Standards-Based Project WET Activity Pool – Grade 5

Pool Title: Interacting Earth Systems – (*California Science Framework - Grade 5, IS3, p: 320*)

Scientists have developed a way of thinking about the Earth as a system of systems. A system has internal components that interact with one another (like the water cycle on Earth), and a system also interacts with its surroundings (like when water in the water cycle causes a flood) In this instructional segment students explore each of Earth's systems and how they work together to explain various phenomena. They then obtain information about the role of humans in altering natural interactions. Students finish with action plans about what they and their community can do to minimize the effects on humans and the impact of human activities on natural systems. (*CSF, p: 320*)

Standards Pool:

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

5-ESS2-2. 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

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

3–5-ETS1-1. Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost

Anchoring Phenomenon: Humans can affect the water flowing between inland, coastal and ocean communities.

Guiding Questions:

- How can we study systems on a state or global scale?
- How does water move and interact as it cycles through Earth systems?
- How much water do we need to live? How much water do we have?
- What can we do to protect Earth's resources?

California Environmental Principles and Concepts:

Principle I - The continuation and health of individual human lives and of human communities and societies depend on the health of the natural systems that provide essential goods and ecosystem services

Principle II - The long-term functioning and health of terrestrial, freshwater, coastal and marine ecosystems are influenced by their relationships with human societies

Principle III - Natural systems proceed through cycles that humans depend upon, benefit from and can alter

Principle IV - The exchange of matter between natural systems and human societies affects the long-term functioning of both

Principle V - Decisions affecting resources and natural systems are based on a wide range of considerations and decision-making processes.

Performance Expectations ***Investigative Phenomena***	**Learning Targets by PE Dimensions.**	**Learning Experience Connections**	**Common Core & Engineering/ Community Action Connections**
5-ESS2-2. 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 *How can we measure something on a global scale?* *How much of the Earth's surface is covered by ocean?*	**SEP**: **Use Mathematics and Computational Thinking:** Students use sampling methods to estimate the amount of the Earth's surface covered by the ocean. **DCI**: **ESS2.C: The Roles of Water in Earth's Surface Processes:** Students describe the role of the ocean as Earth's dominant surface feature. **CCC**: **Scale, Proportion, and Quantity:** Students develop a graph or pie chart to describe the quantity and proportion of ocean covering the Earth's surface.	**'Blue Planet' – (Project WET 2.0, p: 125)** - Students estimate the percentage of Earth's surface that is covered by water and by tossing an inflatable globe, then take a simple probability sample to check their estimates. - Students develop an argument for the question - Does Earth have separate oceans or is there just one world ocean? - Using the globe or an image of Earth projected on a screen, students can be asked to observe and list all ecosystem components they can see on Earth. (CSF, p: 321)	**ELA:** RI.5.1; RI.5.7; RI.5.9; RST.6.7; SL.5.5; W.5.8; W.5.9.a,b **MATH:** MP.2; MP.4 - Students investigate water availability and ongoing research around the world to provide plentiful, clean water.
5-ESS2-1. Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact. *How does water move and interact with other Earth systems as it moves through the water cycle?*	**SEP**: **Develop and Use Models:** Students engage in a water cycle simulation and develop a model of the water cycle. **DCI: ESS2.A: Earth Materials and Systems:** Students can describe how Earth's major systems interact through the water cycle to affect Earth's surface materials and processes. **CCC**: **Systems and System Models:** Students describe The water cycle in terms of its components and their interactions.	**'The Incredible Journey' – (Project WET 2.0, p: 155)** - Students role-play water molecules to simulate the movement of water as it actually travels in the water cycle. -- Student teams can list ecosystem components they can see on each station cube and add to their ***'Blue Planet'*** list, then work in teams to group each into categories as per CSF, p: 321 – 322) - Students can map Interactions between Earth Systems by analyzing each station cube using Table 4.7. (CSF, p: 323) as a template.	**ELA:** RI.5.1; RI.5.7; RI.5.9; RST.6.7; SL.5.5; W.5.8; W.5.9.a,b **MATH:** MP.2; MP.4
5-ESS2-1: Develop a model	**SEP**: **Develop and Use Models:** Students	**'Water Models' (Project WET Portal)**	**ELA:** RI.5.7; SL.5.5

using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact. *How does water move in the water cycle? Can ocean water become fresh water during the water cycle?*	create a simple physical model to observe the water cycle. **DCI: ESS2.A: Earth Materials and Systems:** Students use their models to describe the interaction of water, air and earth materials. **CCC**: **Systems and System Models:** Students describe the interactions and identify the components of the water cycle they observe in their models.	- Students construct models of the water cycle to illustrate its major components and processes. - Salt water can be added to the models to show a primary way the water cycle replenishes fresh water supplies from the ocean. - Students can be challenged to modify models for cold, mild, hot and wet or arid regions of the world.	**MATH:** MP.2; MP.4
5-ESS2-1. Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact. *How can humans affect water as it moves and interacts with other Earth systems through the water cycle?*	**SEP**: **Obtain, Evaluate and Communicate Information:** Students use media to investigate and communicate the effects of human activities on ocean watersheds. **DCI**: **ESS3.C: Human Impacts on Earth Systems:** Students describe human activities that have major effects on watersheds and connecting Earth systems. **CCC**: **Systems and System Models:** Students define 'watershed' and describe the interaction of key components.	**'Blue River' (Project WET 2.0, p: 135)** - Students participate in a whole-body simulation of the annual movement of water through a river and its watershed. - Grasshopper Geography watershed maps can be projected for the class to describe how watersheds connect the land and ocean.	**ELA:** RI.5.1; RI.5.7; RI.5.9; SL.5.5; W.5.8; W.5.9.a,b **MATH:** MP.2; MP.4; 5.G.2 - Students investigate recent annual stream flows, pollution issues in their watershed and present actions that can be taken to better protect water quality. (5-ESS3-1)
5-ESS2-2. 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 *How much of the Earth's water is in a form we as humans can use? How do humans use the water?*	**SEP**: **Use Mathematics and Computational Thinking:** Students calculate and graph the amount of salt, fresh, inaccessible and water available for human use on Earth. **DCI**: **ESS2.C: The Roles of Water in Earth's Surface Processes:** Students describe the amount and locations of Earth's largest water reservoirs. **CCC**: **Scale, Proportion, and Quantity:** Students use standard units to describe the volume of salt, fresh, inaccessible and water available for human use on Earth.	**'A Drop in the Bucket' (Project WET 2.0, p: 257)** - Students calculate the percentage of water supplies on Earth. - Students can read a USGS fact sheet on *'Water Use in the United States in 2015'* by water use sector in each state.	**ELA:** RI.5.1; RI.5.7; RI.5.9; SL.5.5; W.5.8; W.5.9.a,b **MATH:** MP.2; MP.4 *'Students will be able to compare fractions." (CSF, p: 325)* - Students can investigate water use by state and sector through time and/or water use by county to see which has the most/least amount of fresh water per person and how this compares to other countries. (CSF, p: 325)
5-ESS3-1. Obtain and combine information about ways individual communities	**SEP**: **Obtain, Evaluate, and Communicate Information:** Students use multiple information resources to explore solutions	**'Urban Waters' (Project WET 2.0, p: 413)** - Students develop an urban water system from source to return by matching job	**ELA:** W5.8 **MATH:** MP.2

use science ideas to protect the Earth's resources and environment. *What can humans do to better protect the Earth water resources on a local and global scale?*	for better protecting Earth's water resources. **DCI**: **ESS3.C: Human Impacts on Earth Systems:** Students describe how urban centers use science ideas to protect water resources and the environment. **CCC**: **Systems and System Models:** Students describe the key components of an urban water system and its interactions with Earth systems.	descriptions to their role in protecting water resources and the environment. - Students investigate the source(s) of their tap water, how the water is used in their community, and how/where water is returned to the local ecosystem.	- Students identify water pollution concerns in their community and invite in professionals involved in resolving the concerns do discuss why it is important, the role of science in resolving the problem and what students could do to help.
The California Science Framework suggests this focus on water be broadened to consider other human impacts on the local stream leading to the ocean and other Earth systems. Below are Project WET activities that lead students to investigate local water resource issues and what individuals and communities could do to help protect Earth's water resources and environments. (CSF, p: 325)			
5-ESS3-1. Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment. *What can humans do to better protect the Earth water resources on a local and global scale?*	**SEP: Obtain, Evaluate and Communicate Information:** Students use a variety of information resources to explain human solutions to better protect water resources for humans and connecting Earth systems. **DCI: ESS3.C: Human Impacts on Earth Systems:** Students describe how a wastewater treatment plant operates and interacts with the environment. **CCC**: **Systems and System Models:** Students can describe the key components of a wastewater treatment system and how it interacts with Earth systems.	**'Super Bowl Surge' (Project WET 2.0, p: 405)** - Students engage in a simulation to understand how stressed wastewater systems can impact the local environment and water resources.	**ELA:** RI.5.1; RI.5.7; RI.5.9; W.5.8; W.5.9.a,b **MATH:** MP.2; MP.4 - Student tour a local wastewater treatment plant and/or interview wastewater treatment system engineers to learn how their local system operates.
3-5-ETS1-1. Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost. *What can humans do to better protect the Earth water resources on a local and global scale?*	**SEP**: **Ask Questions and Define Problems**: Students develop criteria to assess the effectiveness of methods for cleaning water based on cost, time and improvement in water quality. **DCI**: **ETS1.A: Define and Delimit Engineering Problems**: Students design and test methods for cleaning water using available materials. **CCC**: **People's needs and wants change**	**'Sparkling Water' (Project WET Portal)** - Students develop strategies to remove contaminants from "wastewater."	**ELA:** RI.5.1; RI.5.7; RI.5.9; W.5.8; W.5.9; SL.5.5 **MATH:** MP.2; MP.4; MP.5; 5.G.A.2 - Students design a simple water filtration process. (CSF, p: 326)

	over time, as do their demands for new and improved technologies: Students can describe the history of wastewater water treatment and why it has needed to change over time.		
5-ESS3-1. Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment. *How does our school community impact the flow of water?*	**SEP: Obtain, Evaluate and Communicate Information** Students can use a map to show how water flows across their schoolyard and downstream to the ocean or other end basin. **DCI: ESS3.C: Human Impacts on Earth Systems:** Students identify water contaminant sources on a schoolyard and investigate ways to reduce or eliminate the water contamination. **CCC: Systems and System Models** Students use maps to describe how water flows on a schoolyard and within the context of their larger watershed.	**'Rainy-Day Hike' (Project WET 2.0, p: 169)** - Students create a map of storm water flow on the schoolyard to conceptualize what contaminants it might pick up and wash into the local waterways. (CSF, p: 325)	**ELA:** RI.5.1; RI.5.7; RI.5.9; W.5.8; W.5.9.a,b **MATH:** MP.2; MP.4 - Students develop a strategy to educate community members on how urban runoff contaminants affect all ecosystems down stream to the ocean and actions they can take on a daily basis to reduce the volume of pollutants flowing into local waterways.
5-ESS3-1. Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment. *What methods are communities using to reduce the impact of storm water runoff?*	**SEP: Obtain, Evaluate and Communicate Information** Students can describe differences in common storm water BMPs and how they are and/or may be used in their community. **DCI: ESS3.C: Human Impacts on Earth Systems** Students can describe how storm water BMPs affect the flow of runoff to better protect the environment. **CCC: Systems and System Models** Students can describe common practices used by communities to reduce the impact of urban storm water runoff on the environment.	**'Storm Water' (Project WET 2.0, p: 395)** - Students investigate the effect of permeable and impermeable surfaces on the flow of water.	**ELA:** RI.5.1; RI.5.7; RI.5.9a,b; SL.5.5; W5.7; W.5.8; W.5.9.a,b **MATH:** MP.2; MP.4 - Students then prepare a plan to present to their school site council to install a rainwater capture system on their schoolyard such as rain barrels or a cistern. (CSF, p: 325)