

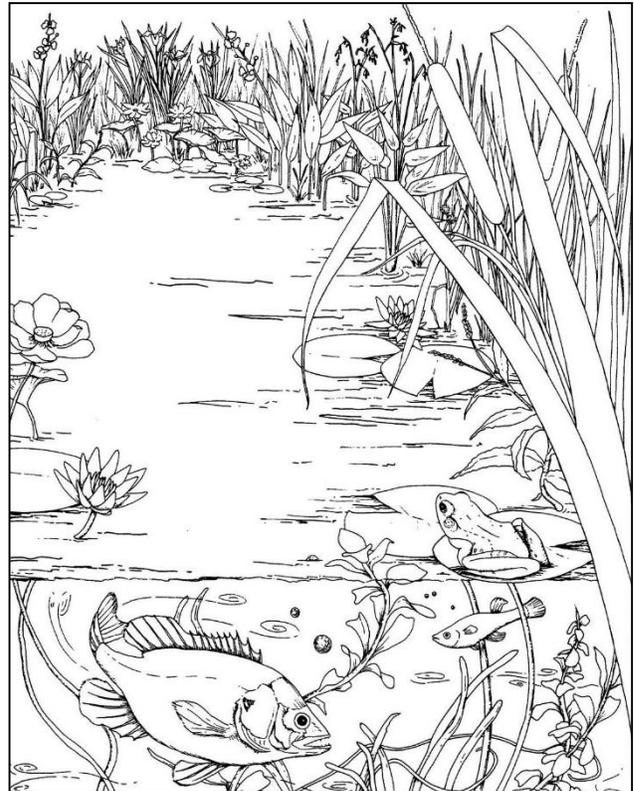


Name: _____ Class Period: _____ Date: _____

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? How does the oxygen from each source enter the water?

The two sources of dissolved oxygen gas in water bodies are the atmosphere, and photosynthesis. Oxygen from the atmosphere is pushed into the water by atmospheric pressure from the air above. Oxygen from photosynthesis is released into the water as a byproduct of photosynthesis by aquatic plants.

2. Describe the difference between photosynthesis and respiration in aquatic plants, and how this affects dissolved oxygen in the water.

In photosynthesis, aquatic plants and algae use carbon dioxide, water and sunlight to make their own food, releasing dissolved oxygen gas into the water as a part of this process. This increases dissolved oxygen levels. In respiration, plants take in dissolved oxygen from the water to help them break down the food they've created during photosynthesis. This lowers dissolved oxygen levels.

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

Dissolved oxygen levels in water are low at night because plants are no longer photosynthesizing and releasing oxygen gas. 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. During daylight hours, photosynthesizing plants usually produce more oxygen than they consume.





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

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.

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

Long periods of warm or cloudy weather, or massive algae blooms which consume large quantities of dissolved oxygen, can cause prolonged episodes of low dissolved oxygen. Micro-organisms that eat the decaying algae also use up lots of oxygen during the decomposition and breakdown process.

The following is a list of suggested standards that pertain to this activity. This list is provided as a reference to incorporate and expand upon as needed.

Common Core State Standards

6th Grade

Common Core Code	FL Common Core Code	Common Core Standard
RI.6.1	LAFS.6.RI.1.1	Cite textual evidence to support analysis of what text says explicitly as well as inferences drawn from text.
RI.6.4	LAFS.6.RI.2.4	Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings.
L.6.4	LAFS.6.L.3.4	Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grade 6 reading and content, choosing flexibly from a range of strategies.
RST.6-8.4	LAFS.68.RST.2.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6–8 texts and topics.

7th Grade

RI.7.1	LAFS.7.RI.1.1	Cite several pieces of textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.
RI.7.4	LAFS.7.RI.2.4	Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the impact of a specific word choice on meaning and tone.
L.7.4	LAFS.7.L.3.4	Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grade 7 reading and content, choosing flexibly from a range of strategies.
RST.6-8.4	LAFS.68.RST.2.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6–8 texts and topics.

8th Grade

RI.8.1	LAFS.8.RI.1.1	Cite the textual evidence that most strongly supports an analysis of what the text says explicitly as well as inferences drawn from the text.
RI.8.4	LAFS.8.RI.2.4	Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the impact of specific word choices on meaning and tone, including analogies or allusions to other texts.



Answer Key – Reading Activity – Dissolved Oxygen



L.8.4	LAFS.8.L.3.4	Determine or clarify the meaning of unknown and multiple-meaning words or phrases based on grade 8 reading and content, choosing flexibly from a range of strategies.
RST.6-8.4	LAFS.68.RST.2.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6–8 texts and topics.



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