Comox Lake Watershed Water Quality

Eco-Asset Management Symposium
"Exploring Ecosystem Services and Eco-asset Management Opportunities in the Upper Comox Valley Watershed"

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Comox Lake Watershed

- Drinking water for 45,000 residents
- Watershed is 461 km^2 - 61% private-managed forest land
- Subwatershed supplies Village of Cumberland
- Lake is 2100 ha with mean depth of 65 m
- BC Hydro reservoir (c. 1912) with 4.5 m drawdown
- Watershed protection planning since 2006
- Watershed Protection Plan April 2014 – April 2016
- Many recreational users
- Unfiltered water supply
- High quality water

Photo courtesy D. Stapley

Watershed Protection Plan

Vision: "*Working through the Watershed Advisory Group, the CVRD will ensure that water resources and ecosystem function within the Comox Lake Watershed are protected in order to provide a high quality, sustainable drinking water supply*."

"This plan recognizes that high quality drinking water is produced by a healthy ecosystem that functions properly with particular processes and attributes: specifically, those aquatic and riparian processes that capture, store and release water while simultaneously moderating or removing suspended sediments, bacteria, viruses, parasites and excess nutrients."

= Ecosystem services

Photo courtesy D. Stapley

What is “Water Quality”?

- Physical, Chemical and Biological characteristics:
  - Clarity (Turbidity)
  - Colour
  - Taste and Odour
  - Temperature

  “clear, cold with no colour and no smell”
  - Nutrients (e.g. nitrogen, phosphorus)
  - Pathogens (certain protozoa, bacteria, & viruses)
  - Toxins (e.g. pesticides, blue-green bacterial toxins)

Drinking Water Quality

- Legal requirement (BC Drinking Water Protection Regulation):
  - Fecal coliform – 0 per 100 mL
  - E. coli – 0 per 100 mL
  - Total coliform – 90% samples have 0 per 100 mL and no sample more than 10 per 100 mL
- No legal requirement for any other parameters
- Drinking Water Treatment Objectives have 4 conditions:

  1. Two disinfection processes to inactive viruses and parasites
  2. Bacterial quality as noted above
  3. Average daily turbidity "around 1 NTU" but not to "exceed 5 NTU for more than 2 days in a 12- month period"
  4. Watershed control program in place

Natural Influences on Water Quality

- Natural - Interaction between soils, water, and vegetation
  - Watershed size/drainage area
  - Slope and aspect
  - Precipitation patterns (how much water and when)
  - Natural disturbances (windthrow, insect outbreaks, wildfire, beaver activity)
  - Wildlife populations and density (ungulates, aquatic animals, birds)
  - Vegetative cover especially in riparian areas
  - Settling, mixing, biological activity in lakes/ reservoirs
  - Wave action on shorelines
  - Dilution
  - Geology and soil type (*e.g.* clay vs. mineral vs. organic)


Courtena
Bevan
Puntledge
Unconsolidated
Perseverance Creek
Volcanic Basalt

Spur Road, Comox Lake Main


Perseverance Creek
Unconsolidated
Photo courtesy CVRD

Human Influences on Water Quality

- Human disturbance
  - Soil disturbance (roads, trails, logging, mining)
  - Compaction of soils (roads, trails, development)
  - Concentration/ alteration of flow patterns (e.g. ditches along roads, water diversions, dams)
  - Operation of reservoirs (changing water level)
  - Introduction of animals (livestock, pets)
  - Change in vegetative cover, especially in riparian areas (forestry, agriculture, development)
  - Water withdrawals
  - Waste inputs (sewage, other pollutants)

White's Bay

Photo courtesy CVRD

Natural Filters – Riparian Areas

- Slow water flow and trap suspended materials
- Provide organic material to feed stream ecosystem
- Tightly recycle nutrients
- Stabilize soils and prevent erosion
- Riparian soils are like sponges, holding and slowly releasing water over time
- Soils filter water and breakdown pollutants

Overland Flow

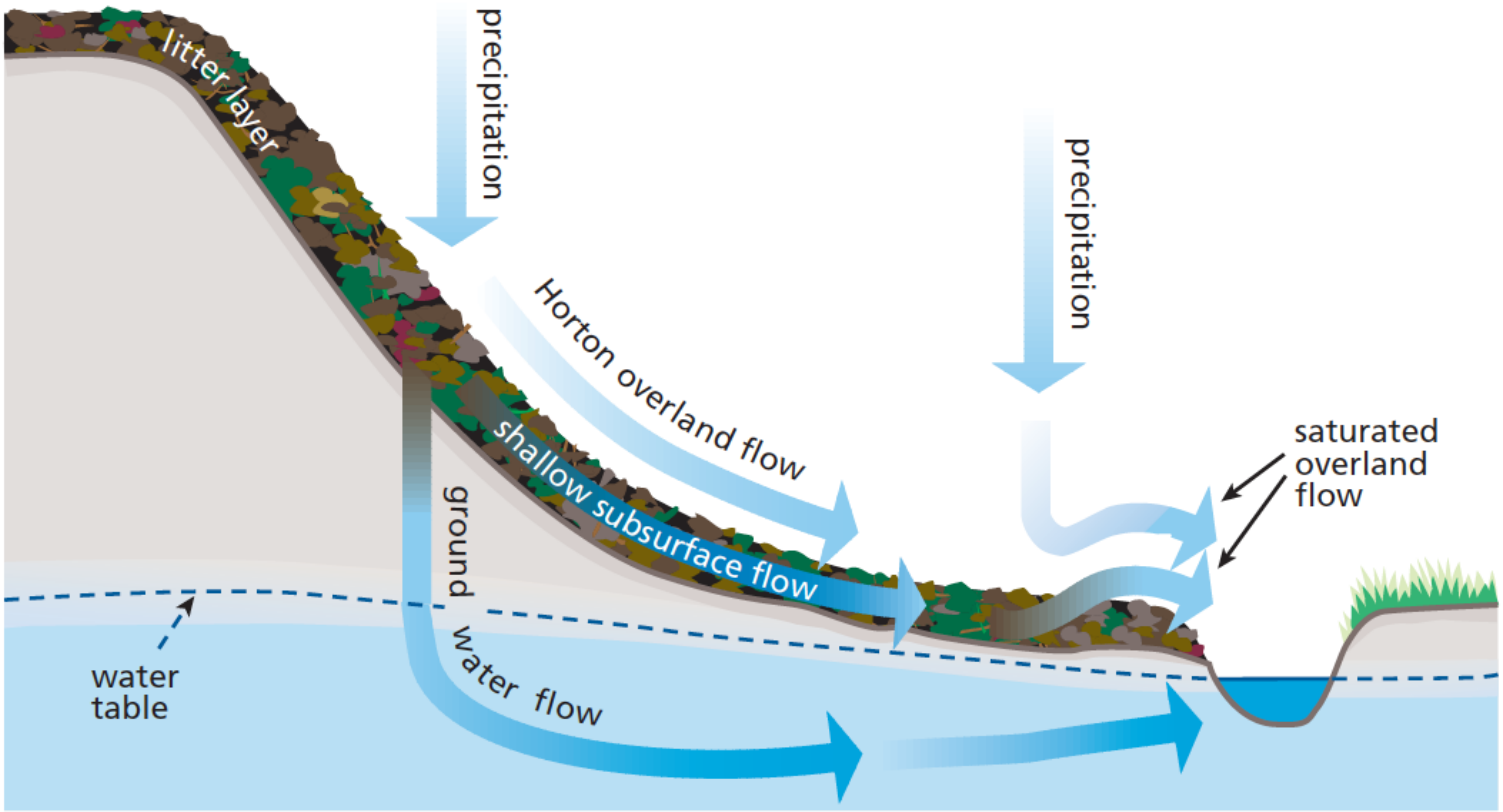
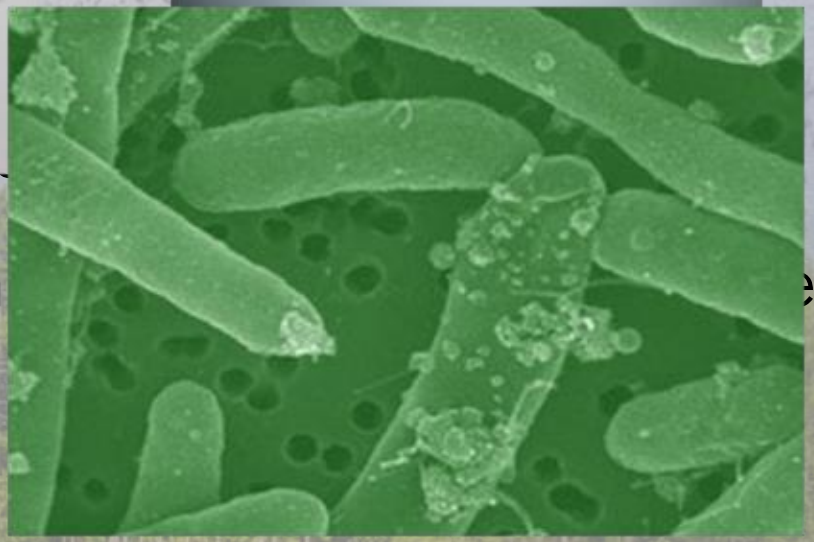


Figure 2.10: Flow paths of water over a surface. *The portion of precipitation that runs off or infiltrates to the ground water table depends on the soil's permeability rate; surface roughness; and the amount, duration, and intensity of precipitation.*

Natural Filters - Lakes

- Water
- Large
- Phyto
- Zoopl
  proto
- Cold
- In general, the longer th



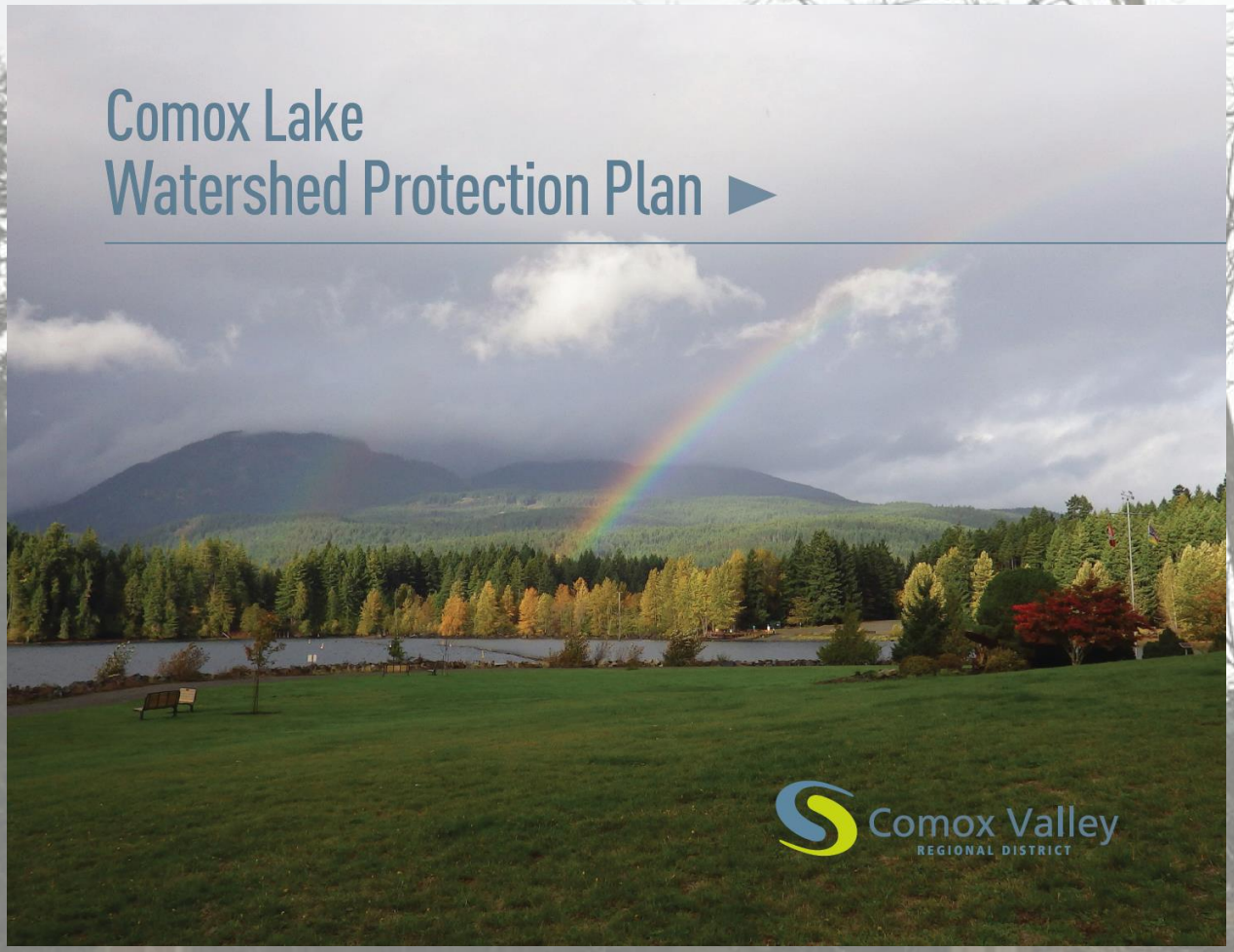
How Can We Protect Water Quality?

- Understand the characteristics of **this** watershed
- Keep riparian buffers intact
- Ensure forest harvest activities do not affect hydrology
- Keep roads and trails to a minimum
- Ensure existing roads and trails are stable and properly drained
- Prevent catastrophic wildfire
  - Emergency response plan and limited access
- Prevent contamination with human pathogens
  - Limit access and development
- Restore natural drainage patterns
  - *e.g.* Perseverance Creek

How Can We Protect Water Quality?

- Monitor water quality for changes and adapt mgmt.
- Plan for changing weather and climate (*e.g.* larger storms, less snowpack)
  - Larger culverts, different shutdown windows
  - Flood and drought planning
  - Monitor for insect outbreaks
  - Control invasive plants
- Maintain the reservoir at a stable level
  - Water conservation; reduced energy generation

Watershed Protection Plan



http://www.comoxvalleyrd.ca/EN/main/departments/water-services/watershed-protection.html

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