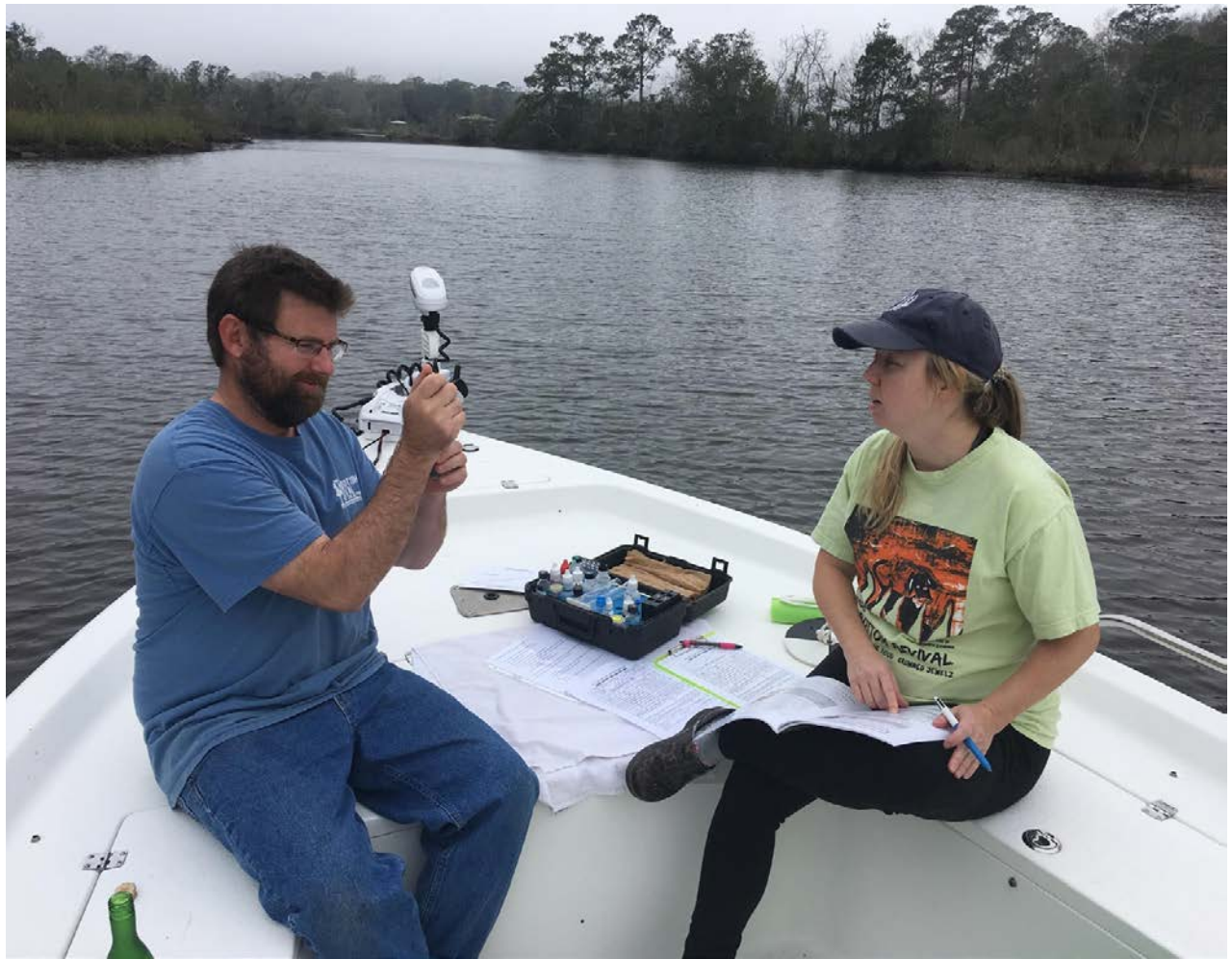
AWW Water Monitoring Parameters

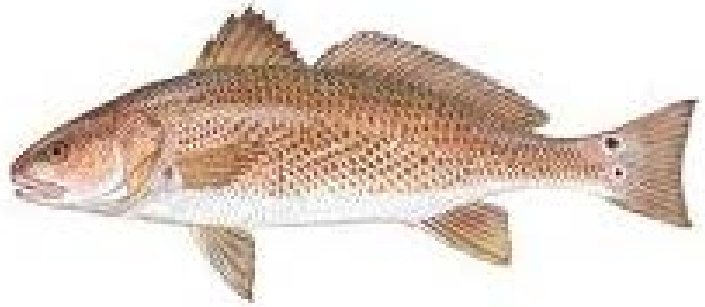
Toward A Better Understanding

Mimi Fearn



Temperature
pH
Alkalinity
Hardness
Dissolved oxygen
Turbidity

Temperature (Alabama max for most streams is 32℃ (90 ℉)

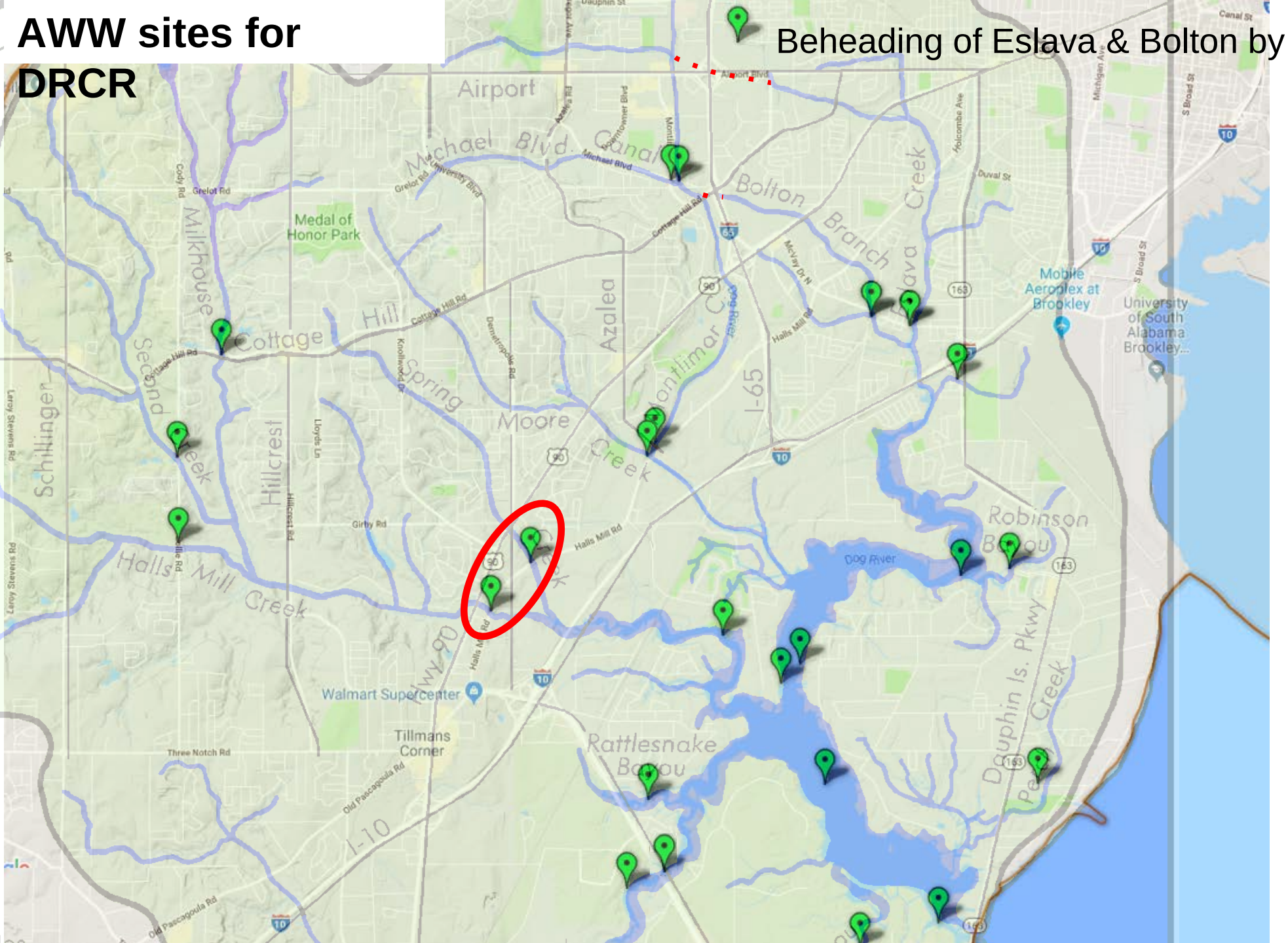


Temperature affects

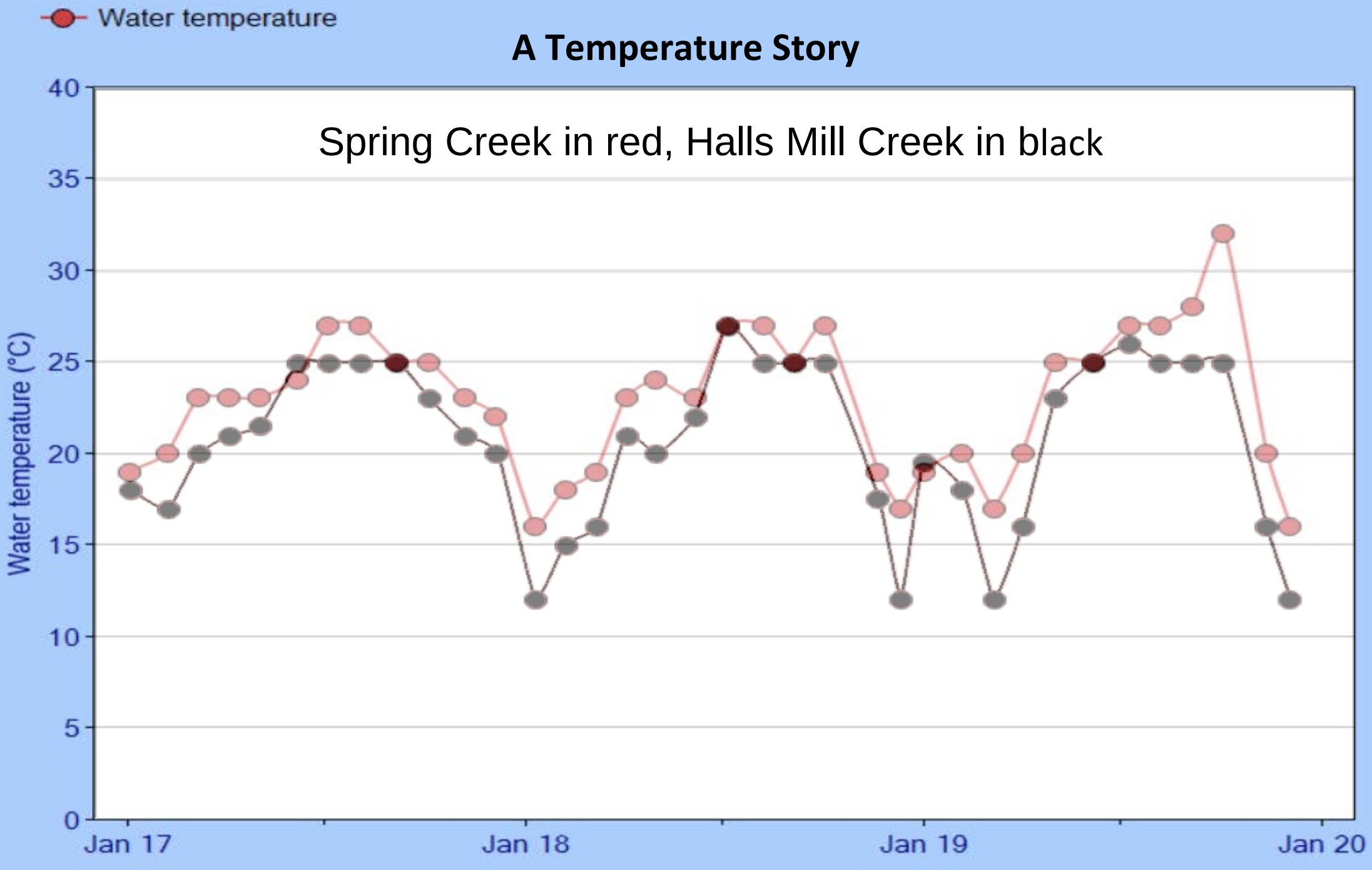
- **dissolved oxygen**
- **metabolic processes**
  - Fish are cold-blooded, higher the temperature, the greater the requirement for oxygen and food
- **<u>decomposition rates</u> / nutrient cycling**
  - **aerobic** decomposition uses oxygen
  - leaves and grass clippings loads high in our area

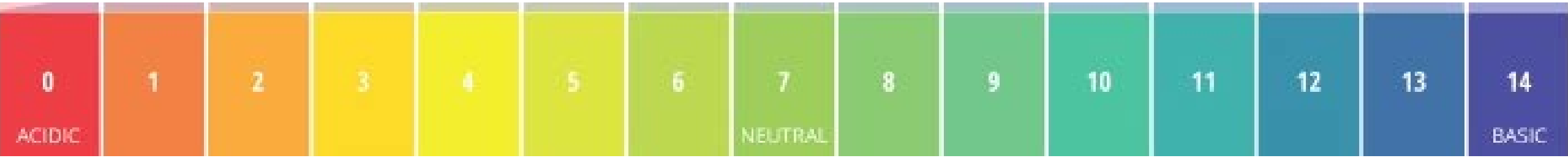
AWW sites for DRCR

Beheading of Eslava & Bolton by I-65



A Temperature Story





pH is a measure of the concentration of hydrogen ions in water,

each step is 10 x more acid or more basic, pH…6.5-7.5 good

A sudden shift in pH is not healthy for the fish / aquatic organisms

pH shifts caused by wastewater, chemical spills, acid rain

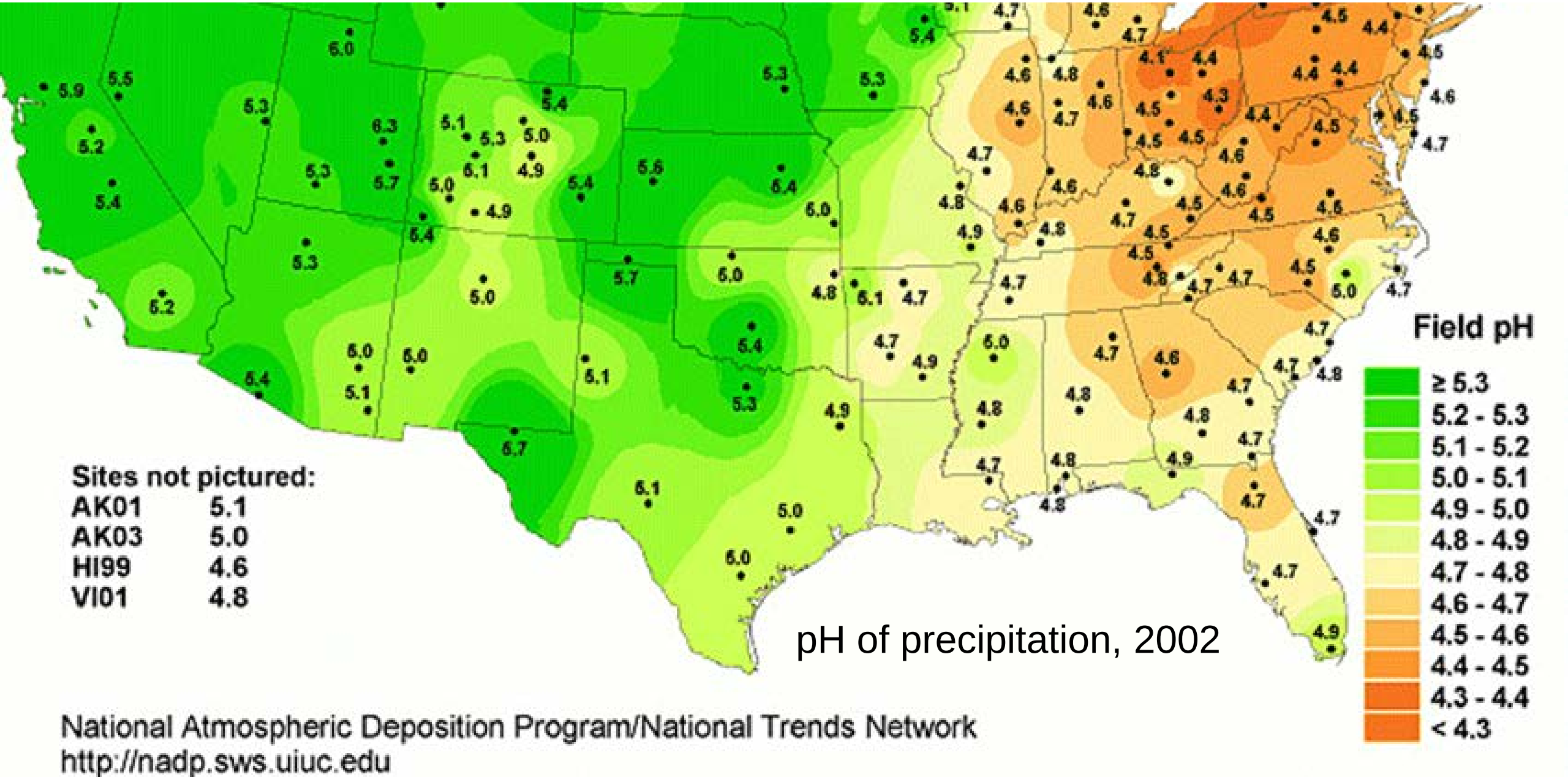
water coming out of an abandoned coal mine can have a pH of 2

pH determines the solubility and biological availability of nutrients / heavy metals

pH determines solubility of heavy metals

more soluble and therefore more toxic at lower pH

As raindrops fall through the air, they interact with carbon dioxide molecules in the atmosphere. This creates carbonic acid in the raindrops, lowering the rain's pH value.



Photosynthesis during day

$$6CO_2 + 6H_20 + (\text{energy}) \rightarrow C_6H_{12}O_6 + 6O_2$$

Carbon dioxide + water + energy from light produces glucose and oxygen

Respiration at night

$$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_20 + (\text{energy})$$

glucose and oxygen produces Carbon dioxide + water + energy

Carbon dioxide reacts with water □ carbonic acid. The pH in ponds rises (less acid) during the day when aquatic plants including microscopic ones remove carbon dioxide from the water during the process of photosynthesis. The pH decreases at night (more acid) because of respiration and production of carbon dioxide by all organisms. In waters with plant life, an increase in pH can be expected during the growing season.

Alkalinity…water's ability to neutralize acid and maintain stable pH

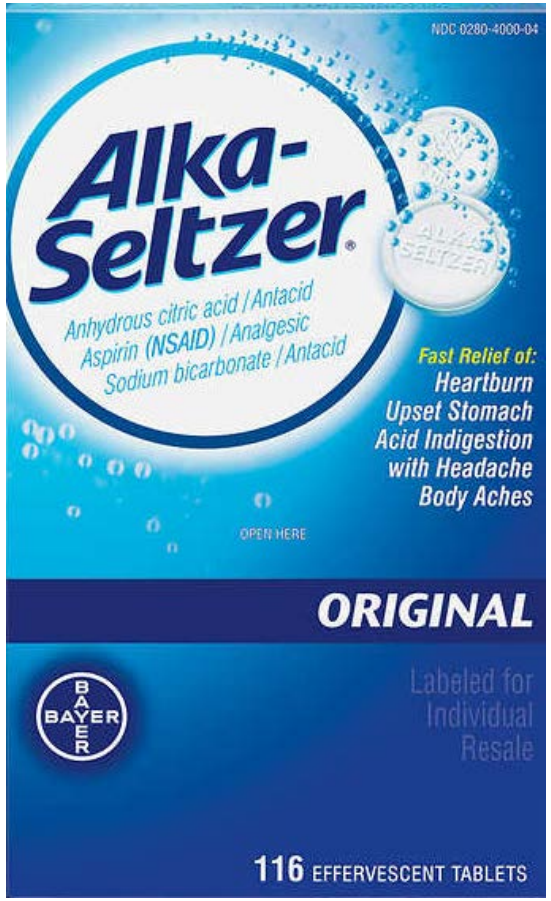
Buffering due to bicarbonates, carbonates, and hydroxides (negative ions)

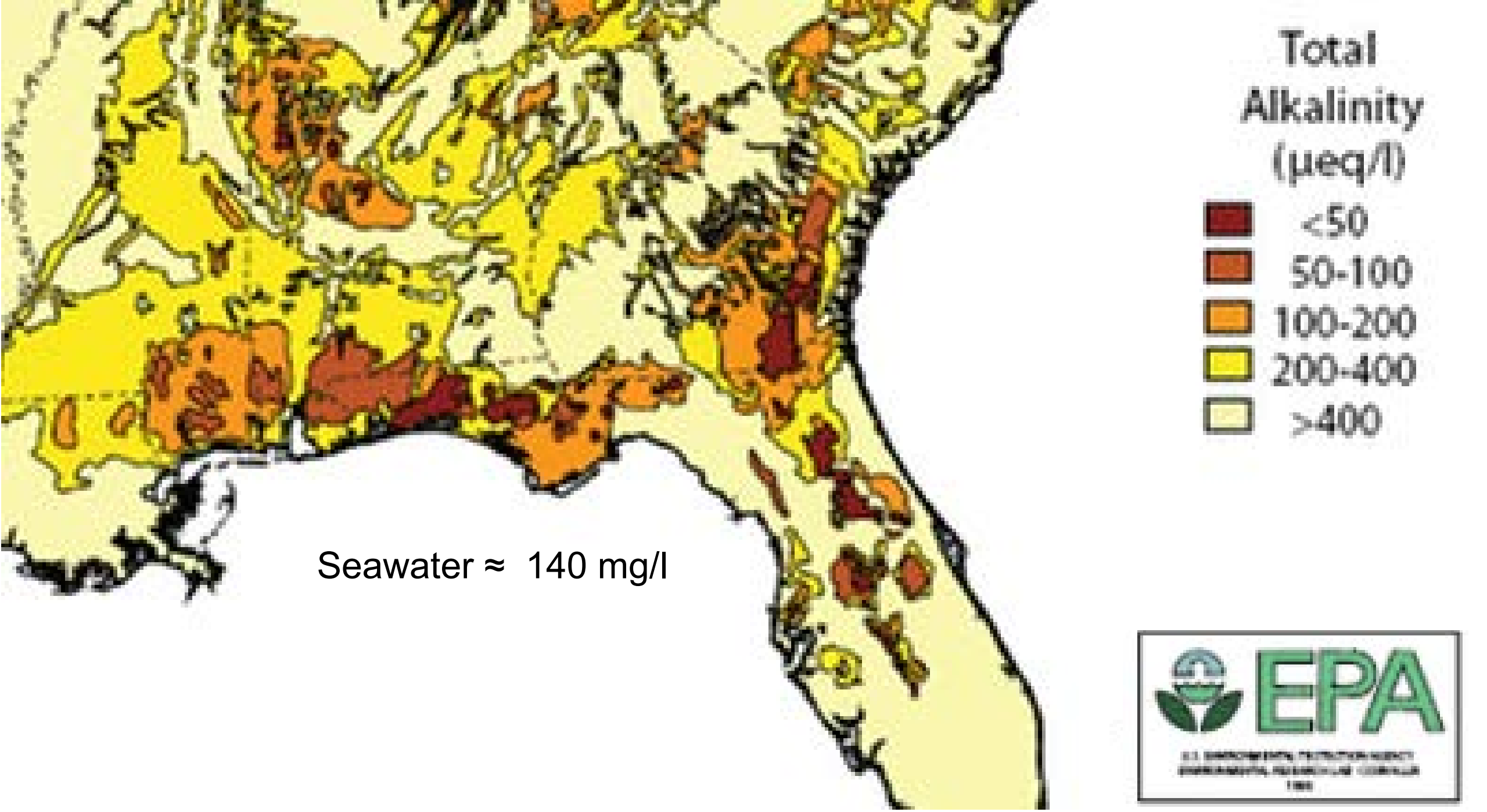
Buffering capacity should be at least 20 mg/L

Water with high alkalinity has pH of 7.0 or above

Fresh water amounts range from 20-200 mg/l

Seawater amounts on average are 100-140 mg/l




Total
Alkalinity
(μeq/l)
<50
50-100
100-200
200-400
>400
Seawater ≈ 140 mg/l
EPA

Hardness…concentration of Calcium and Magnesium ions (++)
There is no criteria for hardness

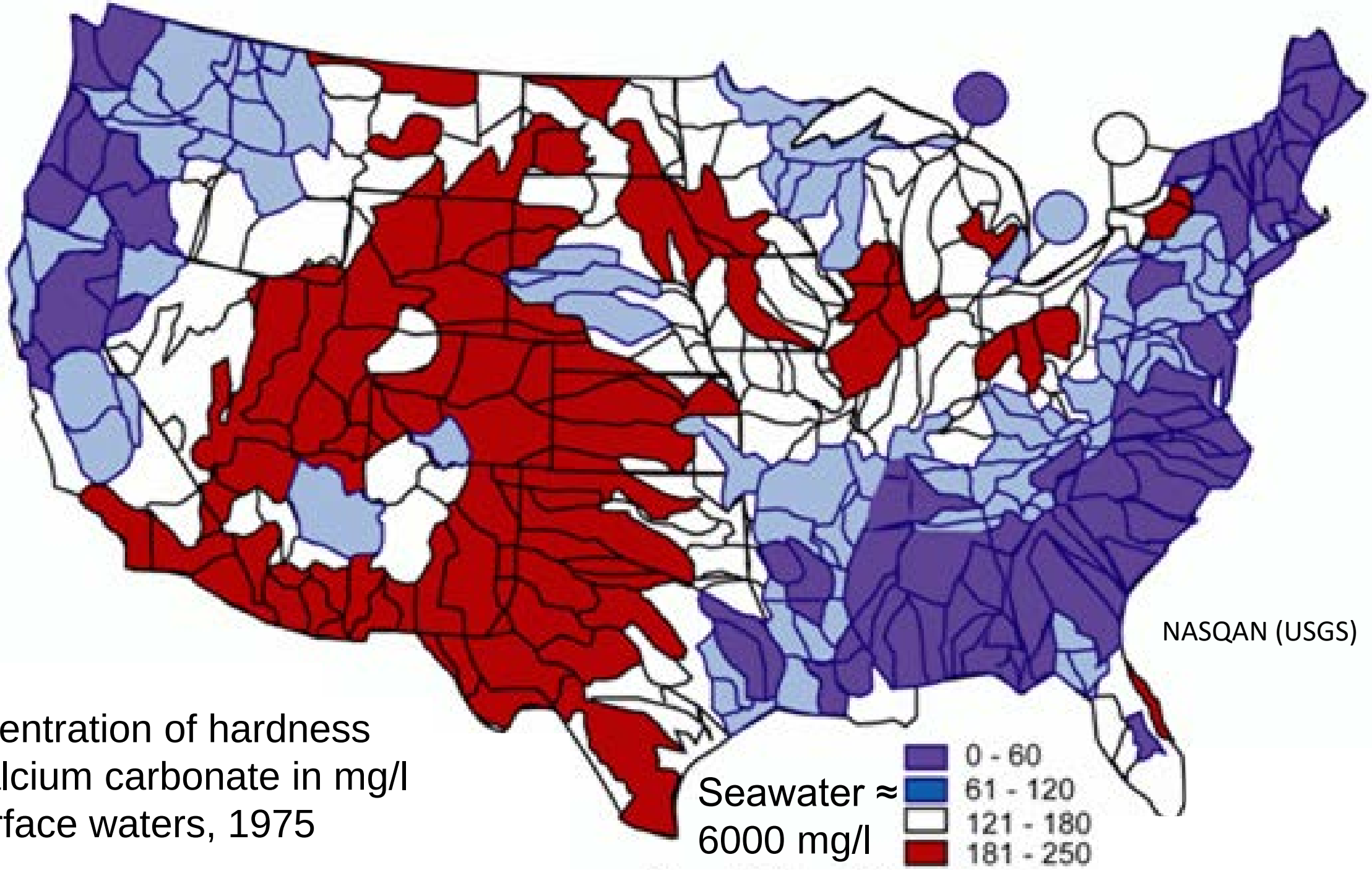
Important impact of hardness on aquatic life is its effect on toxic metals such as lead, cadmium, chromium and zinc. The harder the water, the lower the toxicity.

<u>Blackwater streams have low hardness, pH 3-6</u>.

In seawater, hardness is about 6,000 mg/l.

That's why we do not measure hardness in estuaries.

However, can use hardness as an indicator that salt water is present.



NASQAN (USGS)

Concentration of hardness as calcium carbonate in mg/l in surface waters, 1975

Seawater ≈ 6000 mg/l

Dissolved oxygen

Factors affecting DO		DO
Turbulence	Up	Up
Water temperature	Up	Down
Atmopheric pressure	Up	Up
Salinity	Up	Down
Photosynthesis	Up	Up
Decomposition of organics	Up	Down

Dissolved oxygen…below 5 mg/l is stressful

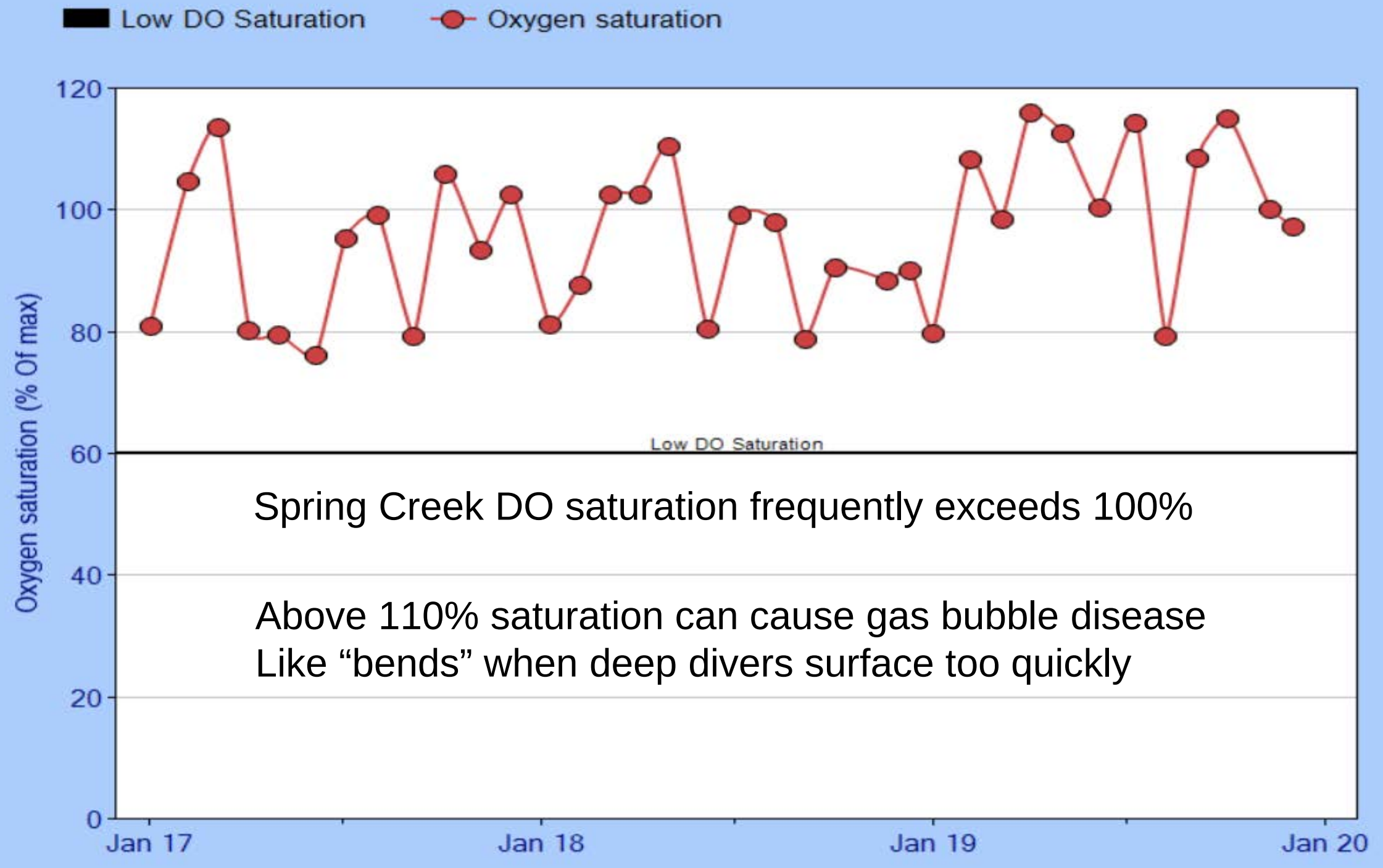
Relate to climbing a mountain

Conditions that can cause DO to drop

- series of cloudy, windless days
- excessive turbidity limits oxygen production through photosynthesis
- large blooms of phytoplankton, zooplankton, etc. respiring during the night
- "crash" of phytoplankton/zooplankton booms
  - subsequent decomposition of organic load

“Blooms” can create large diurnal swings in DO,

High in day, low at night



Spring Creek DO saturation frequently exceeds 100%

Above 110% saturation can cause gas bubble disease
Like “bends” when deep divers surface too quickly

Turbidity… measure of cloudiness of water

Caused by soil in the water (especially clay and silt sized particles)
microscopic organisms in the water (algae etc.)

Limits light penetration, levels exceeding 15 NTU detrimental to SAV

Smothers bottom dwelling organisms, clogs fish gills

Clay means a certain size particle

Less that .002mm
Flat and thin like cards
Faces negatively charged, edges positive

Clay particles are electrostatically charged
toxins may be attached to them

Stay suspended, cause turbidity for days

Settle out when they group together in flocs, act like larger particles (sand, silt)
In fresh water, floc by stacking like house of cards (face to edge)
In salt water, Na+ ions attach to face and facilitate flocculation process