
Aquatics

“Water Planet”

~Approximately 75% of the Earth is covered by water.

~Oceans regulate the Earth’s climate, dilute and degrade wastes, and provide a major habitat for many of Earth’s creatures!

https://www.worldatlas.com/articles/what-percentage-of-the-earth-s-water-is-drinkable.html

Limited Freshwater

Approximately 2.5% of Earth's water is freshwater…….

~69% of that 2.5% is locked up in polar ice caps, leaving 31% of all freshwater accessible.

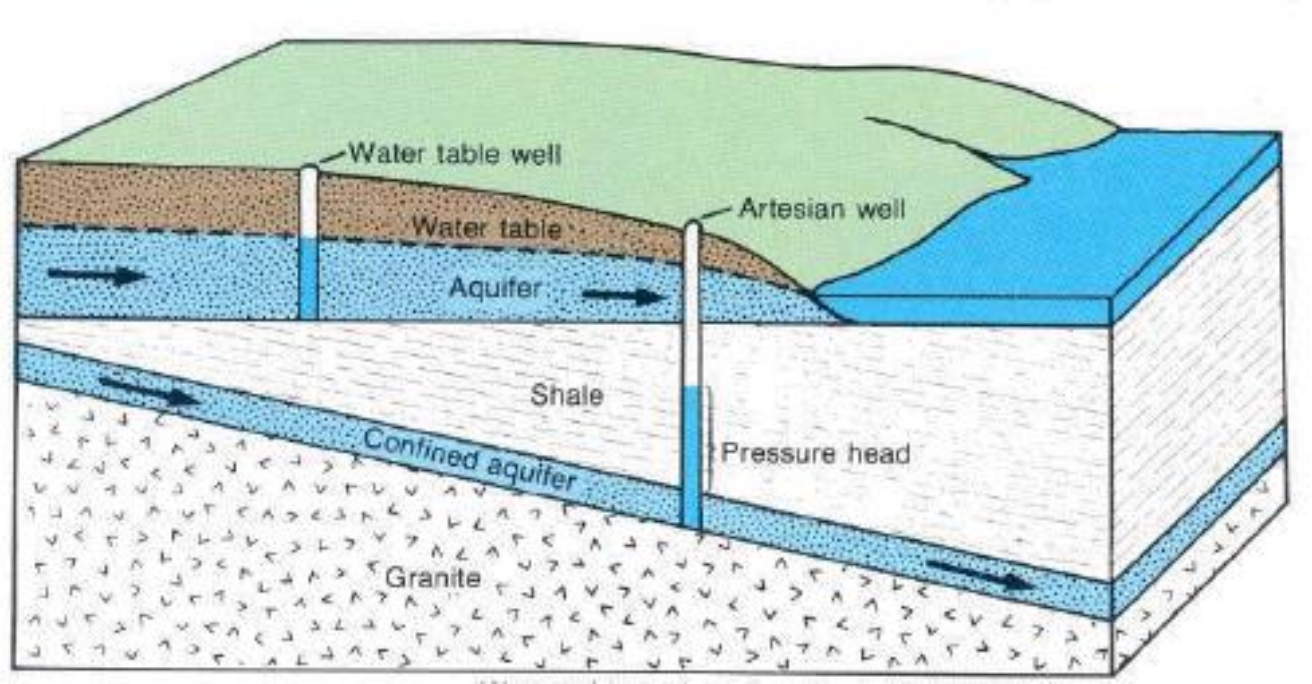
Therefore, only about .0077% of the total volume of the Earth's water is accessible.

https://www.worldatlas.com/articles/what-percentage-of-the-earth-s-water-is-drinkable.html

Aquifers

About 30% of the world's total freshwater resources lies under the Earth's surface as groundwater. When water congregates below the surface it forms an **aquifer**.

Def: A land, gravel or rock formation capable of storing or conveying water below the surface of the land.

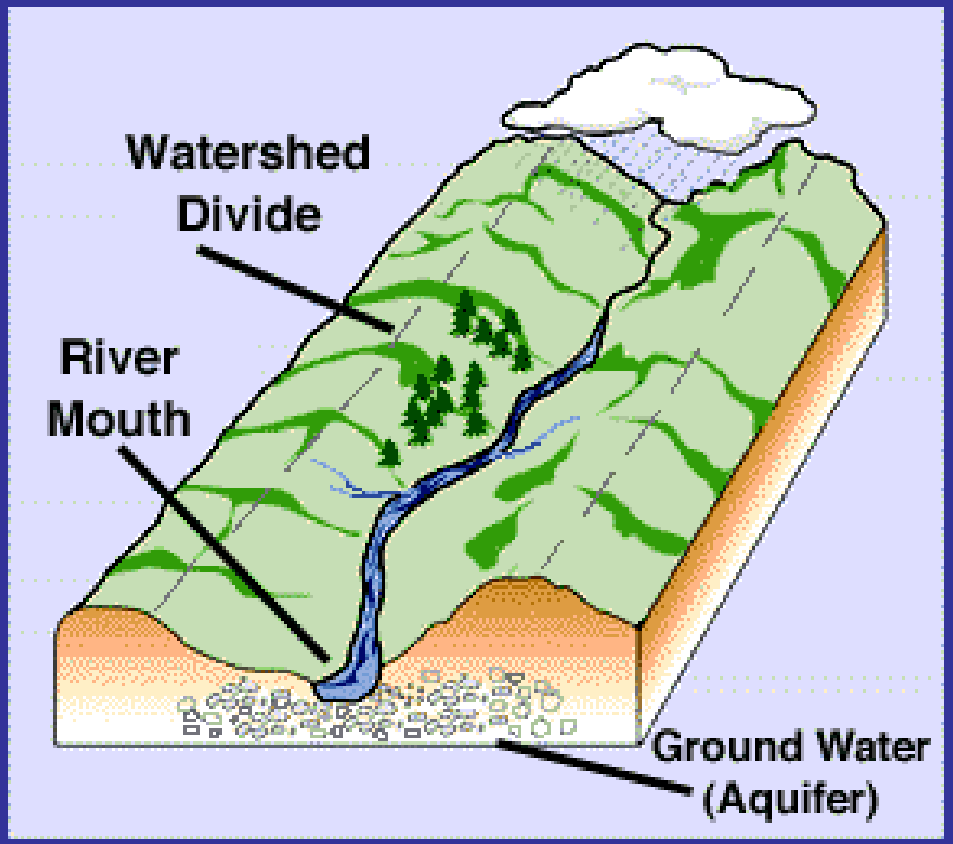


Water runs very slowly and seeps into rivers and lakes through their banks.

Rivers, lakes and wetlands receive water in other ways as well…….


CONDENSATION
PRECIPITATION
EVAPORATION
PERCOLATION
GROUNDWATER
HYDROLOGIC CYCLE

What is a "Watershed?



Definition:

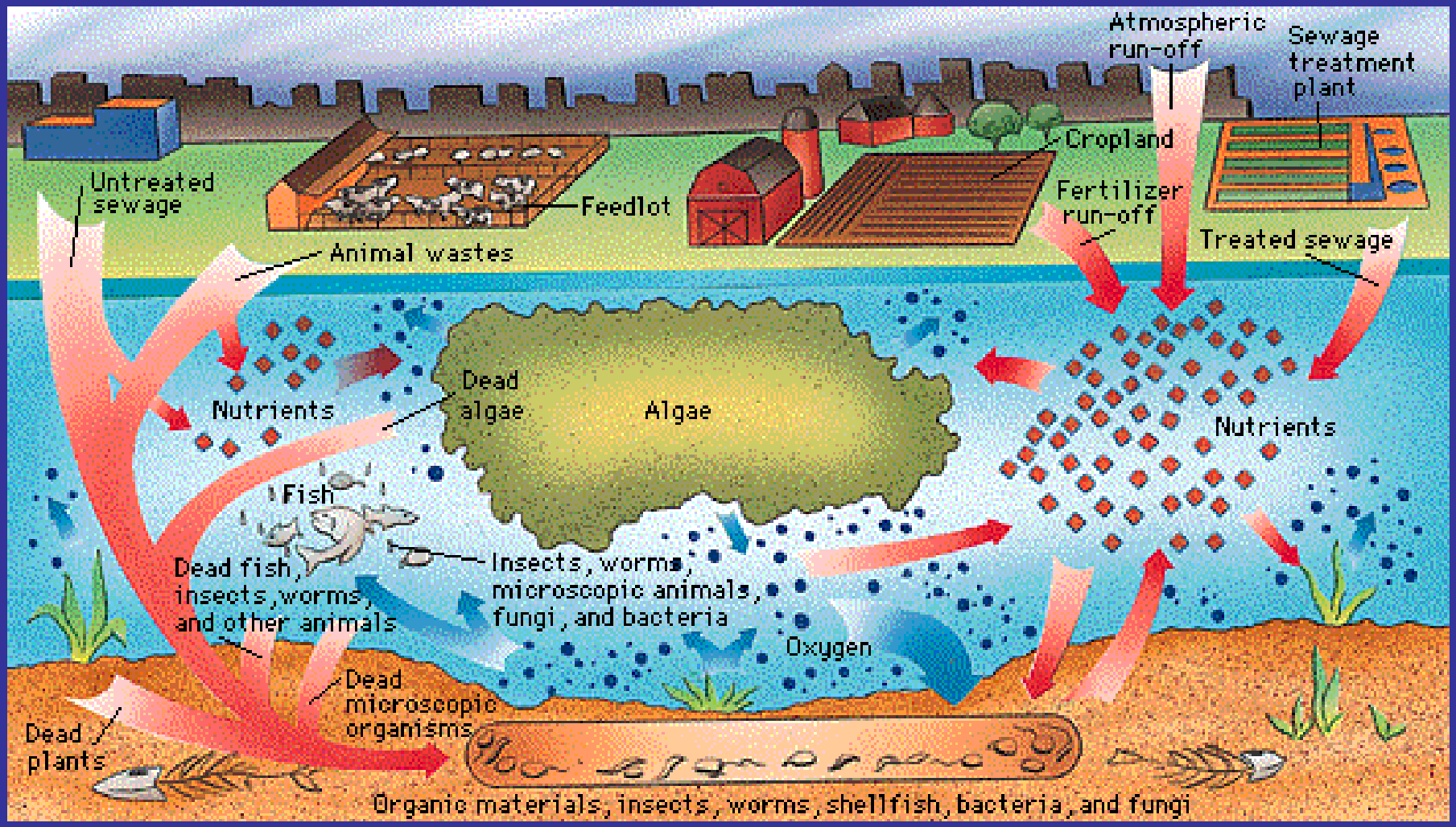
An area of land that drains into a particular river or body of water usually divided by topography.

New York State has 17 watersheds. Chautauqua County is part of TWO watersheds…..

- St. Lawrence to Lake Erie to North Atlantic
- Mississippi to Gulf of Mexico

Chadakoin → Conewango → Allegheny → Ohio → Mississippi → Gulf of Mexico

Water Pollution



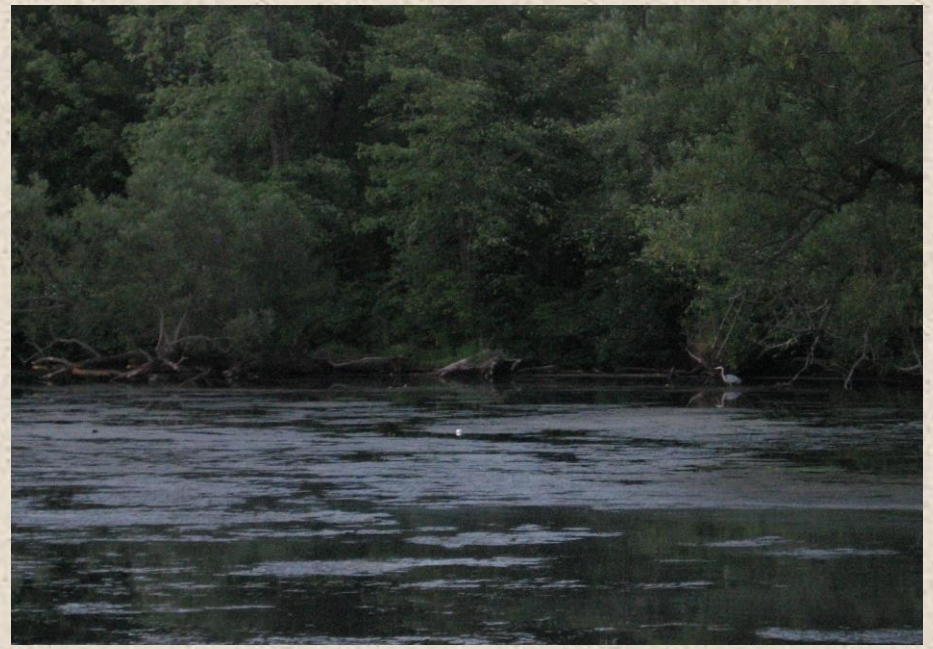
Point Source Pollution

Nonpoint Source Pollution

The Two Major Water Pollutants…

1) Sediments

2) Nutrients



Especially: soil, nitrogen, and phosphorus

Sediments

~Causes water turbidity.

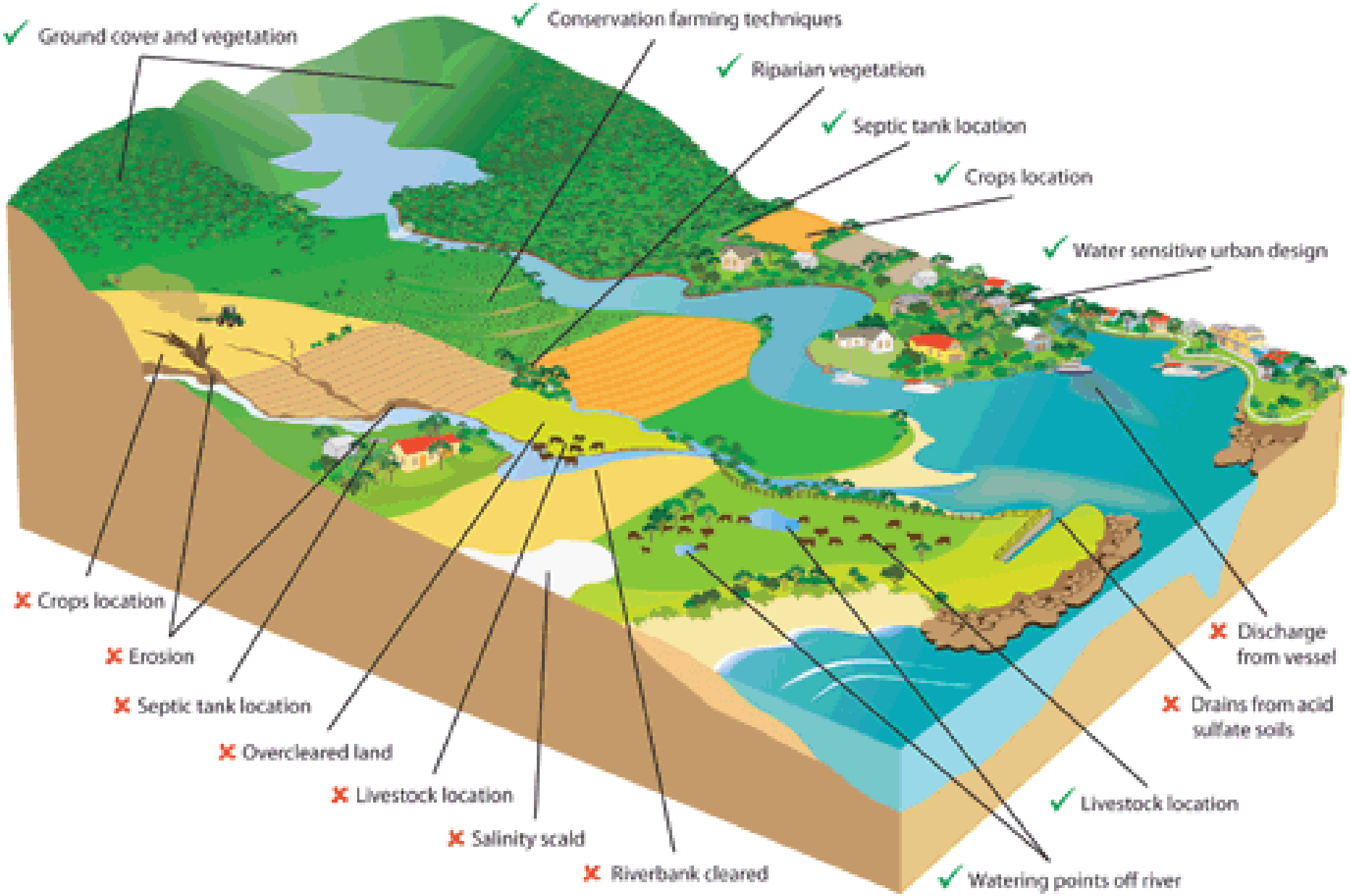
~Carry and store toxic materials, which may lead to bioaccumulation within the food chain.

Nutrients

HAB= Harmful Algal Bloom
(due to toxic cyanobacteria)

Ecological impacts?

- Poor erosion control
- Nutrient run-off (fertilizers, animal wastes, sediments, pollutants).
- Sedimentation, etc.


Ground cover and vegetation
Conservation farming techniques
Riparian vegetation
Septic tank location
Crops location
Water sensitive urban design
Crops location
Erosion
Septic tank location
Overcleared land
Livestock location
Salinity scald
Riverbank cleared
Discharge from vessel
Drains from acid sulfate soils
Livestock location
Watering points off river

Water Testing

Drinking Water

- Alkalinity
- Color
- pH
- Taste & Odor
- Dissolved metals and salts
- Microorganisms (fecal coliforms like *E.coli*)
- Dissolved metals and metalloids (lead, mercury, arsenic, etc.)
- Dissolved organics:
  colored dissolved organic matter (CDOM); dissolved organic carbon (DOC)
- Radon
- Heavy metals
- Pharmaceuticals
- Hormone analogs

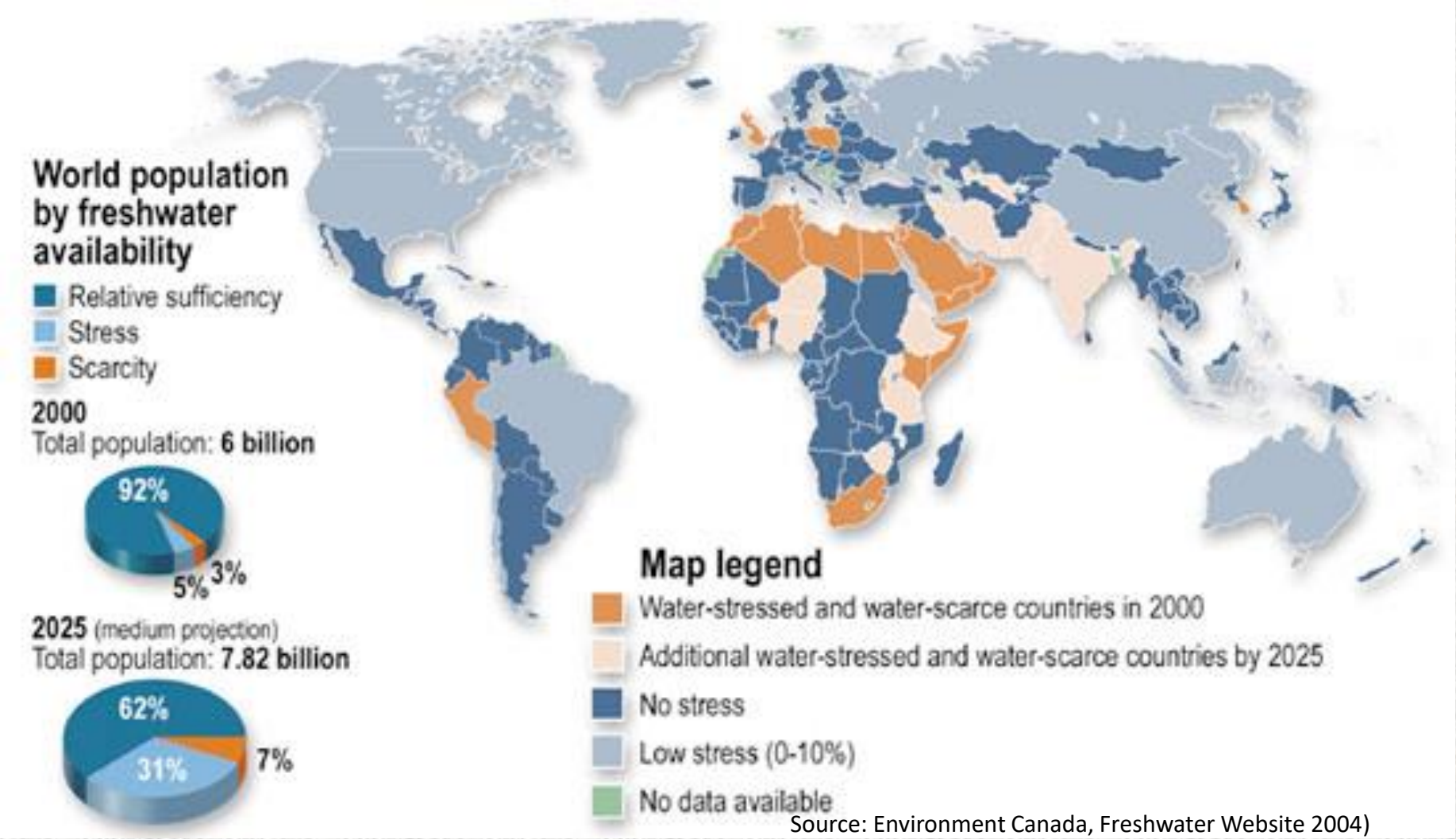
Environmental

Chemical:

- Dissolved Oxygen (DO)
- Nitrate
- Organophosphates
- Chemical Oxygen Demand
- Biochemical Oxygen Demand (BOD)
- Pesticides

Physical:

~pH
~Temperature
~Total suspended solids (TSS)
~Turbidity

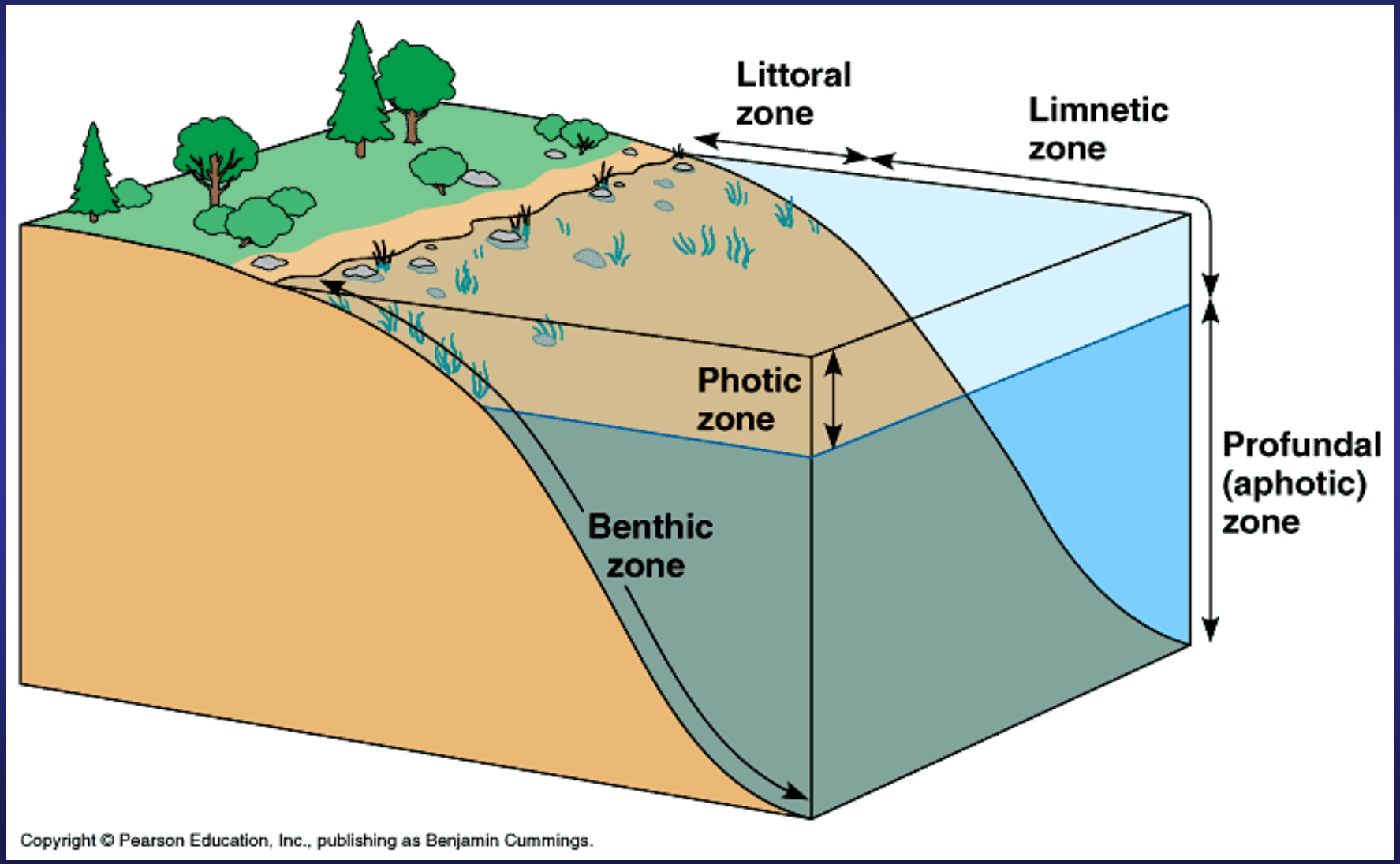


Source: Environment Canada, Freshwater Website 2004)

Global human population was 7.756464220 billion as of 9:15 PM 1/9/2020 increasing by about 81 million (1.05%) per year! https://www.worldometers.info/world-population/

According to the World Bank, as many as two billion people lack adequate sanitation facilities to protect them from water-borne disease, while a billion lack access to clean water altogether. According to the United Nations, which declared 2005-2015 the “Water for Life” decade, 95 percent of the world’s cities still dump raw sewage into their water supplies. Thus it should come as no surprise to know that 80 percent of all the health maladies in developing countries can be traced back to unsanitary water.

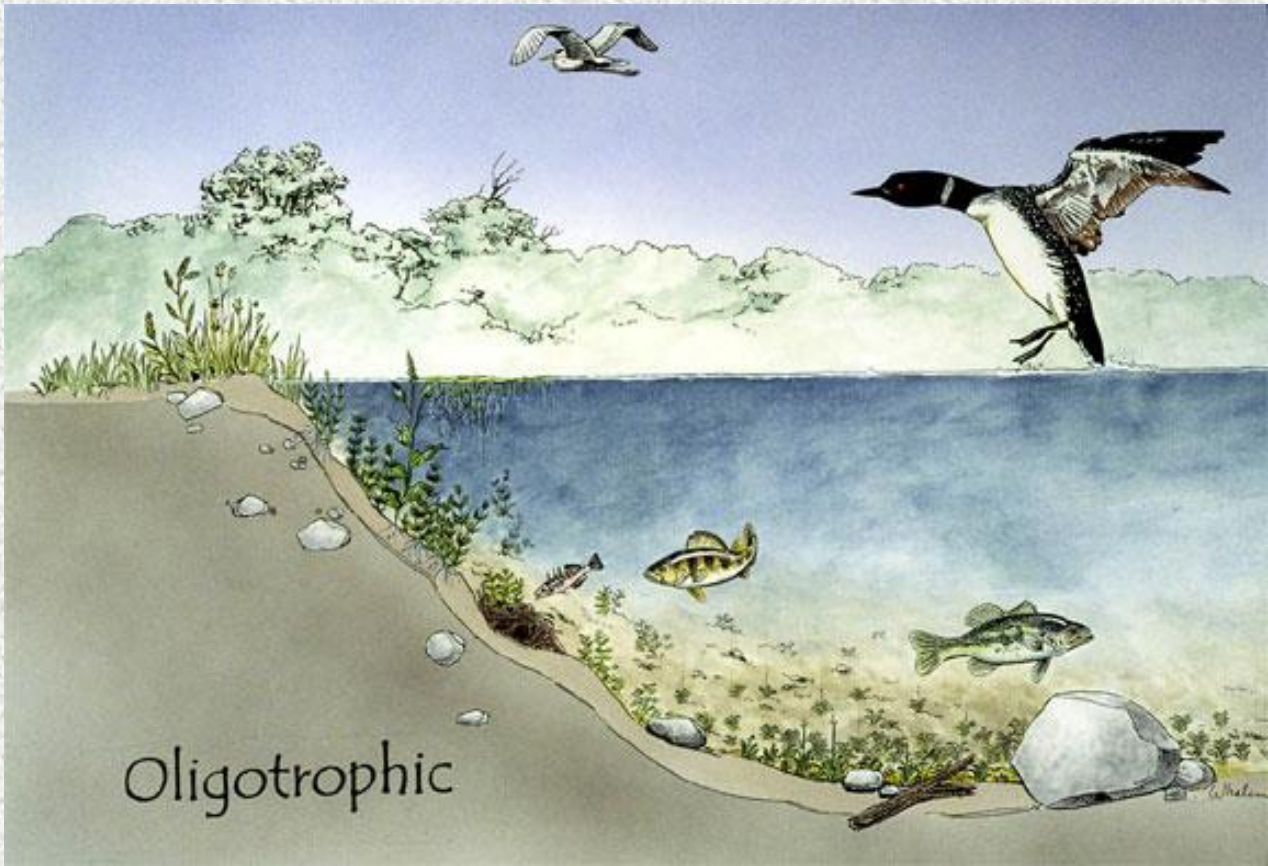
Lake Zonation



Lake Classification

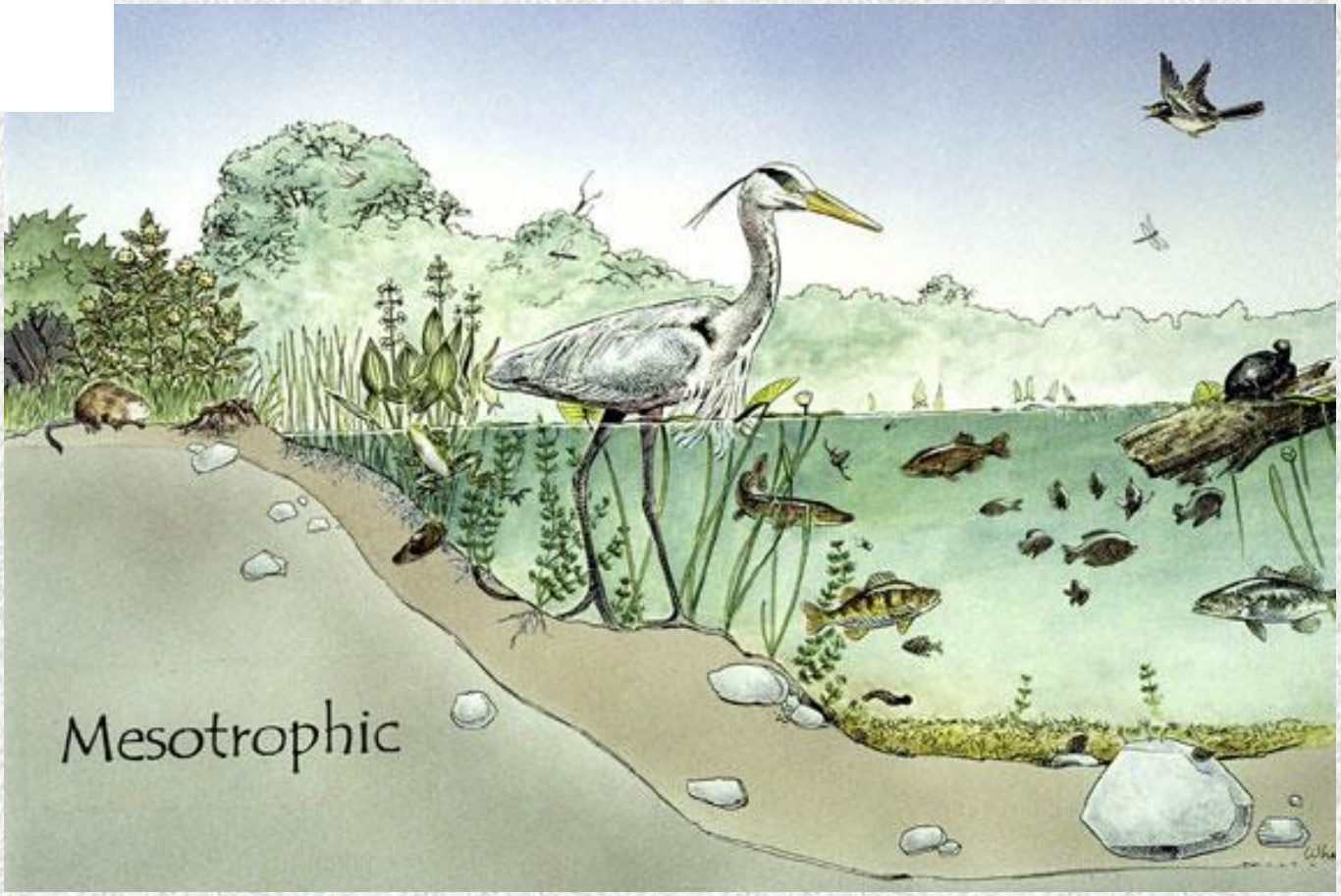
Oligotrophic

- Clear water, low productivity
- Very desirable fishery of large fish



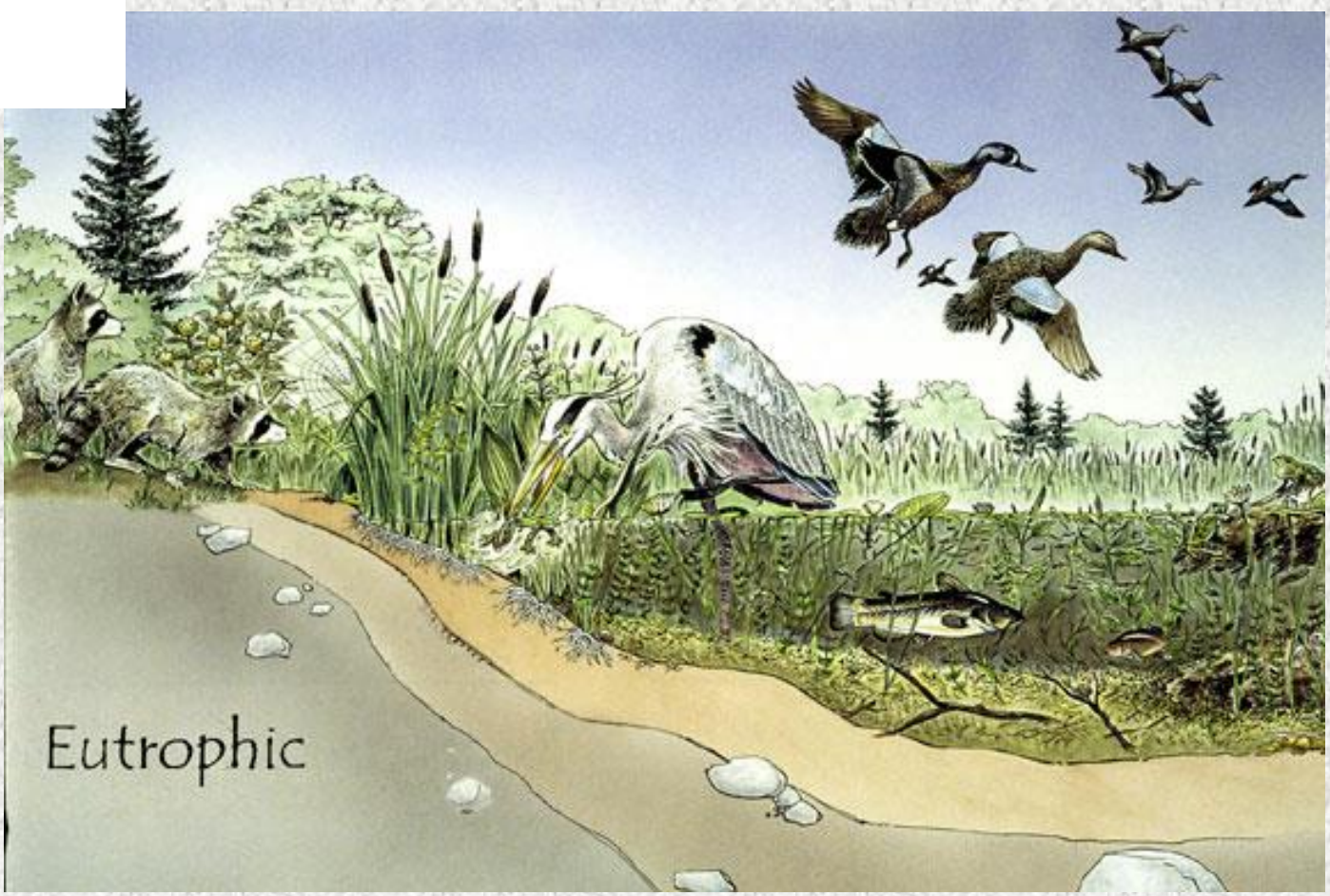
Mesotrophic

- Increased production
- Accumulated organic matter
- Occasional algal bloom
- Good fishery

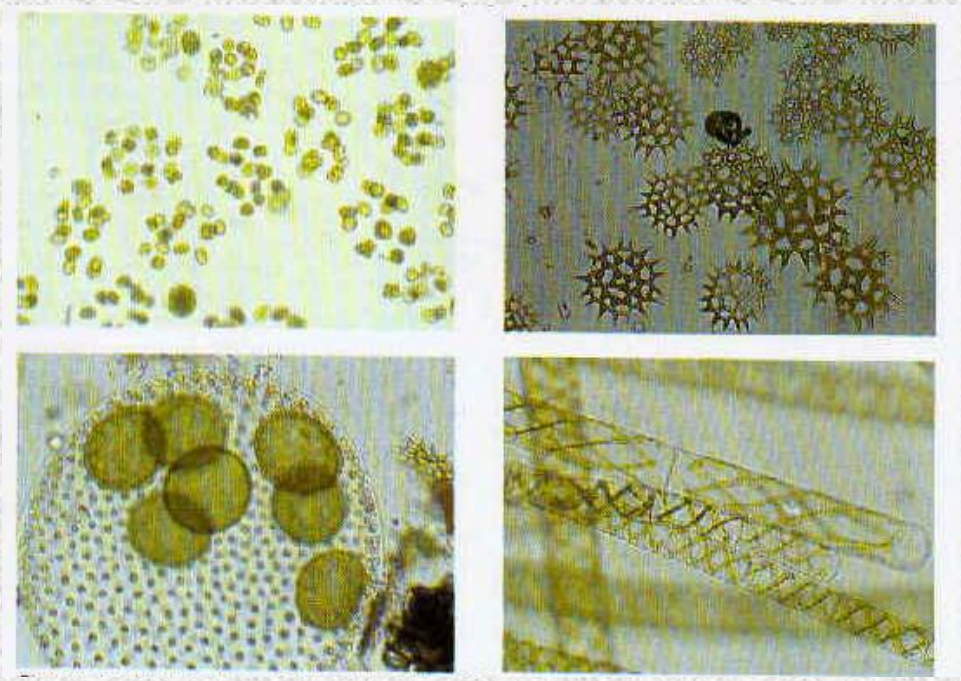


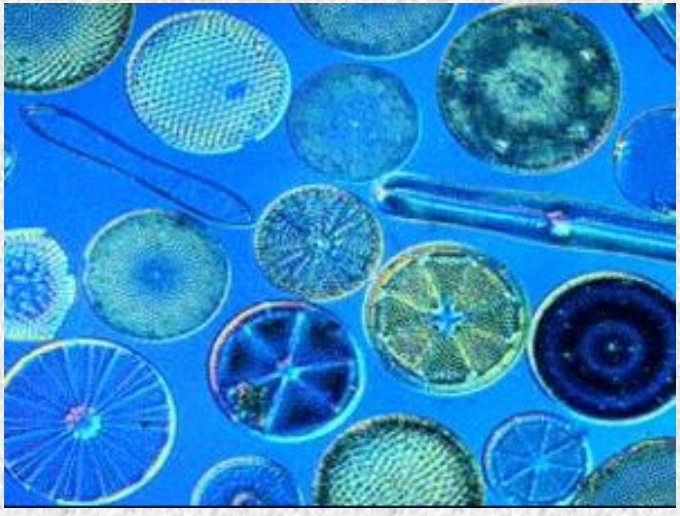
Eutrophic

- Very productive
- May experience oxygen depletion
- Rough fish common

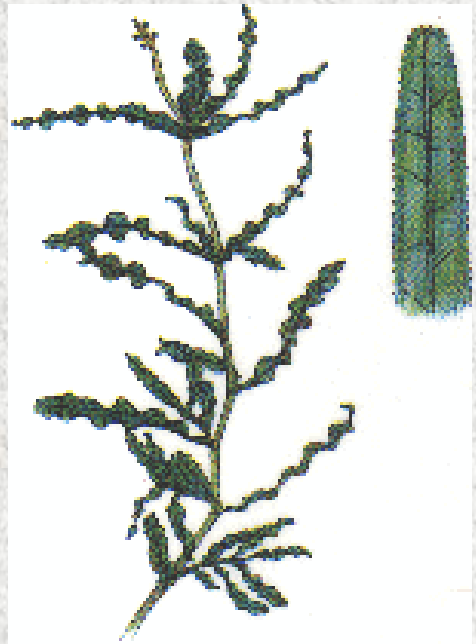


Phytoplankton and Zooplankton

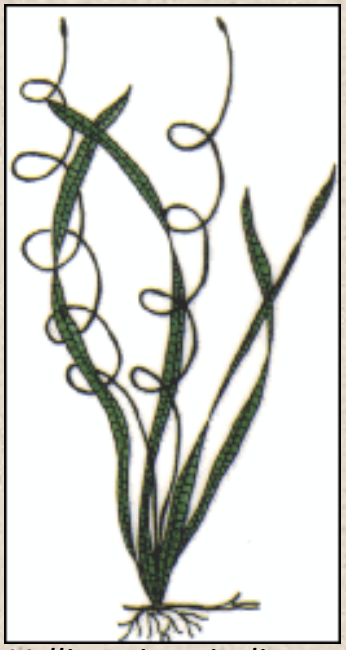




Problematic Aquatic Plant Species

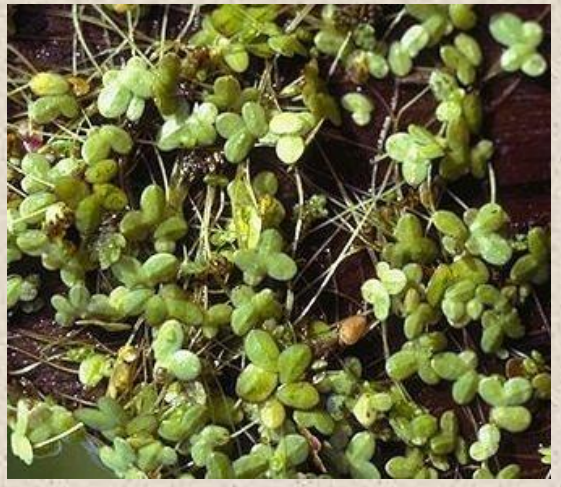


Common Aquatic Plants……

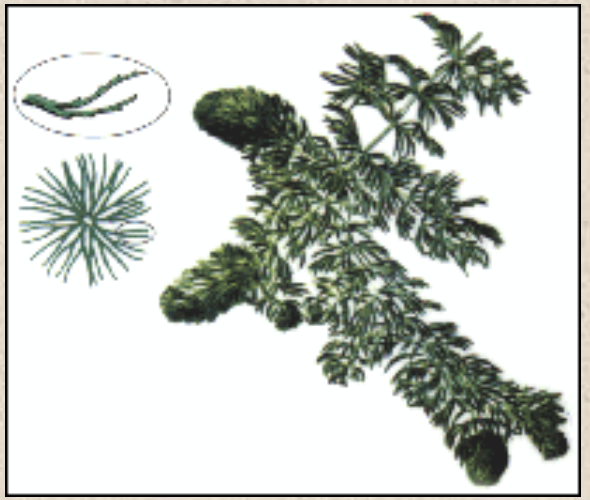


Vallisneria spiralis

Lemna minor



Spirodela polyrhiza



Cerotophyllum demersum

Elodea canadensis

Najas flexilis

Potamogeton amplifolius

Wetlands

Definition: an area that is saturated by surface or ground water through at least some portion of the growing season.

Characteristics:

1) Soil Indicators= **Hydric Soils**

   --> decreased oxygen due to saturation for long periods of time (sulfur smell!)

2) Hydrology Indicators

   --> evidence of standing water at certain periods during the growing season (drift lines, water marks on trees).

Ecological Roles:

1) Filtration
2) Storm Buffers
3) Habitat

*"Indicator Species"= **Hydrophytic Vegetation**

Examples…….

Common Spike Rush

Sweetflag

Pickerel Weed

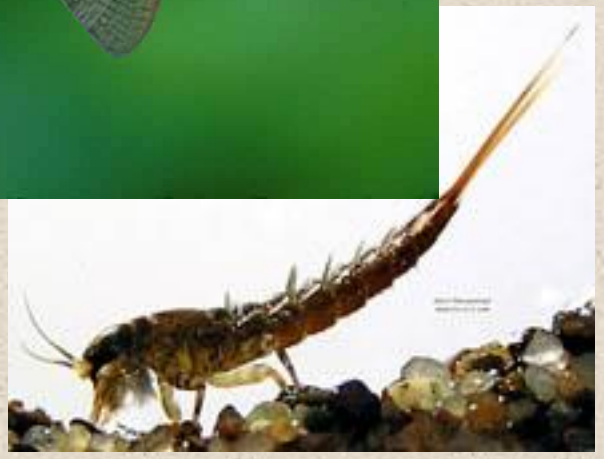
Arrowhead

Swamp Milkweed

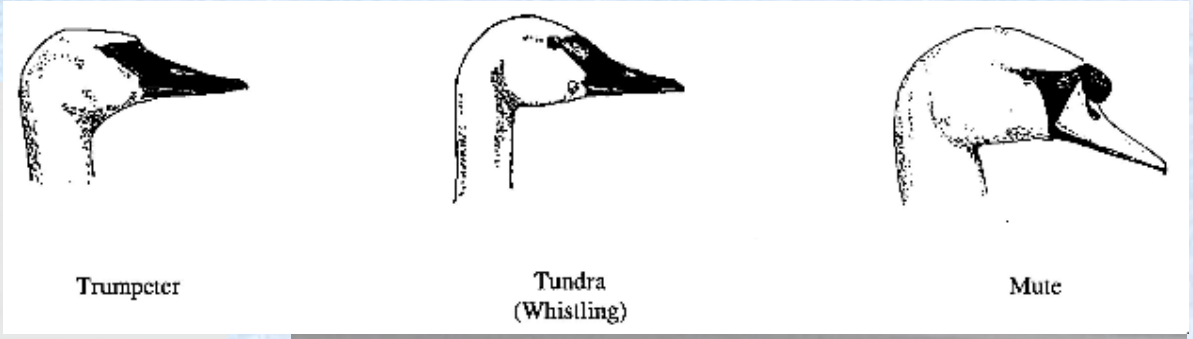
Blue Flag Iris

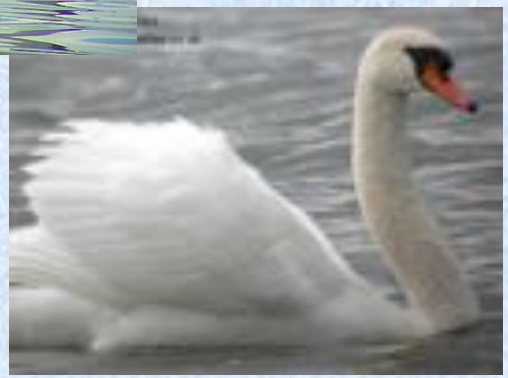

whirligig
saucer bug
water strider
mosquito pupa
mosquito larvae
water boatman
water scorpion
diving beetle
mayfly larva
damselfly larva
alderfly larva
dragonfly larva
caddis fly larva

Invertebrates…



Common Water Birds…


Trumpeter
Tundra
(Whistling)
Mute



American Widgeon

American Coot

Blue-winged Teal

Wood Duck

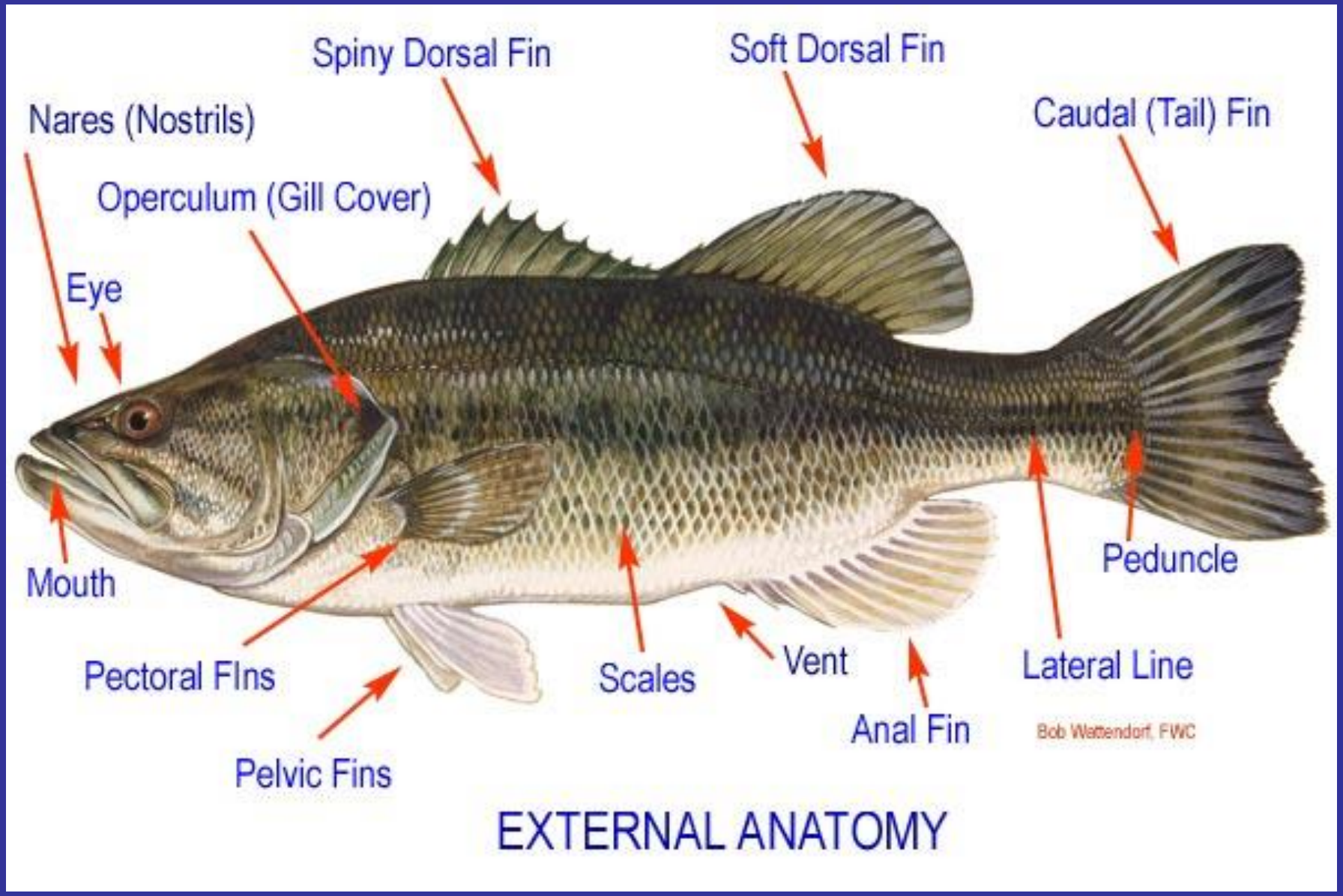




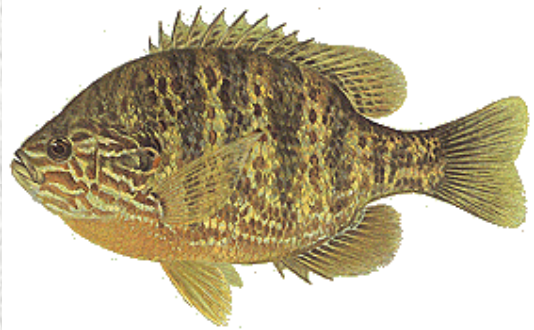

Where do Great Blue Herons nest?

Former: Class Osteichthyes: Fish…

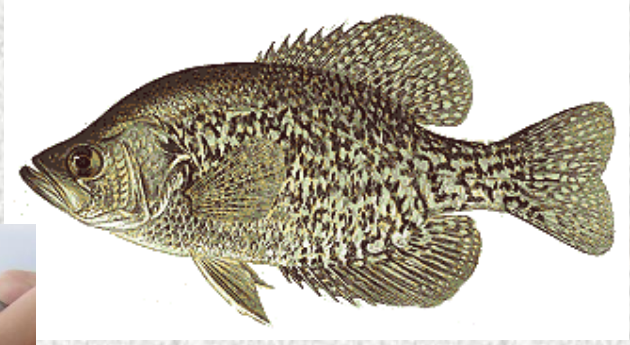
*Note: Ray fin fish are now classified in Class Actinopterygii!



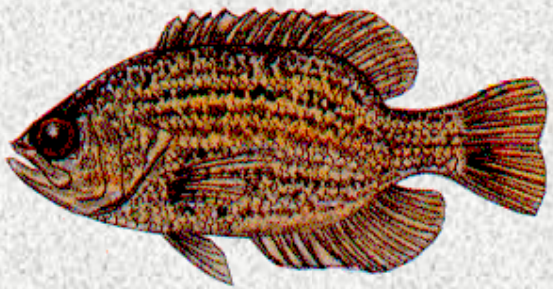
Sunfish Family (Centrarchidae)



Pumpkinseed Sunfish

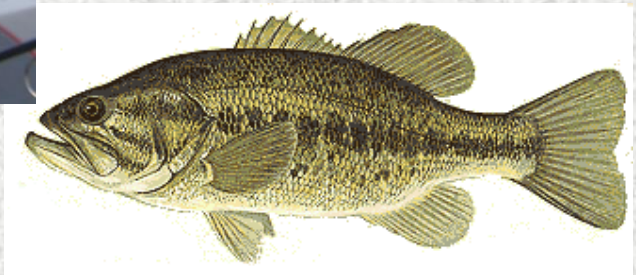


Black Crappie



Rock Bass

Smallmouth Bass



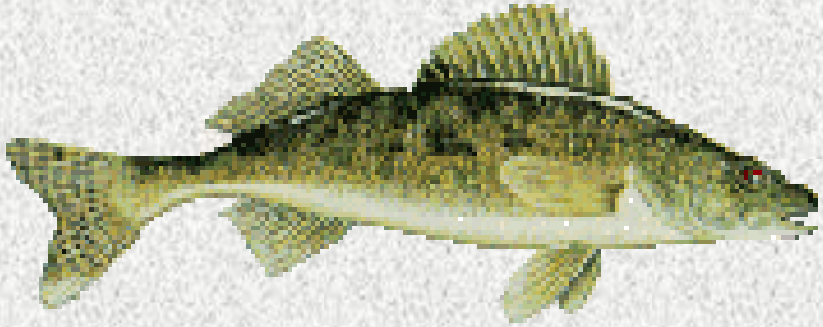
Largemouth Bass

Perch Family (Percidae)

Yellow Perch

White Perch

Walleye



Pike Family (Esocidae)

- Pike
- Pickerel
- Muskellunge

Northern Pike

Chain Pickerel

Muskellunge

Catfish Family

(Ictaluridae)

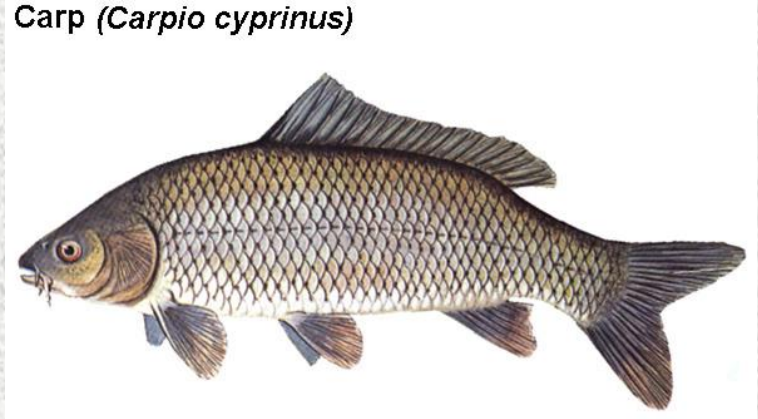
Channel Catfish

Black Bullhead

Minnow Family

(Cyprinidae)

Lake Chub Minnow



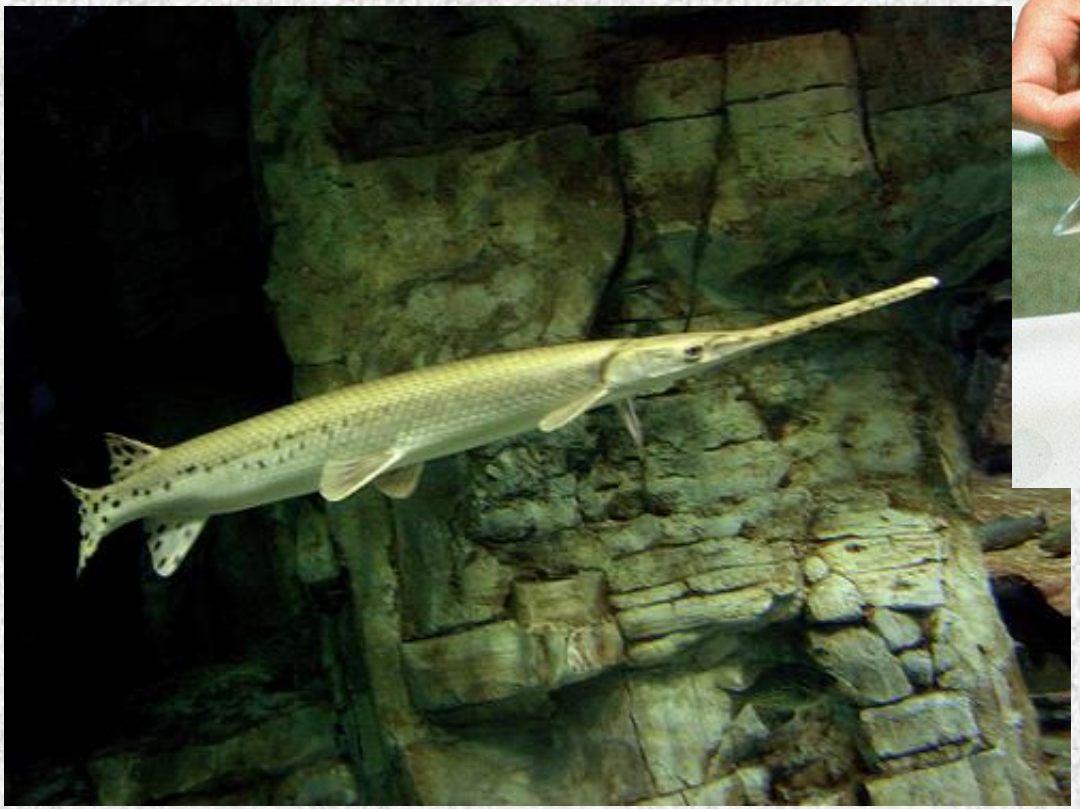
Trout: Salmon Family (Salmonidae)

Brook Trout

Rainbow Trout

Brown Trout

Other fish of interest…….



Longnose Gar

Sea Lamprey (”Jawless”)

Don’t forget the mammals…….

Muskrat

Beaver

Raccoon

River Otter

Study Outline

I. Abiotic Factors
- A. Water Cycle
- B. Watershed Features
  - 1. Stream Order
  - 2. Stream Health Factors
  - 3. Identify Boundaries
- C. Water Conditions
  - 1. Physical
  - 2. Chemical
  - 3. Biological

II. Biotic Factors
- A. Energy Flow
- B. Carrying Capacity
- C. Identify Aquatic Species (Plants, Fish, Amphibians, Micro- and Macro-invertebrates)
  - 1. Common
    - a. Basic Physiology
    - b. Lifecycles
    - c. Habitat
  - 2. Rare, Threatened, Endangered
  - 3. Invasive
  - 4. Water Quality indicators

III. Aquatic Environments
- A. Wetlands
  - 1. Definition
  - 2. Characteristics
  - 3. Functions/Importance/Values
- B. Riparian Zones
- C. Aquifers and Groundwater
- D. Ponds and Lakes
  - 1. Temperature Zones
  - 2. Vegetation

IV. Water Protection and Conservation
- A. Water Quality and Pollution
  - 1. Groundwater
  - 2. Surface Water
  - 3. Thermal
- B. Types of Pollution
  - 1. Point Source
  - 2. Nonpoint Source
  - 4. Control methods
- C. Management and Legislation
  - 1. Laws
  - 2. Agencies

Updated S'20

Website

http://www.nysenvirothon.org/nys-envirothon-aquatic-ecology-study-guide/