Maryland Envirothon Aquatic Ecology

2018

Prepared by Stacy Epperson

MD-DNR

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Format of state test

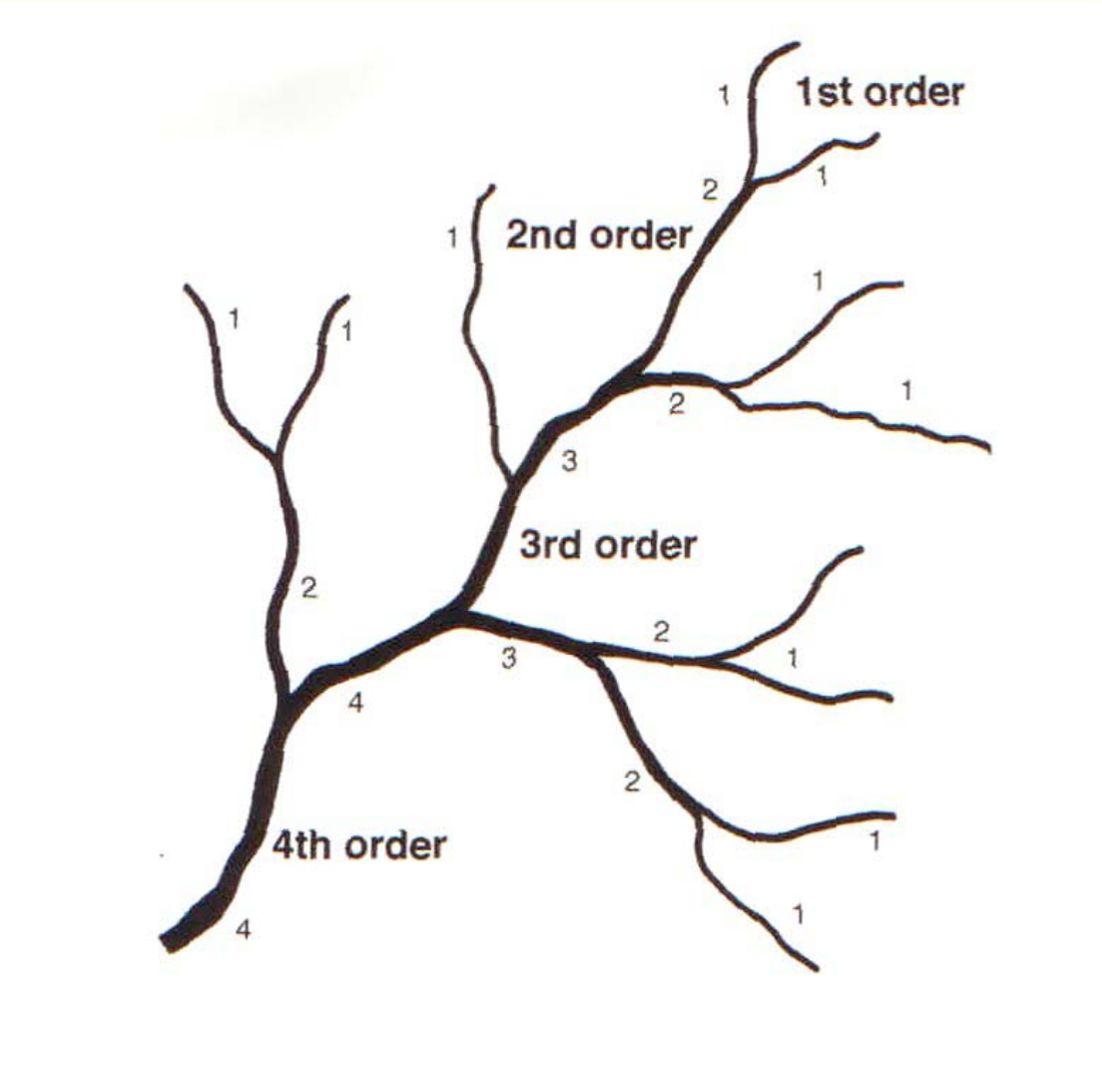
- Four categories:
  - Abiotic
  - Biotic
  - Aquatic Environments
  - Water Protection and Conservation
  - 5th topic woven inside all of these.

- Test Questions:

  Fill in the blank most common; multiple choice, matching (no true/false)

Abiotic

- Stream orders

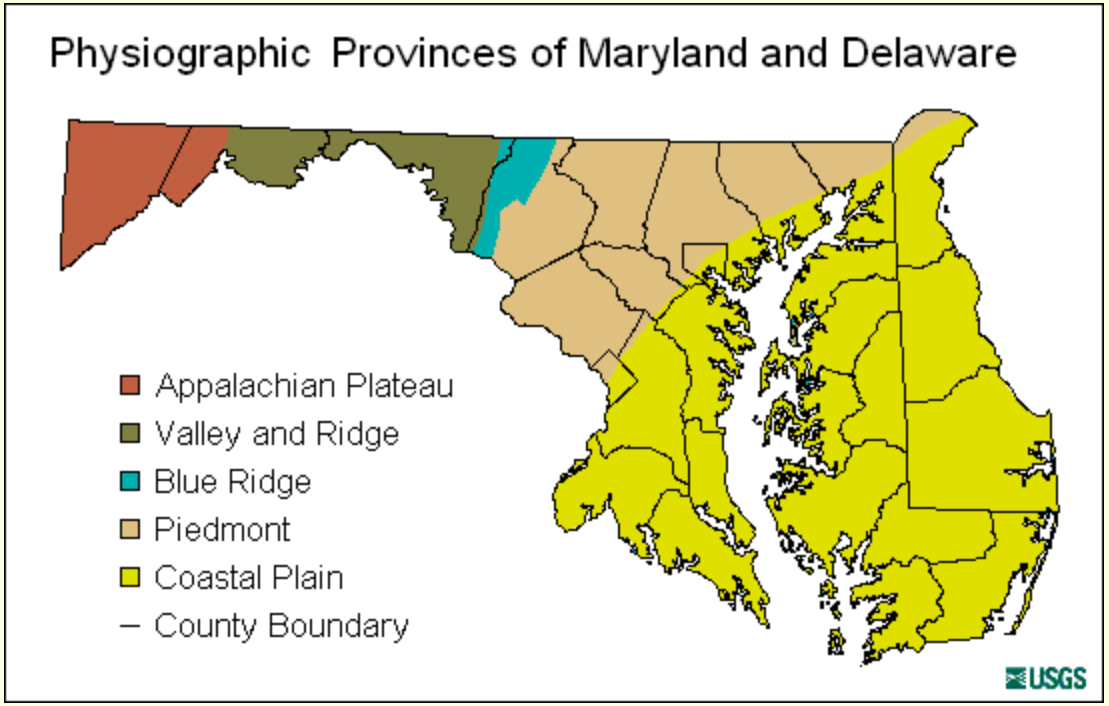


Abiotic

- Stream runoff is affected by
  - Shape of watershed (affects rate)
  - Slope (affects rate)
  - Land use: vegetation and development (affects rate and amount)
  - Land geology and soils (affects amount)

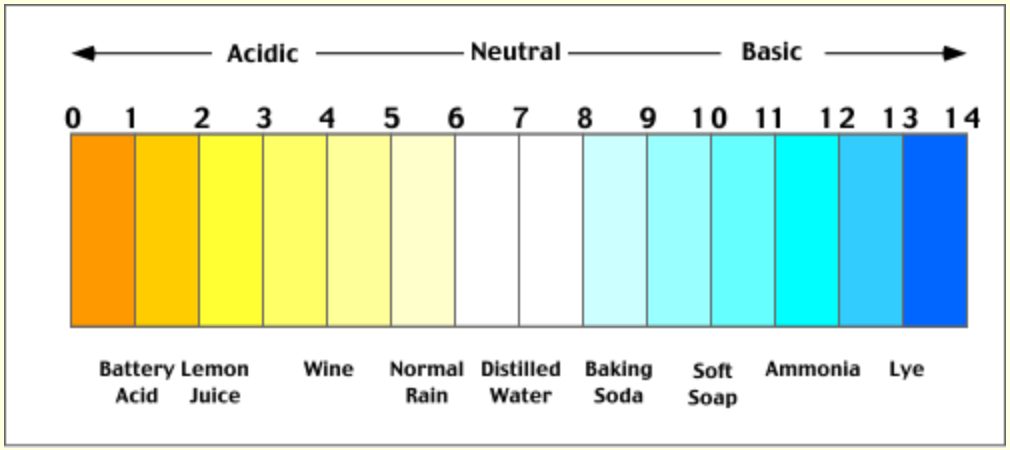
Abiotic

- Physiographic provinces
  - Appalachian Plateau
  - Ridge and Valley
  - Blue Ridge
  - Piedmont
  - Coastal Plain



Abiotic

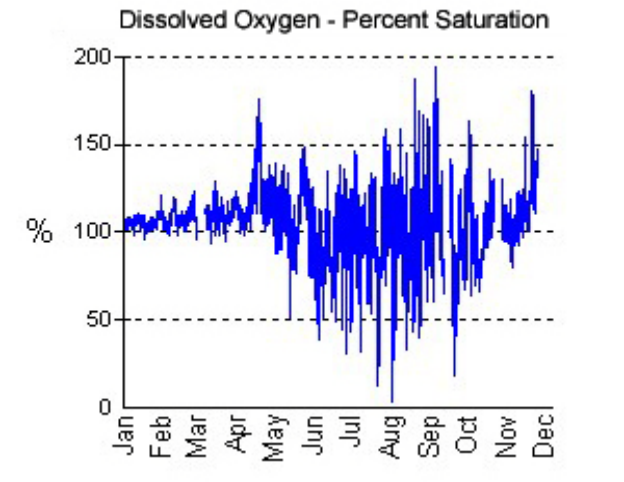
- The lower the pH, the more acidic the substance.



- Since the beginning of the Industrial Revolution, the pH of surface ocean waters has fallen by 0.1 pH units. Since the pH scale, like the Richter scale, is logarithmic, **this change represents approximately a 30 percent increase in acidity**.

Abiotic

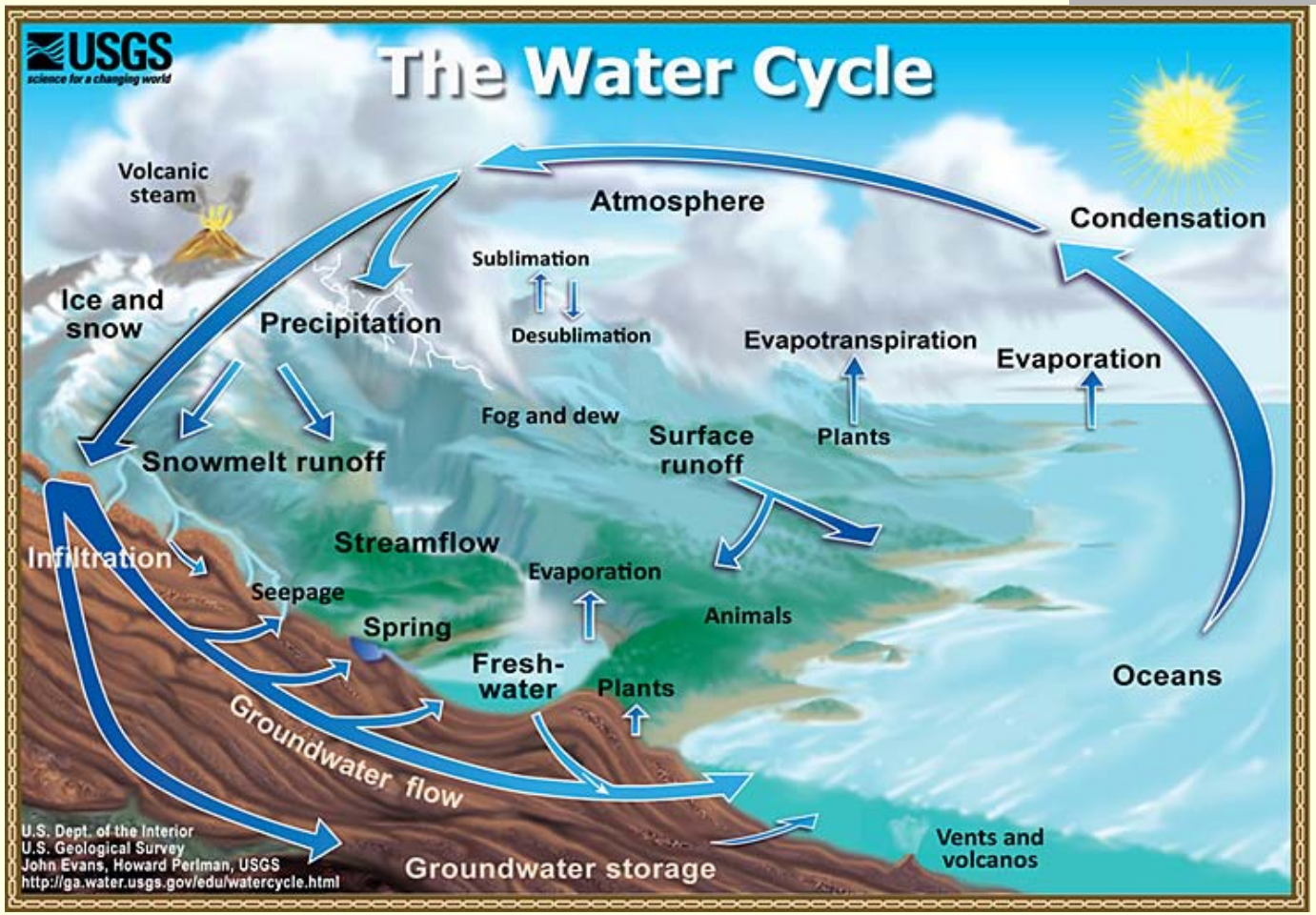
- Temperature, Salinity, Oxygen Relationship
  - Cold water holds more oxygen than warm water.
  - Fresh water holds more oxygen than saline water.
  - Cold fresh water +++oxygen
  - Warm saline water---- oxygen
  - Warm fresh water
    vs cold saline water?



http://www.chesapeakebay.net/content/publications/cbp_13039.pdf

What about freshwater?

Freshwater storage: Freshwater existing on the Earth's surface



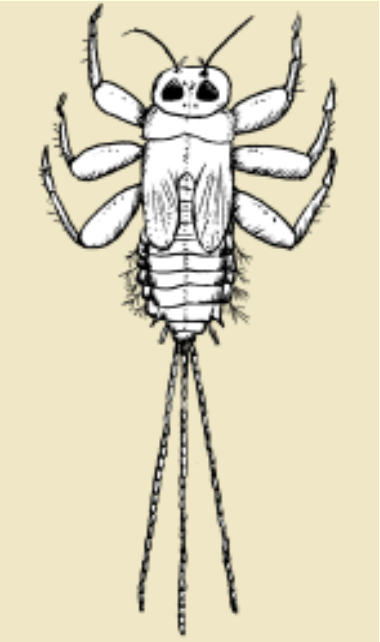
https://water.usgs.gov/edu/watercyclesummary.html

Biotic

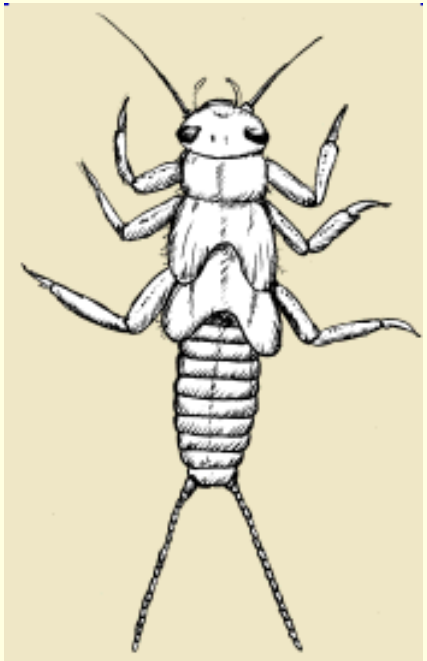
- Macroinvertebrates
  - Sensitivity to pollutants-3 levels
  - Dichotomous Key to Family level:
    - Number and length of tails; location of gills; wing buds; thickness, shape, and length of body
  - Stonefly, Mayfly, Caddis fly, Water penny, Gilled Snail, Alderfly, Crane Fly, Damselfly, Dragonfly, Scud, Black Fly

http://dnr.maryland.gov/streams/Publications/ea-99-2_rev2003.pdf

Biotic



Mayfly: Order Ephemeroptera

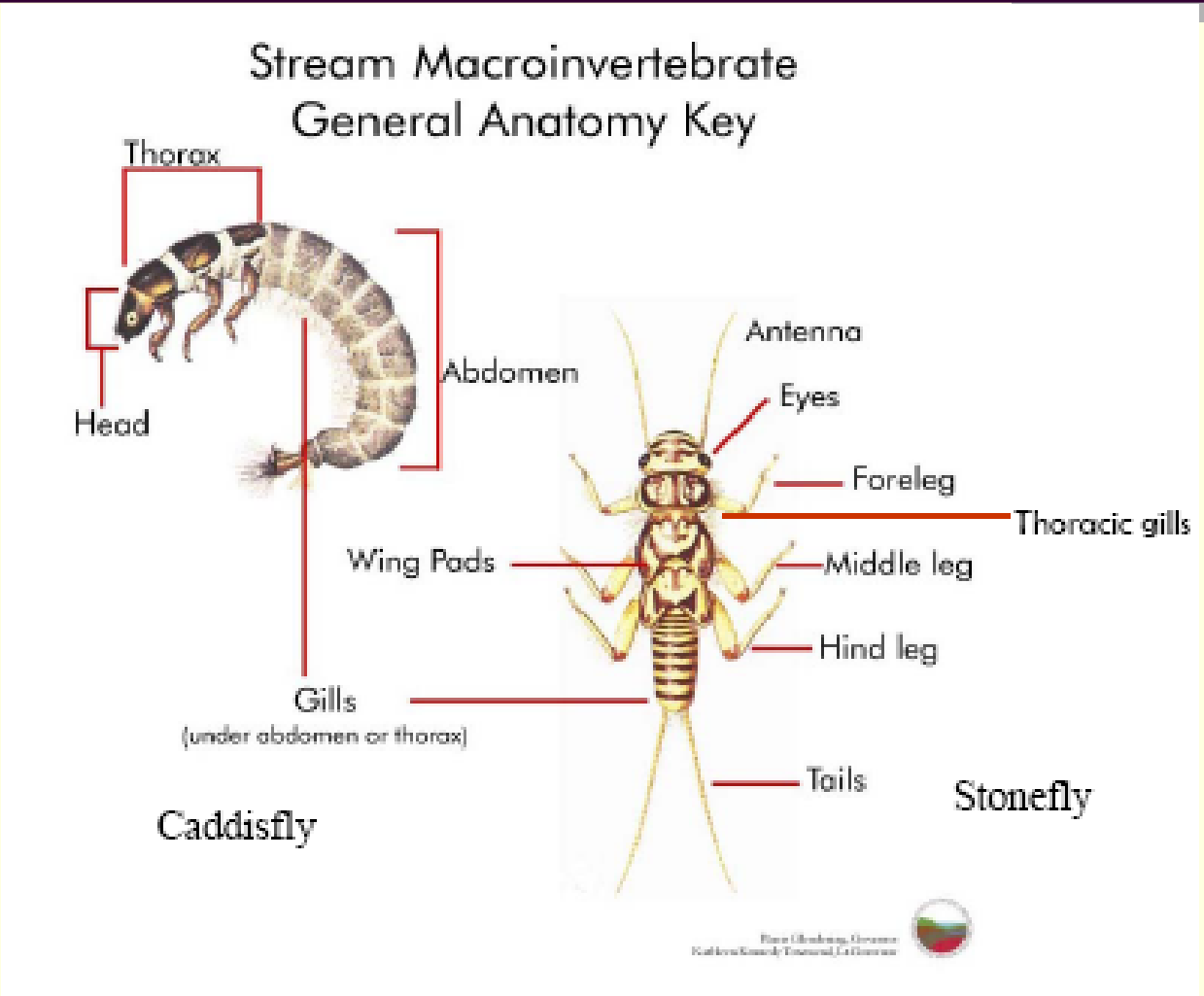


Stonefly: Order Plecoptera

Caddisfly: Order Trichoptera

http://wupcenter.mtu.edu/education/stream/Macroinvertebrate.pdf

Biotic


Stream Macroinvertebrate
General Anatomy Key
Thorax
Abdomen
Head
Gills
(under abdomen or thorax)
Caddisfly
Antenna
Eyes
Foreleg
Thoracic gills
Wing Pads
Middle leg
Hind leg
Tails
Stonefly

Biotic

- Invasive Species
  - Difference between non-native and non-native invasive
  - Introduction method
  - Effect
  - Control methods

http://www.invasivespeciesinfo.gov/aquatics/main.shtml
http://www.mdinvasivesp.org/list_aquatic_plants.html
http://www.mdinvasivesp.org/

Biotic

Common Aquatic Invasive Spec

- Zebra Mussel
- Hydrilla
- Nutria
- Grass Carp
- Didymo
- Water lettuce
- Phragmites
- Rusty Crayfish
- Chinese Mitten Crab

Biotic

- Submerged Aquatic Vegetation
  - Value
  - Invasives: Water lettuce (free floating) and hydrilla

https://www.youtube.com/watch?v=IgQoat0p52k
(Hydrilla at Deep Creek Lake)

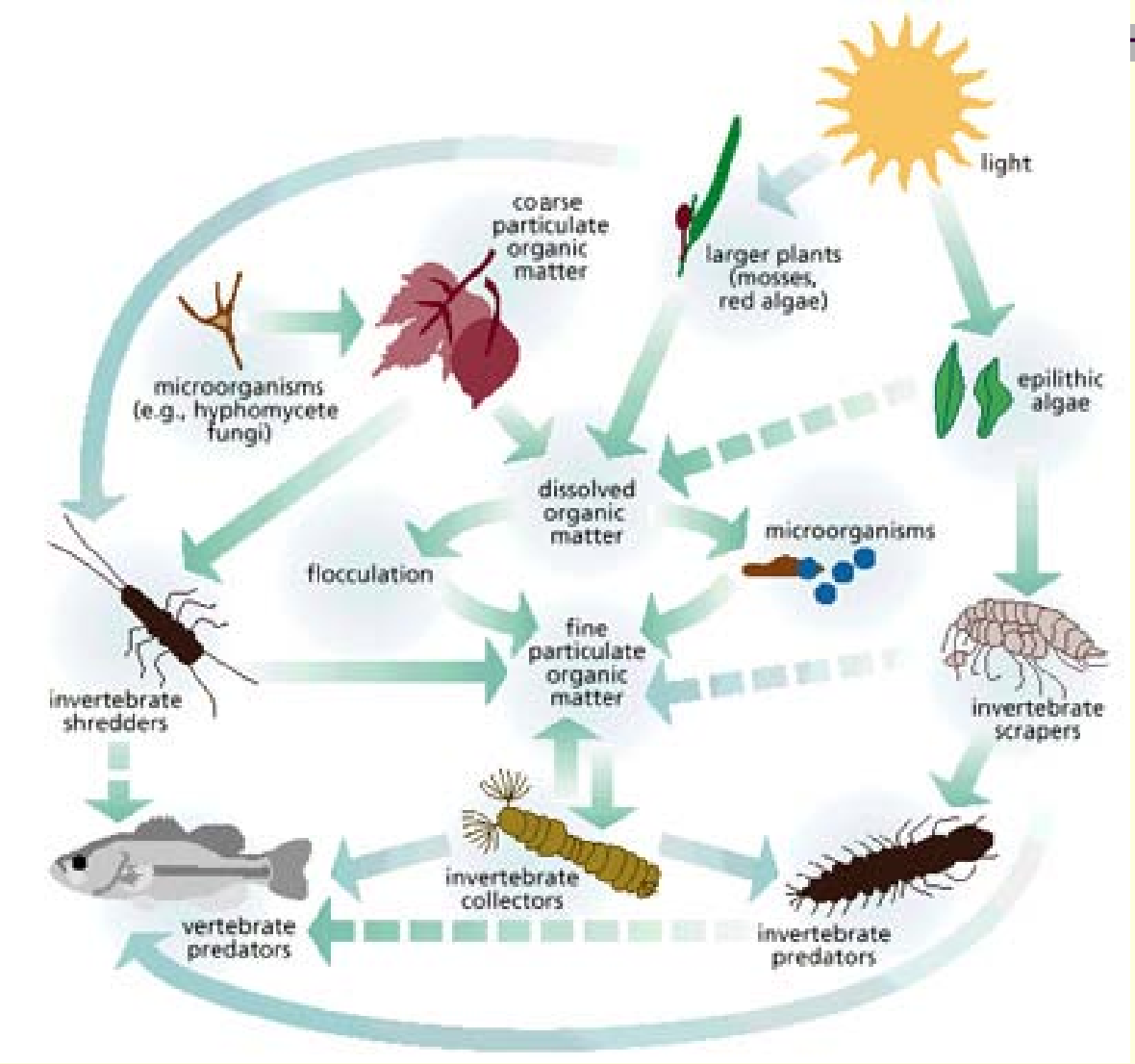
Biotic

- Freshwater Fish ID
  - Eel, catfish, shad, shiner, minnow, dace, chub, killifish, perch, silverside, sculpin, sunfish, bass, darter, trout, sucker
- Invasive fish (fresh and brackish)
  - Blue and Flathead Catfish
  - Northern Snakehead
  - Carp: Black, Silver, Grass, and Bighead

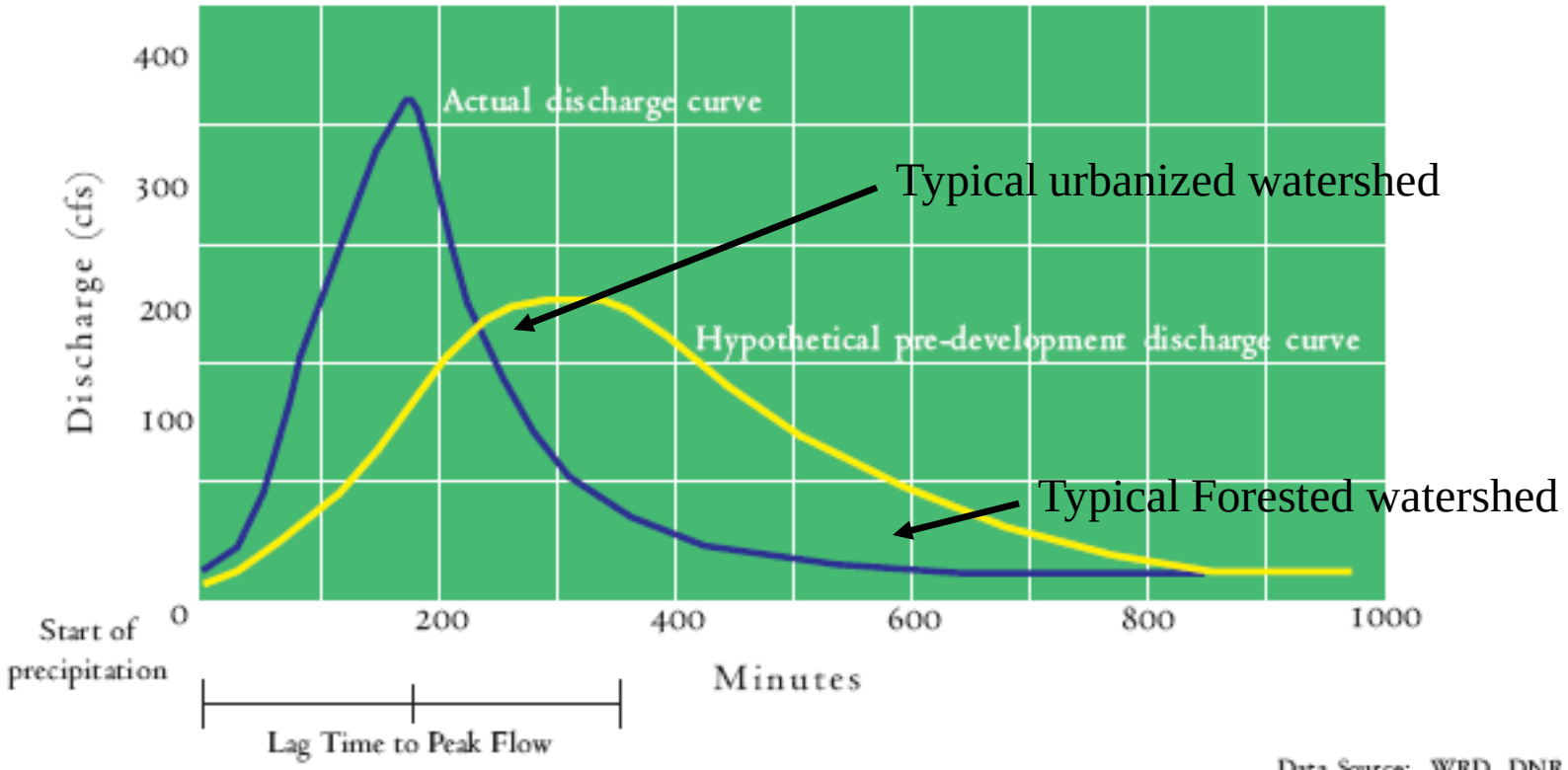
    (no native carp)

Biotic

Food web and trophic levels



Aquatic Environment



Water Protection and Conservation

- Benefits of Using Cover Crops
  - Reduce erosion
  - Increase water retention
  - Reduce weeds and pests
  - Use excess soil nutrients
  - Reduce leaching of nutrients into water

http://mda.maryland.gov/resource_conservation/counties/ConservationChoices_2012_FINAL%20%281%29.pdf

Water Protection and Conservation

- Conservation Choices for Maryland Farmers
  - Reduce Erosion
    - Cover Crops
    - Critical Area Planting
    - Pasture Planting
    - Riparian Buffers
    - Grassed Waterways
    - Diversion
    - Livestock Fencing
    - Etc….

http://mda.maryland.gov/resource_conservation/counties/ConservationChoices_2012_FINAL%20%281%29.pdf

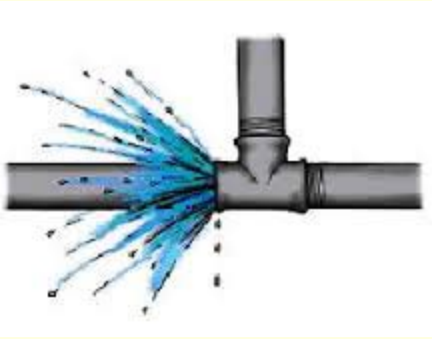
Water Protection and Conservation

- TMDL's
- EPA 2010 established TMDL for Chesapeake Bay
- 6 states and a district
- TMDL
  - Total Maximum Daily Load
  - Nitrates, Phosphorus, Sediment
- All measures in place by 2025

http://www.epa.gov/reg3wapd/pdf/pdf_chesbay/BayTMDLFactSheet8_26_13.pdf

Water Protection and Conservation

- Water Use
  - Average Maryland citizen uses 100 gallons of water per day.
  - U.S. uses 355,000 million gallons per day (2010).
  - Water use going down even as population goes up.
  - Four states use ¼ of all US withdrawals.



http://pubs.usgs.gov/fs/2014/3109/