

NAVAL HISTORY STEM-H LESSON PLAN

TEACHER HELP GUIDE

LESSON PLAN: The Great Green Fleet

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INSTRUCTIONAL GOAL: In this unit of study students will gain a basic understanding of programs developed by the Energy, Environment and Climate Change programs of the Navy. These programs will relate to environmental topics including renewable/alternative energy, methods for estimating populations, and the interrelationship between humans and energy/biological resources.

BACKGROUND:

The U.S. Navy serves as a global force, protecting our citizens at home and abroad, while keeping the seas free for all who sail upon them. The Navy is also committed to reducing our dependence on fossil fuels and setting standards for environmental stewardship. The Energy, Environment and Climate Change programs of the Navy are developing and implementing initiatives that will increase the use of alternative energy, conserve the world's resources, and study the effects of climate change.

As technology transitioned ships from sail to fossil fuels in the 19th century and ship sizes increased as a result, the coal-fired "Great White Fleet's" 14 month circumnavigation of the world was a key event for the U.S. Navy. Later, the transition from coal to oil to nuclear power in the 20th century was marked by a similar cruise: **Operation Sea Orbit**, the circumnavigation of the world in under 2 months by the all nuclear Task Force ONE. Without an ounce of food, fuel, or supplies replenished during the voyage, the three nuclear powered ships sailed without the need for wind or fossil fuel for propulsion. Now, faced with new 21st century challenges, the U.S. Navy has established several task forces to investigate more efficient and sustainable programs for its non-nuclear powered ships and its aircraft and vehicles.

The **Navy energy task force** focuses on making energy production more efficient and sustainable. In order to accomplish this mission current operational techniques and energy consumption are evaluated and improved. Alternative and renewable energies are researched, developed, and tested in the field and at home. Secretary of the Navy, Ray Mabus, has set a goal to provide 50% the Navy's power needs using alternative fuels by 2020. In July 2012, the Navy demonstrated this commitment by launching a green strike group which contained ships and aircraft running on biofuels and a nuclear powered aircraft carrier. Investing in energy will give the Navy a strategic advantage as it depends less on foreign energy supplies.

The **Navy environmental stewardship task force** focuses on minimizing the effect of Navy operations on the environment. Environmental policies are considered during the planning and execution of all

NAVAL HISTORY STEM-H LESSON PLAN

operations to ensure that environmental regulations are followed at sea and on shore. The Navy also works to monitor and study the effect of the Navy's ecological footprint on marine life and water quality. One of the ongoing projects aimed at protecting natural resources is the marine mammal research program. Navy researchers improve methods of determining the locations, population size, and effect of navy generated sounds on marine mammals.

The **Navy climate change task force** focuses on examining how the changing Arctic and global environment will effect naval operations including changing water resources, changing weather/storm patterns, the consequence of sea level rise on naval installations and nations around the world, and humanitarian aid and disaster response. Since the United States is an Arctic nation where climate change is increasingly altering the environment there is a need to gather data and strengthen prediction models to develop strategic goals for the area.

RESOURCES:

<http://greenfleet.dodlive.mil/home/> (U.S. Navy Energy, Environment, and Climate Change web page)

<http://www.history.navy.mil/faqs/faq42-1.htm> (The "Great White Fleet" sent around the world by President Theodore Roosevelt from 16 December 1907 to 22 February 1909 (14 months) consisted of sixteen new coal powered battleships of the Atlantic Fleet. The battleships were painted white except for gilded scrollwork on their bows.)

http://www.usnavymuseum.org/Ex1_NuclearPropulsion.asp (U.S. Navy Nuclear Task Force ONE 1964 sails around the world)

<http://www.youtube.com/watch?v=BXcAgICyrFO&feature=youtu.be> (Navy Sonar and Environmental Stewardship)

http://www.youtube.com/watch?v=xQCriQArXRo&feature=player_embedded (Marine Corps pursues alternative energy on the battlefield)

STANDARDS: Maryland State Department of Education

Science Processes and Skills

1.2.1 Identify meaningful, answerable scientific questions.

1.2.3 Formulate a working hypothesis

1.2.5 Select appropriate instruments and materials to conduct an investigation.

1.4.1 Organize data appropriately using techniques such as tables, graphs, and webs.

NAVAL HISTORY STEM-H LESSON PLAN

Environmental Science

6.2.1 Explain how organisms are linked by the transfer and transformation of matter and energy at the ecosystem level.

6.3.2 Evaluate the interrelationship between humans and water quality and quantity.

6.3.4 Evaluate the interrelationship between humans and biological resources.

6.3.5 Evaluate the interrelationship between humans and energy resources.

Biology

3.5.1 Analyze the relationships between biotic diversity and abiotic factors in environments and the resulting influence on ecosystems.

3.5.3 Investigate how natural and man-made changes in environmental conditions will affect individual organisms and the dynamics of populations

INSTRUCTIONAL PROCEDURES FOR LESSON:

Activity One can be done as a teacher led group, or individually by students or student teams, depending on computer and internet availability. It provides the historical background of the Navy's energy dependence on nature (wind and current), coal, oil, nuclear, and gas for ship propulsion since the U.S. Navy's establishment in 1775. It does this by exploring two historic around-the-world cruises of Navy ships, using on-line resources and source documents. The 20th century cruises of "The Great White Fleet" starting from Norfolk, VA during the Jamestown Exposition, and the first all nuclear powered "Task Force ONE" during "Operation Sea Orbit" in 1964 are used to introduce the Navy's new alternative energy concept for "The Great Green Fleet".

Activity Two introduces students to details about BIOFUELS, including the economic and environmental impacts of using biofuels while evaluating the advantages/disadvantages of biofuels. This is done with reading and audiovisual resources, which prompt student question answering, analysis, and writing.

Activity Three is a similar activity on marine mammals. It presents students with the issue of integrating environmental stewardship and advanced science into the real world need of providing national security and protecting natural resources (marine mammals). Students will view a video covering Navy sonar and environmental stewardship and discuss the implications of using active sonar in waters that marine mammals cal Marine Mammal Abundance Determination

NAVAL HISTORY STEM-H LESSON PLAN

Activity Four is a hands-on activity, using a provided lab sheet, where students will estimate population size to determine the density of animal population, and its implications for integrating environmental stewardship and advanced science into the real world.