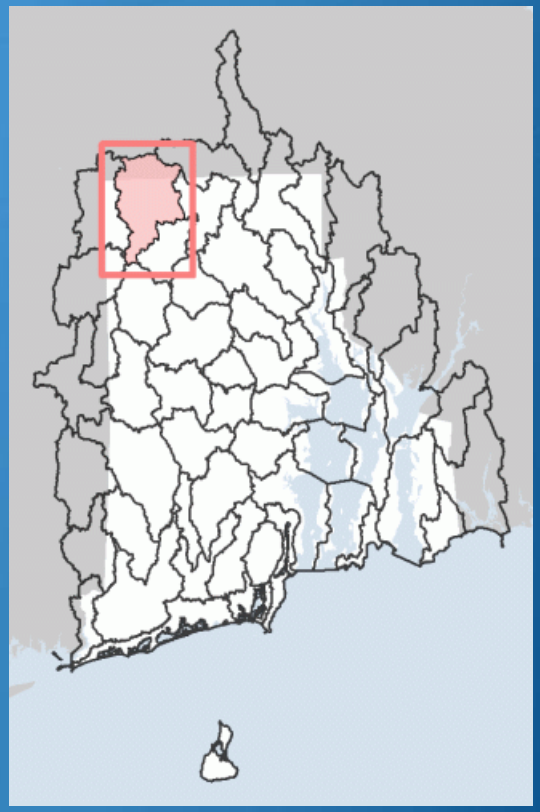
Water Quality Monitoring of the Clear River Watershed

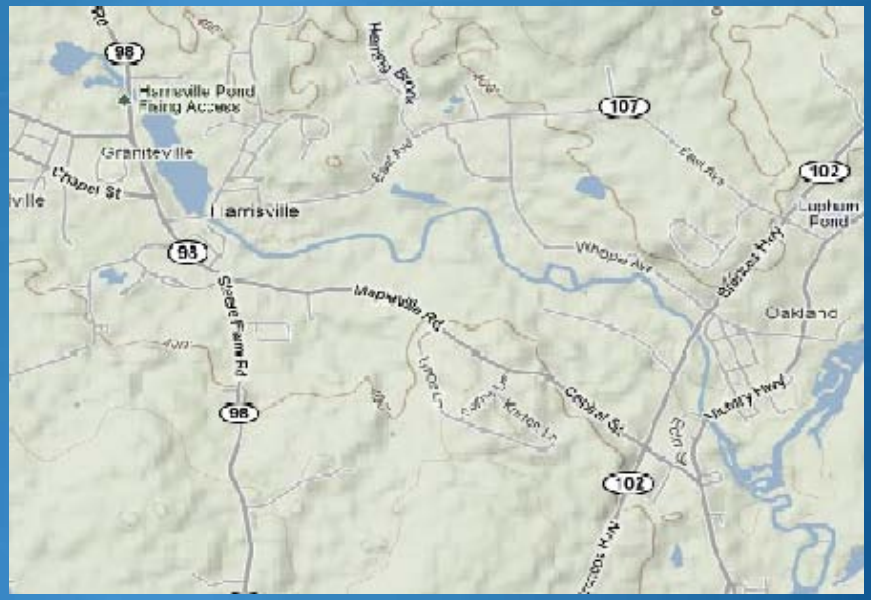
Mr. Leach
Science
Burrillville High School



Clear River Watershed

- The Clear River subwatershed, is located in northwestern Rhode Island. This subwatershed is a component of the Lower Blackstone River Watershed, the Blackstone Subbasin, the Massachusetts-Rhode Island Coastal Basin, the Massachusetts-Rhode Island Coastal Subregion, and the New England Region.
- This predominately rural subwatershed drains approximately 29022 acres, and is home to an estimated 11939 people. Approximately 558 acres are used for agriculture, 22917 acres represent forested areas, and 3150 acres constitute residential areas.

Clear River Location



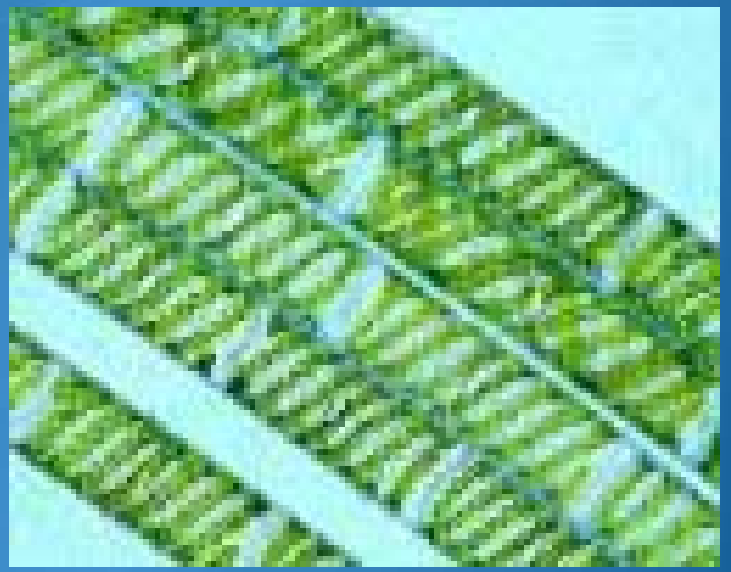
What is Measured?

Water Clarity

- Secchi Depth Transparency
  - Clarity indicator
  - Eutrophication
- How to Use
  - Drop disk until it can’t be seen
  - Measure depth
  - Raise disk until visible
  - Measure depth
  - Average the two measurements
- Usually for lakes and ponds
  - Done from a boat

Algal Density

- Chlorophyll-a
- Water pressed through a filter collects sample
- Disks are frozen and sent to a lab for analysis
- Indicator of nutrient enrichment & eutrophication



Dissolved Oxygen (D.O.)

- Amount of Oxygen in Water
- Indicator of *eutrophication and overall health of aquatic habitat

***eutrophication**: A process by which an excess of plant nutrients (e.g., nitrogen and phosphorous) reduces the oxygen dissolved within a body of water, producing an environment that does not readily support aquatic life.

LaMotte D.O. Procedure

- COLLECT water sample
  - Collect and cap UNDERWATER so there is NO AIR in the sample bottle
- FIX the sample of water
  - 8 drops manganese sulfate
  - 8 drops potassium iodide
  - Cap and mix well
  - Allow precipitate to settle
  - 8 drops sulfuric acid
  - Mix until completely dissolved

LaMotte D. O. procedure (cont'd)

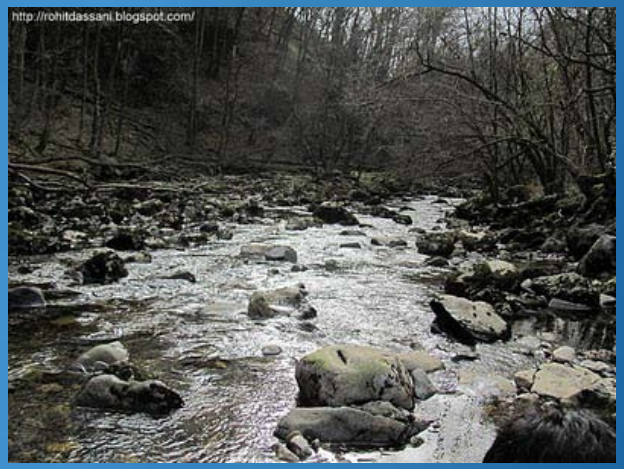
- TITRATION
  - 20 ml of sample into titration bottle
  - Extract Sodium Thiosulfate into titration plunger
  - Dispense titrating solution into sample until it becomes PALE YELLOWISH in color
  - 8 drops of starch indicator (iodine) into sample
  - Continue to carefully titrate sodium thiosulfate into sample DROP BY DROP until it becomes perfectly clear (swirl sample inbetween drops)
  - Use white paper to make sure it is clear

LaMotte Procedure (cont'd)

- Record your results
  - Read ml of sodium thiosulfate used
  - Each division on plunger equals 0.2 ml
  - Total number ml used equals D.O. in ppm
  - ppm = parts per million
  - ug/ml = ppm
- Analysis
  - 5-12 ppm sufficient for most species
  - < 5 ppm stressful for most aquatic species
  - < 2 ppm fatal to many aquatic species

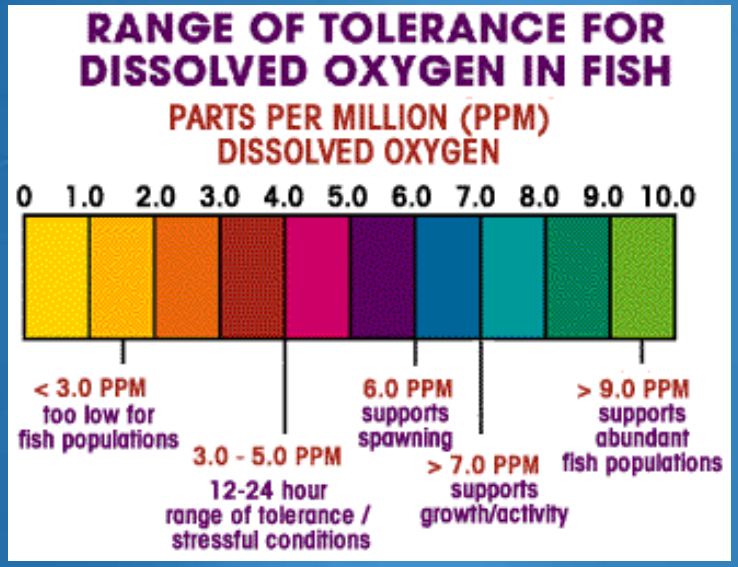
Where does Oxygen come from?

- From the atmosphere (21% Oxygen)
- Amount in water dependent on contact between the air and water (aeration)
- Fast moving streams over rocks = more Oxygen
- Still ponds = less Oxygen
- Photosynthesis of aquatic plants produce Oxygen



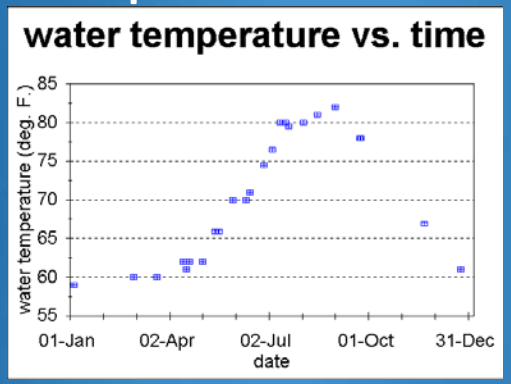
Other Dissolved Oxygen Factors

- Fresh water can hold more than salt water
- Cold water can hold more than warm water
- Elevation: the greater the atmospheric pressure (sea level), the more dissolved oxygen
  - At higher altitudes there is less dissolved oxygen



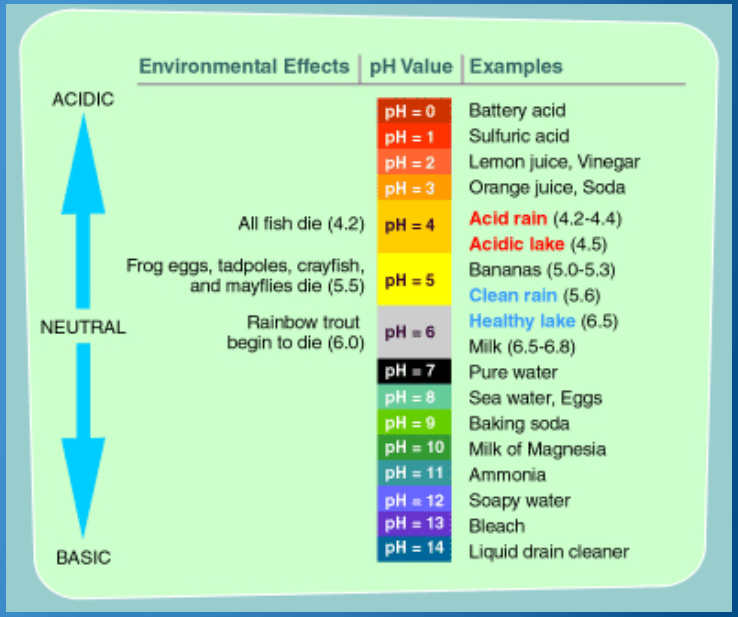
Water Temperature

- High water temperatures stress aquatic ecosystems by reducing the ability of water to hold essential dissolved gasses like oxygen.
  - In a warmwater stream temperatures should not exceed 89^0 F (32^0 C)
  - Cold water streams should not exceed 68^0 F (20^0 C)
  - Often summer heat can cause fish kills in ponds because high temperatures reduce available oxygen in the water



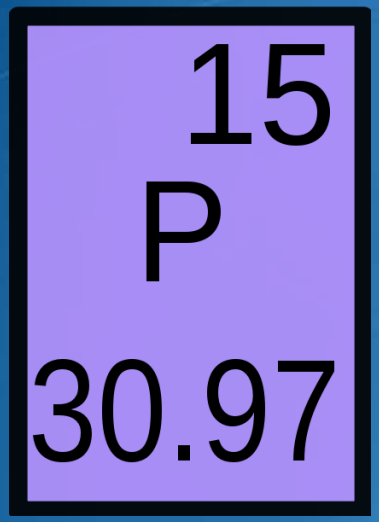
Alkalinity and pH

- used to monitor the acidification status of water bodies
  - Acid rain lowers the pH to about 5.5 to 6.0
  - The water should not be less than 7.0 for most ponds (and not much higher)
  - Low pH is toxic to fish
  - an elevated pH increases the toxicity of ammonia



Nutrients

- (total and dissolved phosphorus, ammonia, total and nitrate-nitrogen
- These measurements are used to assess the degree of nutrient enrichment, or eutrophication
- Must be sent to a lab for analysis



Bacteria

- fecal coliform and enterococci
- Laboratory analysis required
- Can be affected by storm runoff!
- Point and non-point sources of pollution
  - Faulty septic systems
  - Sewer overflow
- These analyses screen for suitability for recreational water uses including shellfishing, and may indicate sewage contamination

Bibliography

- URI Watershed Watch , University of Rhode Island, College of Environmental Sciences
- RI D.E.M.
- LaMotte Laboratories
- Denise Poyer, Watersheds for Educators, URI