

# Water Quality

Water covers 70% of Earth and is an integral part of all life. Having clean water is important for many organisms, but especially for the organisms that live in the water. Just like organisms on land like to live in certain places (in trees, in mountains, in prairies) organisms that live in the water are adapted to specific characteristics like temperatures, the amount of oxygen, and the amount of salt (salinity). On the *Piscataqua* we discuss water quality by



- Measuring temperature, dissolved oxygen, and salinity
- Identifying the adaptations of different organisms to live in the aquatic environment
- Identifying ways that humans change these parameters and the consequences of those changes
- Identifying things that individuals can do to reduce the harmful impacts on the marine environment.
- The following discussions and activities can help prep your students for the discussions that will take place on board and will help enrich their experience.

## *Dissolved Oxygen*

Oxygen is important for many living organisms on land and in the water. Organisms in the water need oxygen to breath just like we do. Many people know that water is made up of hydrogen and oxygen (H<sub>2</sub>O). The oxygen that makes water is not the oxygen that marine organisms use. They use oxygen that is DISSOLVED in the water. This oxygen gets there by mixing with the air when there are waves and also by photosynthesis of phytoplankton (see the “Plankton Overview” for more about phytoplankton). We call this oxygen DISSOLVED OXYGEN, or D.O. for short.

Humans impact the amount of D.O. in many ways. Humans put waste in the rivers like sewage and pet waste that microorganisms love to eat. Those microorganisms use the oxygen that would otherwise be used by fish. People also add extra nutrients through fertilizers that we put on our lawns. Fertilizers are used to help plants grow, and when it gets into the water aquatic plants use it the same way. When the aquatic plants are growing they photosynthesize and produce more oxygen, but when they die they start to decompose with the help of microorganisms that again, use the oxygen, taking it away from the other organisms that need it.

[Click here](#) for an activity that explores excess nutrients in the water.

## **Temperature**

Though temperature is easy to measure it is very important. Many other characteristics of water depend on temperature. Cooler water, for example, can hold more oxygen, while warmer water can increase metabolism rates of organisms as well as increase rates of photosynthesis. Organisms are adapted to a specific range of temperatures. If they move outside of that range they can be susceptible to disease.

[Click here](#) for an activity that looks at how temperature changes waters ability to hold gases.

Human activity can change the temperature in the water. Many industries use water to cool their factories. Cool water from a river enters a factory to absorb excess heat and the heated water is put back in the river. This temperature change can have large effects on the biological communities that live in the area.

## **Salinity**

Salinity is the amount of salt that is in the water. Some of the salt is just like the salt we put in our foods (sodium chloride) but there are also different types of salt. The ocean has about 3.5% (parts per hundred) salinity, or 35‰ (parts per thousand, also written as 35ppt). Aquatic organisms are adapted to live in certain salinities, some like fresh water (less than .5ppt), and some like it salty (salt water), and some like it somewhere in-between (brackish water). Just like with temperature, if an organism is put outside the range it is adapted to, it can cause stress making the organism susceptible to disease, or can even kill it.

Salt gets into the water by erosion and runoff from land. People change the salinity by developing near the shorelines (this creates more erosion) or by the salt we put on the roads.

## **Turbidity**

Turbidity is the amount of suspended solids in the water. Think about when water looks “murky” or when it looks clear. Water that comes out of our faucet has a very low turbidity, meaning that it comes out very clear. Some people think that murky water means that it is dirty water, but this is not always the case! Water can look murky or dirty when there is a lot of plankton or sediment in it. If there is a lot of plankton and/or sediment and the water looks dirty, it is said to have a high turbidity. Plankton are the basis of the food web in the water, so having them there is a *very good thing*. Sediment gets in the water by rain runoff from land. This sediment can bring lots of good nutrients that organisms need to survive, but sometimes too much sediment

[Click here](#) for an activity that introduces the concept of turbidity.

can be bad. If there is too much sediment, it can cover plants and animals on the bottom, or block out the sunlight that marine plants need to grow.

We measure turbidity using an instrument called a secchi disk (sec-ee). We lower a secchi disk into the water and look at it until it disappears. This tells us how deep sunlight is penetrating the water. If there is high turbidity the secchi disk will disappear very quickly, many 6 inches from the surface. If there is low turbidity, the secchi disk will disappear much deeper.