Forces of Nature

Program Summary

Get up close and personal to erupting volcanoes, devastating earthquakes, and powerful storms as scientists travel the world trying to understand what causes these dangerous natural events. Risking their lives for scientific discovery, these experts forge their way through volcanic flows, along treacherous fault lines, and in cars heading straight toward a raging twister.

Forces of Nature is a National Geographic production.

Tennessee Science Standards

See www.adventuresci.com to find specific Grade Level Expectations (GLE).

EMBEDDED INQUIRY

Conceptual Strand: *Understandings about scientific inquiry and the ability to conduct inquiry are essential for living in the 21st century.*

EMBEDDED TECHNOLOGY AND ENGINEERING

Conceptual Strand: *Society benefits when engineers apply scientific discoveries to design materials and processes that develop into enabling technologies.*

STANDARD 7 – The Earth

Conceptual Strand 7: *Major geologic events that occur over eons or brief moments in time continually shape and reshape the surface of the Earth, resulting in continuous global change.*

STANDARD 8 – The Atmosphere

Conceptual Strand 8:*The earth is surrounded by an active atmosphere and an energy system that controls the distribution of life, local weather, climate, and global temperature.*

STANDARD 10 – Energy

Conceptual Strand 10: *Various forms of energy are constantly being transformed into other types without any net loss of energy from the system*

STANDARD 11 – Motion

Conceptual Strand 11: *Objects move in ways that can be observed, described, predicted, and measured.*

Objectives

1. Name one active volcano.
2. Name at least one active fault zone in North America.
3. Describe conditions that cause many thunderstorms in the Midwest.

Pre-Visit Activities

1. Discuss the structure of the Earth and the factors that shape landmasses both above and below the surface: plate tectonics, volcanoes, wind and water erosion, drought, human activity, etc.
2. Examine the geologic processes that create volcanoes and the difference between Hawaiian volcanoes and Mount St. Helens.
3. Have students research the plates that make up and surround North America and how those plates are moving relative to one another.
4. Discover how many tornadoes occur each year in Tennessee and other southern states and when they typically occur. Research “tornado alley” and how weather patterns increase the chance of severe storms and tornadoes.

Vocabulary

ash clouds
atmosphere
chronology
continental
crust
deformation
Doppler radar
earthquakes
eruptions
fault
geophysicist
Hagia Sophia
hail
lava
magnitude
magma
Montserrat
plates
pyroclastic
radar hooks
Richter scale
rupture
seismic
supercell
thunderstorm
tornado
Tornado Alley
volatile
volcano
volcanologist
water vapor

Post-Visit Activities

1. Download a grade-specific activity from the National Geographic website (see link below).
2. The March 2011 earthquake in Japan ranks near the top of historic earthquakes. Examine where earthquakes have occurred around the world and their resulting impact.
3. Have students research the New Madrid quakes of 1811-12 and the fault zone area of west Tennessee and southeast Missouri. What are the predictions for future quakes there?
4. Have students assess their hometown for all types of disasters. What can one expect and how often?
5. *Forces of Nature* discusses how we should be prepared for disasters. Have students create emergency plans and kits for home and school. Consider scenarios such as: what would you do if there was no electricity for two weeks after a storm?
6. Have students research historic volcanic events. How could a large volcano affect atmosphere, weather and climate around the globe?

Exhibit Connections

1st floor Solar System Survey

- Watch for the 2005 hurricane season, moving plates, active volcanoes, and more on the **Magic Planet** giant sphere.
- Using the **Solar System Touchscreens**, look for information about weather and volcanoes on other planets or moons.

1st floor Adventure Tower

- Build simple block structures and see how they stand up to an earthquake on the **Earthquake Table**.
- Create a tornado using water at the **Water Vortex.**

Adventure Tower, Pinnacle level

- Look out across Nashville to see our current weather and compare what you see to **cloud types and diagrams**.

Resources

Websites

National Geographic lesson plans:
www.nationalgeographic.com/forcesofnature/film/education.html

US Geological Survey: everything earthquake
earthquake.usgs.gov

USArray: a continental-scale seismic observatory
www.usarray.org/

Earthscope: Exploring the Structure and Evolution of the North American Continent
www.earthscope.org

New Madrid Fault Information:
ceri.memphis.edu/awareness/nmsz.html

New Madrid Bicentennial:
newmadrid2011.org/

National Weather Service Storm Prediction Center daily outlook:
www.spc.noaa.gov/products/outlook/day1otlk.html

NOAA Tornado FAQs:
www.spc.noaa.gov/faq/tornado/

US Geological Survey: everything volcano
volcanoes.usgs.gov

Worldwide Volcanic Activity:
www.volcano.si.edu/reports/usgs/index.cfm?content=worldmap

Mount St. Helens volcano cam:
www.fs.fed.us/gpnf/volcanocams/msh/

Books

Volcano & Earthquake (DK Eyewitness Books)
by Susanna van Rose

Encyclopedia of Earthquakes and Volcanoes (Science Encyclopedia)
by Alexander Gates and David Ritchie

Furious Earth: The Science and Nature of Earthquakes, Volcanoes, and Tsunamis
By Ellen Prager

On Shaky Ground: The New Madrid Earthquakes of 1811-1812
by Norma Hayes Bagnall

Tornadoes
by Seymour Simon

Hunting Nature's Fury: A Storm Chaser's Obsession With Tornadoes, Hurricanes, and Other Natural Disasters
by Roger Hill and Peter Bronski