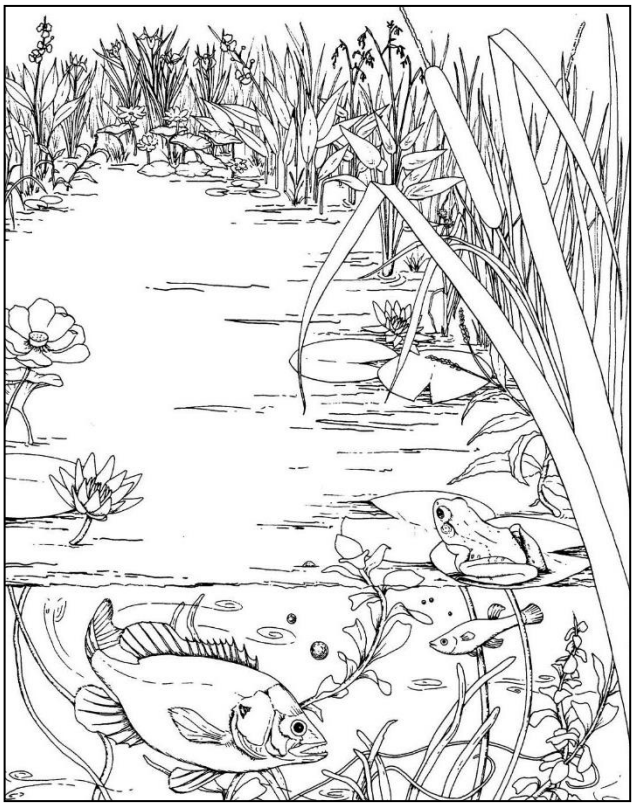
Module 2 ~ A Fish Tale (MS)

Reading Activity – Dissolved Oxygen

Name: _____ Class Period:_____ Date:_____



Fish and other aquatic animals cannot live without oxygen. (Neither can we!) Aquatic plants need oxygen to **respire** (breathe) too. However, because they live in water, aquatic plants and animals get their oxygen in a form known as **dissolved oxygen** gas.

It is important to understand that this dissolved oxygen gas does not come from the oxygen molecules that are part of the water itself (two hydrogen atoms and one oxygen atom (**H_2O**) per each molecule of water). Rather, dissolved oxygen gas is made up of molecules consisting of two oxygen atoms (**O_2**), and is constantly entering the water from two main sources. Our atmosphere is the first of these sources. Molecule by molecule, oxygen is pushed into the water by atmospheric pressure from the air above.

Photosynthesis is the second important source of dissolved oxygen. Photosynthesis is a process that occurs in algae and other green plants; they use carbon dioxide, water and sunlight to make their own food. Dissolved oxygen gas is released into the water as a byproduct of this process.

Simple, one-celled aquatic plants like algae and larger, more complex aquatic plants like **coontail** also take in some dissolved oxygen for respiration. In plants, this process is almost the opposite of photosynthesis: oxygen is used to help the plant break down the food it has created through photosynthesis, and to put those **nutrients** to work in the form of energy. The two most important processes that occur in all green plants, whether simple or complex in form, are photosynthesis and respiration.

At night and on very cloudy days, algae and other **submersed** (underwater) plants remove oxygen from the water for respiration. During daylight hours, photosynthesizing plants usually produce more oxygen than they consume.

Dissolved oxygen levels in water bodies vary over the course of the day, as well as in response to weather conditions and other factors. At night, dissolved oxygen levels are low because plants are no longer photosynthesizing; without sunlight, no oxygen is produced. Meanwhile, both plants and animals are still respiring and using what's left of the oxygen in the water. This means that dissolved oxygen levels are lowest just before sunrise.

Temperature can also affect the amount of dissolved oxygen in water. Cooler water holds more dissolved oxygen than warm water. Florida's warm summer temperatures can cause dissolved oxygen to drop to very low levels in a lake or pond.

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Like humans, fish can endure brief periods of reduced oxygen. However, if the dissolved oxygen content *remains* low in a waterbody, a fish kill can occur. This type of oxygen-related fish kill is common in Florida, particularly in still or slow-moving waters such as lakes and ponds. These mass die-offs of fish and other aquatic animals usually happen in the summer when water temperatures are very warm, following several days of cloudy weather.

Sharp drops in D.O. that cause fish kills can also be caused by large algae blooms, which use up lots of oxygen in a short amount of time as the single-celled plants reproduce rapidly and then die off in huge numbers. **Micro-organisms** that eat the decaying algae also use up lots of oxygen in the process of consuming the tiny plants. The death of large numbers of **macrophytic** (bigger, multi-celled) aquatic plants in a lake or pond can also cause sharp drops in dissolved oxygen as the plants decay. This can happen due to natural causes such as storms, drought, freezes and other weather events, or due to human activities such as cutting or spraying plants with herbicides in and around waterbodies.

Dissolved Oxygen Reading Activity (MS) – answer in complete sentences.

1. What are the two sources of dissolved oxygen gas in water?

2. Describe the difference between photosynthesis and respiration in aquatic plants.

3. How do dissolved oxygen levels in waterbodies vary over the course of a day?

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4. How does temperature affect dissolved oxygen levels in water bodies?

5. What causes prolonged periods of low dissolved oxygen in waters? What are some of the effects of low dissolved oxygen?

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