5. Earth's Systems

5-ESS2-1: Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.

UCAR – Community Program
Introduction to Climatology for the Tropical Pacific Islands – **Requires generating a free account**
This lesson provides information on climatology—what it is, the factors that create an area's climate, and the sources and uses of climate information. Focused specifically on tropical Pacific islands, the content covers the key features influencing climate in that region and includes examples for four locations distributed across the tropical Pacific Ocean, both north and south of the equator. The lesson provides a basic introduction to tropical climatology intended for a wide range of users, from meteorology technicians, forecasters, and scientists, to those in industries or sectors influenced by climate.
https://www.meted.ucar.edu/

UCAR – Community Program
Climate Change and Sea Level Rise – **Requires generating a free account**
This module looks at how increasing temperatures due to climate change have affected sea level rise and what effects scientist expect in the future, given rising greenhouse gas emissions. The various mechanisms of sea level rise are discussed, as well as the tools and research used to study this topic. The module also discusses how countries and communities are preparing for future increases in sea levels.
https://www.meted.ucar.edu/

UCAR – Community Program
Gap Winds – **Requires generating a free account**
This lesson provides a basic understanding of why gap winds occur, their typical structures, and how gap wind strength and extent are controlled by larger-scale, or synoptic, conditions. You will learn about a number of important gap flows in coastal regions around the world, with special attention given to comprehensively documented gap wind cases in the Strait of Juan de Fuca and the Columbia River Gorge. Basic techniques for evaluating and predicting gap flows are presented. The lesson reviews the capabilities and limitations of the current generation of mesoscale models in producing realistic gap winds. By the end of this lesson, you should have sufficient background to diagnose and forecast gap flows around the world, and to use this knowledge to understand their implications for operational decisions. Other features in this lesson include a concise summary for quick reference and a final exam to test your knowledge. Like other lesson in the Mesoscale Meteorology Primer, this lesson comes with audio narration, rich graphics, and a companion print version.
https://www.meted.ucar.edu/

UCAR – Community Program
Flow Interaction with Topography– **Requires generating a free account**
This is a foundation module in the Mesoscale Meteorology Primer series. Topics covered include an overview of factors that control whether air will go up and over a mountain or be forced around it, the role of potential and kinetic energy, the Froude number and what it tells you, and air flow blocked by topography.
https://www.meted.ucar.edu/

PBS Learning Media
Cloud Types
Before going to the beach, you might look outside for signs of clouds or rain that could affect your plans. However, the clouds that you see are more than just determinants of weather conditions. They also help to maintain the energy budget and climate on Earth and are an essential part of the water cycle. Learn about how clouds are named and identified, in this interactive resource adapted from NASA's *S'COOL Project Tutorial.*
https://ny.pbslearningmedia.org/resource/ess05.sci.ess.watcyc.cloudtype/cloud-types/

PBS Learning Media
Yield of Colorado
One of the things that the Basin Project Act in '68 required was for the Secretary of the Interior to do a study. The conclusions were very interesting and they're as applicable then, as they are now. There isn't going to be enough water to go around.
https://ny.pbslearningmedia.org/resource/kaet.beyond.yield/yield-of-the-colorado/

PBS Learning Media
The Deep Ocean |Ocean Today
As you descend into the ocean, you move through different environments, or zones. In the top 200 meters, sunlight is able to penetrate the water. This top layer (or zone) is called the "open ocean" or, commonly, the "photic zone". The next 800 meters is called the "twilight zone": there is very little light. When you reach 1,000 meters below the surface of the ocean, there is no light at all. You have reached the "deep ocean." The extreme pressures in this zone could crush a car, and the temperature stays near freezing. Yet, despite these harsh conditions, there is life that survives in the deep ocean. Rich communities of microbes generate their own energy without sunlight through a process called chemosynthesis, and other animals eat them to survive. As much of the deep ocean remains unexplored, scientists have an exciting opportunity to discover and document new, unusual species that thrive under such conditions.
https://ny.pbslearningmedia.org/resource/noaa-interactive-23/the-deep-ocean-ocean-today/

5-ESS2-2: Describe and graph the amounts of salt water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.

PBS Learning Media
Watersheds in Kentucky
There are several regional and local watersheds in Kentucky. This interactive resource explains what a watershed is and where you can find them in Kentucky.
https://ny.pbslearningmedia.org/resource/knh.wsheds/watershedsinkentucky/

PBS Learning Media
Groundwater Beneath the Surface
This lighthearted animation takes us beneath the surface to see groundwater in action. Watch anthropomorphized drops of groundwater travel through this system. A smiling character with a shovel digs us down to the water table, allowing us to flow through the water cycle and thus making the process much easier to understand.
https://ny.pbslearningmedia.org/resource/20196d0e-5cab-408c-8ee0-9141a7d28b83/groundwater-beneath-the-surface/

PBS Learning Media
What is an Aquifer?
Aquifers are bodies of saturated rock and sediment through which water can move, and they provide 99% of our groundwater. Humans rely on aquifers for most of our drinking water. However, we are not only depleting this supply but are its biggest polluters as well. This infographic provides facts and illustrations to explain the process.
https://ny.pbslearningmedia.org/resource/94cf16a4-dd62-4aba-a1b4-0e75d17aa17b/what-is-an-aquifer/

PBS Learning Media
Alaskan Oceans: Temperature and Salinity |Harriman Expedition Retraced
This documents a student project on the temperature and salinity of Alaskan oceans. In 1899 Edward Harriman assembled a distinguished team of scientists and artists and took them on a two-month survey of the Alaska Coast. In the Harriman Expedition Retraced, scientists, naturalists and artists are observing anew the sites visited by Harriman's scouting parties a century ago.
https://ny.pbslearningmedia.org/resource/pbs_org14_hexpre_soc_5/harriman-expedition-retraced-alaskan-oceans-temperature-and-salinity/

PBS Learning Media
Water Cycle
This short video segment from IdahoPTV's *D4K* explains how the water cycle works, in moving water from the ocean to the clouds, around the earth and back to the ocean.
https://ny.pbslearningmedia.org/resource/idptv11.sci.ess.watcyc.d4kwcy/water-cycle/

PBS Learning Media
Water
This video segment from IdahoPTV's *D4K* informs us that only 3% of all the water on earth is fresh water, but most of that is frozen. Only .3% is available for use. See how the power of a river formed Hells Canyon on the Snake River in Idaho. Learn why it's important to conserve water.
https://ny.pbslearningmedia.org/resource/idptv11.sci.ess.earthsys.d4kwat/water/

5-ESS3-1: Obtain and combine information about ways individual communities use science ideas to protect Earth's resources and environment.

NOAA's Office of Response and Restoration
Explore an ocean's-worth of information related to our efforts to protect and restore the nation's waters from pollution. You'll find experiments and activities for elementary school students and life-long learners alike. We hope the information here helps inspire you and others to further investigate and preserve our incredible marine resources.
http://response.restoration.noaa.gov/training-and-education/education-students-and-teachers

NOAA's Habitat Conservation | Habitat Protection:
10 Things you can do for Coastal Wetlands
http://www.habitat.noaa.gov/protection/wetlands/whatyoucando.html

How NOAA Protects Essential Fish Habitat
http://www.habitat.noaa.gov/protection/efh/howweprotect.html

How NOAA Protects River Habitat impacted by dams
http://www.habitat.noaa.gov/protection/hydro/howweprotect.html

NOAA's National Marine Sanctuaries
How to get involved
Volunteers help to ensure national marine sanctuaries remain America's underwater treasures for future generations. These volunteers participate in a wide variety of activities including diving, whale identification, beach cleanups, water quality monitoring, collecting field observations and surveys, acting as visitor center docents, and wildlife monitoring.
http://sanctuaries.noaa.gov/involved/volunteer_future.html

NOAA's National Ocean Service
Protecting Our Planet Starts with You
This link discusses ten simple choices for a healthier planet.
http://oceanservice.noaa.gov/ocean/earthday.html

NOAA's Climate
Global Warming Frequently Asked Questions
https://www.climate.gov/news-features/understanding-climate/global-warming-frequently-asked-questions