# Correlations

of the

## Aquatic WILD Online Course Activities

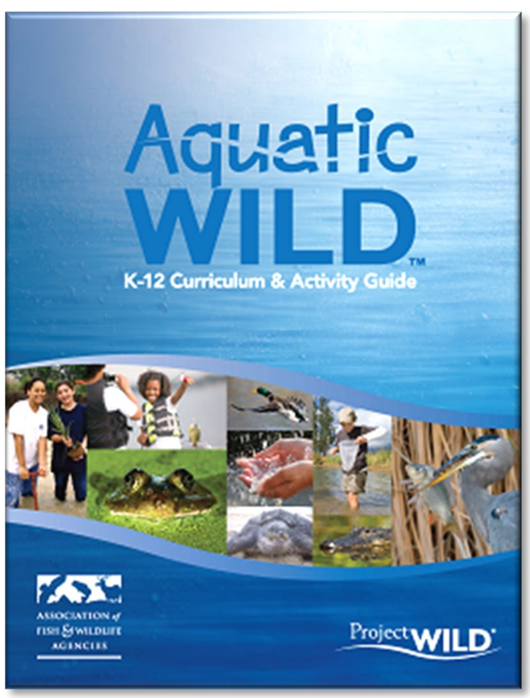
to

## Next Generation Science Standards

and the

## Framework for K-12 Science Education

2022



# Aquatic WILD Activity Correlations

## *Introduction*

### Purpose:

The *Aquatic WILD K-12 Curriculum & Activity Guide* (WILD) is interdisciplinary, offering activities that focus on everything from mathematics to social studies. However, Aquatic WILD is especially relevant to science, specifically the K-12 science classroom. Most states have now adopted *The Next Generation Science Standards* (NGSS) or standards based on *A Framework for K-12 Education.* The foundations for both are three dimensions of science: Disciplinary Core Ideas, Science and Engineering Practices, and Crosscutting Concepts. Project WILD materials, including *Aquatic WILD*, provide phenomenon-based experiences and activities that are three-dimensional, supporting the standards teachers must help their students achieve. Now more than ever, Project WILD and Aquatic WILD can be viewed tools to help teachers get students outside while engaging in standards-based teaching and learning. This document was developed as a companion for the Aquatic WILD online course to highlight the three-dimensionality and phenomenon-based aspects of the five science-focused activities included from the *Aquatic WILD K-12 Curriculum & Activity Guide*.

### NGSS & the Framework:

The NGSS are national K–12 science content standards. They set the expectations for what students should know and be able to do at the end of instruction. The NGSS were developed by states to improve science education for all students by providing a set of research-based, up-to-date K–12 science standards. These benchmarks give local educators the flexibility to design classroom learning experiences that stimulate students' interests in science and prepare them for college, careers, and citizenship.

Learn more about how Achieve coordinated the work of twenty-six Lead State Partners and collaborated with critical partners, including the National Research Council, the National Science Teachers Association, and the American Association for the Advancement of Science, to develop the NGSS based on the NRC's K-12 Framework for Science Education.

#### Terms to Know

**DCI: Disciplinary Core Idea | SEP: Science and Engineering Practice | CCC: Crosscutting Concept**

**PE: Performance Expectation**

### Phenomenon-Based & The Untethered Dimensions:

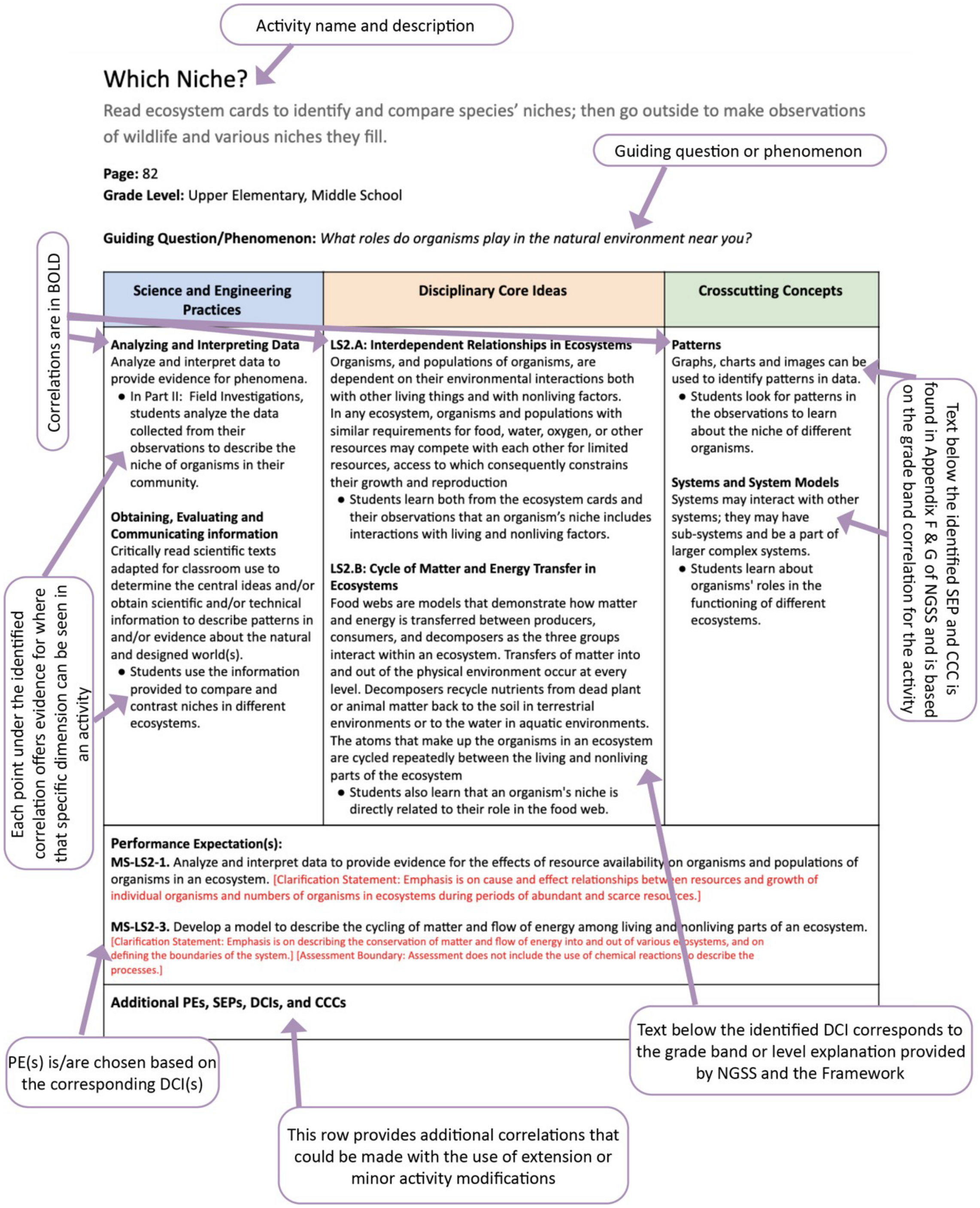
According to NGSS, natural phenomena are observable events that occur in the universe and that we can use our science knowledge to explain or predict. Framing the phenomenon at the crux of the activity for each correlation is a "Guiding Question." This question or phenomenon is meant to drive the instruction and allow students to use SEPs to explain or predict and CCCs to make sense of that phenomenon.

The actual "standard" in NGSS is the three-dimensional Performance Expectation (PE). The PEs are not the focus of these correlations because any single standard (or PE) cannot be effectively taught in one lesson or activity. Consequently, the approach for developing these correlations is known as "untethered," where the appropriate DCI from the Performance Expectation is used but is not necessarily the stated SEPs or CCCs. Rather, the SEPs and CCCs actually used by students in the activity are specified in the correlations.

### The Correlation Document:

Each correlation document begins with basic details about the activity and a guiding question/phenomenon. The guiding question is meant to serve teachers with an idea for how the experience can be based on and driven by phenomena. Teachers are encouraged to adapt the guiding question to make it as relevant to students and their environment as possible.

The actual correlations can be found in the table on each document. The correlations are broken down by the three-dimensions and three columns: SEPs, DCIs, and CCCs. The bold words in each column signify the specific correlation(s). In most instances, there are multiple correlations for each dimension. Each correlation has a bullet providing evidence of the specified dimension from the activity. The Performance Expectation (the actual standard) supported by the learning experience is in the row below the three columns. As stated above, however, we have used the untethered approach as recommended by Nextgenscience for connecting the SEPs and CCCs. Both the SEP and the CCC text below the bolded correlations are found in the NGSS progressions, [Appendix F](#) and [Appendix G](#) respectively. These progressions show how each SEP or CCC relates directly to an activity's specified grade band. Some activities can be easily modified to support additional correlations. Notes about these additional correlations, where applicable, have been made in the last row of the table. Below is a diagram to help with understanding each correlation page.



# Fashion a Fish

Design a new fish species based on a set of specifications provided from a set of "Fish Adaptation Cards," and describe how these adaptations help the fish survive.

**Page:** 96
**Grade Level:** Lower Elementary, Upper Elementary

**Guiding Question/Phenomenon:** *The fish we see at an aquarium, in a pond, at the grocery store, or that you might catch at a lake or by the ocean can look quite different from each other. Why are there so many variations in shape, coloration, and other characteristics?*

| Science and Engineering Practices | Disciplinary Core Ideas | Crosscutting Concepts |
|---|---|---|
| **Developing and Using Models**<br>Develop models to describe phenomena.<br>● Students develop a model to represent the adaptations (trait variations) of the fish and describe the type of habitat these traits would be suited for.<br><br>**Constructing Explanations and Designing Solutions**<br>Use evidence (e.g. observations, patterns) to support an explanation Use evidence (observations, patterns) to construct an explanation.<br>● Students use evidence represented by their fish's characteristics to explain how it could (or could not) survive in a particular environment. | **LS1.A: Structure and Function**<br>Animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction.<br>● Students assign specialized functions to the structures they draw for their designed fish.<br><br>**LS3.B: Variations of Traits**<br>Different organisms vary in how they look and function because they have different inherited information. The environment also affects the traits that an organism develops.<br>● Students explain how inherited information and/or environmental factors influence how the fish looks and acts.<br><br>**LS4.B: Natural Selection**<br>Sometimes the differences in characteristics between individuals of the same species provide advantages in surviving, finding mates, and reproducing.<br>● Students explain how the structures of their fish gives it advantages to survive and thrive in their habitat.<br><br>**LS4.D: Biodiversity and Humans**<br>There are many different kinds of living things in any area, and they exist in different places on land and water.<br>● Students learn about different types of fish and the various adaptations they have that are suited to the places they live. | **Cause and Effect**<br>Cause and effect relationships are routinely identified.<br>● Students explain how inherited or environmentally influenced traits have caused their fish to be able to survive and thrive in their habitats.<br><br>**Systems and System Models**<br>A system can be described in terms of its components and their interactions.<br>● Students describe how each structure (subsystem) works with the other structures of the fish (system) to ensure its success in its habitat (ecosystem). |

**Performance Expectation(s):**

**3-LS3-1.** Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms. [Clarification Statement: Patterns are the similarities and differences in traits shared between offspring and their parents, or among siblings. Emphasis is on organisms other than humans.] [Assessment Boundary: Assessment does not include genetic mechanisms of inheritance and prediction of traits. Assessment is limited to non-human examples.]

**3-LS4-2.** Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing. [Clarification Statement: Examples of cause and effect relationships could plants that have larger thorns than other plants may be less likely to be eaten by predators; and, animals that have better camouflage coloration than other animals may be more likely to survive and therefore more likely to leave offspring.]

**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, petals, heart, stomach, lung, brain, and skin.] [Assessment Boundary: Assessment is limited to macroscopic structures within plant and animal systems.]

**Additional PEs, SEPs, DCIs, and CCCs**

# Migration Headache

Simulate the migration of water birds by “flying” through an obstacle course to understand the limiting factors birds experience during their journey.

**Page:** 16
**Grade Level:** Middle School

**Guiding Question/Phenomenon:** *How does the availability and quality of habitat affect migrating birds?*

| Science and Engineering Practice | Disciplinary Core Idea | Crosscutting Concepts |
|---|---|---|
| **Developing and Using Models**<br>Develop and/or use a model to predict and/or describe phenomena.<br>● Students participate in a simulation to model the effects of habitat loss and degradation (or improvement) on a population of waterbirds.<br>Evaluate limitations of a model for a proposed object or tool.<br>● Students discuss what is realistic and unrealistic about the simulation, examining the limitations of the model.<br><br>**Using Mathematics and Computational Thinking**<br>Use mathematical and/or computational representations of phenomena to support explanations.<br>● Students develop graphical representations of the fluctuation in waterbird population based on the simulation.<br><br>**Analyzing and Interpreting Data**<br>Analyze and interpret data to provide evidence for phenomena.<br>● Students discuss the graph of the waterbird population over time and interpret the results. | **LS2.A: Interdependent Relationships in Ecosystems**<br>Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors.<br>● Students observe that changes to both living and nonliving factors of habitat affect the waterbird population.<br><br>**LS2.C: Ecosystem Dynamics, Functioning, and Resilience**<br>Ecosystems are dynamic in nature; their characteristics can vary over time. Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations.<br>● Students observe situations that enhance or degrade a habitat site, which impacts the waterbird population. | **Patterns**<br>Patterns can be used to identify cause and effect relationships.<br>● Students graph the changing population to observe how the habitat changes impact the waterbird population.<br><br>**Cause and Effect**<br>Cause and effect relationships may be used to predict phenomena in natural or designed systems.<br>● Students note the effects on the waterbird population based on the enhancement or degradation of habitat.<br><br>**Stability and Change**<br>Small changes in one part of a system might cause large changes in another part.<br>● Students observe that a change in one area of the waterbirds’ migration route can impact the population and how it interacts with another area on the migration route.<br>. |

**Performance Expectation(s):**

**MS-LS2-1.** Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem. [Clarification Statement: Emphasis is on cause and effect relationships between resources and growth of individual organisms and the numbers of organisms in ecosystems during periods of abundant and scarce resources.]

**MS-LS2-2.** Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems. [Clarification Statement: Emphasis is on predicting consistent patterns of interactions in different ecosystems in terms of the relationships among and between organisms and abiotic components of ecosystems. Examples of types of interactions could include competitive, predatory, and mutually beneficial.]

**MS-LS2-4.** Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations. [Clarification Statement: Emphasis is on recognizing patterns in data and making warranted inferences about changes in populations, and on evaluating empirical evidence supporting arguments about changes to ecosystems.]

**Additional PEs, SEPs, DCIs, and CCCs**

# Urban Waterway Checkup

Use water-quality parameters to investigate the health of a hypothetical urban waterway, predict how human actions affect the health of the waterway, and write a "prescription" for actions to improve the health of the waterway.

**Page:** 52
**Grade Level:** Middle School

**Guiding Question/Phenomenon:** *How can we tell if an urban waterway is healthy or not?*

| Science and Engineering Practices | Disciplinary Core Ideas | Crosscutting Concepts |
|---|---|---|
| **Developing and Using Models**<br>Use a model to predict and/or describe phenomena.<br>● Students use a model of Somewhere Creek and compare observed water conditions to infer what species might live there.<br><br>**Analyzing and Interpreting Data**<br>Analyze and interpret data to provide evidence for phenomena.<br>● Students review photos of a creek and compare against healthy waterway criteria to assess the state of the creek. Students read about Somewhere Creek and Stream Inhabitants and interpret which species might live in different stretches of the creek based on environmental factors.<br><br>**Constructing Explanations and Designing Solutions**<br>Construct an explanation using models or representations.<br>● Students use a map of Somewhere Creek to help explain why certain animals are more likely to inhabit a certain stretch of the creek. | **LS2.A: Interdependent Relationships in Ecosystems**<br>Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors.<br>● Students read about Somewhere Creek, Stream Inhabitants, and Waterway Vital Signs and interpret which species might live in different stretches of the creek based on environmental factors.<br><br>**LS2.C: Ecosystem Dynamics, Functioning, and Resilience**<br>Ecosystems are dynamic in nature; their characteristics can vary over time. Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations.<br>● Students learn about Somewhere Creek, how its ecosystem has been impacted by human activity, and how changes in the system can impact which species live there.<br><br>**ESS3.C Human Impacts on Earth Systems**<br>Human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of other species. But changes to Earth's environments can have different impacts (negative and positive) for different living things.<br>● Students learn about Somewhere Creek, how its ecosystem has been impacted by human activity, and how changes in the system can impact which species live there. | **Cause and Effect**<br>Cause and Effect relationships may be used to predict phenomena in natural or designed systems.<br>● Students observe that the characteristics of a stream impact the type of species that can live there.<br><br>**Systems and System Models**<br>Systems may interact with other systems; they may have sub-systems and be a part of larger complex systems. Models can be used to represent systems and their interactions—such as inputs, processes and outputs—and energy, matter, and information flows within systems.<br>● Students learn about Somewhere Creek, how it is impacted by physical features and human actions, and how upstream activities can impact downstream activities. Students use a map to indicate where certain species might live, according to their habitat needs. |

**Performance Expectation(s):**

**MS-LS2-4.** Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations. [Clarification Statement: Emphasis is on recognizing patterns in data and making warranted inferences about changes in populations, and on evaluating empirical evidence supporting arguments about changes to ecosystems.]

**MS-ESS3-3.** Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.* [Clarification Statement: Examples of the design process include examining human environmental impacts, assessing the kinds of solutions that are feasible, and designing and evaluating solutions that could reduce that impact. Examples of human impacts can include water usage (such as the withdrawal of water from streams and aquifers or the construction of dams and levees), land usage (such as urban development, agriculture, or the removal of wetlands), and pollution (such as of the air, water, or land).]

**MS-ESS3-4.** Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems. [Clarification Statement: Examples of evidence include grade-appropriate databases on human populations and the rates of consumption of food and natural resources (such as freshwater, mineral, and energy). Examples of impacts can include changes to the appearance, and structure of Earth's systems as well as the rates at which they change. The consequences of increases in human populations and consumption of natural resources are described by science, but science does not make the decisions for the actions society takes.]

## Additional PEs, SEPs, DCIs, and CCCs

If students conduct a checkup on a local waterway, then the SEP Planning and Carrying Out Investigations also applies.

This activity also correlates well with the same SEPs at the upper-elementary grade level.

This activity also correlates well with these upper-elementary school DCIs without any modifications:

**LS4.D: Biodiversity and Humans**
Populations live in a variety of habitats, and change in those habitats affects the organisms living there.

**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.

# Wetland Metaphors

Create metaphors with everyday objects to understand the functions wetlands provide.

**Page:** 78
**Grade Level:** Upper Elementary

**Guiding Question/Phenomenon:** *What is the value of wetland ecosystems?*

| Science and Engineering Practices | Disciplinary Core Ideas | Crosscutting Concepts |
|---|---|---|
| **Developing and Using Models**<br>Develop a model using an analogy, example, or abstract representation to describe a scientific principle or design solution.<br>• Students use metaphors to describe various functions of wetlands. | N/A | **Systems and System Models**<br>A system is a group of related parts that make up a whole and can carry out functions its individual parts cannot.<br>• Students learn about wetland ecosystems and various functions they provide. |

**Performance Expectation(s):**
N/A

**Additional PEs, SEPs, DCIs, and CCCs**
This activity also correlates well with the same SEP at the 3-5 level.

# Where Have All the Salmon Gone?

Analyze authentic data on Chinook Salmon populations as well as historical events in order to make inferences about the causes of fluctuations in fish populations.

**Page:** 252
**Grade Level:** Middle School, High School

**Guiding Question/Phenomenon:** *How can human decisions and habitat changes affect wildlife populations?*

| Science and Engineering Practices | Disciplinary Core Ideas | Crosscutting Concepts |
| --- | --- | --- |
| **Developing and Using Models**<br>Develop and/or use a model to predict and/or describe phenomena. Develop, revise, and/or use a model based on evidence to illustrate and/or predict the relationships between systems or between components of a system.<br>● Students compare a graph of the salmon population with a timeline of historical events to infer how habitat changes and human actions have impacted the salmon population.<br><br>**Analyzing and Interpreting Data**<br>Analyze and interpret data to provide evidence for phenomena.<br>● Students review qualitative and quantitative data to infer how habitat changes and human actions have impacted the salmon population.<br><br>**Using Mathematics and Computational Thinking**<br>Use mathematical representations to describe and/or support scientific conclusions and design solutions.<br>● Students compare a graph of the salmon population with a timeline of historical events to infer how habitat changes and human actions impacted the salmon population.<br><br>**Constructing Explanations and Designing Solutions**<br>Construct an explanation that includes qualitative or quantitative relationships between variables that predict(s) and/or describe(s) phenomena. Construct an explanation using models or representations. Apply scientific ideas, principles, and/or evidence to construct, revise and/or use an explanation for real-world phenomena, examples, or events.<br>● Students compare a graph of the salmon population with a timeline of historical events to infer how habitat changes and human actions impacted the salmon population. | **LS2.A: Interdependent Relationships in Ecosystems**<br>Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors.<br>● Students compare a graph of the salmon population with a timeline of historical events to infer how environmental interactions, such as dam building and wetlands destruction, may have impacted the salmon population.<br><br>**LS2.C: Ecosystem Dynamics, Functioning, and Resilience**<br>Ecosystems are dynamic in nature; their characteristics can vary over time. Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations. Moreover, anthropogenic changes (induced by human activity) in the environment—including habitat destruction, pollution, introduction of invasive species, overexploitation, and climate change—can disrupt an ecosystem and threaten the survival of some species.<br>● Students compare a graph of the salmon population with a timeline of historical events to infer how habitat changes and human actions have impacted the salmon population both positively and negatively.<br><br>**LS4.D: Biodiversity and Humans**<br>Populations live in a variety of habitats, and change in those habitats affects the organisms living there.<br>● Students explain how human interaction may have affected Chinook salmon populations throughout historical periods. | **Cause and Effect**<br>Changes in systems may have various causes that may not have equal effects.<br>● Students describe how human development affected Chinook salmon populations and about methods, laws, and management tools used to conserve the salmon.<br><br>**Patterns**<br>Graphs, charts, and images can be used to identify patterns in data.<br>● Students establish patterns between human activity and the Chinook salmon population throughout historical periods.<br><br>**Stability and Change**<br>Stability might be disturbed either by sudden events or gradual changes that accumulate over time.<br>● Students review how a variety of changes may have impacted the salmon population—some more immediately than others. |

| | | |
|---|---|---|
| | **ESS3.C: Human Impacts on Earth Systems**<br>Human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of other species. But changes to Earth's environments can have different impacts (negative and positive) for different living things. Typically as human populations and per-capita consumption of natural resources increase, so do the negative impacts on Earth unless the activities and technologies involved are engineered otherwise.<br>● Students explain how human interaction may have affected Chinook salmon populations throughout historical periods. | |

**Performance Expectation(s):**

**MS-LS2-4.** Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations. [Clarification Statement: Emphasis is on recognizing patterns in data and making warranted inferences about changes in populations, and on evaluating empirical evidence supporting arguments about changes to ecosystems.]

**HS-LS2-1.** Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales. [Clarification Statement: Emphasis is on quantitative analysis and comparison of the relationships among interdependent factors including boundaries, resources, climate, and competition. Examples of mathematical comparisons could include graphs, charts, histograms, and population changes gathered from simulations or historical data sets.] [Assessment Boundary: Assessment does not include deriving mathematical equations to make comparisons.]

**HS-LS2-2.** Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales. [Clarification Statement: Examples of mathematical representations include finding the average, determining trends, and using graphical comparisons of multiple sets of data.] [Assessment Boundary: Assessment is limited to provided data.]

**Additional PEs, SEPs, DCIs, and CCCs**

If more emphasis is placed on the life cycle and reproductive behaviors of the salmon, this DCI could also be met:

**LS1.B: Growth and Development of Organisms**
Animals engage in characteristic behaviors that increase the odds of reproduction.