Teacher's Guide for ODYSSEY

April 2014: Land & Sea

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Teacher's Note:
This guide contains project ideas, short answer, extended response, fill-in, and true/false with correction. The variation is designed to have the students think critically, as well as to test their comprehension. An answer key to the short answer sections can be found at the end of the guide.

Extended Response: Comprehension & Critical Thinking
The questions below can be used as written, simply answered in complete sentences or easily transformed into longer essay (ELA) style questions, or even research topics. In any case, have the students support their answers with details from the text or use critical thinking skills to create a thorough and interesting answer. The questions, essays and projects have been aligned with the **Common Core Standards**. Consider the level of your students when deciding how to use the questions.

"Tide Pool Treasures" p. 6-9

1. What kind of program is LiMPETS?
2. Explain the topology of the rocky intertidal zone, where the ocean meets land.
3. List the characteristics and key organisms of the four main zones around the central Pacific coast: ***Splash Zone*** ***High Tide Zone*** ***Mid Zone*** ***Low Tide Zone***
4. Where do tide pools form and what wildlife makes their home there?
5. Explain the process of monitoring the intertidal area.
6. How is the data organized after it is compiled?
7. What discoveries have the students in the LiMPETS project made?
8. Based on what you read in this article and your own experiences, what are the personal benefits that you think the students in LiMPETS gain?

"Where People Meet the Sea" p. 10-12

1. What advice does Dr. Christopher Reddy, senior scientist at Woods Hole Oceanographic Institution and director of the Coastal Ocean Institute offer budding environmental scientists interested in the fate of our coastal waters?
2. What exactly does Reddy study?
3. Why do people have the most effect on the health of the coastline?
4. What are some of the biggest issues facing the coast?

5. Define thermal pollution.
6. Explain the duality that exists concerning the use of chemicals and the health of our waters.
7. How can kids help to protect the coastal waters?

"**Coastal Areas in the Eye of the Storm" p. 13-17**

Mark the following statements TRUE or FALSE. Provide the correct answer if FALSE.

_____ 1. In the ocean, hurricane winds stir up high walls of waves, called a 'storm surge."

_____ 2. Coastal areas are the least vulnerable to large storms, such as hurricanes, tsunamis and other natural disasters.

_____ 3. Approximately 44 percent of the world's population lives within 75 miles of the sea.

_____ 4. A typhoon is similar to a hurricane, but occurs in the Pacific Ocean instead of the Atlantic Ocean.

_____ 5. With a hurricane, meteorologists cannot forecast when it is going to reach land.

_____ 6. Countries can significantly reduce their risk by listening to the warnings, and planning ahead way before the disasters strike.

_____ 7. Satellite information and scientific modeling can tell us about how a hurricane or tsunami will affect coastal areas.

_____ 8. If an evacuation is ordered, you need to decide when and how to leave.

_____ 9. The main purpose of the Red Cross is to connect people with the resources they need.

_____ 10. The best thing you can do to prepare for any storm is to make a plan. Be ready. All household members should discuss and know the plans.
_____ 11. There is growing evidence that population change is causing more extreme weather disasters.

_____ 12. Scientists who analyze climate date predict that rising sea levels, tides and storm surges will affect flood risks in coastal areas.

_____ 13. Scientists think global warming might be making hurricanes less dangerous, because it makes the oceans hot.

"Wind Farms are Coming" p. 18-21

1. How many wind turbines currently operate on land in the United States?
2. What are wind farms?
3. Why is it important to know how animals use mid-Atlantic waters?
4. What methods are being used to survey animal life in the mid-Atlantic waters?
5. What are researchers looking for when they study the mid-Atlantic videos frame by frame?

6. Why have researchers put satellite transmitters on certain species?
7. What is the advantage of satellite tagging?
8. What are some of the perceived dangers of the developing of offshore wind to wildlife?

Activity: *Make a T-chart listing the pros and cons of wind farms. Organize your data into a short essay and include your own opinion on the subject. Use facts from the article to support your opinion.*

"Sea Lion Sentinels" p. 22-25

1. Why have scientists attached satellite trackers to these specific sea lions that were rescued in California?
2. Why is it unusual to have sea lions alone on the mainland in January?
3. What two things caused biologists to be extremely concerned about these seal lions?
4. What did NOAA study In March 2013 in order to assess this situation?
5. What differences did the satellite data show between the two groups of seal lions tracked?
6. Why is the type and amount of food critical for the well-being of the pups?
7. How does water temperature affect sea lion pups?
8. Explain the scientists' hypothesis of the decreasing sea lion population? Why are they optimistic for the pups?

"The Mighty Mangrove" p. 26-30

1. Where do mangroves grow?
2. Use the five senses to describe what it is like in a mangrove forest to the best of your ability.
3. Why does the soil in many mangrove forests never dry out?
4. What meaning can be derived from the type of life that is found in a particular mangrove forest?
5. What is the purpose of the above-ground roots of the mangrove tree?
6. Why is it necessary for mangroves to have massive root systems?
7. The organic matter in the soil of a mangrove forest decomposes anaerobically. Explain what this means.
8. Make a list of the many ways in which mangroves are productive systems.
9. Briefly describe three creative ways to farm with salty water form the sea. Include how each way is helping to eradicate poverty and starvation.

"Troubled Waters on the Inland Seas" p. 34-37
Read the article in its entirety and then fill in the blanks. Refer back to the text if necessary.

1. With an area of 94,000 square miles, the Great Lakes have 84 percent of North America's _____ surface water.

2. The Great Lakes are an enormous and important _____ resource and asset to North America and to the United States.

3. The Great Lakes provide drinking water for about _____ million people.

4. The Great Lakes provide water and _____ for many industries.

5. Bright green slime that spread across one third of Lake Erie was a harmful algal bloom, caused by _____.

6. Heavy spring rains washed away tons of _____ from farms and the runoff drained into rivers that fed the lake.

7. _____ in the fertilizer spurred cyanobacteria growth that threatened the health of people and wildlife.

8. Harmful algal blooms upset _____ webs in a lake.

9. Cities are working to get rid of combined sewer overflows, but that takes _____ and _____.

10. _____ particles from cosmetics and other sources disrupt lifecycles in the lakes.

11. Decades-old pollution causes many problems. Harbor dredging for ships can stir up _____ compounds that settled into sediments.

12. Asian carp are an _____ species that present peril for waters such as the Mississippi River Basin, and are now threatening the Great Lakes.

13. Some ponds allow stocking with _____ grass carp to control weed growth.

14. Invasive species crowd out _____ plants that birds and other 'nearshore species' need for nesting or other reasons.

15. In 2012, the US and Canada amended the Great Lakes Water _____ Agreement. New treaty provisions cover climate change, invasive species, _____ loss, and harmful algal blooms and other issues.

"Dead Zones" p. 38-41

1. What are 'dead zones' ?
2. Explain how dead zones develop.
3. What is the rapid population increase of bacterias called?
4. Define: **photosynthesis phytoplankton hypoxia eutrophication**
5. What happens to aquatic species in hypoxic habitats?
6. How long will a dead zone remain deserted?
7. How do humans directly influence the incidence of dead zones?
8. Where is one of the world's largest dead zones? Why is where it located relevant?
9. How does climate change further complicate the situation of dead zones?
10. What can humans do to turn a dead zone into a success story?

ANSWER KEY

"Coastal Areas"

1. *True*
2. *False, most vulnerable*
3. *False, 93 miles*
4. *True*
5. *False, can forecast*
6. *True*
7. *True*
8. *False, leave quickly and know 2 ways out*
9. *True*
10. *True*
11. *False, climate change*
12. *True*
13. *False, more dangerous*

"Troubled Water"

1. *fresh*
2. *natural*
3. *35 million*
4. *transportation*
5. *cyanobacteria*
6. *fertilzer*
7. *phosphorus*
8. *food*
9. *time and money*
10. *plastic*
11. *toxic*
12. *invasive*
13. *sterile*
14. *native*
15. *Quality, habitat*