

Slough School / Water Chemistry

Name _____

What is the quality of the water in West Whitaker Pond?

Hypothesis:

HORRIBLE _____ AMAZING!

Test	Tool	Hypothesis (circle one)
Temperature	Thermometer	Cold / Cool / Warm
Turbidity	Secchi Disc	Very murky / Kind of murky / Kind of clear / Very clear
Dissolved Oxygen	Glass Ampules	None / Enough for mosquitos / Enough for some fish / A Lot
pH	Indicator	Very acidic / Acidic / Neutral / Alkaline / Very Alkaline

Results:

Temperature (°F)	Turbidity (cm)
<p>What is the temperature of your water?</p> <p>Is that warm, cool, or cold?</p> <p>What can live in that temperature of water?</p> <p>How can we affect the temperature of water in the Slough?</p>	<p>How deep did the Secchi disc go before it disappeared?</p> <p>How does turbidity affect water quality? (see USGS reading)</p> <p>How can we affect the turbidity in the Slough?</p>

Dissolved Oxygen (PPM)	pH
<p data-bbox="131 210 808 283">How many parts per million of Dissolved Oxygen are in your water?</p> <p data-bbox="131 388 808 430">What can live with that level of oxygen?</p> <p data-bbox="131 535 808 609">How can we affect how much Dissolved Oxygen is in the Slough?</p>	<p data-bbox="820 210 1487 252">What number did you get for your pH reading?</p> <p data-bbox="820 388 1487 430">Is that acidic, neutral, or alkaline?</p> <p data-bbox="820 535 1487 577">What can live in that pH?</p> <p data-bbox="820 682 1487 724">How can we affect the pH of water in the Slough?</p>

Dissolved Oxygen (D.O.)

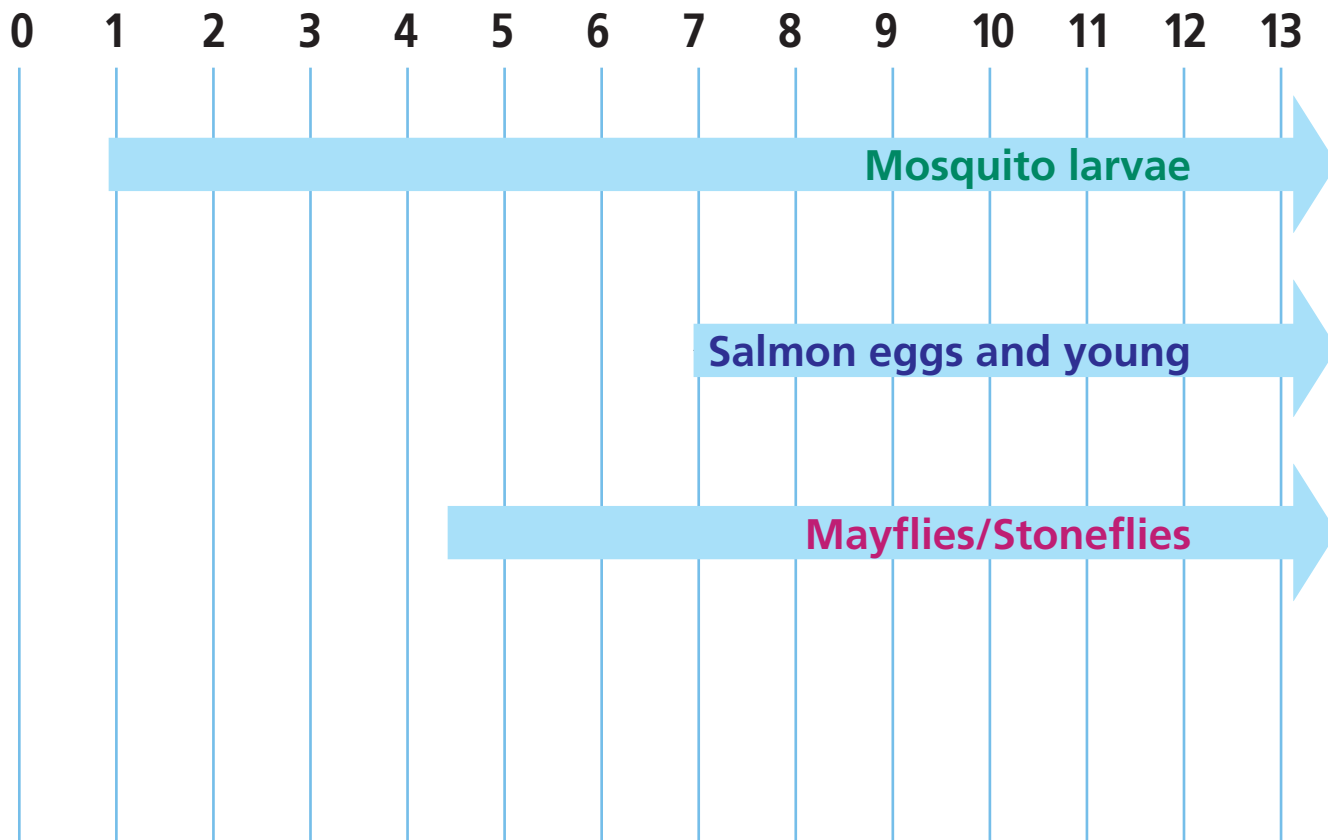
Definition: The amount of oxygen in the water.

Importance: Required by aquatic life to breathe.

How is it measured? In Parts Per Million (PPM).

(some scientists use mg/l or percent saturation)

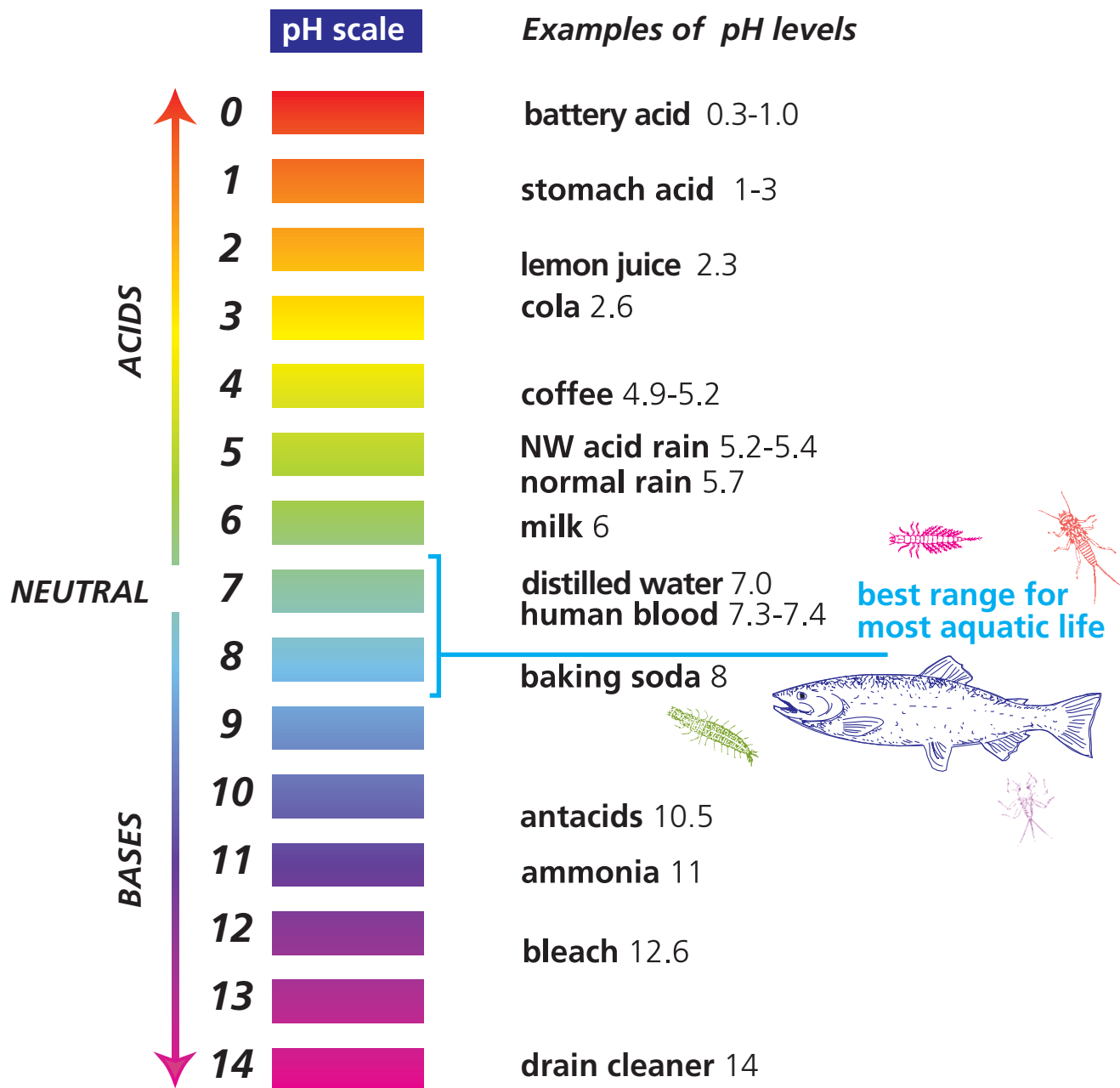
Dissolved Oxygen (PPM)



pH

Definition: Measure of how acidic or basic (alkaline) the water is.

Importance: Pollution can change the pH of water.
If water is too acidic or too basic aquatic life can die.



Temperature

water beetle



Aquatic organisms breathe oxygen that is dissolved in the water.

- Warmer water may mean less dissolved oxygen is available for aquatic animals to breathe.
- Colder water can hold more dissolved oxygen.

Rapid changes in water temperature can kill aquatic organisms.

water boatman



dragonfly



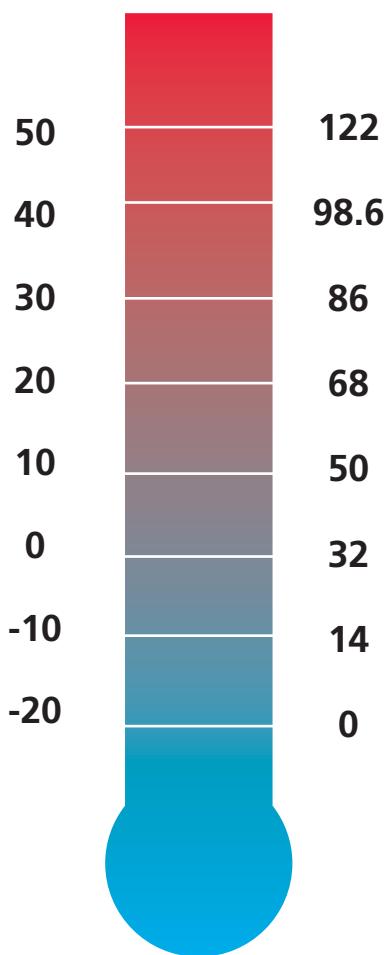
alderfly



°C

°F

Preferred Temperature



Warm

Above 68° F (20° C)
dragonflies, bass, carp, catfish



Cool

55-68° F (13-20° C)
Chinook, coho, sturgeon,
cutthroat trout, mayflies

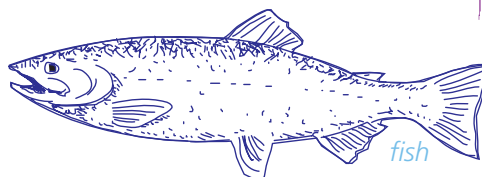
mayfly nymph



Cold

Below 55° F (13° C)
Steelhead, caddisflies, stoneflies,
salmon eggs and alevins

stonefly



fish



hellgramite



snail

Turbidity and Water

Lucky for us all, our drinking water is almost always clear (very low turbidity). Other water, such as the creek behind your house after a rainstorm, is likely to be highly turbid—brown with floating sediment.

Turbidity is the clarity of water and it is an important factor in water quality.



A USGS hydrographer collecting a suspended-sediment water sample from the Little Colorado River, Grand Canyon, Arizona, USA. (Credit: Mike Nolan, USGS)

Turbidity is the measure of relative clarity of a liquid. It is an optical characteristic of water and is a measurement of the amount of light that is scattered by material in the water when a light is shined through the water sample. The higher the intensity of scattered light, the higher the turbidity. Material that causes water to be turbid include clay, silt, very tiny inorganic and organic matter, algae, dissolved colored organic compounds, and plankton and other microscopic organisms.

Turbidity makes water cloudy or opaque. The picture to the right shows a U.S. Geological Survey (USGS) hydrologist sampling highly turbid water in the Colorado River in Arizona. The water collected in a bottle will be used to find out the turbidity, which is measured by shining a light through the water and is reported in nephelometric turbidity units (NTU). During periods of low flow (base flow), many rivers are a clear green color, and turbidities are low, usually less than 10 NTU. During a rainstorm, particles from the surrounding land are washed into the river making the water a muddy brown color, indicating water that has higher turbidity values. Also, during high flows, water velocities are faster and water volumes are higher, which can more easily stir up and suspend material from the stream bed, causing higher turbidities.



Turbidity is measured in Nephelometric Turbidity Units (NTU). These bottles show various turbidity levels.

Turbidity and water quality

High concentrations of particulate matter affect light penetration and ecological productivity, recreational values, and habitat quality, and cause lakes to fill in faster. In streams, increased sedimentation and siltation can occur, which can result in harm to habitat areas for fish and other aquatic life. Particles also provide attachment places for other pollutants, notably metals and

bacteria. For this reason, turbidity readings can be used as an indicator of potential pollution in a water body.

Turbidity and human health

Excessive turbidity, or cloudiness, in drinking water is aesthetically unappealing, and may also represent a health concern. Turbidity can provide food and shelter for pathogens. If not removed, the causes of high turbidity can promote regrowth of pathogens in the water, leading to waterborne disease outbreaks, which have caused significant cases of intestinal sickness throughout the United States and the world. Although turbidity is not a direct indicator of health risk, numerous studies show a strong relationship between removal of turbidity and removal of protozoa. The particles of turbidity provide "shelter" for microbes by reducing their exposure to attack by disinfectants. Microbial attachment to particulate material has been considered to aid in microbe survival. Fortunately, traditional water treatment processes have the ability to effectively remove turbidity when operated properly. *(Source: U.S. Environmental Protection Agency)*



Sediment-laden tributaries flowing into the clearer Paraná River, Argentina. (Credit: NASA Johnson, Flickr)

Measuring turbidity

State-of-the-art turbidity meters are beginning to be installed in rivers to provide an instantaneous turbidity reading. A long device is lowered into the water and at the end is a turbidity sensor. It reads

turbidity in the river by shining a light into the water and reading how much light is reflected back to the sensor. These devices can house multiple water-quality sensors, such as a conductivity sensor to measure [electrical conductance](#) of the water, which is strongly influenced by dissolved solids, and a [temperature](#) gauge.

Do you want to test your local water quality?

Water test kits are available from [World Water Monitoring Challenge](#) (WWMC), an international education and outreach program that builds public awareness and involvement in protecting water resources around the world. *Teachers and water-science enthusiasts: Do you want to be able to perform basic water-quality tests on local waters?* WWMC offers inexpensive test kits so you can perform your own tests for temperature, pH, turbidity, and dissolved oxygen.

Some information on this page is from "A Primer on Water Quality", by Swanson, H.A., and Baldwin, H.L., U.S. Geological Survey, 1965.