Marine Extension and Georgia Sea Grant
UNIVERSITY OF GEORGIA
Sea Grant

SECOORA
Southeast Coastal Ocean Observing Regional Association

WATER SHAPES OUR PLANET AND OUR LIVES

EDUCATORS GUIDE TO ESSENTIAL STANDARDS

TO BEGIN, PLEASE SELECT THE SYMBOL FOR YOUR STATE OR STANDARDS

NEXT GENERATION
SCIENCE STANDARDS

OCEAN & CLIMATE
LITERACY PRINCIPLES

Executive Summary

Faculty from the University of Georgia Marine Extension and Georgia Sea Grant created the virtual curriculum, Water Shapes our Planet and our Lives, to teach water, weather and climate topics through the 21st century lens of climate change. The curriculum covers traditional science standards for upper elementary and middle school students and includes ocean and climate literacy to prepare youth to engage in climate change conversations. The curriculum contains a series of interactive lessons created using Pear Deck for Google Slides and video tutorials demonstrating hands-on activities to reinforce each lesson. A final activity provides prompts for students to research and communicate about climate change and it impacts on habitats and animals on Earth.

The 'Educators Guide to Essential Standards' highlights the concepts and principles addressed in the lessons with relevance to education in the southeast region. The curriculum has been reviewed by at least one educator in each state – North Carolina, South Carolina, Georgia and Florida. The standards included in this guide received a rating of either "good" or "excellent" by evaluators based on how well the standard is addressed by the curriculum.

The full curriculum can be accessed at https://secoora.org/education-outreach/water-shapes-our-planet-and-our-lives-curriculum/

NORTH CAROLINA

NCES.5.P.2.1 **LESSONS 1, 2, 3, 4**
Explain how the sun's energy impacts the processes of the water cycle (including evaporation, transpiration, condensation, precipitation and runoff).

NCES.4.L.1.3 **LESSONS 2, 4, 5**
Explain how humans can adapt their behavior to live in changing habitats (e.g., recycling wastes, establishing rain gardens, planting trees and shrubs to prevent flooding and erosion).

NCES.5.L.2.1 **LESSON 4**
Compare the characteristics of several common ecosystems, including estuaries and salt marshes, oceans, lakes and ponds, forests, and grasslands.

NCES.5.E.1.3 **LESSON 6**
Explain how global patterns such as the jet stream and water currents influence local weather in measurable terms such as temperature, wind direction and speed, and precipitation.

NCES.5.L.2.3 **LESSON 7**
Infer the effects that may result from the interconnected relationship of plants and animals to their ecosystem.

SOUTH CAROLINA

4.E.2A.1 **LESSONS 1, 2, 3, 4**

Obtain and communicate information about some of the gases in the atmosphere (including oxygen, nitrogen, and water vapor) to develop models that exemplify the composition of Earth's atmosphere where weather takes place.

4.E.2A.2 **LESSON 1**

Develop and use models to explain how water changes as it moves between the atmosphere and Earth's surface during each phase of the water cycle (including evaporation, condensation, precipitation, and runoff).

4.E.2B.1 **LESSONS 1, 2, 3**

Analyze and interpret data from observations, measurements, and weather maps to describe patterns in local weather conditions (including temperature, precipitation, wind speed/direction, relative humidity, and cloud types) and predict changes in weather over time.

5.E.3A.1 **LESSONS 2, 4, 5**

Construct explanations of how different landforms and surface features result from the location and movement of water on Earth's surface through watersheds (drainage basins) and rivers.

5.E.3B.2 **LESSON 6**

Develop and use models to explain the effect of the movement of ocean water (including waves, currents, and tides) on the ocean shore zone (including beaches, barrier islands, estuaries, and inlets).

6.E.2A.3 **LESSON 1**

Construct explanations of the processes involved in the cycling of water through Earth's systems (including transpiration, evaporation, condensation and crystallization, precipitation, and downhill flow of water on land).

6.E.2B.1 **LESSON 3**

Analyze and interpret data from weather conditions (including wind speed and direction, air temperature, humidity, cloud types, and air pressure), weather maps, satellites, and radar to predict local weather patterns and conditions.

6.E.2B.2 **LESSON 2**

Develop and use models to explain how relationships between the movement and interactions of air masses, high and low pressure systems, and frontal boundaries result in weather conditions and storms (including thunderstorms, hurricanes and tornadoes).

6.E.2B.4 **LESSON 2**

Construct explanations for how climate is determined in an area (including latitude, elevation, shape of the land, distance from water, global winds, and ocean currents).

GEORGIA

S4E3 — LESSONS 1, 4, 5, 6

a. Plan and carry out investigations to observe the flow of energy in water as it changes states from solid (ice) to liquid (water) to gas (water vapor) and changes from gas to liquid to solid.

b. Develop models to illustrate multiple pathways water may take during the water cycle (evaporation, condensation, and precipitation).

S4E4 — LESSONS 2, 3

a. Construct an explanation of how weather instruments (thermometer, rain gauge, barometer, wind vane, and anemometer) are used in gathering weather data and making forecasts.

b. Interpret data from weather maps, including fronts (warm, cold, and stationary), temperature, pressure, and precipitation to make an informed prediction about tomorrow's weather.

c. Ask questions and use observations of cloud types (cirrus, stratus, and cumulus) and data of weather conditions to predict weather events.

d. Construct an explanation based on research to communicate the difference between weather and climate.

S6E3 — LESSONS 1, 2, 4, 5, 6

Obtain, evaluate, and communicate information to recognize the significant role of water in Earth processes.

a. Ask questions to determine where water is located on Earth's surface (oceans, rivers, lakes, swamps, groundwater, aquifers, and ice) and communicate the relative proportion of water at each location.

b. Plan and carry out an investigation to illustrate the role of the sun's energy in atmospheric conditions that lead to the cycling of water.

S6E4 — LESSONS 2, 3

Obtain, evaluate, and communicate information about how the sun, land, and water affect climate and weather.

d. Construct an explanation of the relationship between air pressure, weather fronts, and air masses and meteorological events such as tornados and thunderstorms.

e. Analyze and interpret weather data to explain the effects of moisture evaporating from the ocean on weather patterns and weather events such as hurricanes.

FLORIDA

SC.4.P8.2 **LESSON 1, 5**

Identify properties and common uses of water in each of its states.

SC.4.L.17.4 **LESSONS 4, 7**

Recognize ways plants and animals, including humans, can impact the environment.

SC.5.E.7.1 **LESSON 1**

Create a model to explain the parts of the water cycle. Water can be a gas, a liquid, or a solid and can go back and forth from one state to another.

SC.5.E.7.2 **LESSONS 1, 5**

Recognize that the ocean is an integral part of the water cycle and is connected to all of Earth's water reservoirs via evaporation and precipitation processes.

SC.5.E.7.6 **LESSON 2**

Describe characteristics (temperature and precipitation) of different climate zones as they relate to latitude, elevation, and proximity to bodies of water.

SC.5.E.7.3 **LESSON 3**

Recognize how air temperature, barometric pressure, humidity, wind speed and direction, and precipitation determine the weather in a particular place and time.

SC.5.E.7.4 **LESSONS 2, 3, 7**

Distinguish among the various forms of precipitation (rain, snow, sleet, and hail), making connections to the weather in a particular place and time.

NEXT GENERATION SCIENCE STANDARDS

3-ESS2-1 **LESSONS 1, 2, 3**
Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season.

3-ESS2-2 **LESSONS 1, 2, 3, 6**
Obtain and combine information to describe climates in different regions of the world.

3-ESS2-3 **LESSON 7**
Make a claim about the merit of a design solution that reduces the impacts of a weather related hazard.

4-ESS2-1 **LESSON 1**
Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.

5-ESS2-1 **LESSONS 1, 2**
Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.

MS-ESS2-4 **LESSON 1**
Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.

MS-ESS2-6 **LESSONS 2, 6**
Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.

MS-ESS3-5 **LESSON 2**
Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.

MS-ESS2-5 **LESSON 3**
Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions

MS-ESS3-2 **LESSONS 2, 3**
Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.

5-ESS2-2 **LESSONS 4, 5**
Describe and graph the amounts and percentages of water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.

MS-ESS3-1 **LESSONS 4, 5, 7**

Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.

MS-ESS3-3 **LESSON 7**

Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.

OCEAN & CLIMATE LITERACY PRINCIPLES

OLP 6 **LESSONS 1, 6**

The ocean and humans are inextricably interconnected.

CLP 1 **LESSONS 1, 2**

Sunlight reaching Earth can heat the land, ocean, and atmosphere. Some of that sunlight is reflected back to space by the surface, clouds, or ice. Much of the sunlight that reaches Earth is absorbed and warms the planet.

OLP 3 **LESSONS 2, 6**

The ocean is a major influence on weather and climate.

CLP 2 **LESSONS 2, 3, 4**

Earth's climate is influenced by interactions involving the Sun, ocean, atmosphere, clouds, ice, land, and life. Climate varies by region as a result of local differences in these interactions.

CLP 4 **LESSON 2**

Climate is determined by the long-term pattern of temperature and precipitation averages and extremes at a location. Climate descriptions can refer to areas that are local, regional, or global in extent. Climate can be described for different time intervals, such as decades, years, seasons, months, or specific dates of the year.

CLP 5 **LESSONS 2, 3**

The components and processes of Earth's climate system are subject to the same physical laws as the rest of the Universe. Therefore, the behavior of the climate system can be understood and predicted through careful, systematic study.

CLP 6 **LESSONS 2, 6, 7**

The overwhelming consensus of scientific studies on climate indicates that most of the observed increase in global average temperatures since the latter part of the 20th century is very likely due to human activities, primarily from increases in greenhouse gas concentrations resulting from the burning of fossil fuels.

CLP 3 **LESSON 7**

Individual organisms survive within specific ranges of temperature, precipitation, humidity, and sunlight. Organisms exposed to climate conditions outside their normal range must adapt or migrate, or they will perish.

CLP 7 **LESSONS 6, 7**

Melting of ice sheets and glaciers, combined with the thermal expansion of seawater as the oceans warm, is causing sea level to rise. Seawater is beginning to move onto low-lying land, contaminating coastal fresh water sources, and gradually submerging coastal facilities and barrier islands. Sea-level rise increases the risk of damage to homes and buildings from storm surges such as those that accompany hurricanes.

OLP 4 **LESSON 6**

Most of the oxygen in the atmosphere originally came from the activities of photosynthetic organisms in the ocean. This accumulation of oxygen in Earth's atmosphere was necessary for life to develop and be sustained on land.

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