



MINNESOTA ZOO®

ENVIRONMENTAL STUDIES TREK

A SELF-GUIDED TOUR FOR UPPER LEVEL ENVIRONMENTAL STUDIES STUDENTS

WELCOME TO THE ENVIRONMENTAL STUDIES TREK

This TREK was developed for upper level Environmental Studies students. Topics covered include habitats, environment, human impact, and climate. There are questions for each trail at the Zoo (note: the Wells Fargo Family Farm is closed November-March). 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)

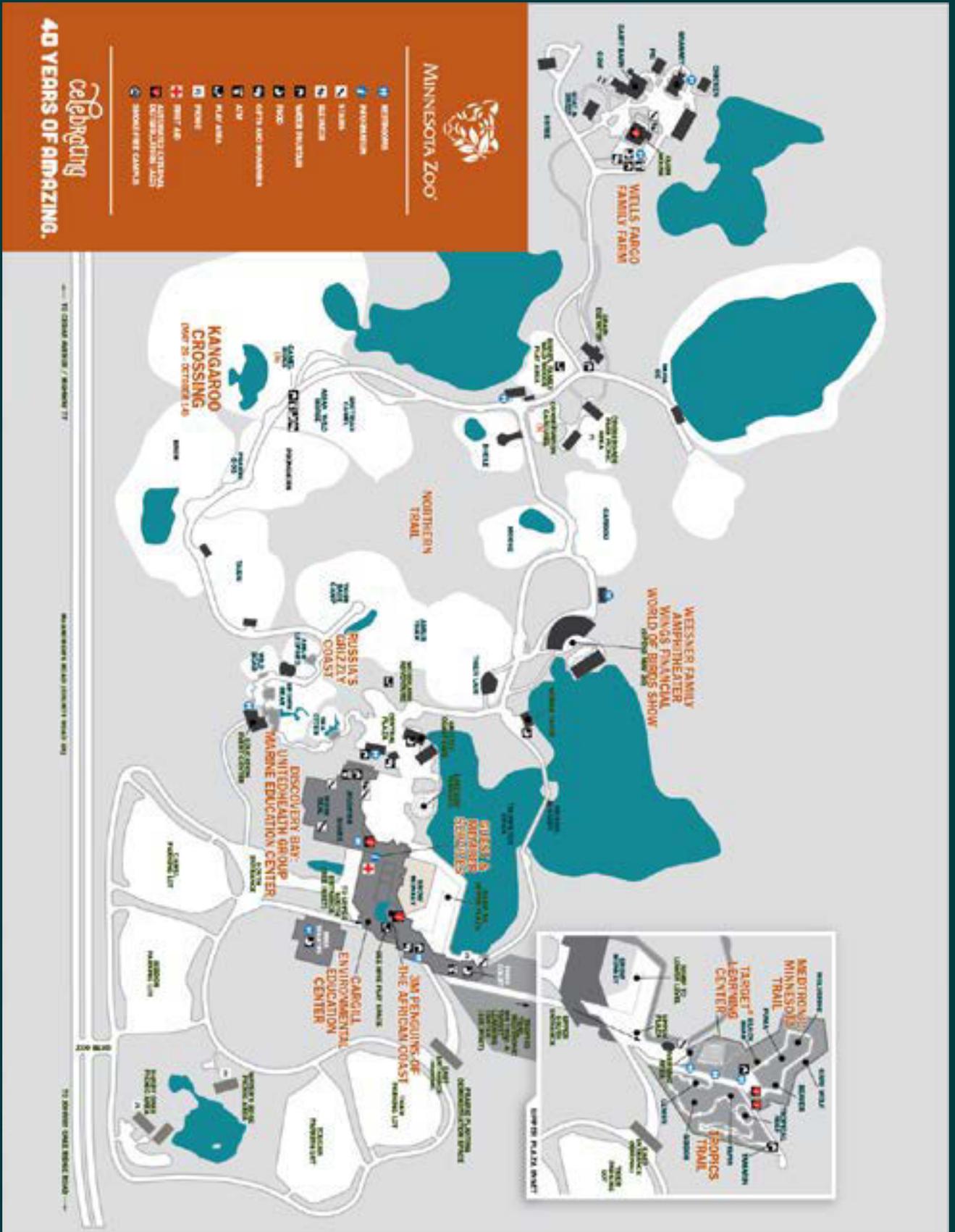
The bus will be leaving at _____.
(time)

Meet at _____ before we depart.
(location)

Other reminders:



MINNESOTA ZOO MAP



DISCOVERY BAY

WELCOME TO THE OCEAN

Directions: Look for the answers to the following questions on the graphics in the Great Hall of Discovery Bay and be sure to answer each question thoroughly.

Activity Stop: Shark Reef

1. Crevalle jacks and Horse-eye jacks are indicators of what in their environment?

Because they are important top predators, healthy Jack populations indicate overall ecosystem health.

2. What reproductive strategy do Goliath groupers use?

All groupers are born female, then after 7-10 years they become male. They reproduce and grow very slowly. K – selected species.

3. Explain where and why shark fin soup is desirable in some cultures. What are the environmental impacts of this practice?

In China, it was once eaten by the Chinese nobility and thus became a status symbol for a rising upper-middle class. The demand for shark fins results in fishermen hunting sharks, stripping them of their fins, and returning them to the ocean to die.

4. What reproductive strategy do sharks use?

Slow reproducers, K-selected species

5. Define bycatch and explain its impact on sea turtles.

The catch of a species that was not intended. Sea turtles are often bycatch because they get trapped in fishing nets not meant for them. This lowers turtle populations. Some nets have been created with escape holes for sea turtles to limit this issue.

Activity Stop: Hawaiian Monk Seal Habitat

6. What human activities have threatened monk seal populations?

Fishing nets, ghost fishing nets (previously used nets that are floating in the ocean), dogs, humans on beaches.

DISCOVERY BAY

WELCOME TO THE OCEAN

Activity Stop: Our Oceans, Our Choices

7. Describe the habitat and organisms found in tide pools.

Tide pools are small depressions in a rocky shore line that fill with water when the tide comes in and retain the water as the tide goes out. Environmental factors such as temperature, water depth, salinity, wind, oxygen, and sunlight all vary and play important roles in the habitat.

Sea stars: they absorb nutrients from the water across their body and eat oysters, clams, scallops, snails, and other shellfish.

Sea anemones: carnivorous, feed on fish or any live animal of suitable size (clams, snails, shrimp).

8. Describe the environmental impact of shrimp farming.

Mangrove forests along the coasts are often torn down to create shrimp farms. Raising a high density of shrimp leads to an abundance of chemical waste that seeps into the surrounding environment. The shrimp also pass diseases quite readily to wild animals because of their dense population.

9. Find the “Planet Ocean” graphic. Describe why all of the following ocean factors are important:

Planet Ocean

Our ocean makes our planet unique. The earth is the only known planet with liquid water, which covers 72 percent of the surface. We've renamed this expanse of saltwater as smaller seas and five oceans—Arctic, Atlantic, Indian, Pacific and Southern. The reality is that there is only one World Ocean. It's rich in resources and beauty, it functions as the heart of our climate system, and it's our responsibility to protect it.

Similar to how your heart circulates blood and regulates your body temperature, the ocean controls the circulation of heat and moisture throughout the climate system. The ocean guides the earth's temperature by moving heat and moisture via currents and winds. A healthy ocean also can stabilize the earth's temperature by absorbing the sun's heat and moving it elsewhere within the climate system.

Currents
Currents move heat, nutrients, and food around the ocean, distributing it in the proper manner.

Waves
Waves carry sand and debris to new locations, preventing build up in one area.

Tides
Tides provide the foundation for the diversity of life found in tide pools.

Chemistry
The right water chemistry is important for all marine species, especially corals and shell-builders.

Depth
Differing water depth provides the necessary pressures for diversity among marine life.

Arctic Ocean
Atlantic Ocean
Pacific Ocean
Indian Ocean
Southern Ocean

DISCOVERY BAY

WELCOME TO THE OCEAN

10. Explain how fishing and fisheries contribute to the Triple Bottom Line (be sure to explain both positive and negative impacts of fisheries).

The Triple Bottom Line refers to the social, environmental, and financial aspects of systems. Fisheries provide food and jobs to millions of people, but also the lack of regulation puts those jobs and food supplies in danger if the fisheries stop producing. Environmentally, most fisheries are destructive because of overfishing, bycatch, and other negative externalities. Financially, fisheries provide livelihoods for millions of people in the industry. However, money is only made when the fish are caught, which puts the environmental aspect in direct competition with the financial.

11. Using the series of posters explaining the “Heart of the Climate System.”

A. Explain how oceans are related to climate regulation.

The oceans, covering 70% of the Earth, absorb heat from the sun and redistribute it throughout the world. The oceans are responsible for regulating heat and moisture.

B. Describe the importance of coastal ecosystems.

Coastal ecosystems provide an important buffer against natural forces like hurricanes, waves, and storms. They also provide critical habitat for a wide variety of species.

C. Give an example of the impact of a warming ocean on plants and animals.

Warming oceans create excellent environment for invasive species. The invasive species are able to move in because of the change in temperature, but they face no predation because the ecosystem did not evolve with them. They take over and outcompete the native species for resources.

D. Explain the impact of ocean acidification and global warming on sensitive animals like corals.

Ocean acidification reduces the amount of calcium in the oceans. Corals use calcium as building blocks, without it they cannot grow properly.

RUSSIA'S GRIZZLY COAST AND THE NORTHERN TRAIL

Directions: Look for the answers to the following questions on the graphics along Russia's Grizzly Coast and the Northern Trail and be sure to answer each question thoroughly.

Activity Stop: Sea Otters

13. Define keystone species and explain why otters are a keystone species in their ecosystem.

A species that plays a critical role in the ecosystem; its effect is greater than would be expected based on its prevalence. Otters eat sea urchins and other invertebrates that prey on kelp. Kelp provides habitat to countless other species. Without sea otters, there would be no kelp.

Activity Stop: Mammoth Dig

14. Describe the climate of the tundra and some of the plants and animals you find there.

The tundra is a marshy, treeless, squishy plain. Plants include grasses, sedges, low-flowering herbs, and lichens.

Activity Stop: Conservation Cabin

15. Inside the cabin by the Amur leopard, describe the **three** major threats to species in Russia's Grizzly Coast and at least one action being taken to protect threatened species.

1. Poaching: taking animals for profit.
2. Loss of habitat: deforestation, etc.
3. Loss of prey: due to poaching, or taking more game than is allowed by law.

RUSSIA'S GRIZZLY COAST AND THE NORTHERN TRAIL

Activity Stop: Prairie Dogs

16. Explain how prairie dogs help improve soil health.

Burrowing mixes soil nutrients, decreases runoff, and creates new open patches of ground for plants to grow.

Activity Stop: Moose

17. List and define the three factors contributing to Minnesota moose decline.



1. Disease: brain worm / liver flukes from deer.
2. Predators: wolves.
3. Climate: moose are heat sensitive. Longer warm seasons, and more days with extreme heat are stressful for moose.

TROPICS TRAIL AND MINNESOTA TRAIL

Directions: Look for the answers to the following questions on the graphics along Tropics Trail and the Minnesota Trail and be sure to answer each question thoroughly.

Activity Stop: Africa

18. Define the term “biodiversity hotspot” and explain the location of the majority of these hotspots.

A small region with high animal and plant diversity that is also under significant threats of losing that diversity. Typically tropical, or mid-latitude regions on the coasts.

19. What are the issues facing the fig tree and how can you help?

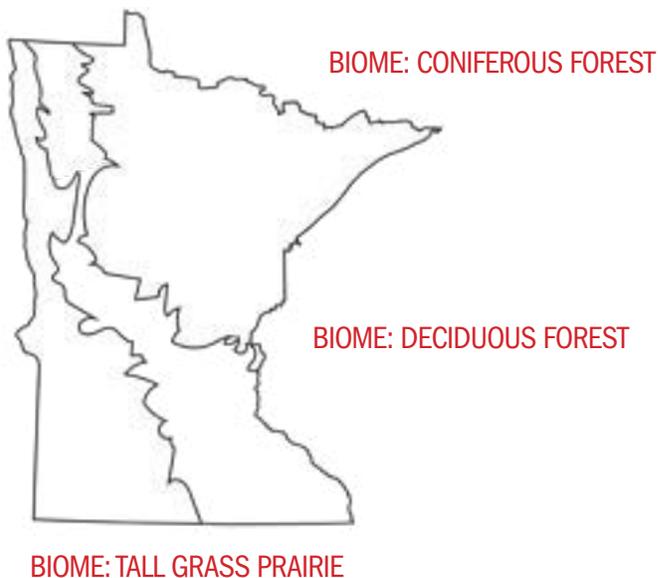
Clearcutting, loss of seeds dispersers like bats and primates.

20. Explain the environmental impact of palm oil on the rainforest.

Many primary forests are clearcut to make way for the more profitable palm oil trees. This loss of forests eliminates the habitat for countless species.

Activity Stop: Minnesota

21. Label the three biomes found in Minnesota.



TROPICS TRAIL AND MINNESOTA TRAIL

22. Summarize the ecosystem services provided by wetlands.

Wetlands provide flood and drought control, better water quality through filtration, recreation opportunities, and habitat for countless native species.

23. List at least three invasive species and describe their impact on native species.

<p>Invasive Species: PURPLE LOOSETRIFE</p>	<p>Invasive Species: ZEBRA MUSSEL</p>	<p>Invasive Species: BIGHEAD/SILVER CARP</p>
<p>List its environmental impact</p> <p>A plant that outcompetes the natives for resources.</p>	<p>List its environmental impact</p> <p>It attaches directly to native mussels and kills them by eating all of the native mussel food sources.</p>	<p>List its environmental impact</p> <p>Eat too much plankton, leaving no food for native organisms.</p>

WELLS FARGO FAMILY FARM (SEASONAL TRAIL)

Directions: Look for the answers to the following questions on the graphics at the Wells Fargo Family Farm and be sure to answer each question thoroughly.

24. Visit the time line of agriculture in the building behind the farm house and record the events for the following dates:

A. 1862: USDA established.

B. 1896: George Washington Carver's researched ways to restore worn out crop land by planting peanuts and sweet potatoes helped revolutionize the economy of the South.

C. 1933-1939: Dust Bowl. Drought devastates agricultural areas in Kansas, Colorado, and New Mexico.

D. 1938: Agricultural Adjustment Act establishes the basic price-support and crop-control system that will characterize US. ag policy for years.

E. 1945: End of WWII, farmers urged to produce at capacity to aid famine overseas.

F. 1970: U of M grad Normal Borlaug wins Nobel Peace Prize for research in hybridizing wheat to increase crop yields. He is known as the father of the Green Revolution.

G. 1980's: Failure to compete on the world markets, high interest rates, and collapsing farm values create worst economic depression in agriculture since 1930's.

H. 1983: Payment-in-kind (PIK) program is announced, giving farmers surplus commodities in return for idling acreage. This program attempted to reduce the surplus and ensuing price fall of crops.

I. 1986: FDA approves irradiation of fruits and vegetables to prolong shelf life / kill insects.

J. 1993: NAFTA is approved, provides for elimination of all tariffs between US, Canada, and Mexico over 15 years.

K. 1996: Freedom to Farm bill replaces farm subsidies with system of fixed declining federal payments.