******Earth’s Systems Pool Course: 4-5

Course Phenomenon:

Choices we make affect our watershed and ocean environments far downstream.

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| Disciplinary Core Ideas: |
| **ESS2.A: Earth Materials and Systems**  Earth’s major systems are the geosphere (solid and molten rock, soil, and sediments), the hydrosphere (water and ice), the atmosphere (air), and the biosphere (living things, including humans). These systems interact in multiple ways to affect Earth’s surface materials and processes. The ocean supports a variety of ecosystems and organisms, shapes landforms, and influences climate. Winds and clouds in the atmosphere interact with the landforms to determine patterns of weather. **(5-ESS2-1)**  Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. **(4-ESS2-1)**  **ESS2.C: The Roles of Water in Earth’s Surface**  Nearly all of Earth’s available water is in the ocean. Most fresh water is in the ocean. Most fresh water is in glaciers or underground; only a tiny fraction is in streams, lakes, wetlands, and the atmosphere. **(5-ESS2-2)**  **ESS2.B: Plate Tectonics and Large-Scale System Interactions**  The locations of mountain ranges, deep ocean trenches, ocean floor structures, earth quakes, and volcanoes occur in patterns. Most earthquakes and volcanoes occur in bands that are often along the boundaries between continents and oceans. Major mountain chains form inside continents or near their edges. Maps can help locate the different land and water feature areas of Earth. **(4-ESS2-2)**  **ESS3.C: Human Impacts on Earth Systems**  Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help protect Earth’s resources and environments. **(5-ESS3-1)** |

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| Supported Performance Expectations: |
| **5-ESS2-1.** Develop a model using an example to describe ways in which the geosphere, biosphere, hydrosphere, and/or atmosphere interact.  [Clarification Statement: Examples could include the influence of the ocean on ecosystems, landform shape, and climate; the influence of the atmosphere on landforms and ecosystems through weather and climate; and the influence of mountain ranges on winds and clouds in the atmosphere. The geosphere, hydrosphere, atmosphere, and biosphere are each a system.] [Assessment Boundary: Assessment is limited to the interactions of two systems at a time.]  **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. [Assessment Boundary: Assessment is limited to oceans, lakes, rivers, glaciers, ground water, and polar ice caps, and does not include the atmosphere.]  **5-ESS3-1.** Obtain and combine information about ways individual communities use science ideas to protect the Earth’s resources and environment. [Assessment  **4-LS1-1.** Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. [Clarification Statement: Examples of structures could include thorns, stems, roots, colored petals, heart, stomach, lung, brain, and skin. Each structure has specific functions within its associated system (CA).] [Assessment Boundary: Assessment is limited to macroscopic structures within plant and animal systems.]  **4-ESS2-1.** Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind or vegetation. [Clarification Statement: Examples of variables to test could include angle of slope in the downhill movement of water, amount of vegetation, speed of wind, relative rate of deposition, cycles of freezing and thawing of water, cycles of heating and cooling, and volume of water flow.] [Assessment Boundary: Assessment is limited to a single form of weathering or erosion.]  **4-ESS2-2.** Analyze and interpret data from maps to describe patterns of Earth’s features. [Clarification Statement: Maps can include topographic maps of Earth’s land and ocean floor, as well as maps of the locations of mountains, continental boundaries, volcanoes, and earthquakes.] |

Charting the Course:

Notes to the teacher about making this work as a course of study for a unit– things to focus on – how to connect activities from day to day – notes about order they should be done.

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| **Activity, Page, &**  **Phenomenon** | **Science & Engineering Practice(s)** | **Crosscutting Concept(s)** | **Local Applications** |
| **Blue Planet**  PWET, p. 125  *Is Earth’s surface covered by more land or water?* | *Example:*  **Using Mathematics and Computational Thinking**  Describe and graph quantities such as area and volume to address scientific questions. | *Example:*  **Systems and System Models**  A system can be described in terms of its components and their interactions. | *Example:*  Students use simple statistical sampling techniques and probability to estimate the percentage of water and land on Earth’s surface. Students use evidence to debate the concept of seven or one world ocean as an Earth system. |
| **How Wet is Our Planet?**  AQWILD, p. 180  *How much water is on Earth and where is it located?* | **Developing and Using Models**  Develop a model to describe phenomena. | **Scale, Proportion, and Quantity**  Standard units are used to measure and describe physical quantities such as weight and volume. | Students describe the amount and distribution of water on Earth in the ocean, underground and on the land surface. Students explore state surface and groundwater resources through time and discuss the importance of water conservation. |
| **The Incredible Journey**  PWET, p. 155  *How does water move on Earth?* | **Developing and Using Models**  Develop a model to describe phenomena. | **Systems and System Models**  A system can be described in terms of its components and their interactions. | Students simulate the movement of water within the water cycle. Students create a photo or video documentary of the local watershed that represents each aspect of the water cycle. Students investigate how human activities can pollute and clean water as it moves through the water cycle. |
| **Seeing Watersheds** PWET, p. 187  *What is a watershed?* | **Developing and Using Models**  Develop a model to describe phenomena. | **Systems and System Models**  A system can be described in terms of its components and their interactions.  **Patterns**  Patterns can be used as evidence to support an explanation. | Students use maps to characterize their local watershed; to identify the key parts and functions of their local watershed; determine the watershed boundaries; and to describe how water flows in their watershed based on elevation. |
| **Sum of the Parts**  PWET, p. 283  *How does water flow in our community?* | **Developing and Using Models**  Develop a model to describe phenomena. | **Cause and Effect**  Cause and effect relationships are routinely identified, tested, and used to explain change. | Students demonstrate how everyone can contribute to the pollution of a river as it flows through a watershed. Students identify individual and group actions that can reduce the amount of pollutants entering their local streams. |
| **Where Does Water Run?**  AQWILD, p. 44  *How does water flow in our community?* | **Using Mathematics and Computational Thinking**  Describe and graph quantities such as area and volume to address scientific questions. | **Scale, Proportion, and Quantity**  Standard units are used to measure and describe physical quantities such as weight and volume. | Students measure a study site and calculate the pervious versus impervious cover. Students collect, organize and analyze data on runoff from the study site to develop conclusions and potential need to mitigate current runoff flow patterns. |
| **Where Have All the Salmon Gone?**  AQWILD, p. 254  *Where have all the salmon gone?* | **Obtaining, Evaluating, and Communicating Information**  Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem. | **Cause and Effect**  Cause and effect relationships are routinely identified, tested, and used to explain change. | Students analyze, interpret and construct working explanations about fluctuation fish populations in the Sacramento River watershed from actual data. Students analyze the effects of human use and habitat changes on fish populations. |
| **What’s in the Water?**  AQWILD, p. 206  *What’s in the water?* | **Analyzing and Interpreting Data**  Analyze and interpret data to make sense of phenomena using logical reasoning. | **Patterns**  Patterns can be used as evidence to support an explanation. | Students analyze simulated data to identify major sources of aquatic pollution and make inferences about the potential effects of aquatic pollutants on wildlife, wildlife habitat and water resources. |
| **Plastic Voyages**,  AQWILD, p. 189  *Where does plastic pollution in marine environments originate?* | **Analyzing and Interpreting Data**  Analyze and interpret data to make sense of phenomena using logical reasoning. | **Cause and Effect**  Cause and effect relationships are routinely identified, tested, and used to explain change. | Students identify and describe sources of marine debris. Students describe the potential effects of plastic waste on aquatic wildlife and habitat. Students identify specific actions they can take to reduce or eliminate plastic pollution from their home and community. |

Beyond WET & WILD:

Notes about other potential programs to include in this course of study.

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| **Activity, Program, &**  **Phenomenon** | **Science & Engineering Practice(s)** | **Crosscutting Concept(s)** | **Local Applications** |
| Effie Yeaw Nature Center - Nature Plus! program | **Planning and Carrying Out Investigations**  Make observations to produce data to serve as the basis for evidence for an explanation of a phenomenon. | **Cause and Effect**  Cause and effect relationships are routinely identified, tested, and used to explain change. | Engages students in an extended hike, nature journaling, and personal encounters with our resident animals. Fourth and fifth grade station activities explore human impact on watersheds. |
| Nimbus Fish Hatchery Tour | **Obtaining, Evaluating, and Communicating Information**  Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem. | **Cause and Effect**  Cause and effect relationships are routinely identified, tested, and used to explain change. | Guided tours address the natural history of salmon and/or steelhead, the reasons for the hatchery, hatchery operations, resource management and individual stewardship. Tours are aligned to State Science and Standards. |
| **GLOBE Program** | | | |
| Water Wonders  *What are macroinvertebrates and why do scientists study them to assess water quality?* | **Engaging in Argument from Evidence**  Construct an argument with evidence, data, and/or a model. | **Systems and System Models**  A system can be described in terms of its components and their interactions. | Students are introduced to different species of aquatic macroinvertebrates and hypothesize why each insect looks the way it does. Students can make observations of macroinvertebrates in a classroom aquarium or visit a local stream in their watershed to conduct field observations. |
| Water Walk  *How can we plan and carry out effective investigations of our watershed?* | **Obtaining, Evaluating, and Communicating Information**  Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem. | **Systems and System Models**  A system can be described in terms of its components and their interactions. | Students conduct a visual survey of a Hydrosphere Study Site to develop questions about local land cover and/ or water chemistry issues that may require further investigation. Students will learn different methods for finding out about a study site, such as through library research, field visits and interviews. |
| Model a Catchment Basin  *How can changing landscape patterns effect the flow of water?* | **Developing and Using Models**  Develop a model to describe phenomena. | **Systems and System Models**  A system can be described in terms of its components and their interactions. | Students construct a 3-dimensional model of a catchment basin. They will use the model to explore catchment basins, water pathways, and manipulate the model to illustrate how catchment basins can change over time. |
| GLOBE Protocols  *Is the water in our local streams safe to drink, swim in, water plants or send to communities downstream?* | **Planning and Carrying Out Investigations**  Make observations to produce data to serve as the basis for evidence for an explanation of a phenomenon. | **Scale, Proportion, and Quantity**  Standard units are used to measure and describe physical quantities such as weight and volume. | GLOBE Hydrosphere protocols enable students to plan and conduct investigations with accurate measurements of the quality of water bodies in their community. The student generated data can be analyzed and interpreted to identify patterns and relationships that impact the local watershed system. |
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| GLOBE Data Apps  *How can technology be used to help us record and analyze data while studying our watershed?* | **Planning and Carrying Out Investigations**  Make observations to produce data to serve as the basis for evidence for an explanation of a phenomenon. | **Systems and System Models**  A system can be described in terms of its components and their interactions. | GLOBE Observer allows students to implement GLOBE science protocols outside of a school setting from field study sites, local parks or at home. GLOBE data collected by students will support student in class research and strengthening science education, while providing additional data for scientists. |