

Envirothon: Aquatics Module

With your host Andrew Downey



ALLIANCE DU BASSIN VERSANT
PETITCODIAC
WATERSHED ALLIANCE

And... GO!

If you have questions or need clarification:

Andrew Downey

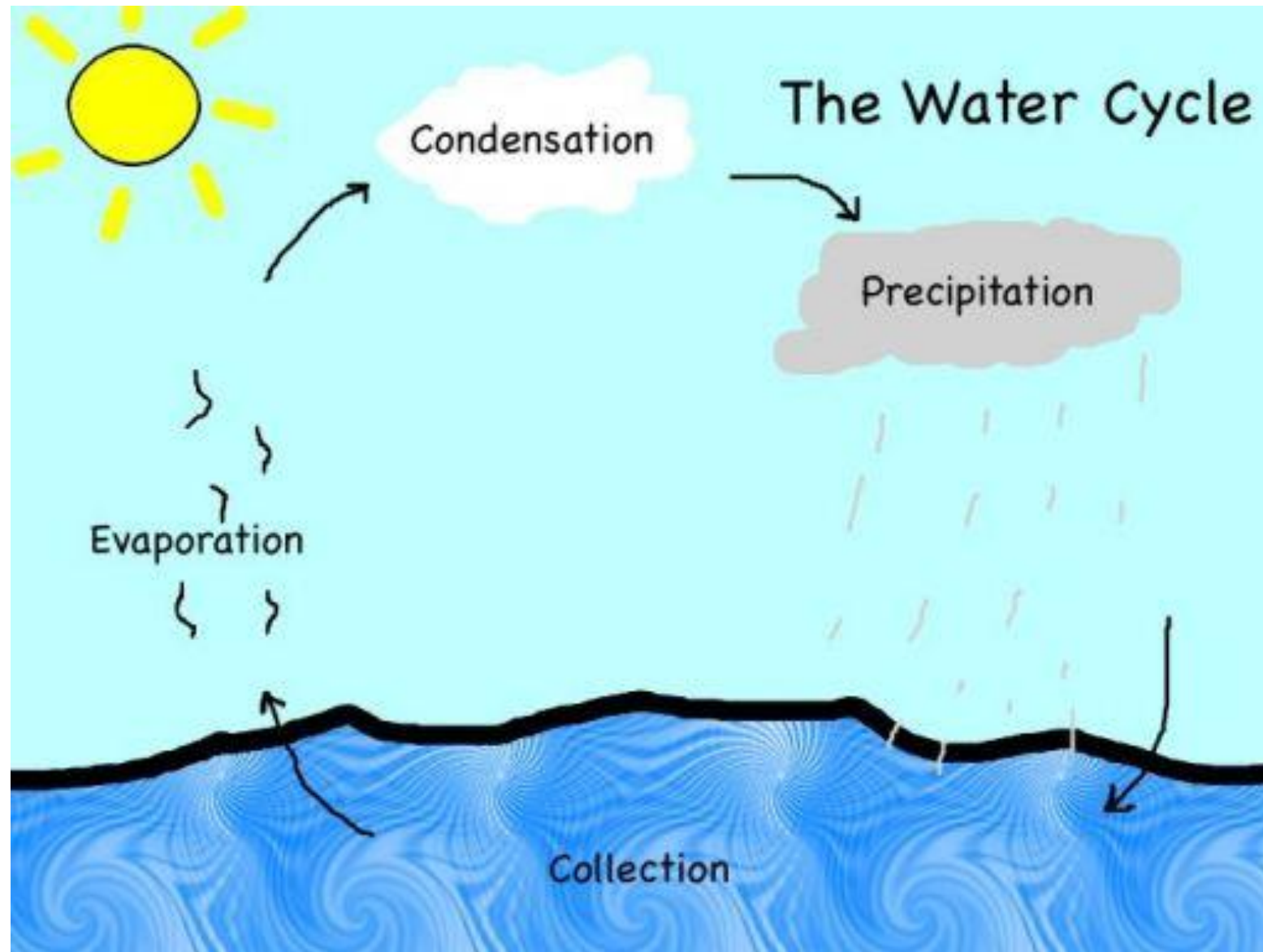
andrew@petitcodiacwatershed.org

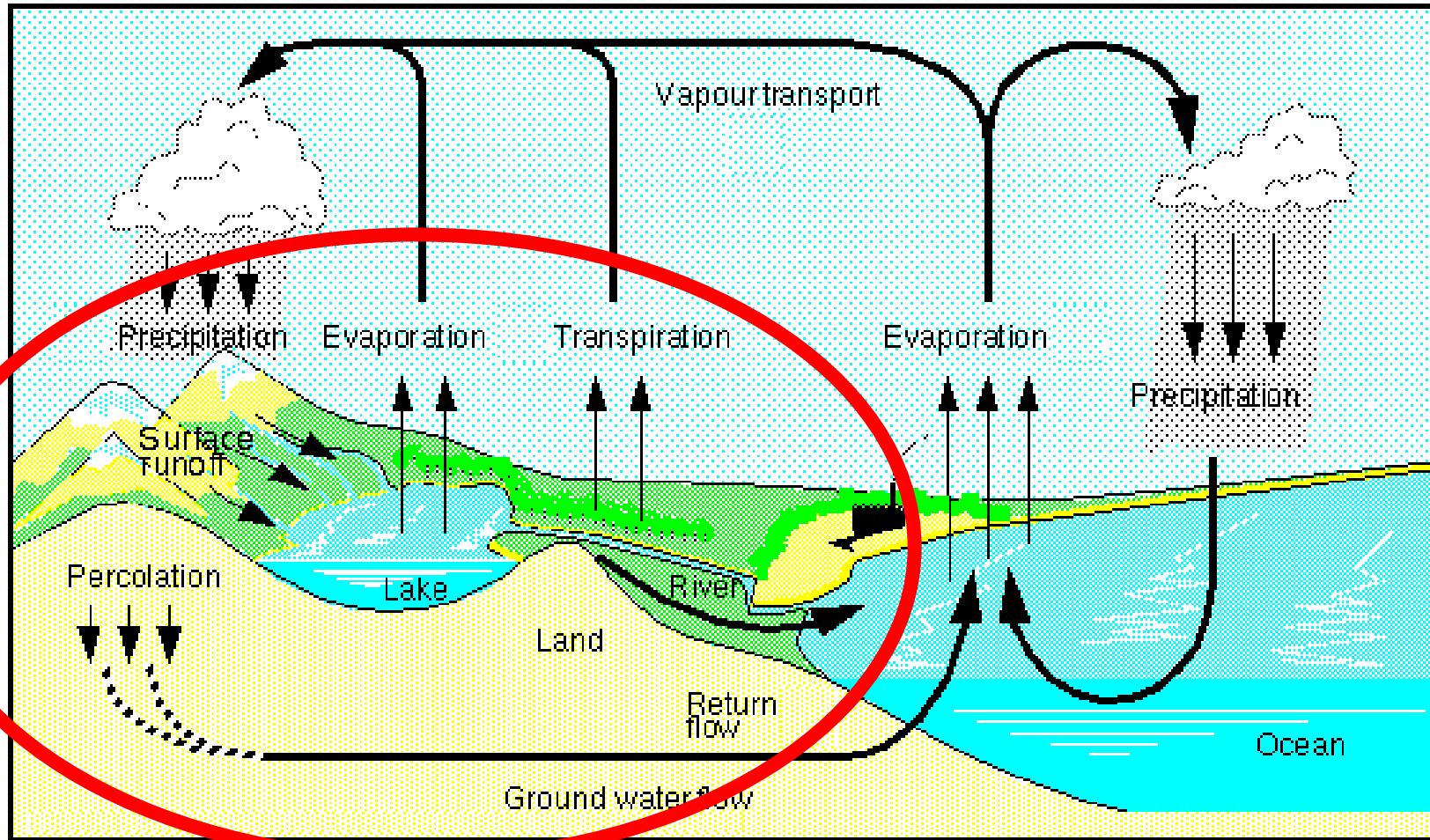
384-3369

I will send you the presentation, so please just take minor notes and listen.

ABIOTIC: Non-living stuff

Water, rocks, mountains, sand, nutrients, etc.





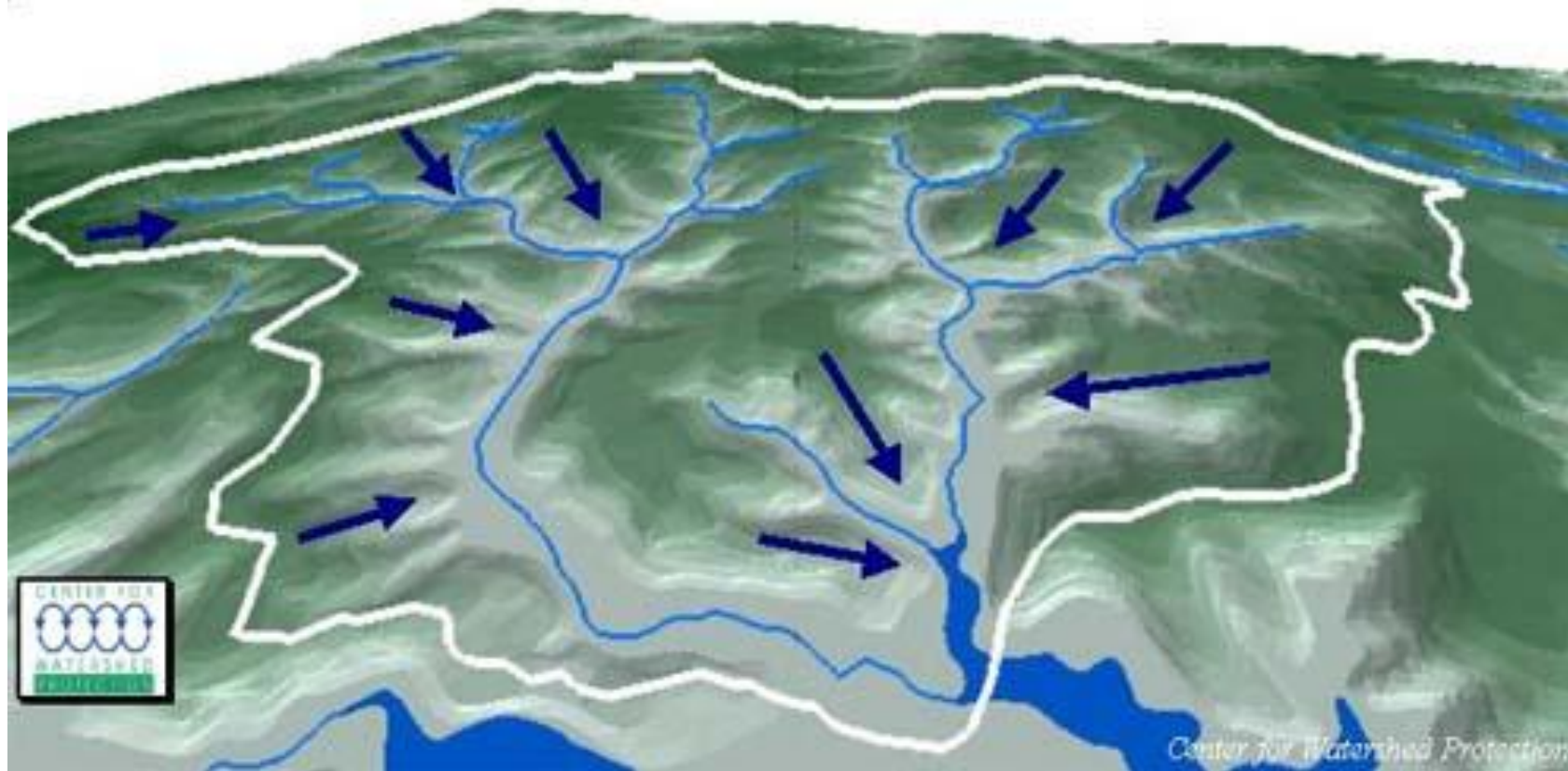
KEY WORDS

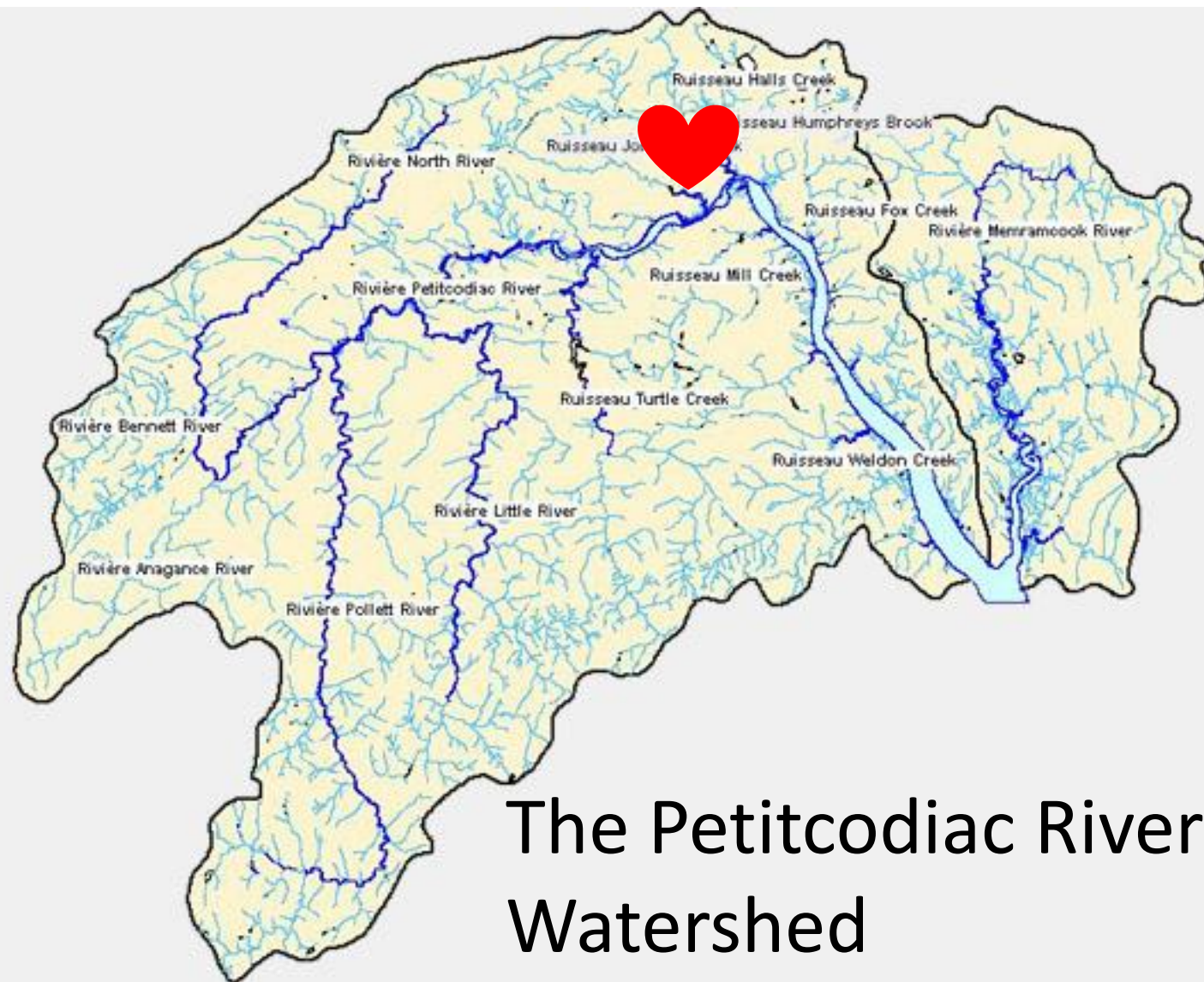
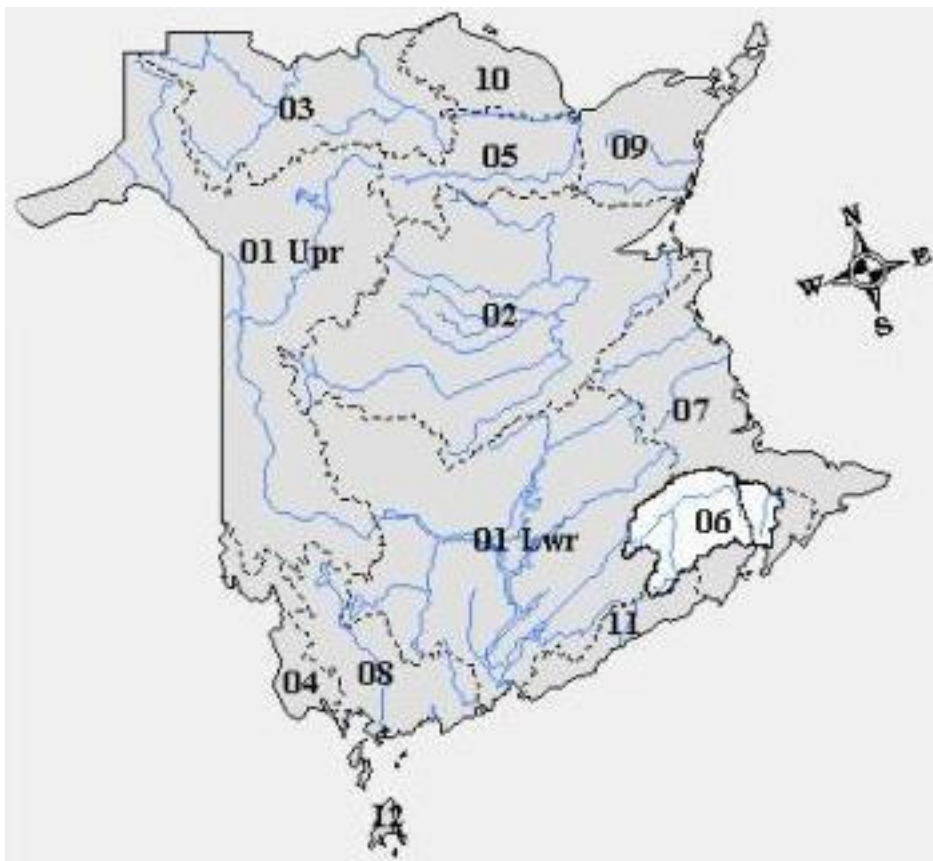
- Precipitation
- Evaporation
- Transpiration
- Percolation
- Ground water
- Surface water

Courtesy Erich Roeckner, Max Planck Institute for Meteorology

What Is a Watershed?

A watershed is the area of land that drains to a particular point along a stream

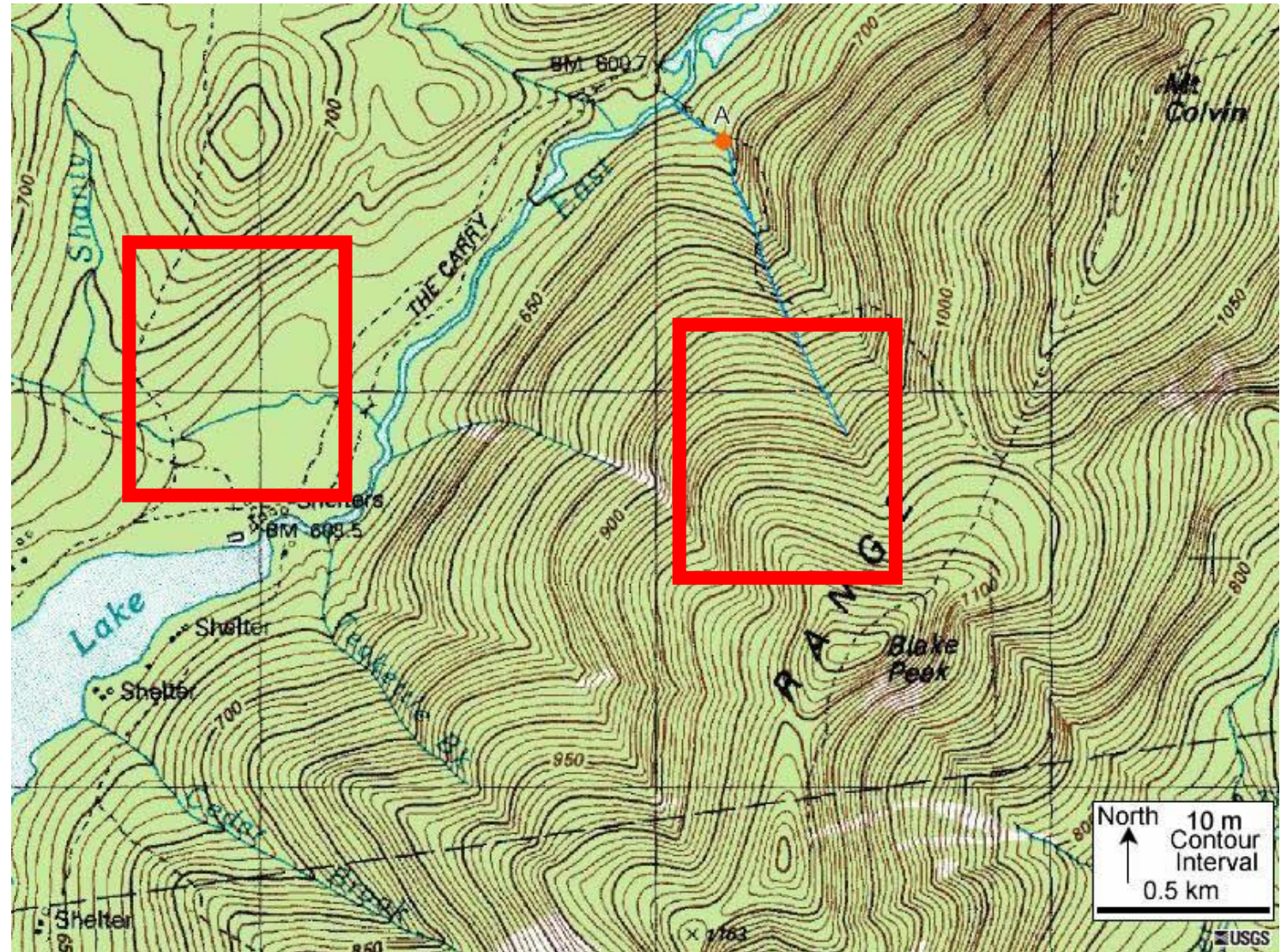




The Petitcodiac River
Watershed

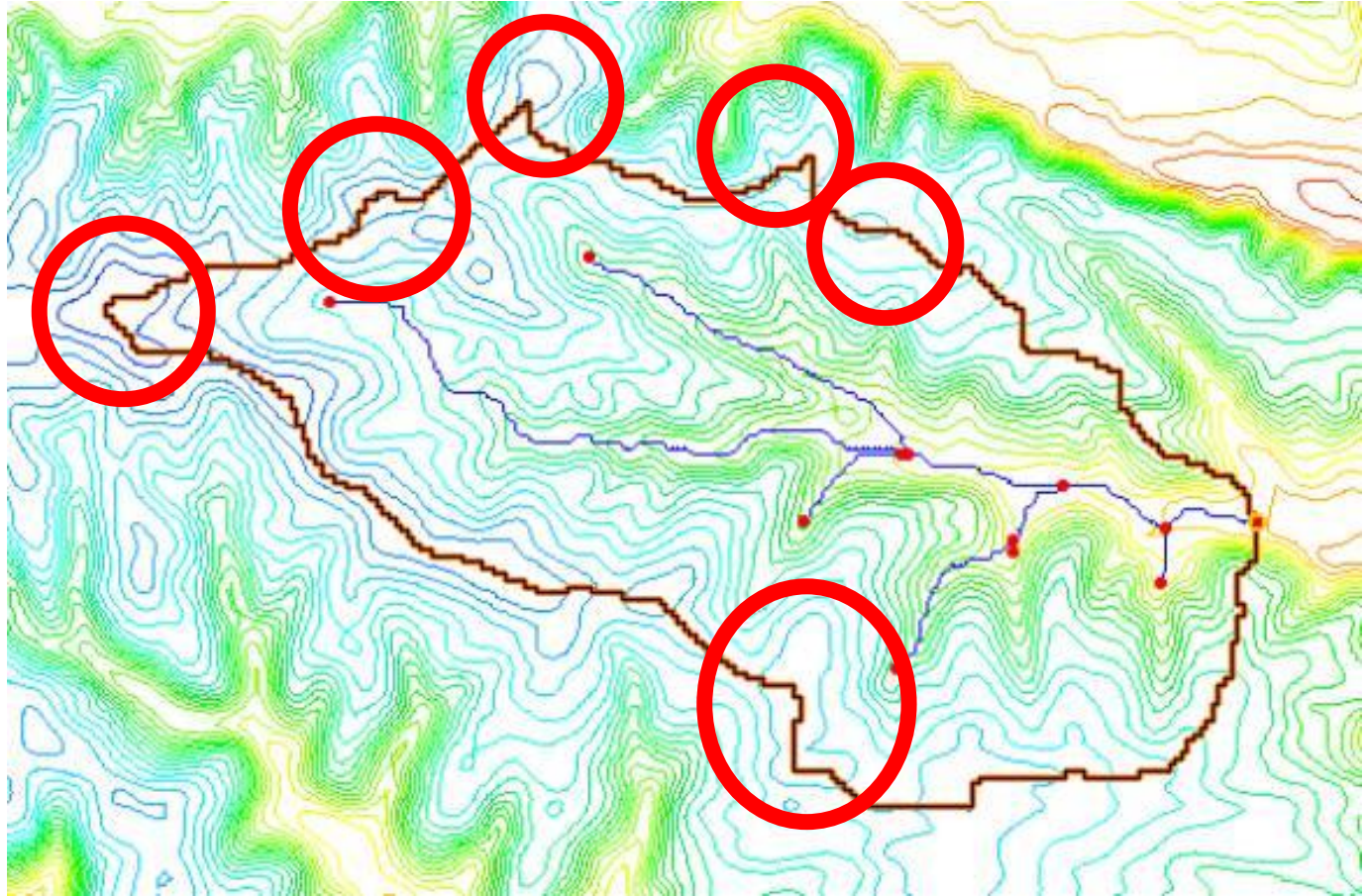
Topography

- Circles depict top of hill/mountain
- Lines denote slope
- Spacing between lines is consistent



Delineating Watersheds

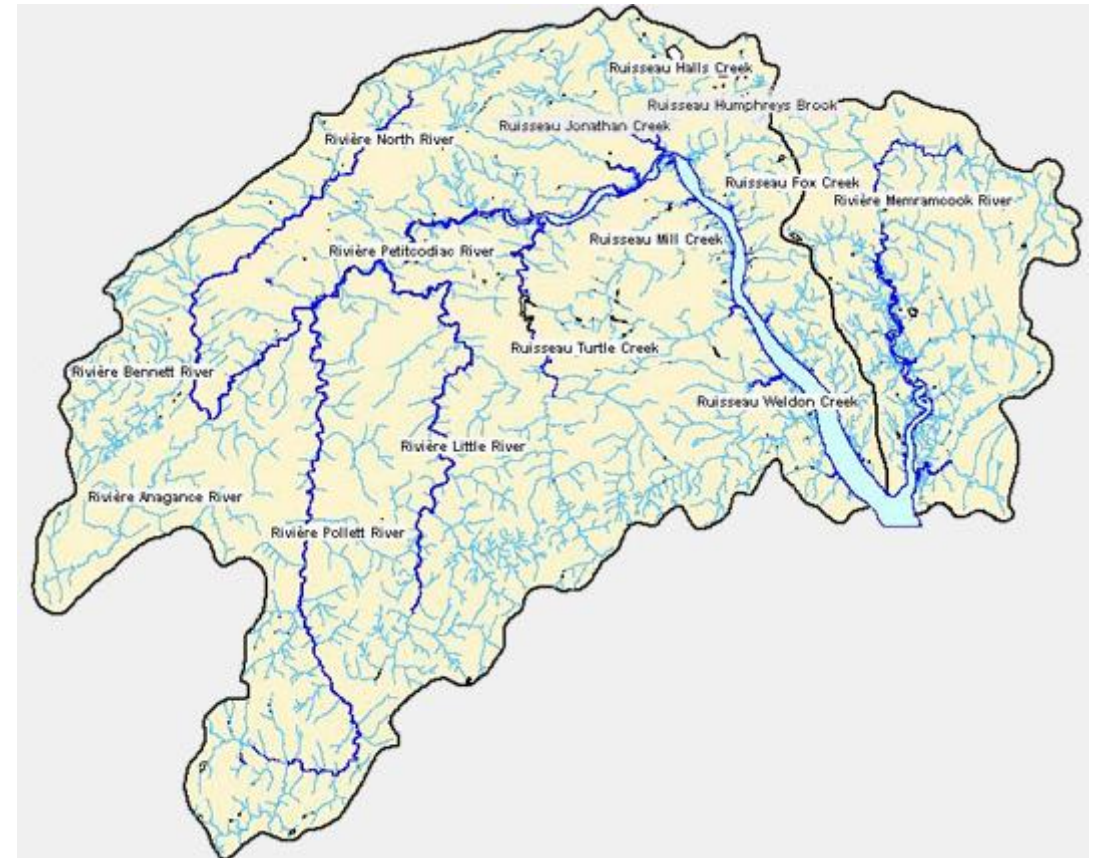
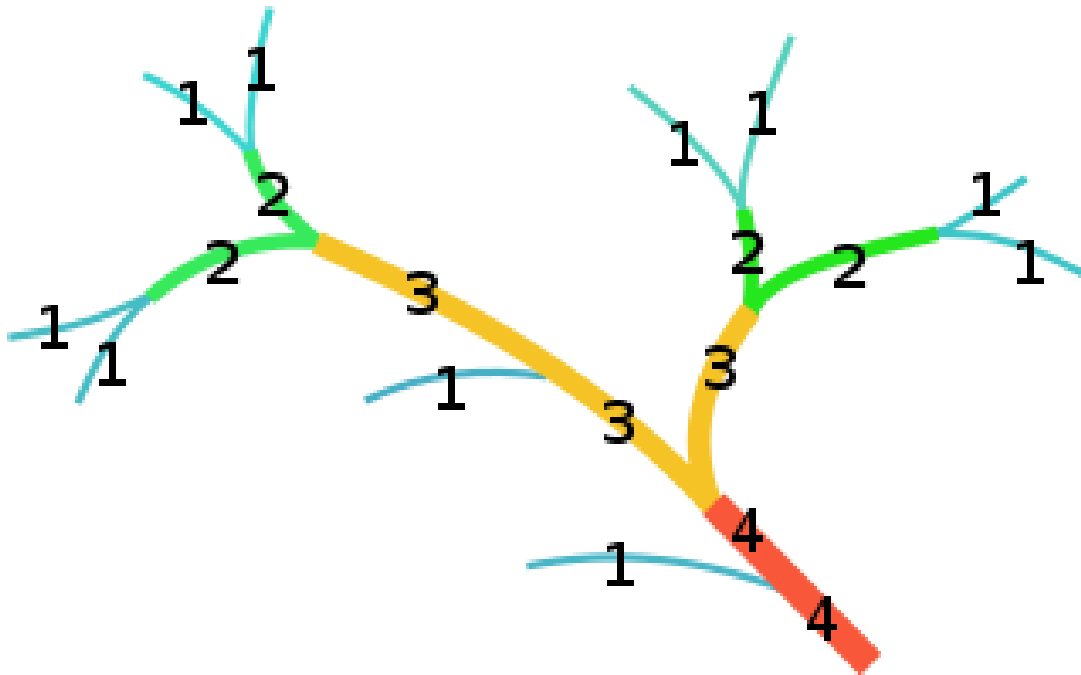
- Topography-based
- Look for the circles
- Draw lines between



Practice time!

Watershed Delineation

Determining Stream Order

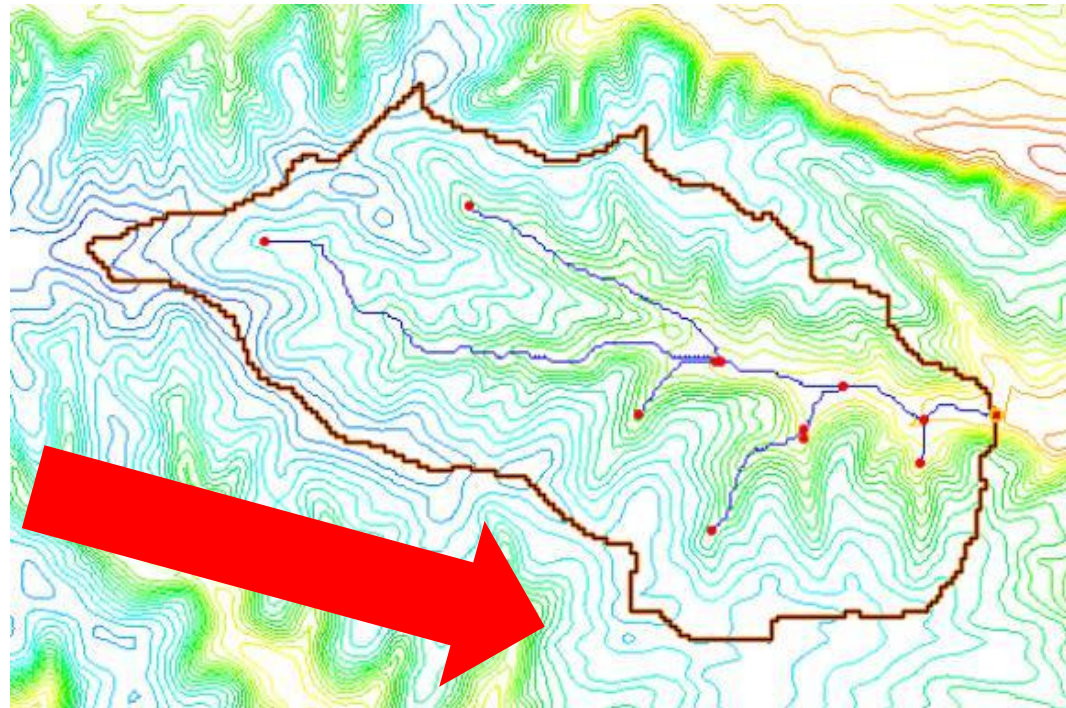


Watershed Health

- The actions on the land determine watershed health
 - Actions at the top of the watershed will affect those below it
 - We are all connected

WATER QUANTITY

WATER QUALITY



Water Quantity

- How much water is moving through the system?
- Human practices can change that
 - Clear cutting (inability for the environment to absorb precipitation, less transpiration)
 - Industrial practice (e.g. bottled water company sucking a lake dry)

Q: What are some consequences of too much or too little water?

Water Quality

- Chemical, physical, and biological characteristics of water
 - Temperature, pH, total dissolved oxygen, turbidity, total coliform, salinity
 - Affects biota, or life



Q: What are some consequences of poor water quality in a river, lake, pond, or ocean?

Water Quality Monitoring Using a Probe

- <http://curah2o.com/community-partners/calibration-and-storage-videos/>
- Determine the following:
 - pH
 - Temperature

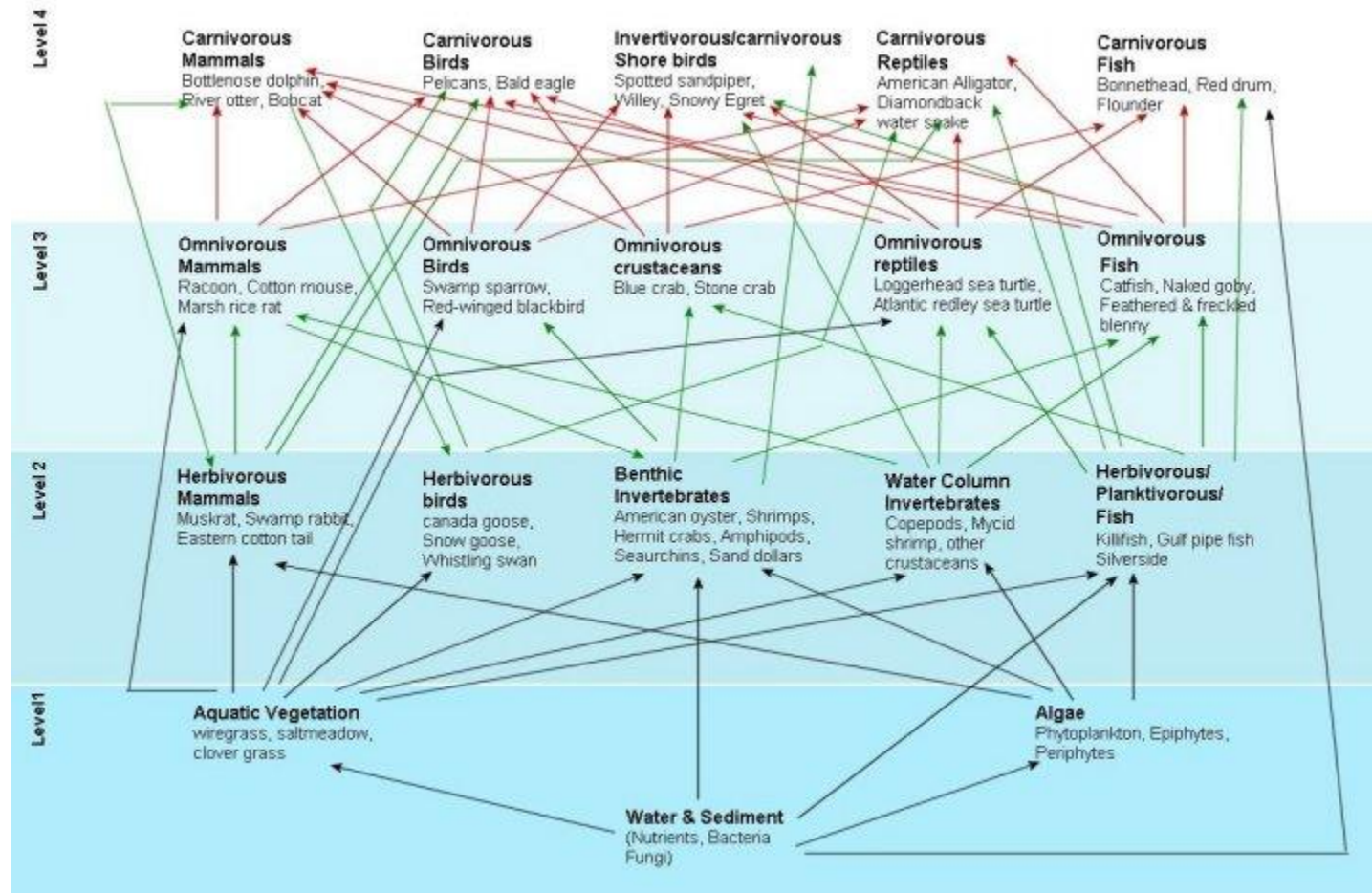


BIOTIC: Living stuff

Animals, plants, bacteria, fungi, etc.

Aquatic food webs

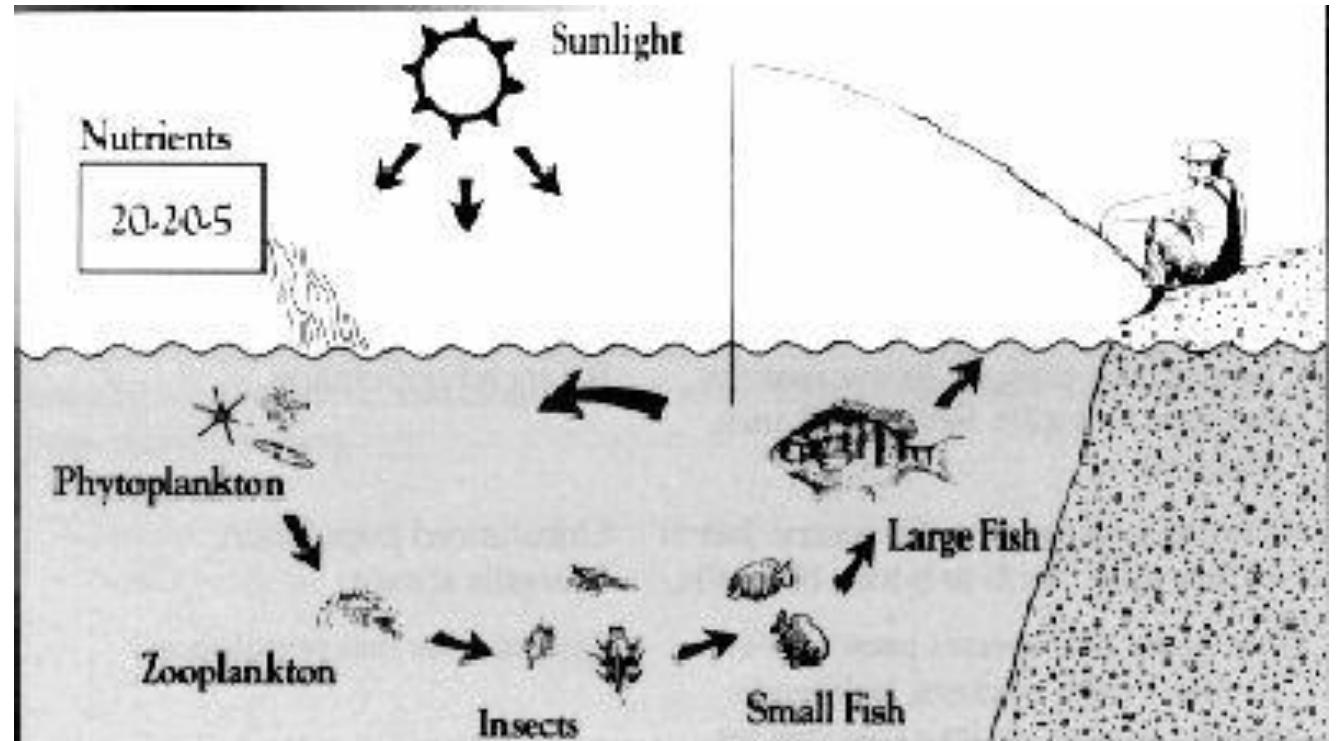
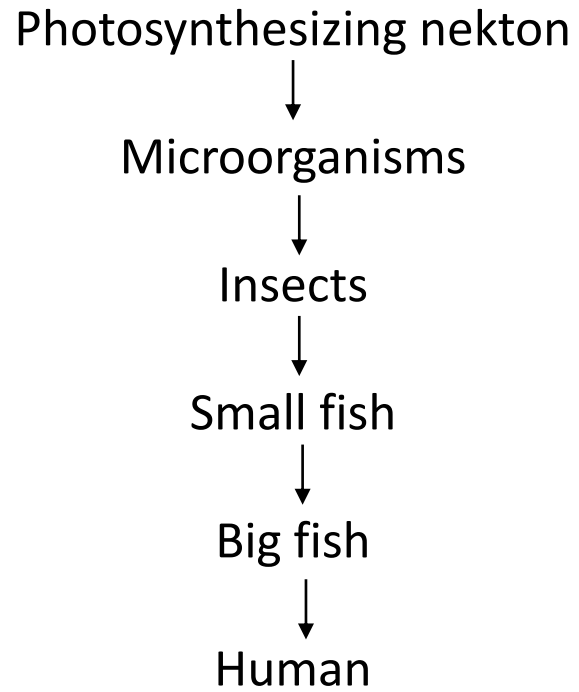
There's a lot going on!



DON'T MEMORIZE THIS SCHEMATIC

Energy is transferred through a system, and all organisms in a food chain are connected to one another. If one link is missing, the whole food chain is affected.

An example



Carrying capacity

- = the maximum number of organisms that an ecosystem can support

Q: An alien needs 2 boxes of Kraft Dinner every day to survive. On planet Envirothonica, the environment produces 60 boxes of Kraft Dinner every day. How many aliens can the planet support?

A: 30 aliens



Same applies to ecosystems, and is obviously more complicated. Fish and insects, humans and deer, etc. The main point is that you need to have a healthy and biologically diverse environment to be able to produce the most food sources.

Sustaining aquatic populations

- Water quality and quantity affect aquatic food webs
- General rules for healthy water ecosystems:
 - Cold
 - Clear
 - Highly oxygenated
 - Little human-caused nutrient input (farms, industrial practice)
 - Deep and shallow sections
 - A healthy vegetative buffer between it and human activity
- These rules should be considered when altering any aspect of a watershed system (remember: connection)



Locally Found Aquatic Species-at-Risk

- Inner Bay of Fundy Atlantic Salmon (on the brink of extinction)
- American eel
- Striped Bass
- Wood Turtle



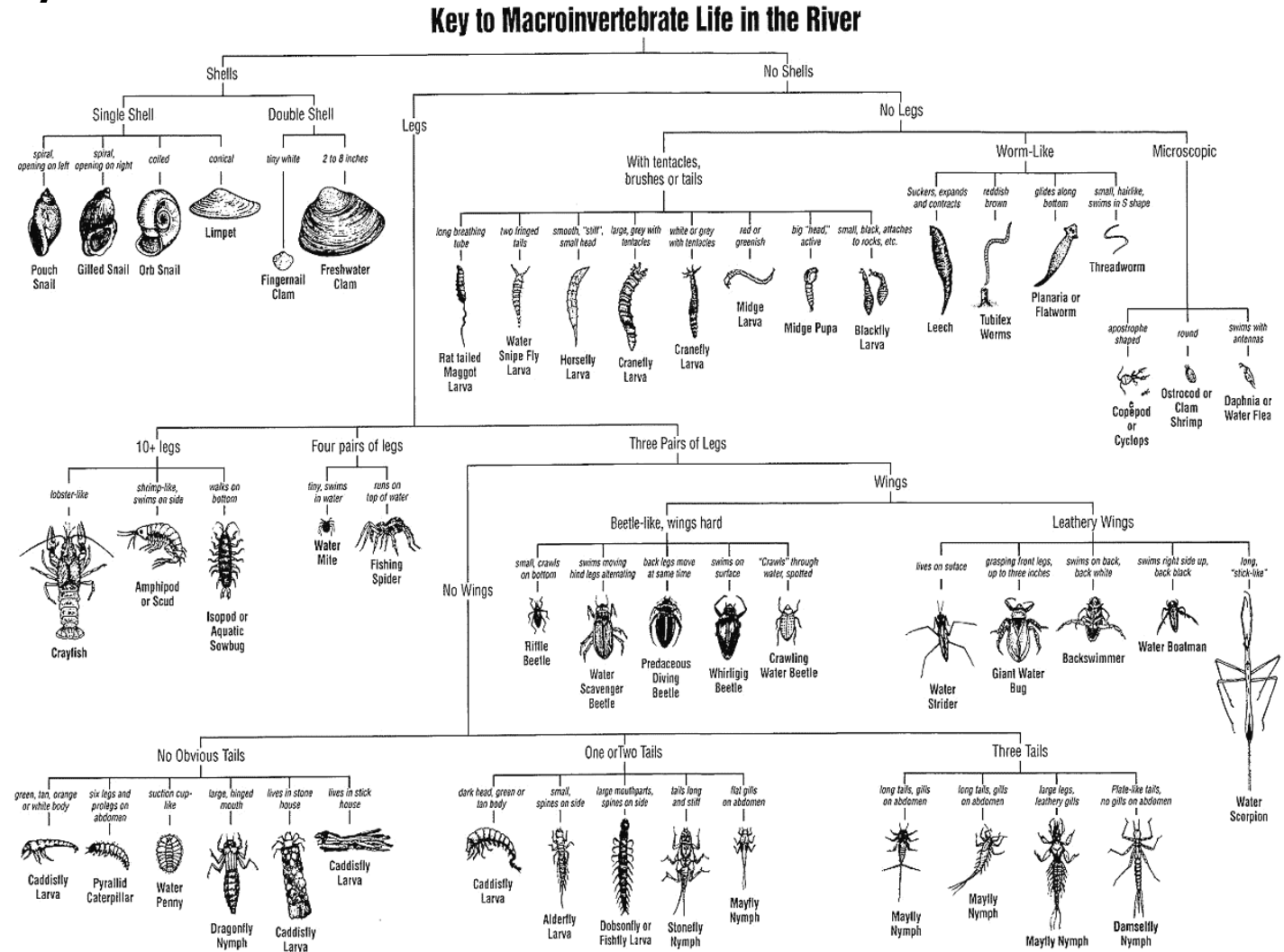
Biological indicators

- Water quality provides snapshot of water health
- Biological indicators gives longer term information
 - Some species are more sensitive to pollutants than others
 - The presence of pollutant sensitive species usually means it's a healthy system
 - E.g. Canadian Aquatic Biomonitoring Network (CABIN)
 - Uses aquatic invertebrates as an indicator of water quality



Dichotomous keys

- Uses yes/no questions
- Can be visual or descriptive



Practice!

Make sure to start at Question #1

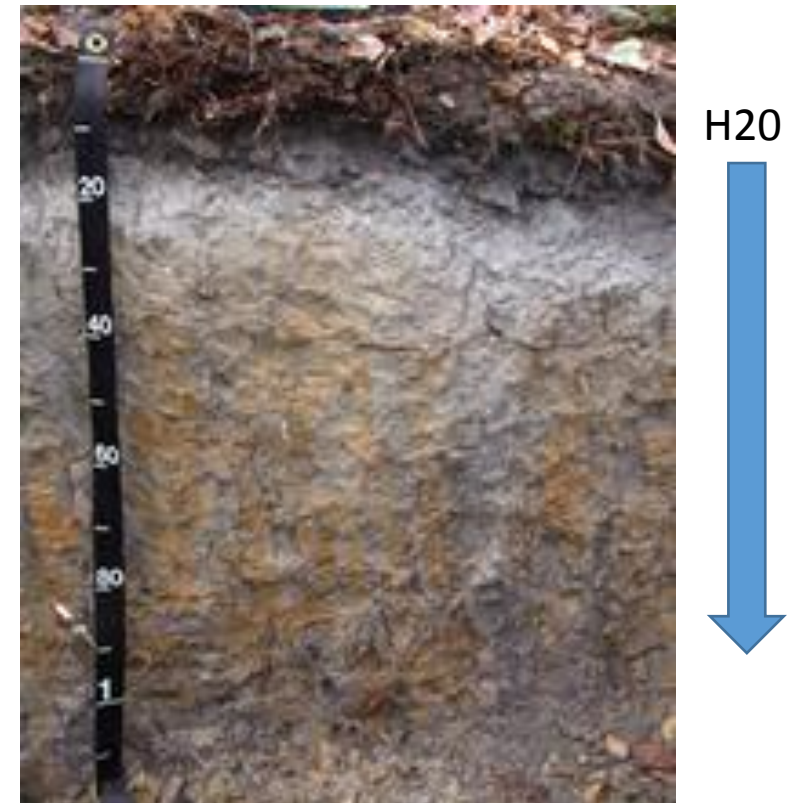
AQUATIC ENVIRONMENTS

Wetlands, rivers, oceans, lakes, ponds, riparian zones, etc.

Wetlands defined

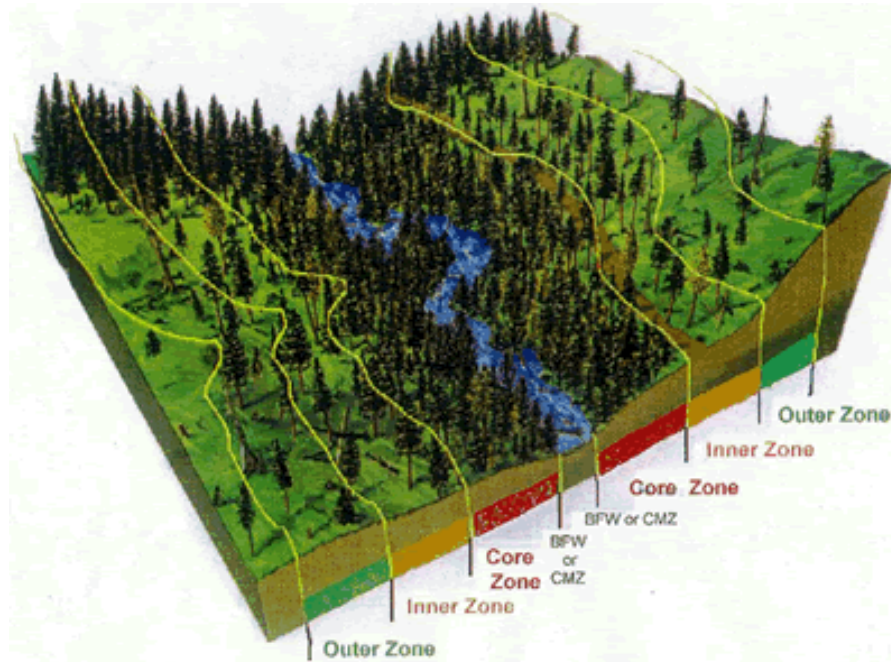
(if the land is wet a lot, it's probably a wetland)

- Presence of wetland plants
- Presence of hydrology (or water)
- “Hydric” soil



Riparian zones defined

- Transitional zone between aquatic and terrestrial ecosystems
- Buffer waters from human land uses (farming, etc.)
- Look for a mixture of water-loving and terrestrial species

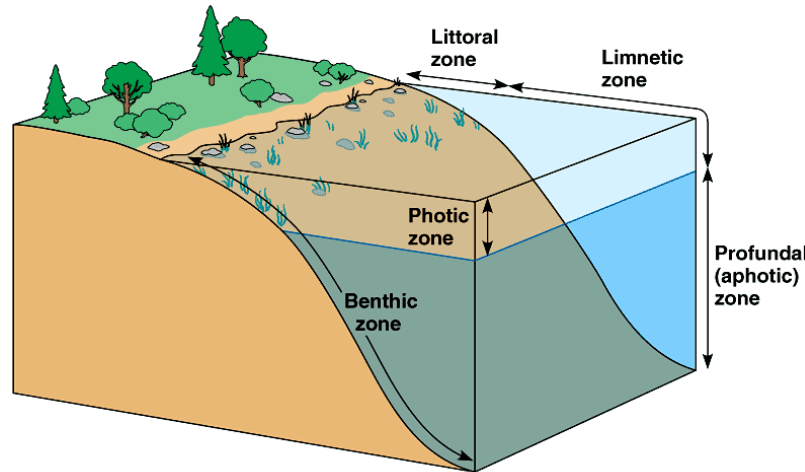


Lakes vs. ponds defined

- All about light penetration – can it reach the bottom across its entirety?

Yes -> Pond

No -> Lake



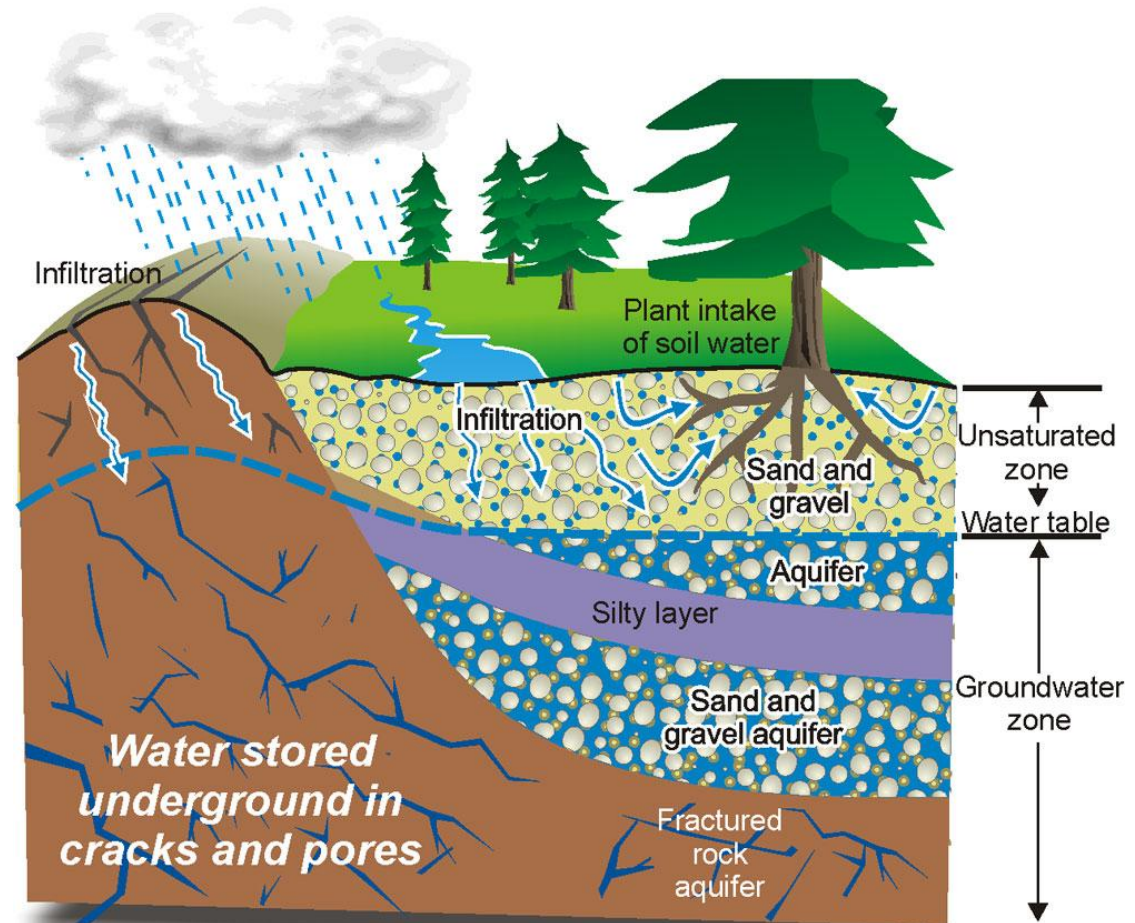
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Light determines whether or not photosynthesizing plants can survive, thus community structures are different in lakes (with benthic zone) and ponds (without a benthic zone).

Groundwater and Aquifers

- Water is moved and stored underground

*This is how wells are able to collect water

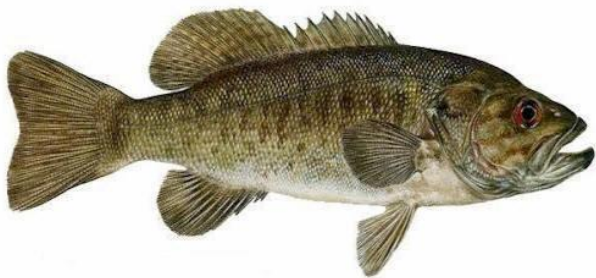


INVASIVE ALIEN SPECIES

More common than UFOs, presence of invasive species are increasing globally

INVASIVE ALIENS

- Species that are not native to an area (alien)
- Species that outcompete native biota (invasive)
 - Smallmouth bass
 - Purple loosestrife
 - European starling



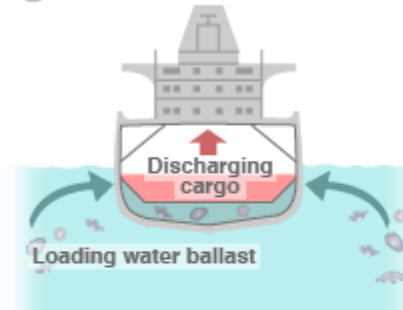
How can invasive species be introduced?

- Ship ballasts
- People
- Exotic pet trade

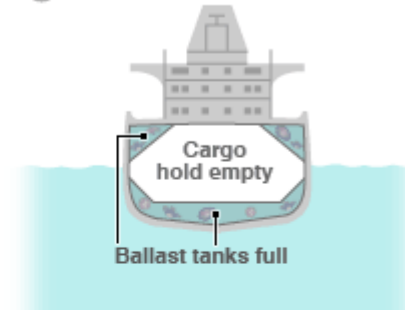


BALLAST WATER CYCLE

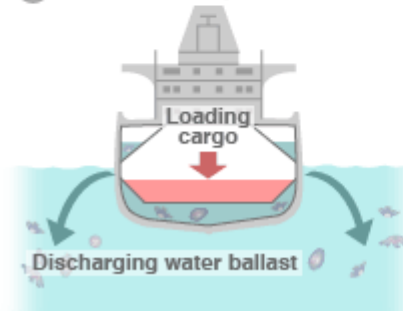
① At source port



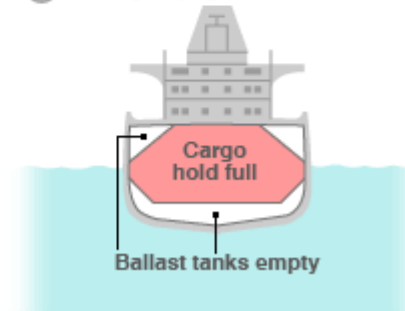
② During voyage



③ At destination port



④ During voyage



SOURCE: GloBallast

Governing and Law Enforcement

- Aquatic Nuisance Species Task Force
- Department of Fisheries and Oceans Canada
- Department of Natural Resources



**STOP AQUATIC
HITCHHIKERS!**

Prevent the transport of nuisance species.
Clean all recreational equipment.

www.ProtectYourWaters.net



Fisheries and Oceans
Canada

Pêches et Océans
Canada

OTHER CONSIDERATIONS

Water, water, everywhere. Or is it?

Pollution

- Point source: a single identifiable source of pollution
- Non-point source: does not meet point source definition (multiple)



Groundwater pollution

- Just because it's underground, doesn't mean its safe
- Non-point -> Saltwater intrusion: PEI
- Point -> Leaching from industrial activity

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Salt-water intrusion in Prince Edward Island

P. A. Carr

 [PDF \(1364 K\)](#)
 [PDF-Plus \(758 K\)](#)
 [Citing articles](#)

Canadian Journal of Earth Sciences, 1969, 6(1): 63-74, 10.1139/e69-007

ABSTRACT

The numerous saline estuaries situated throughout Prince Edward Island permit high tides to carry salt water a long way inland and to penetrate the bedrock aquifer. Very little groundwater consumption occurs around the banks of the Eliot River estuary, yet salt water has moved into the bedrock and created a large zone of diffusion. This salty water extends as far as 1200 ft inland and has penetrated to a depth of 185 ft. Beneath this salty water is fresh groundwater, which extends down to about 600 ft where it is underlain by salt water. The salty water in the

Water Wars

- All life depends on water
 - Naturally some competition would arise
 - Who does it belong to?
- Examples:
 - Water supply for humans
 - Hydropower
 - Navigation
 - Wildlife
 - Recreation
 - Waste assimilation
 - Irrigation
 - Industry

#firstworldproblems #Canada

- Ridiculously excessive water consumption
- Denial about water availability (it's NOT an unlimited resource)
 - 2nd most wasteful per capita in the world (329 litres/person/day)
- Canada is one of the most water rich countries in the world
 - Buried rivers under asphalt
 - Lakes so polluted you can't even swim in them
 - Fish kills in the news every summer
 - Aboriginal communities living in third world conditions (no running water, etc.)

WHY?



Things you can do

- Use a rain barrel to collect water for watering your garden
- When it's yellow, let it mellow
- Plant something useful and less water thirsty than turf grass
- Don't waste
- Join water groups
 - Local watershed groups
 - National groups: Canadian Water Network, Waterlution
- Talk about it! Break the denial!
 - Harness social media – Twitter is HUGE for water conversations

Bringing it all together

- Abiotic variables shape the landscape (geology, hydrology)
- ^ determines what habitat will be formed
- ^ determines what biota, or life, will be present
- Biotic webs are complicated and dynamic
- Globalization and human influence can alter these sensitive systems
- Must be protected and understood

Thank you! Questions?

ADD US ON FACEBOOK AND TWITTER!

Petitcodiac Watershed Alliance

@PetitcodiacWA

