Name:_____

Everglades Peat and Marl Soils

Objectives: Students will be able to:

- Describe why soil in general is important to an ecosystem, what peat and marl soils are made of, and how they are specifically important to the health of the Everglades ecosystem.
- Explain how peat and marl soils are different, such as how their needs for oxygen vary.
- Describe how human impacts have had an effect on Everglades soils.
- Explain why Everglades restoration is important to protecting Everglades soils, ridges, and slough habitats.
- Analyze a map to depict how pre-drainage Everglades bedrock and Everglades peat soils are related.

Standards:

- **SC.7.E.6.2:** Identify the patterns within the rock cycle and relate them to surface events (weathering and erosion) and subsurface events (plate tectonics and mountain building).
  Also assesses:
  - **SC.6.E.6.1:** Describe and give examples of ways in which Earth's surface is built up and torn down by physical and chemical weathering, erosion, and deposition.
  - **SC.7.E.6.6:** Identify the impact that humans have had on Earth, such as deforestation, urbanization, desertification, erosion, air and water quality, and changing the flow of water.

Lexile Level: 1010L-1200L

Name:_____

Everglades Peat and Marl Soils Vocabulary

- **Aerobic reaction:** A reaction that needs oxygen to work.
- **Anaerobic conditions:** Conditions that lack oxygen.
- **Carbon sequestration:** The long-term removal of carbon dioxide from the atmosphere.
- **Carbon sink:** A forest, ocean, or other natural environment viewed in terms of its ability to absorb carbon dioxide from the atmosphere.
- **Fossilized:** When something is preserved and becomes a fossil.
- **Hydroperiod:** The number of days per year that an area of land is wet, or the length of time that there is standing water at a location.
- **Mineral soil:** Any soil consisting primarily (but not completely) of mineral (sand, silt, and clay) material.
- **Marl soil:** Any soil (like sand, silt, or clay) that contains a large amount of calcium carbonate.
- **Oxidation:** When a chemical substance changes because it is combined with oxygen.
- **Peat soil:** Type of soil made of dead plants that have not completely rotted. It is formed in wet ground that is not well drained.
- **Periphyton:** A community of organisms grouped together including algae, fungi, and bacteria.

Name:_____

Everglades Peat and Marl Soils Reading Passage

Soil is an important characteristic of an ecosystem. It helps determine how much water will be stored or will flow on the surface of the ground, the amount of nutrients it contains, and which types of plants will grow in an ecosystem. The Everglades is made up of many different types of soils. Two distinct types of soils found in the Everglades are **marl** and **peat soils**. What characterizes these soils and how are they important to the Everglades ecosystem?

Marl soils are primarily **mineral soils**, any soil consisting primarily, but not completely, of mineral (sand, silt, and clay) material. They are a product of **periphyton**, a community of organisms grouped together including algae, fungi, and bacteria. During the dry season in the Everglades, the **periphyton** undergoes an **aerobic reaction**, which is a chemical reaction that requires oxygen to break down the periphyton. In this case, the **aerobic reaction** is the process of **oxidation**, or the process when a chemical substance changes because it is combined with oxygen. Other examples of **oxidation** include rust formation or when fruit turns brown.

A key exhibiting oxidation through rusting.
(Trung Quac Don, Wikipedia Commons).

Name:_____

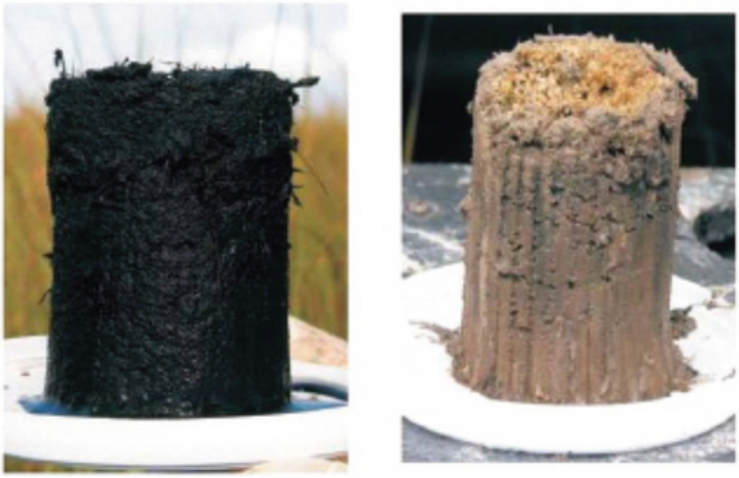
Everglades Peat and Marl Soils Reading Passage

After the **periphyton** oxidizes, this leaves behind calcium carbonate as a light colored soil.

Marl soil is a gray, clay-like substance. (Jeff Wasielewski, Wikipedia Commons).

Marl soils form in short **hydroperiods,** which are the number of days per year that an area of land is wet or the length of time that there is standing water at a location. **Marl soils** occur closer to the surface, particularly in low lying lands in South Florida, mainly in Miami-Dade and Monroe Counties, including Everglades National Park.

Peat soils are highly organic in nature, as they are derived from organic remains of plants. The color of the soil is dependent upon the plant species that it is made from. Compared to **marl soils, peat** is usually darker in coloration.



Peat Soil **Marl Soil**

Peat and marl soils of the Everglades. Source: (Scheidt and Kalla 2007).

Name:_____

Everglades Peat and Marl Soils Reading Passage

In order for **peat** to form, it requires **anaerobic conditions,** or the lack of oxygen. **peat soils** have a longer **hydroperiod** than **marl soils** do. **Peat soils** thrive in acidic environments where the accumulated plant matter gathers for a long period of time. During **peat soil** formation, each layer that accumulates lacks oxygen. When **peat soils** are **fossilized**, or preserved to become a fossil, they can turn into coal. Just as coal burns, so do **peat soils**. Average daily temperatures in the Everglades rise in the spring. Because of this and low levels of water, natural fires can occur that burn the **peat soils.**

Peat soil burning in the Everglades. (Shuttershock Image).

Peat soil in the Everglades. (National Park Service photo).

These roots are growing out of the soil, indicating loss of peat soils. This can lead to more open water ponds, where the water is too deep for plant communities to grow. (Benjamin J. Wilson, Florida Coastal Everglades Blogspot).

Name:_____

Everglades Peat and Marl Soils Reading Passage

Everglades habitats, like wetlands that contain **peat soil**, play an essential role in **carbon sequestration**, or the long-term removal of carbon dioxide from the atmosphere. These habitats require freshwater to remain healthy and functional. Alterations to the Everglades watershed have created drier conditions that lead to negative effects in the environment. The alterations of the water flow have severely impacted the **peat soils**. With less freshwater from the headwaters of the Everglades (in the Orlando/Kissimmee area) flowing south towards Florida Bay, drier conditions are more prevalent than ever before. Drier conditions mean higher chances of fires and **peat soil oxidation**. When **peat soils** are subjected to fires and increased **oxidation**, they burn more, which reduces the amount of **peat**. This reduces the ridge and slough habitats that are made up of **peat soils** and are critical for the wildlife found in the Everglades. When these soils burn, carbon dioxide is emitted into the atmosphere and this greenhouse gas is a driver of climate change.

This is why Everglades restoration is more important than ever. Restoring the Everglades ecosystem will ensure the water will flow south as it did naturally in the historic Everglades, before it was altered. This will lead to less peat soil burning, healthier Everglades soils, and ultimately a healthier Everglades system.

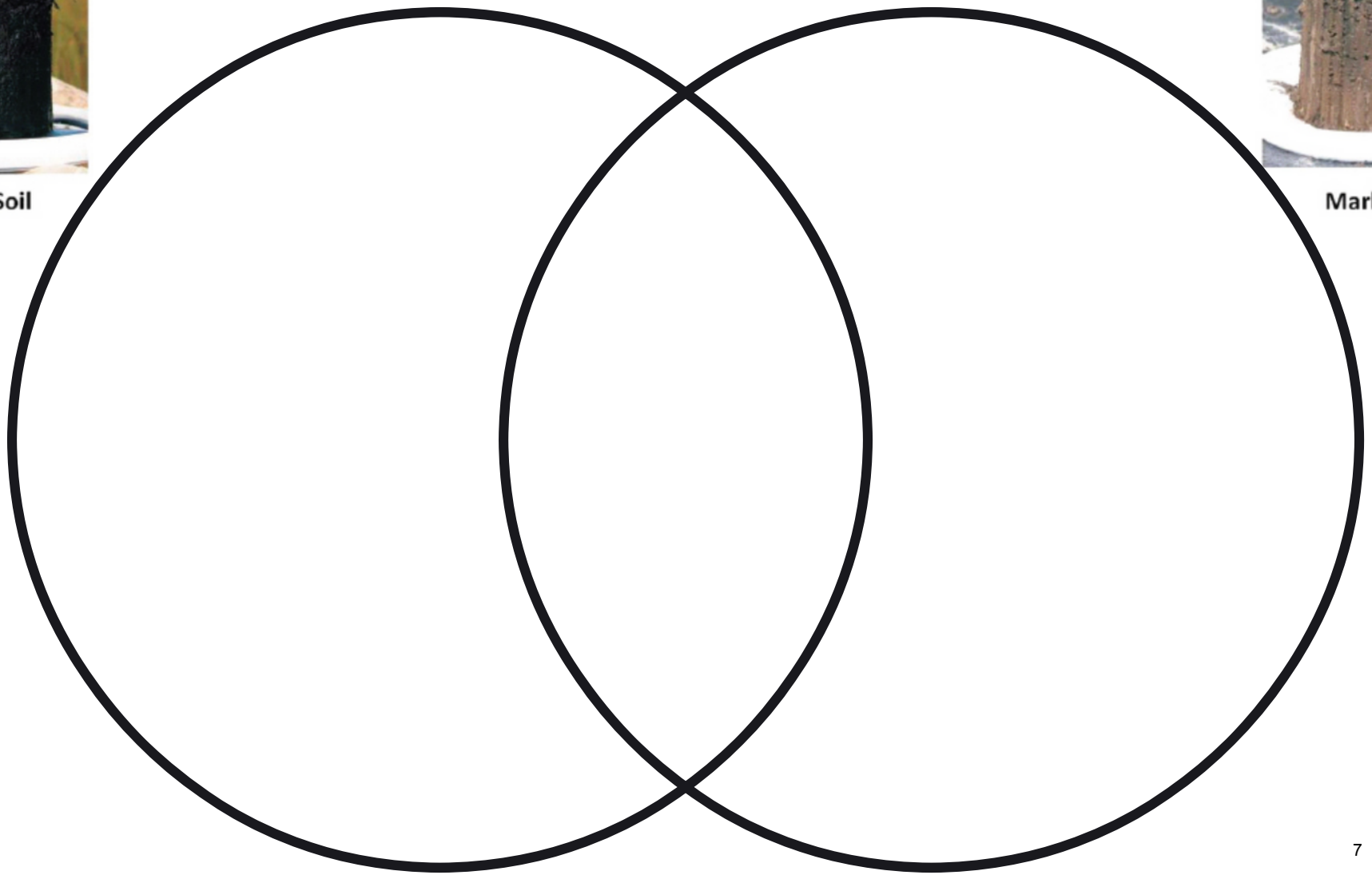
Name:_____

Everglades Peat and Marl Soils Venn Diagram

Directions: Using information from reading passage, fill out the Venn Diagram. Then, use the Venn Diagram to compare and contrast peat and marl soils in the Everglades.

Peat Soil

Marl Soil



Name:_____

Everglades Peat and Marl Soils Questions

Directions: After reading the reading passage and completing the Venn Diagram, answer the following questions.

1. What happens to the Everglades when peat soil is diminished?

   a.) It negatively affects the Everglades ecosystem because it reduces the amount of water in the Everglades watershed.

   b.) It negatively affects the Everglades ecosystem because it alters the habitat structures.

   c.) It negatively affects the Everglades ecosystem because a reduction in peat soil means an addition in the amount of marl soil.

   d.) It positively affects the Everglades ecosystem because it promotes a healthier food web.

2. How has altering the Everglades water flow affected the peat soils?

_____

_____

_____

_____

_____

_____

_____

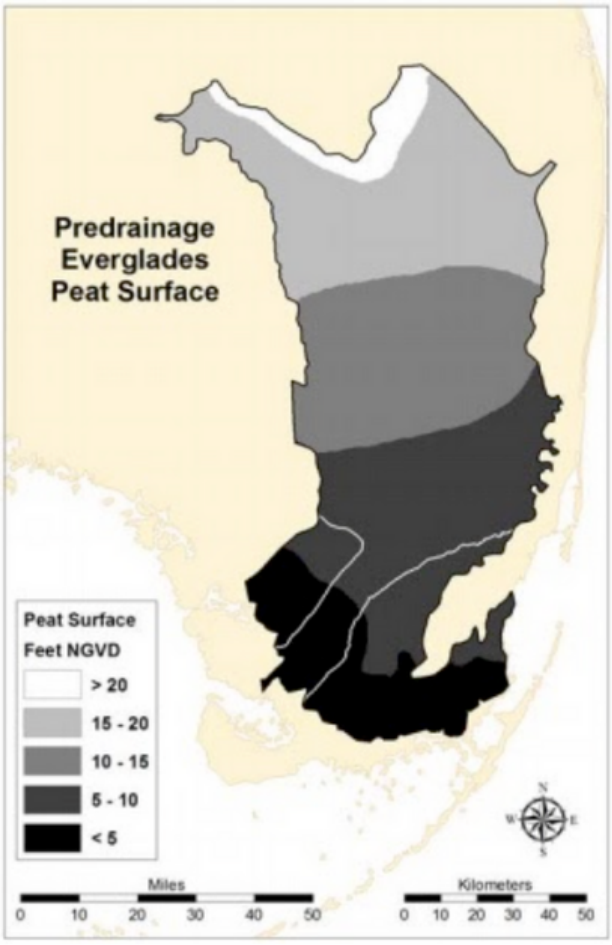
_____

Name:_____

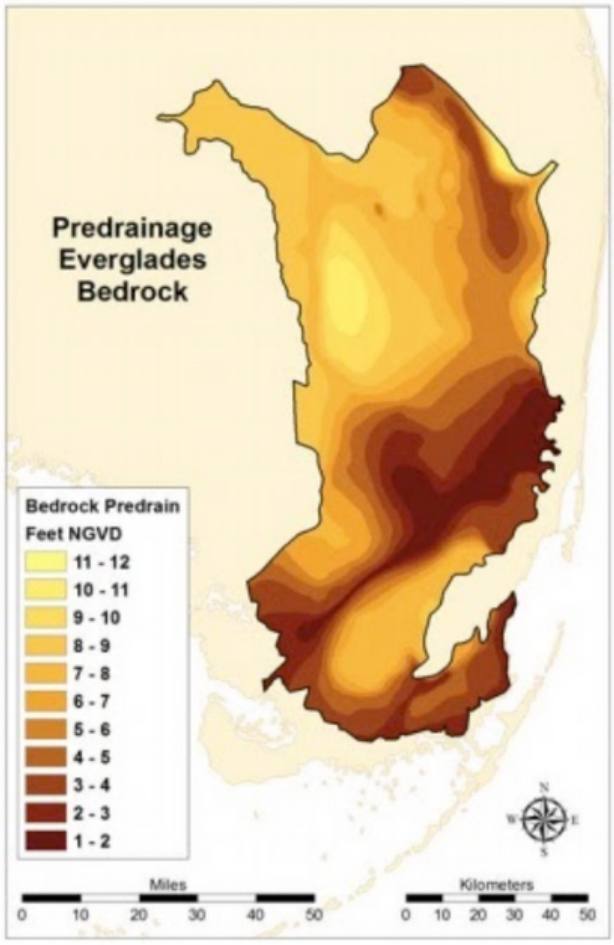
Everglades Peat and Marl Soils Map Questions

Directions: Use the maps to answer the following true or false questions.

Left: Map of the historical Everglades peat surface (derived from McVoy et al. 2011 and Said & Brown 2011).



Right: Map of the Everglades bedrock surface (derived from Parker et al. 1955).



Altitudes are in feet above the National Geodetic Vertical Datum of 1929 (NGVD).
Map source: S.M. Hohner & T.W. Dreschel (2015) Everglades peats; Using historical and recent data to estimate predrainage and current volumes, masses and carbon contents. Mires and Peat, 16(Article 1).

- **True or False:** Moving north on the map on the left (Pre-drainage Everglades Peat Surface), the peat surface levels decrease.
- **True or False:** Scientists compare historical and recent data to estimate pre-drainage and current volumes, masses, and carbon contents of soils in the Everglades.
- **True or False:** These maps depict pre-drainage versions of the Everglades, meaning before the Everglades water flow was altered.

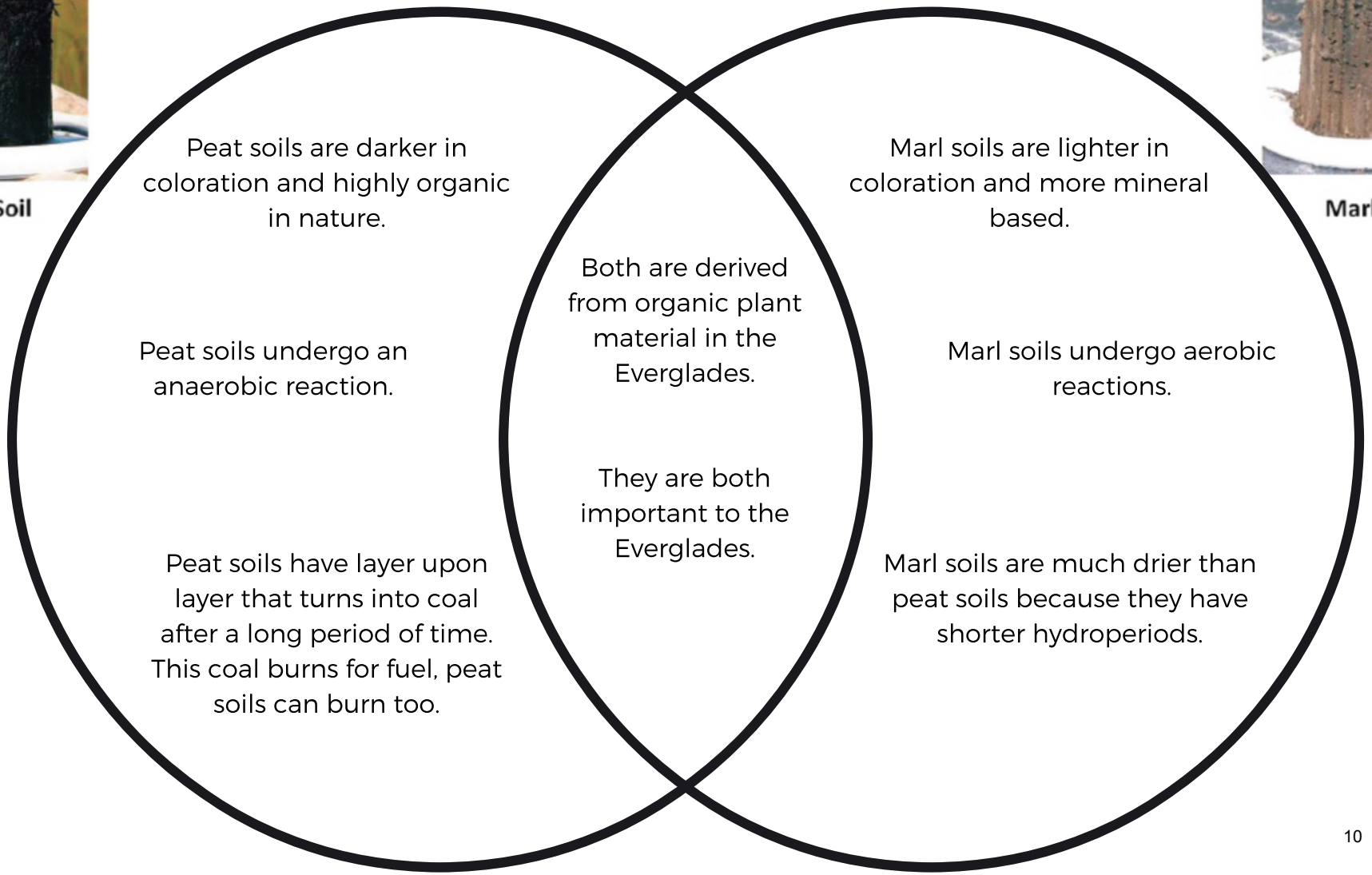
Name:_____

Everglades Peat and Marl Soils Answer Key

Directions: Using information from reading passage, fill out the Venn Diagram. Then, use the Venn Diagram to compare and contrast peat and marl soils in the Everglades.

Peat Soil

Marl Soil



Name:_____

Everglades Peat and Marl Soils Answer Key

Directions: After reading the reading passage and completing the Venn Diagram, answer the following questions.

1. What happens to the Everglades when peat soil is diminished?

   a.) It negatively affects the Everglades ecosystem because it reduces the amount of water in the Everglades watershed.

   b.) It negatively affects the Everglades ecosystem because it alters the habitat structures.

   c.) It negatively affects the Everglades ecosystem because a reduction in peat soil means an addition in the amount of marl soil.

   d.) It positively affects the Everglades ecosystem because it promotes a healthier food web.

2. How has altering the Everglades water flow affected the peat soils?

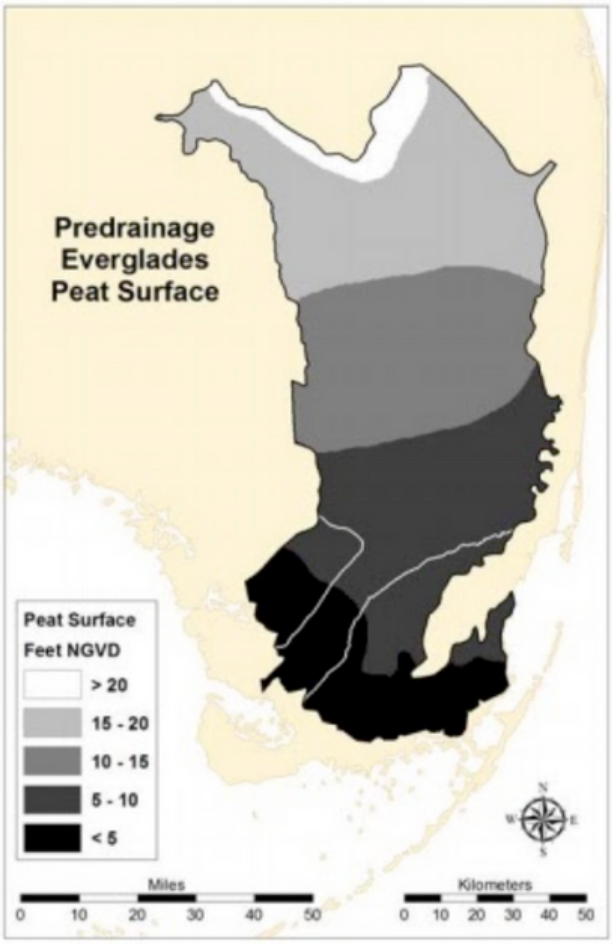
Reducing the water flow had created drier conditions. Increased dry conditions, such as drought events, increase fire and oxidation which leads to burning more peat soil. Fires and increased peat soil oxidation reduce the ridge and slough habitats.

Name:_____

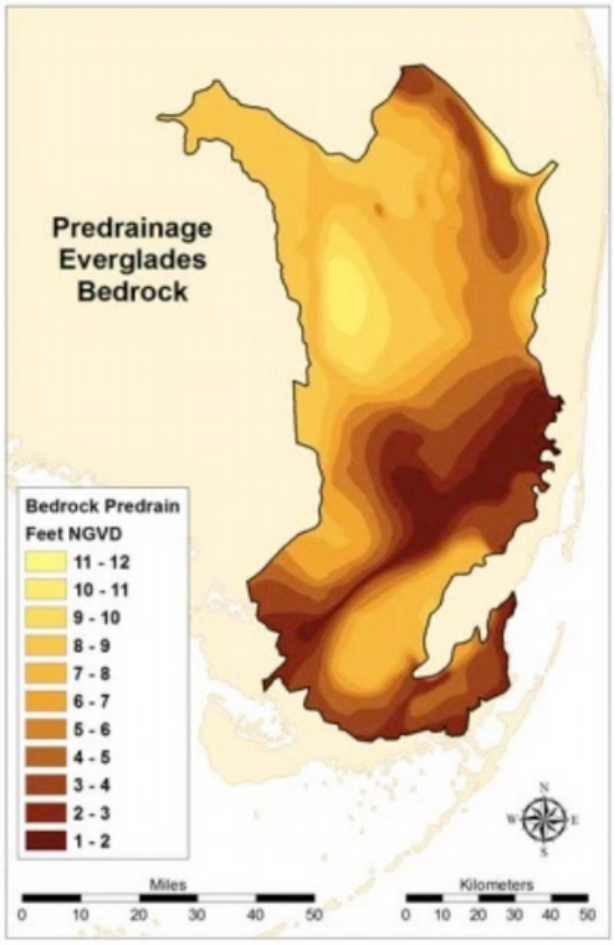
Everglades Peat and Marl Soils Map Answer Key

Directions: Use the maps to answer the following true or false questions.

Left: Map of the historical Everglades peat surface (derived from McVoy et al. 2011 and Said & Brown 2011).



Right: Map of the Everglades bedrock surface (derived from Parker et al. 1955).



Altitudes are in feet above the National Geodetic Vertical Datum of 1929 (NGVD).
Map source: S.M. Hohner & T.W. Dreschel (2015) Everglades peats; Using historical and recent data to estimate predrainage and current volumes, masses and carbon contents. Mires and Peat, 16(Article 1).

- **True or False:** Moving north on the map on the left (Pre-drainage Everglades Peat Surface), the peat surface levels decrease.
- **True or False:** Scientists compare historical and recent data to estimate pre-drainage and current volumes, masses, and carbon contents of soils in the Everglades.
- **True or False:** These maps depict pre-drainage versions of the Everglades, meaning before the Everglades water flow was altered.