4.
- 20-30 minutes for individual posters.
- 10 minutes to compare with Okanagan Waterscape.

Prescribed Learning Outcomes

- Geography 12: Evaluate how climate affects human activities.

Objectives

- To have students analyse the effect of changing climate will have on the waterscape and subsequent effects on their personal lives in order to provide relevance to the curriculum.

Materials

- 8.5 x 14 inch paper for each student.
- Pencil crayons.
- Okanagan Basin Waterscape poster.

ACTIVITY

1. After the ideas of the brainstorm have been recorded at the front of the class, have students break into groups of 4 and discuss their recreational activities. One student can be recorder (often a quieter student) and the group's activities can be listed as involving water or not.

2. Following the activities discussion a second discussion should take place on what can cause the climate to change with specific reference to global warming. This should also include the effect on local climate and the waterscape.
3. Finally, students can breakout of group to do an individual poster, divided into four sections (one for each season) of their current recreation using the top 11 inches of their paper.
4. Once completed, have students write what affects the change in waterscape would have on their recreation and how they feel about this in the lower 3 inches of their sheet of paper. For students who want more space an additional sheet or the reverse side can be used.
5. Students should compare their results of a changing climate and its affects to the waterscape with the Okanagan Basin Waterscape poster panel.
6. As a home assignment students should reflect and record their opinions on how climate change occurs, what the ramifications of increased global temperature would have on the planet and in their lives, is our current green house gas production sustainable and what are some possible solutions.

Extensions

- Students enthused about climate change issues can conduct further research into causes and cycles of climate change through earth history.
- Other projects can be undertaken to explore the amounts of green house gases produced per capita across the globe, or compile lists of green house effects.



Activity

Effects of Human Use on the Water Table

Subjects

- Geology 12
- Geography 12

Time

- Half of the entire period depending on how much is prepared in advance.

Prescribed Learning Outcomes

- S1, S2 and S3 or Geology, describe the characteristic of renewable and non-renewable resources and explain contemporary concepts of sustainability for Geography 12.

Objectives

- To observe the effect of lowering the water table on shallow wells, and to consider both human and geological influences affecting the level of the water table. To determine at what rate a resource may be consumed before that rate becomes unsustainable.

Materials

- One plastic groundwater model, half to two thirds filled with gravel.
- One plastic groundwater model, half to two thirds filled with sand.
- One plastic groundwater model, half to two thirds filled with sand and gravel.
- One pump (from an old dispenser of soap etc.), or a straw.
- Blue food colouring.
- Sink, bucket or large bowl to catch water in.
- One nylon.

ACTIVITY

1. Cut away one of the narrow sides of the bottle.
2. Fill the bottle 2/3 full of gravel/sand/sand and gravel, so that the material completely covers the mouth of the bottle. This creates your aquifer. Put the nylon over the neck of the bottle using the elastic to hold it in place. Screw the bottle cap over the top of the nylon.
3. Insert the pump or “well” into the gravel aquifer.
4. Pour the blue coloured water into the aquifer until above the bottom of the well.
5. Begin pumping slowly, observe and record what happens in the water table.
6. Pump faster and describe the rate of change in the water table, alternately more students can insert pumps to the same level.
7. Refill gravel aquifer and fill sand and sand/gravel aquifers to the same level.
8. Loosen caps and allow to drain while timing. Record the order the aquifers drain from fastest to slowest.

Activity

Effects of Human Use on the Water Table cont'd

Discussion

1. How does increasing the withdrawal rate affect the water table?
2. What does the addition of more pumps represent, and how has this been reflected in your community over the past 3 to 5 years?
3. What is necessary to recharge the depleted aquifer?
4. If withdrawal exceeds recharge, what will eventually happen to the ground water resource?
5. How does the size of grains affect permeability?
6. How does sorting affect permeability?

Extensions

- Students can contact local water providers to determine what percentage of water in their neighbourhood uses ground water and find out if the population is increasing or decreasing.
- Students can purchase a high viscosity drink like a milkshake and draw from it at a high rate to make a cone of depression around the straw (well).

Activity ~ Ground Water Pollution and Prevention

Subjects

- Geology 12

Time

- 15 minutes as a demo, half period as a student activity.

Objectives

- Model groundwater permeability
- Illustrate the nature of pollutant infiltration
- Illustrate the prevention of infiltration/conservation.

Materials

- One 1.80L rectangular plastic bottle from cranberry cocktail.
- 1/2 Ice cream pail of fine gravel
- 1/4 to 1/8 inch pieces of white gravel
- Gravel
- Nylon stocking
- Rubber band
- Water
- Blue food colouring
- Clear plastic or glass jar/beaker/glass
- Cocoa (about 1/4 tsp.)
- Clear 2L pop bottle
- Film canister with holes punched in bottom (translucent is best).

ACTIVITY

1. Cut away one of the narrow sides of the bottle.
2. Fill the bottle 2/3 full of gravel –so that gravel completely covers the mouth of the bottle. This creates your aquifer. Put the nylon over the neck of the bottle using the elastic to hold it in place. Screw the bottle cap over the top of the nylon.



Ground Water Pollution and Prevention Step 2

3. Pour the coloured water into the container and fill it until it is halfway up the mouth of the bottle. This set-up demonstrates the groundwater in the aquifer and the water table. The groundwater model represents a cross section of ground with gravelly soil underfoot. The nylon/rubber band represents the root structure on the bank of the river which prevents the gravelly soil from flowing freely into the river (clear container for catching water flowing from model). Discuss groundwater movement—does it flow or remain static? Students should sketch the apparatus at this time, labeling the water table, zone of aeration, zone of saturation and aquifer.



Ground Water Pollution and Prevention Step 3

4. To demonstrate the flow of groundwater, have a clear pop bottle full of the blue coloured water and a clear container for catching the water ready. Remove the cap on the groundwater model and simultaneously pour water from the pop bottle into the opposite end of the groundwater model. Collect the groundwater flowing through the model in a clear container.

Activity ~ Ground Water Pollution and Prevention cont'd

5. Now place the film canister (which has holes punched through the bottom) on top of the gravel bed at the far end from the mouth of the bottle, and close to the front side of the model. This represents a tank, industrial site, septic tank or any container from which a contaminate may leak onto the surface of the ground. With the lid screwed on the plastic groundwater model, fill the film canister with the cocoa water "contaminate." This could represent excess fertilizer, sewage from cattle, leakage from an oil storage tank. etc. Allow the canister to empty into the aquifer, watching the contaminate plume form.



Ground Water Pollution and Prevention Step 4



Ground Water Pollution and Prevention Step 5



Ground Water Pollution and Prevention Step 6

6. Demonstrate the movement of this plume by carrying out the same procedure as was used for the groundwater flow.
7. Collect the water in the plastic container and then compare it to the water entering the groundwater flow.
8. Using a similar apparatus, place a layer of plasticine on the surface before the film canister is added. This will stimulate the emplacement of an impermeable layer below the pollution source. Repeat step 5 through 7.

Discussion

1. What effect would a higher recharge rate have on the polluted aquifer?
2. What was the result of placing an impermeable layer around the pollution source?
3. Give local examples of potential or actual polluters of the ground water.

Extensions

- Take a field trip to the local sanitary landfill or have a guest speaker come in to discuss how groundwater is protected here.
- Research in what must be done with the storage tanks for gas stations as maintenance over time.
- Conduct telephone interviews of civic personnel or the Ministry of Environment to determine what the local by-laws are regarding clean-up of industrial sites, septic tanks or other potential polluters.



Activity ~ Urban Pollutants

Subjects Geography 12

Time

- 15 minute introductory class discussion,
- 15 min gathering school evidence
- 30 min homework

Prescribed Learning Outcomes

Explain contemporary concepts of sustainability

Objectives

- Model groundwater permeability
- Illustrate the effects of impermeable building materials on infiltration
- Collect evidence of urban pollutants
- Illustrate the prevention of infiltration / conservation

Materials

- Photograph of local school
- Digital camera

Discussion

1. What are some possible solutions to contamination from vehicular sources?
2. What effects does a direct flow storm drain system cause with regard to contamination?
3. What are some roofing materials which wash off and can potentially contaminate the water basin?
4. Which roofing materials have the least amount of environmental impact?

ACTIVITY

1. Discuss with the class showing a picture of your school what effects building materials have on infiltration.
2. Explain that the movement of water through the ground (ground water) has a cleaning effect on the water.
3. Ask students to explain what a yellow fish spray painted beside a storm drain means.
4. Have students predict what the result is on the water supply of decreased infiltration from impermeable building materials along with the storm drain system.
5. After wrapping up the discussion go as a class to the school parking lot with the digital camera and have students photograph evidence of oil and other car fluids leaking from the parked cars onto the surface. Allow students to go around the school yard and collect other evidence of pollutants which could be carried by rainwater runoff into the water basin.
6. As a home activity have students photograph the discharge from the downspouts around their house and record their roofing material.
7. The next day have students compare roofing materials and the amount washed off.

Extensions

- Interview a provincial government official responsible for vehicle inspection. Be sure to focus questions based on environmental impact of the vehicles.
- Conduct telephone interviews of civic personnel in charge of hazardous waste clean up and drop off. If no program exists in your community interview other personnel to find out why.