



MINNESOTA ZOO®

# CLIMATE CHANGE OCEAN TREK

A SELF-GUIDED TOUR FOR MIDDLE AND UPPER LEVEL STUDENTS.

# WELCOME TO THE CLIMATE CHANGE OCEAN TREK

This TREK was developed for middle and upper level students to use at the Minnesota Zoo in order to examine how human actions have affected many aspects of marine life and understand methods for reducing human impacts on the oceans.

Students can find the answers to pages 4 -11 throughout Discovery Bay. Pages 12-14 can be answered back in your classroom using the information gathered during the field trip.

If you need assistance in locating something Zoo staff and volunteers can help.

We are meeting together at the Minnesota Zoo for \_\_\_\_\_.  
(lunch or program)

Meet at \_\_\_\_\_ at \_\_\_\_\_.  
(location) (time)

The bus will be leaving at \_\_\_\_\_.  
(time)

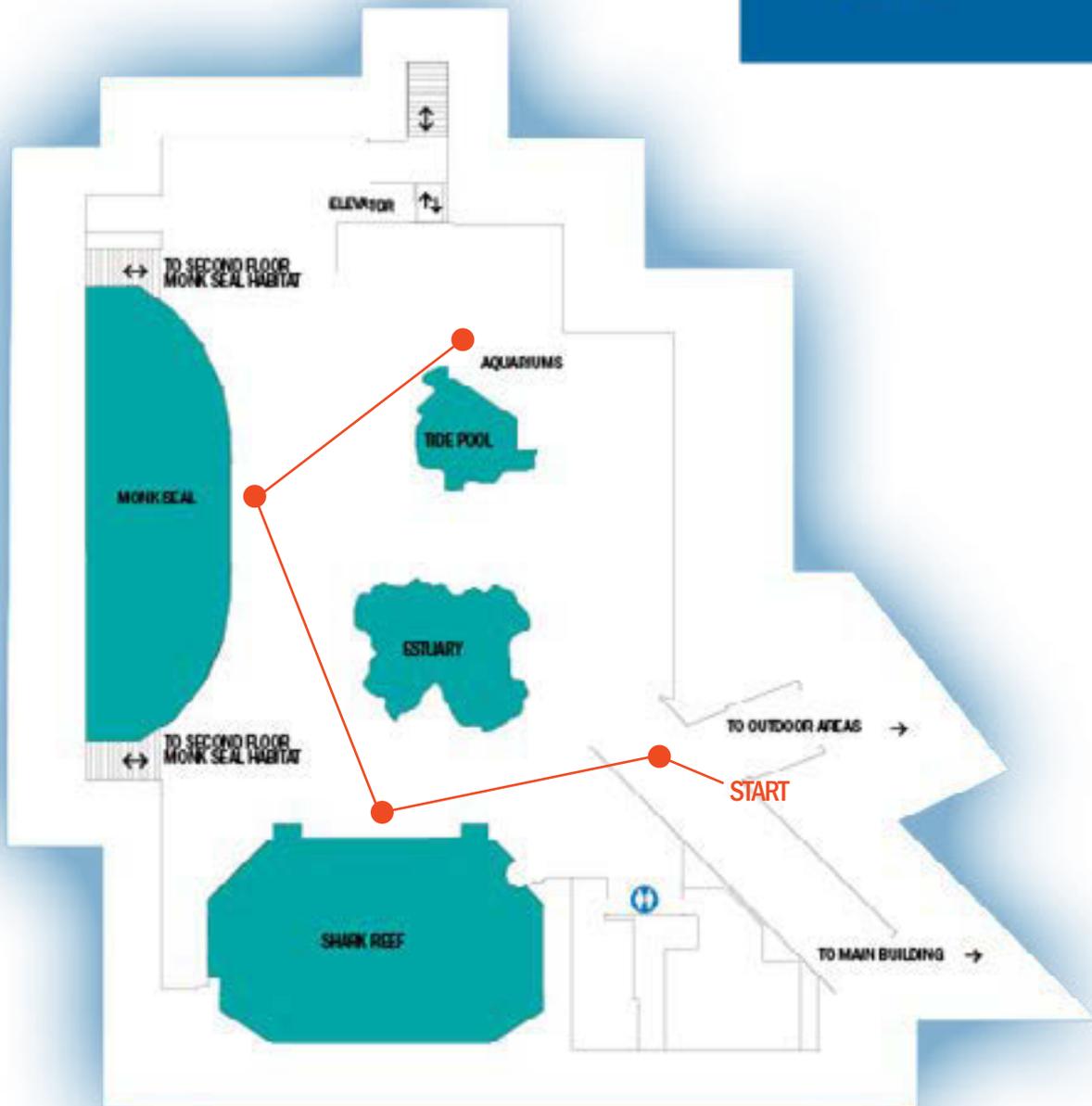
Meet at \_\_\_\_\_ before we depart.  
(location)

Other reminders:



# DISCOVERY BAY MAP

DISCOVERY BAY:  
UNITED HEALTH  
GROUP MARINE  
EDUCATION  
CENTER



# DISCOVERY BAY

## WELCOME TO THE OCEAN

**Directions:** You will either use the exhibits or graphics found in Discovery Bay to answer the questions on these pages. Start at the entrance to Discovery Bay before proceeding to the Shark Reef, Hawaiian Monk Seal Habitat, Living Reef Exhibit and finally the graphics behind the Tide Pool. Either fill in the blanks or give short answers.

Before proceeding, the oceans are incredibly important for humans. Can you list 3 things we use oceans for?

- a.
- b.
- c.



The oceans make up around \_\_\_\_\_ of the surface of the Earth and

possibly could contain more than \_\_\_\_\_ marine species.

# SUSTAINABLE FISHERIES

## Sharks: Amazing Apex Predators, Delicacy or Demise?

1. How many years ago did the first sharks start swimming in the oceans?



2. Why are sharks more vulnerable to population loss from fishing and loss of habitat than other species?

3. How do top predators help create a healthy ecosystem?

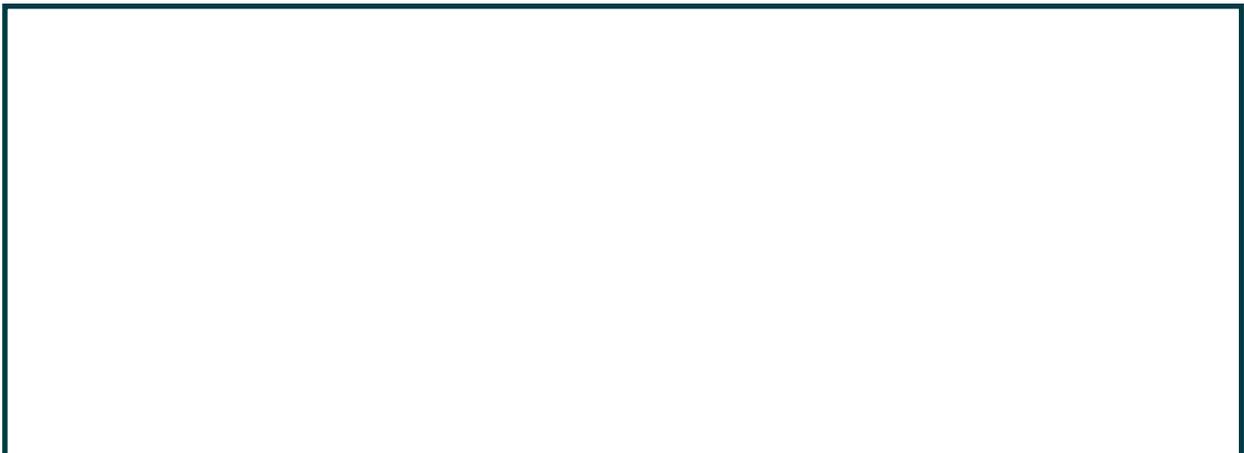
4. What is the one big threat sharks are facing?

5. What can we do to conserve large marine predators?

# SUSTAINABLE FISHERIES

## Sharks, Jacks and Groupers

6. List three interesting characteristics, either physical or behavioral, about the Goliath grouper.
  - a.
  - b.
  - c.
  
7. What is significant the about the Goliath grouper population in the 1970-80's?
  
8. Is there a connection between your answers to question 6 and 7? YES or NO (circle)  
Explain why or why not.
  
9. In the exhibit tank, look for either a shark, jack or the Goliath grouper. Sketch one of them in detail, label what it is and the human activity that can hurt their survival.



## Saving Sea Turtles

**In the Shark Reef we have two different species of sea turtles; a green and a Kemp's ridley. Both turtles cannot be released back into the wild.**

10. Find a Zoo volunteer or staff member. Ask them what happened to the turtles out in the ocean. Write down the answer below. Could this type of injury be avoided? How?

11. In the chart below, identify three threats to sea turtles and possible solutions to those threats.

Threat to sea turtles	Possible solution to threat
1.	1.
2.	2.
3.	3.

# HUMAN IMPACT



## Hawaiian Monk Seals

**Found only in the waters surrounding the Hawaiian Islands, the monk seals are highly endangered.**

12. Write down three adaptations the monk seals have and the benefit to their environment.

Trait	Benefit

13. How many monk seals are estimated to be left?

14. Identify two threats to their survival?

a.

b.

15. What is the most vulnerable time for a Hawaiian monk seal and why?

# OCEANS AND A CHANGING CLIMATE

## Stony Corals

**The ocean, and all of its living inhabitants, have adapted perfectly to a certain set of temperatures, seasons, and rhythms. Unfortunately, a series of rapid changes are occurring to the ocean, and many of the species are struggling to adapt and survive.**

16. Take a few minutes to observe the living reef exhibit. Using tally marks, count the number of different kinds of marine species you see. *Be sure to look in the rock crevices.*

17. What are the three biggest threats to coral reefs?

a.

b.

c.

18. To the right of the living reef exhibit is a smaller aquarium with small coral rock fragments. After reading what its purpose is, how could this technique help the reefs?

# OCEANS AND A CHANGING CLIMATE

## Corals-Sensitive Animals

**Corals require specific environmental conditions in order to survive. They are very sensitive to any changes in their environment. Corals cannot move to a different location thus leaving them extremely vulnerable to these small changes and they suffer.**

19. The major threat to the world's coral reefs is called \_\_\_\_\_.

It is when fossil fuels like \_\_\_\_\_ and \_\_\_\_\_

are burned and they release excess \_\_\_\_\_ into the atmosphere.

The oceans absorb some and it changes the \_\_\_\_\_.

Changing the ocean chemistry reduces \_\_\_\_\_ found in the ocean.

Sea creatures, like corals, need it to build \_\_\_\_\_ and \_\_\_\_\_

otherwise they get \_\_\_\_\_ and \_\_\_\_\_.

This matters because \_\_\_\_\_

\_\_\_\_\_

# OCEANS AND A CHANGING CLIMATE

## Coastal Ecosystems

20. What is happening to the ocean temperature?

21. What are two threats when this happens?

a.

b.

22. In your opinion, the ocean expanding or glaciers melting, which one do you think leads to a greater rise in sea level? Why?

23. The oceans are heating up and their chemistry is changing. What is the most effective way to prevent additional stress on the ocean climate system?

# APPLICATION QUESTIONS

Great job with the Climate Change Ocean Trek! It's time to take all of that knowledge and apply it to real work scenarios.

1. Fossil Fuels include coal, petroleum, and natural gas. Review the pie charts below and list three things YOU can do to reduce your fossil fuel consumption.

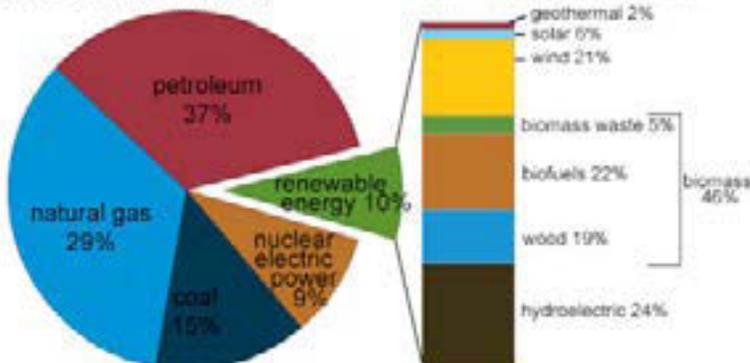
a.

b.

c.

U.S. energy consumption by energy source, 2016

Total = 97.4 quadrillion British thermal units (Btu)



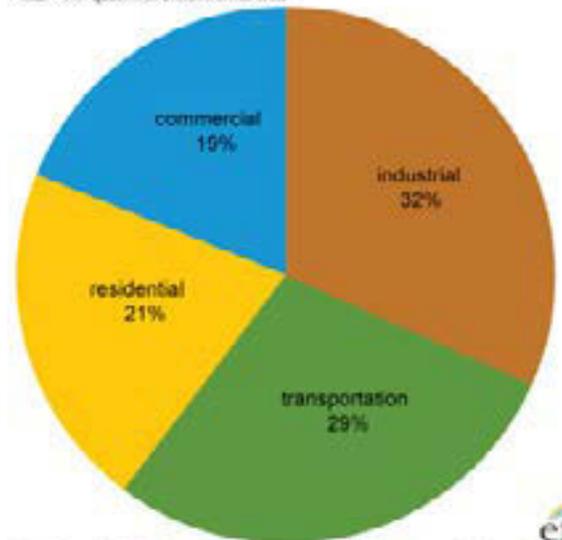
Note: Sum of components may not equal 100% because of independent rounding.

Source: U.S. Energy Information Administration, Monthly Energy Review, Table 1.3 and 10.1, April 2017, preliminary data



Share of total U.S. energy consumed by end-use sector in the United States, 2016

Total = 97.4 quadrillion British thermal units



Note: Sum of individual percentages may not equal 100 because of independent rounding.

Source: U.S. Energy Information Administration, Monthly Energy Review, Table 2.1, April 2017, preliminary data



# APPLICATION QUESTIONS

2. Think about if the sea level rises one meter worldwide, how would that affect us in Minnesota?

3. Do an internet search for the percentage of the world's population that lives within 100 km (62 miles) of a coastline.

What does it say? \_\_\_\_\_

Think about where those animals and people would go if the ocean level rises.  
Does this change your answer in how it would affect us in Minnesota?

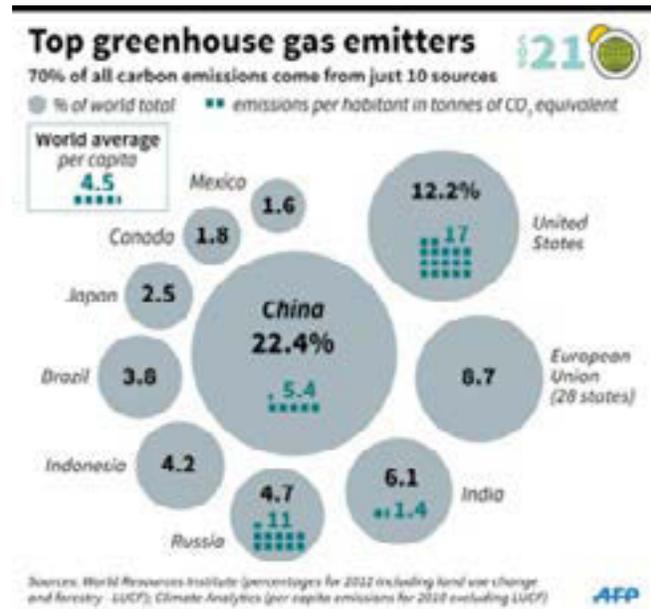
# APPLICATION QUESTIONS

Look at the figure below to answer the following questions.

4. Which countries are the top greenhouse gas emitters?

\_\_\_\_\_ and \_\_\_\_\_

Why do you think this is?



b. The top three populated countries in the world are China, India and the United States, respectively. Look at the emissions per habitant for those three countries. Who should bear the most responsibility for limiting greenhouse gases and why?

c. Who will suffer the most from the ocean climate change? Which people and which animals? Will this have a direct effect on YOUR life?