Washington Office of Superintendent of
PUBLIC INSTRUCTION

Learning that works for Washington
CTE

Statewide Framework Document for: 030101

Natural Resources

Standards may be added to this document prior to submission but may not be removed from the framework to meet state credit equivalency requirements. Performance assessments and leadership alignment may be developed at the local level. In order to earn state approval, performance assessments must be submitted within this framework. **This course is eligible for one credit biology or lab science.** The Washington State Science Standards performance expectations for high school blend core ideas (Disciplinary Core Ideas, or DCIs) with scientific and engineering practices (SEPs) and crosscutting concepts (CCCs) to support students in developing usable knowledge that can be applied across the science disciplines. These courses are to be taught in a three-dimensional manner. The details about each performance expectation can be found at Next Generation Science Standards.

School District Name	
Course Title: Natural Resources	**Total Framework Hours:** 180
CIP Code: 030101 ☒ Exploratory ☐ Preparatory	**Date Last Modified:** December 30, 2020
Career Cluster: Agriculture, Food and Natural Resources	**Cluster Pathway:** Natural Resources Systems
Course Summary: This is a general course that focuses on the studies and activities relating to the natural environment and its conservation, use, and improvement. The course includes instruction in subjects such as climate, air, soil, water, land, fish, wildlife, and plant resources. Students will learn about the basic principles of environmental science and natural resources management, and they will explore topics around the recreational and economic uses of renewable and nonrenewable natural resources. Conservation, preservation, and their impacts on earth's systems are a major focus of this course. Students will learn course content in an applied and hands-on manner. As with all agriculture courses, instruction and assessment in the Supervised Agriculture Experience (SAE) is a requirement. The Supervised Agriculture Experience includes placing a student in a position where he or she will learn the practices of entrepreneurship and the fundamentals of research and experimentation in the agricultural field. Participants in the SAE will conduct exploratory projects with the purpose of learning about and improving practices in their surroundings. SAE.01. This course will include instruction in and Student involvement in Supervised Agriculture Experience Projects (SAE).	
Eligible for Equivalent Credit in: Science	**Total Number of Units:** 9

Unit 1: Native Fauna and Biodiversity	**Total Learning Hours for Unit:** 30

Unit Summary:

Competencies include:

1.1.1 Biodiversity refers to the variety of living components in an ecosystem.

1.1.2 Vegetation types present in an ecosystem are influenced by the environment and the activity of animals and humans.

1.1.3 Plants are scientifically identified using taxonomy and various classification systems.

1.1.4 Plant populations shift in response to changes in the environment.

Performance Assessments: (Districts to complete for each unit)

Example assessments for this unit include:

- Determine the biodiversity of plants in a given area using a common sampling technique.
- Conduct a survey of the vegetation present in a given plot of land and classify the plants according to their features.
- Simulate the process of vegetative succession by role-playing in a game.
- Research and report the common plant species and vegetation types in the ecosystem they have selected to study.
- Pass quizzes on common and scientific names of native plant varieties.
- Complete a native plant portfolio.

Leadership Alignment: (Districts to complete for each unit)

Leadership alignment must include a unit specific project/activity that aligns with the 21st Century Leadership Skills.

Example:

- Students think creatively, access and evaluate information, and interact effectively with others to identify native vegetation and biodiversity within an ecosystem.

Industry Standards and/or Competencies:

Agriculture, Food, and Natural Resources (AFNR) Standards - Natural Resource Systems (NRS) Pathway:

NRS.01.01. Performance Indicator: Apply knowledge of natural resource components to the management of natural resource systems.

Level III: NRS.01.01.01.c. Research and debate one or more current issues related to the conservation or preservation of natural resources.

NRS.01.02. Performance Indicator: Classify natural resources.

Level I: NRS.01.02.01.a. Describe morphological characteristics used to identify trees and other woody plants.

Level II: NRS.01.02.01.b. Identify trees and other woody plants.

Level III: NRS.01.02.01.c. Conduct a field inventory of trees and other woody plants, and record and document findings.

Level I: NRS.01.02.02.a. Describe morphological characteristics used to identify herbaceous plants.

Level II: NRS.01.02.02.b. Identify herbaceous plants.

Level III: NRS.01.02.02.c. Conduct a field inventory of herbaceous plants, and record and document findings.

Aligned Washington State Academic Standards	
Science	HS-LS2-1. Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales. 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.

	HS-LS2-7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity. HS-LS4-1. Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence. HS-LS4-2. Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment. HS-LS4-4. Construct an explanation based on evidence for how natural selection leads to adaptation of populations. HS-LS4-5. Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species. HS-LS4-6. Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity. HS-ESS3-3. Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity. HS-ESS3-4. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems. HS-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts

Science and Engineering Practice	Disciplinary Core Idea	Crosscutting Concept

Unit 2: Ecosystems, Ecology, and Energy of Life	**Total Learning Hours for Unit:** 20

Unit Summary:

Competencies include:

- 2.1.1 Energy and nutrients flow through trophic levels within an ecosystem.
- 2.1.2 The geographic area of an ecosystem influences the complexity and type of organisms present.
- 2.1.3 The availability of required resources determines the carrying capacity of a given species in an ecosystem.
- 2.2.1 Accurate and useful field notes are the result of regular observations of the natural world and are used as a tool in the scientific study of the natural world.

2.2.2 A biome is a classification of the predominant vegetation present and is largely determined by climate, altitude, and latitude.
2.2.3 Diversity of an ecosystem includes both the living and nonliving components

Performance Assessments: (Districts to complete for each unit)

Example assessments for this unit include:

- Determine the sequence of energy flow of a group of organisms and sketch the food web.
- Calculate the percent of energy transfer through the trophic levels of a food chain.
- Research their ecosystem of choice and determine the food web present in that ecosystem.
- Use a graphic organizer to depict a food web and the relationships within that web.
- Simulate the carrying capacity of a deer population in relation to access to food, water, and shelter.
- Determine the habitat area requirements for a group of animals in an ecosystem and the overall area needed to sustain the ecosystem.
- Research a biome and determine the defining characteristics of that biome.
- Present biome information using multimedia presentation tools as a team.
- Record observations of natural artifacts using scientific note taking in their ecosystem journal.
- Observe a local ecosystem and record field notes based on their observations.
- Identify and initiate research of a chosen ecosystem to be studied for the remainder of the course.
- In a group, present a real-life debate of the Lorax video.
- Design and present a PowerPoint presentation of one ecosystem.
- Design and present a diorama of one biome.
- Participate in the lab *Tragedy of the Commons*.

Leadership Alignment: (Districts to complete for each unit)

Leadership alignment must include a unit specific project/activity that aligns with the 21st Century Leadership Skills.

Example:

- Students work creatively with others, communicate clearly, create media products, and interact effectively with others through the development and presentation of biome information.
- Students are self-directed learners, manage products, and reason effectively through the simulation of carrying capacity, energy transfer calculation, and ecosystem observations.

Industry Standards and/or Competencies:

NRS.01.01. Performance Indicator: Apply knowledge of natural resource components to the management of natural resource systems.
Level I: NRS.01.01.01.a. Identify natural resources.
Level II: NRS.01.01.01.b. Differentiate between renewable and nonrenewable natural resources. Level I: NRS.01.01.02.a. Define ecosystem and related terms.
Level II: NRS.01.01.02.b. Describe the interdependence of organisms within an ecosystem.
Level III: NRS.01.01.02.c. Conduct a field study of an ecosystem, and record and document observations of species interactions.

NRS.02.03. Performance Indicator: Measure and survey natural resource status to obtain planning data.
Level I: NRS.02.03.01.a. Describe the value of resource inventories and population studies.

NRS.02.03. Performance Indicator: Measure and survey natural resource status to obtain planning data.

Level II: NRS.02.03.01.b. Discuss the procedures for conducting resource inventories and population studies.

NRS.02.04. Performance Indicator: Demonstrate natural resource enhancement techniques.

Level I: NRS.02.04.05.a. Identify natural resource characteristics desirable for recreational purposes.

Level II: NRS.02.04.05.b. Identify natural resource management techniques for improving recreation opportunities.

Level III: NRS.02.04.05.c. Evaluate the impact of recreational activities on natural resources and create an improvement plan.

NRS.02.06. Performance Indicator: Apply ecological concepts and principles to natural resource systems.

Level I: NRS.02.06.01.a. Identify biogeochemical cycles.

Level II: NRS.02.06.01.b. Diagram biogeochemical cycles and explain the processes.

Level III: NRS.02.06.01.c. Determine the human influence on biogeochemical cycles.

Level I: NRS.02.06.05.a. Describe the processes associated with ecological succession.

Level II: NRS.02.06.05.b. Give examples of primary succession and secondary succession species in a community of organisms.

Level I: NRS.02.06.06.a. Explain population ecology, population density and population dispersion.

Level II: NRS.02.06.06.b. Discuss factors that influence population density and population dispersion.

Level I: NRS.02.06.08.a. Describe sources of pollution and delineate between point and nonpoint source pollution.

Level II: NRS.02.06.08.b. Describe the impact of pollution on natural resources.

Level I: NRS.02.06.09.a. Describe climatic factors that influence natural resources.

Level II: NRS.02.06.09.b. Describe the impact climate has on natural resources.

NRS.03.01. Performance Indicator: Produce, harvest, process and use natural resource products.

Level I: NRS.03.01.08.a. Identify recreational uses of natural resources.

NRS.05.01. Performance Indicator: Communicate natural resource information to the public.

Level I: NRS.05.01.01.a. Identify ways in which a message regarding natural resources may be communicated to the public.

Aligned Washington State Academic Standards

Science	**Washington Science Standards (Next Generation Science Standards):** HS-LS1-2. Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. HS-LS1-3. Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. HS-LS1-5. Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy. HS-LS1-6. Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules. HS-LS1-7. Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy. HS-LS2-1. Use mathematical and/or computational representations to support explanations of factors

	that affect carrying capacity of ecosystems at different scales. 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. HS-LS2-3. Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions. HS-LS2-4. Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem. HS-LS2-5. Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere. HS-LS2-6. Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem. HS-LS2-7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity. HS-LS2-8. Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce. HS-LS3-3. Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population. HS-LS4-2. Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment. HS-LS4-3. Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait. HS-LS4-4. Construct an explanation based on evidence for how natural selection leads to adaptation of populations. HS-LS4-5. Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species. HS-LS4-6. Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity. HS-ESS2-6. Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere. HS-ESS3-1. Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.

	HS-ETS1-1. Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants. HS-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and tradeoffs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

Science and Engineering Practice	Disciplinary Core Idea	Crosscutting Concept

Unit 3: Soils and Land	**Total Learning Hours for Unit:** 20

Unit Summary:

Competencies:

- 3.1.1 Soil formation factors, including climate and parent material, influence soil types and uses.
- 3.1.2 Soil texture and structure influence soil properties and usability.
- 3.1.3 Soil is a natural filter and can collect nutrients and other materials from water.
- 3.1.4 The development, use, and management of soil as a natural resource are directly related to soil properties.
- 3.2.1 Topographic maps provide information on the configuration of the surface of the Earth.
- 3.3.2 Erosion influences land use and may cause environmental changes in ecosystems.
- 3.3.3 A soil survey is used as a land use planning tool.

Performance Assessments: (Districts to complete for each unit)

Example assessments for this unit include:

- Depict the process of soil formation by drawing a comic strip.
- Determine soil texture by feel and ribbon testing.
- Describe and sketch the differences in soil structure types.
- Compare the permeability and filtration capacity of different soil types.
- Calculate slope of an area of land.
- Classify land according to appropriate use based on slope, erosion factors, drainage, and workability.
- Conduct a lab on weathering.
- Conduct various labs on soil textures.
- Properly take a soil sample.
- Conduct labs on soil nutrients and amendments.
- Use the soil texture triangle.
- Conduct an extended lab using Bottle Biology.
- Demonstrate knowledge of soils on quizzes.

Leadership Alignment: (Districts to complete for each unit)

Leadership alignment must include a unit specific project/activity that aligns with the 21st Century Leadership Skills.

Example:

- Students reason effectively, solve problems, and be self-directed learners in learning and depicting the process of soil formation.
- Students are self-directed learners, work independently, and produce results in soil texture testing.

Industry Standards and/or Competencies:

Agriculture, Food, and Natural Resources (AFNR) Standards - Natural Resource Systems (NRS) Pathway:

NRS.01.01. Performance Indicator: Apply knowledge of natural resource components to the management of natural resource systems.

Level I: NRS.01.01.01.a. Identify natural resources.

Level II: NRS.01.01.01.b. Differentiate between renewable and nonrenewable natural resources.

NRS.01.02. Performance Indicator: Classify natural resources.

Level I: NRS.01.02.05.a. Demonstrate techniques used to identify rock, mineral and soil types.

Level II: NRS.01.02.05.b. Identify rock, mineral and soil types.

Level III: NRS.01.02.05.c. Conduct a field inventory of rock, mineral and soil types, and record and document findings.

NRS.03.01. Performance Indicator: Produce, harvest, process and use natural resource products.

Level I: NRS.03.01.05.a. Describe the value of minerals and ores to the economy.

Level II: NRS.03.01.05.b. Describe economically important minerals and ores that are extracted and processed.

Level III: NRS.03.01.05.c. Give examples of methods used to extract and process minerals and ores.

Level I: NRS.03.01.06.a. Describe the value of fossil fuels to the economy.

Level II: NRS.03.01.06.b. Describe sources of fossil fuels and products made from fossil fuels.

Level III: NRS.03.01.06.c. Give examples of methods used to extract and process fossil fuels

Aligned Washington State Academic Standards

Science	**Washington Science Standards (Next Generation Science Standards):** HS-ETS1-1. Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants. HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering. HS-ESS3-4. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems. HS-ESS2-5. Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes. HS-ESS2-6. Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.

Science and Engineering Practice	Disciplinary Core Idea	Crosscutting Concept

Unit 4: Forestry Management and Safety	**Total Learning Hours for Unit:** 30

Unit Summary:

Competencies include:

4.1.1 Sustainable agriculture practices include the efficient use of nonrenewable and on-farm resources and, where appropriate, integrate natural biological cycles.

4.1.2 Agricultural stewardship balances agriculture productivity and profitability while conserving natural resources.

4.2.1 Effective forest management requires identification of goals and proposed uses of the forest, such as aesthetics, recreation, urban values, water, wilderness, wildlife, and wood products.

4.2.2 Forest management techniques include timber extraction, planting and replanting of various species, cutting roads and pathways through forests, and fire management.

Performance Assessments: (Districts to complete for each unit)

Example assessments for this unit include:

- Read a story about non-sustainable use and apply the lessons learned to agricultural land management.
- Compare the story to the Dust Bowl and reflect on defining sustainable use.
- Use the "4R" nutrient stewardship approach to make fertilizer recommendations.
- Apply skills and knowledge learned regarding stewardship and sustainable agriculture management decisions related to a fictitious property; determine a commodity to raise; apply for a stewardship program; and determine the best stewardship practices to implement.
- Determine the value of a tree using the National Tree Benefit calculator.
- Calculate board feet of lumber and timber and estimate the value of local trees.
- Develop a forest management plan summary based on research of an assigned national forest.
- Use a clinometer, Biltmore stick, and diameter tape to measure trees.
- Complete measurements of trees in order to mathematically calculate board feet, cubic feet, and cords of wood.
- Complete an owl dissection lab.
- Complete a chainsaw safety course and exam.
- Use a chainsaw safely to properly process firewood.
- Research history timelines in order to correlate them to the rings on a felled tree.
- Demonstrate knowledge of forestry tools on an identification exam.
- Demonstrate knowledge of forestry diseases by passing an identification exam.

Leadership Alignment: (Districts to complete for each unit)

Leadership alignment must include a unit specific project/activity that aligns with the 21st Century Leadership Skills.

Example:

- Students access and evaluate information, use systems thinking, and communicate clearly to determine applications in agricultural land management.
- Students apply technology effectively and be flexible as they learn fertilizer recommendations, the value of a tree, and how to calculate board feet of lumber.

Industry Standards and/or Competencies:

Agriculture, Food, and Natural Resources (AFNR) Standards - Natural Resource Systems (NRS) Pathway:

NRS.01.01. Performance Indicator: Apply knowledge of natural resource components to the management of natural resource systems.

Level I: NRS.01.01.01.a. Identify natural resources.

Level II: NRS.01.01.01.b. Differentiate between renewable and nonrenewable natural resources.

Level III: NRS.01.01.01.c. Research and debate one or more current issues related to the conservation or preservation of natural resources.

NRS.01.02. Performance Indicator: Classify natural resources.

Level I: NRS.01.02.01.a. Describe morphological characteristics used to identify trees and other woody plants.

Level II: NRS.01.02.01.b. Identify trees and other woody plants.

Level III: NRS.01.02.01.c. Conduct a field inventory of trees and other woody plants, and record and document findings.

NRS.02.01. Performance Indicator: Develop a safety plan for work with natural resources.

Level I: NRS.02.01.01.a. Identify hazards associated with the outdoor environment.

Level II: NRS.02.01.01.b. Demonstrate safety practices when working in an outdoor environment.

NRS.02.02. Performance Indicator: Demonstrate cartographic skills to aid in developing, implementing and evaluating natural resource management plans.

Level I: NRS.02.02.01.a. Demonstrate how to use maps to identify directions and features, calculate actual distance and determine the elevations of points.

Level II: NRS.02.02.01.b. Locate natural resources using a land survey and geographic coordinate system.

Level III: NRS.02.02.01.c. Employ Global Positioning System and Geographic Information Systems technologies to inventory features in natural resource management.

NRS.02.03. Performance Indicator: Measure and survey natural resource status to obtain planning data.

Level I: NRS.02.03.01.a. Describe the value of resource inventories and population studies.

Level II: NRS.02.03.01.b. Discuss the procedures for conducting resource inventories and population studies.

Level III: NRS.02.03.01.c. Conduct resource inventories and population studies to assess resource status.

NRS.02.04. Performance Indicator: Demonstrate natural resource enhancement techniques.

Level I: NRS.02.04.02.a. Identify characteristics of a healthy forest.

Level II: NRS.02.04.02.b. Identify ways in which forest stands may be improved.

Level III: NRS.02.04.02.c. Formulate a timber stand improvement plan for a forest.

Level I: NRS.02.04.05.a. Identify natural resource characteristics desirable for recreational purposes.

Level II: NRS.02.04.05.b. Identify natural resource management techniques for improving recreation opportunities.

NRS.02.05. Performance Indicator: Interpret laws related to natural resource management and protection.

Level I: NRS.02.05.01.a. Identify laws associated with natural resource systems.

Level II: NRS.02.05.01.b. Identify the purposes of laws associated with natural resource systems.

Level I: NRS.02.05.02.a. Define mitigation.

Level II: NRS.02.05.02.b. Identify issues involving mitigation of natural resources.

NRS.02.06. Performance Indicator: Apply ecological concepts and principles to natural resource systems.

Level I: NRS.02.06.05.a. Describe the processes associated with ecological succession.

Level II: NRS.02.06.05.b. Give examples of primary succession and secondary succession species in a community of organisms.

Level III: NRS.02.06.05.c. Conduct a field study to determine the stages of ecological succession in a community of organisms.
Level I: NRS.02.06.06.a. Explain population ecology, population density and population dispersion.
Level II: NRS.02.06.06.b. Discuss factors that influence population density and population dispersion.
Level III: NRS.02.06.06.c. Create and implement a management plan based on a population study for a community of organisms.
Level I: NRS.02.06.07.a. Define invasive species.
Level II: NRS.02.06.07.b. Discuss factors that influence the establishment and spread of invasive species.
Level III: NRS.02.06.07.c. Develop and implement a plan to reduce the impact of invasive species on natural resources.
NRS.03.01. Performance Indicator: Produce, harvest, process and use natural resource products.
Level I: NRS.03.01.01.a. Describe forest-harvesting methods.
Level II: NRS.03.01.01.b. Determine when to harvest forest products.
Level I: NRS.03.01.02.a. Describe uses of tree species.
Level II: NRS.03.01.02.b. Describe processing of forest products.
NRS.04.01. Performance Indicator: Manage fires in natural resource systems.
Level I: NRS.04.01.01.a. Differentiate between desirable and undesirable fires and prepare a report on the role fire plays in a healthy ecosystem.
Level II: NRS.04.01.01.b. Describe techniques used to suppress wildfires and manage prescribed fires.
NRS.04.02. Performance Indicator: Diagnose plant and wildlife diseases and follow protocol to prevent their spread.
Level I: NRS.04.02.01.a. Identify causes of diseases in plants.
NRS.04.03. Performance Indicator: Manage insect infestations of natural resources.
Level I: NRS.04.03.01.a. Identify harmful and beneficial insects and signs of insect damage to natural resources.
Level III: NRS.04.03.01.c. Describe techniques used to manage pests of natural resources.

Aligned Washington State Academic Standards	
Science	**Washington Science Standards (Next Generation Science Standards):** HS-LS1-5. Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy. HS-LS1-7. Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy. 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. HS-LS2-5. Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere. HS-LS2-6. Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem. HS-LS2-7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the

	environment and biodiversity. HS-LS2-8. Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce. HS-LS4-2. Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment. HS-LS4-4. Construct an explanation based on evidence for how natural selection leads to adaptation of populations. HS-LS4-5. Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species. HS-LS4-6. Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity. HS-ETS1-1. Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants. HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering. HS-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and tradeoffs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

Science and Engineering Practice	Disciplinary Core Idea	Crosscutting Concept

Unit 5: Human Impact – Recreation and Need	**Total Learning Hours for Unit:** 20

Unit Summary:

Competencies include:

- 5.1.1 Human populations and their need for food, fiber, and fuel affect the natural environment.
- 5.1.2 Energy is available from diverse renewable and nonrenewable sources.
- 5.1.3 Managing waste affects society and has environmental costs and benefits.
- 5.1.4 Proper waste management is essential for healthy ecosystems.
- 5.2.1 Human recreational activities affect the natural environment and native species.
- 5.5.2 Protected natural spaces, such as National Parks and Scenic areas, have been designated to preserve landmarks as well as native flora and fauna.

5.2.3 Recreational use of natural resource areas requires the development of skills to ensure the safety of the individual while protecting the integrity of the natural resource.

Performance Assessments: (Districts to complete for each unit)

Example assessments for this unit include:

- Determine their personal carbon footprint and the carbon footprint of their family and consider how to reduce their carbon emission impact on the natural environment.
- Simulate the buying and selling of energy units from a diverse group of energy producers and discuss how changes in energy prices affect the average consumer.
- Research the differences and classifications of brownfield sites versus superfund sites and identify those sites within the area in which they live.
- Investigate the positive and negative impacts of waste on the environment and how to mitigate the environmental costs of waste management.
- Identify the current uses and the historical states of outdoor recreational areas in their local region and determine how human use has affected the native species in both beneficial and harmful ways.
- Research a national park or forest to identify and summarize its history, unique features, and available recreational activities in order to develop a guide.
- Investigate and plan an outdoor experience that incorporates personal interests while leaving the smallest footprint possible in order to protect the integrity of the natural resource.
- Develop a PowerPoint presentation of a fish species.
- Conduct a lab on overfishing.
- Complete a study packet on warm water fish.

Leadership Alignment: (Districts to complete for each unit)

Leadership alignment must include a unit specific project/activity that aligns with the 21st Century Leadership Skills.

Example:

- Students reason effectively and make judgments and decisions to determine their personal and family carbon footprint.
- Students practice solving problems and thinking creatively as they explore ways to reduce carbon emissions.
- Students interact and work effectively with others, to produce results, through the research and presentation on the impacts of human activity on the environment.

Industry Standards and/or Competencies:

Agriculture, Food, and Natural Resources (AFNR) Standards - Natural Resource Systems (NRS) Pathway:

NRS.01.01. Performance Indicator: Apply knowledge of natural resource components to the management of natural resource systems.

Level I: NRS.01.01.01.a. Identify natural resources.

Level III: NRS.01.01.01.c. Research and debate one or more current issues related to the conservation or preservation of natural resources.

NRS.01.02. Performance Indicator: Classify natural resources.

Level I: NRS.01.02.04.a. Describe morphological characteristics used to identify aquatic species.

Level II: NRS.01.02.04.b. Identify aquatic species.

Level III: NRS.01.02.04.c. Conduct a field inventory of aquatic species, and record and document findings.
NRS.02.03. Performance Indicator: Measure and survey natural resource status to obtain planning data.
Level III: NRS.02.03.01.c. Conduct resource inventories and population studies to assess resource status.
NRS.02.04. Performance Indicator: Demonstrate natural resource enhancement techniques.
Level I: NRS.02.04.05.a. Identify natural resource characteristics desirable for recreational purposes.
Level II: NRS.02.04.05.b. Identify natural resource management techniques for improving recreation opportunities.
Level III: NRS.02.04.05.c. Evaluate the impact of recreational activities on natural resources and create an improvement plan.
Level I: NRS.02.04.06.a. Identify characteristics of healthy marine and coastal natural resources.
Level II: NRS.02.04.06.b. Identify methods to improve marine and coastal natural resources.
NRS.02.05. Performance Indicator: Interpret laws related to natural resource management and protection.
Level I: NRS.02.05.01.a. Identify laws associated with natural resource systems.
Level II: NRS.02.05.01.b. Identify the purposes of laws associated with natural resource systems.
NRS.02.06. Performance Indicator: Apply ecological concepts and principles to natural resource systems.
Level I: NRS.02.06.01.a. Identify biogeochemical cycles.
Level II: NRS.02.06.01.b. Diagram biogeochemical cycles and explain the processes.
NRS.03.01. Performance Indicator: Produce, harvest, process and use natural resource products.
Level I: NRS.03.01.07.a. Describe the benefits of hydroelectric generation.
Level III: NRS.03.01.07.c. Describe hydroelectric generation techniques and procedures, and prepare a report on the impacts of hydroelectric dams on aquatic systems.
Level I: NRS.03.01.09.a. Identify aquatic species harvested for commercial and recreational purposes.
Level II: NRS.03.01.09.b. Describe techniques used to harvest aquatic species.
Level I: NRS.03.01.10.a. Identify uses of aquatic species.
Level II: NRS.03.01.10.b. Explain techniques used to process aquatic species.

Aligned Washington State Academic Standards

Science	**Washington Science Standards (Next Generation Science Standards):** HS-LS1-2. Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. HS-LS1-3. Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. HS-LS2-1. Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales. 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. HS-LS2-4. Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem. HS-LS2-6. Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems

	maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem. HS-LS2-7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity. HS-LS2-8. Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce. HS-LS3-2. Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors. HS-LS3-3. Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population. HS-LS4-2. Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment. HS-LS4-4. Construct an explanation based on evidence for how natural selection leads to adaptation of populations. HS-LS4-5. Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species. HS-ETS1-1. Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants. HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering. HS-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and tradeoffs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

Science and Engineering Practice	Disciplinary Core Idea	Crosscutting Concept

Unit 6: Invasive Species/Endangered Species	**Total Learning Hours for Unit:** 20
Unit Summary: Competencies include: 6.1.1 Environmental policies and regulations, such as the Endangered Species Act and wilderness protection designations, have been	

established to protect the environment for future generations of wildlife, vegetation, and human use.

6.1.2 National conservation practices have shifted over time due to changes in environmental perceptions.

6.1.3 Many organizations influence protection of species and the environment.

6.2.1 Balancing the needs of the human population and demands for food, fiber, and fuel with maintaining environmental quality is a complex social issue.

6.2.2 Ecosystems change over time based upon management decisions.

Performance Assessments: (Districts to complete for each unit)

Example assessments for this unit include:

- Research species classified as endangered or extinct and develop an informative flyer.
- Explore the impact of natural resource and conservation practices and policies in relation to sustainability.
- Research federal natural resource agencies and identify primary purposes and responsibilities each agency has regarding water contamination.
- Argue the role of federal natural resource agencies in a water contamination scenario.
- Review their beliefs and opinions on how natural resources should be used and write a brief statement summarizing their beliefs.
- Develop a multiple use management plan for the ecosystem they have studied throughout the course.
- Conduct Internet research on an invasive species.
- Create a wanted poster of an invasive species.
- Participate in the replanting of native species and removal of invasive species.
- Write an essay outlining a plan for the preservation of a species.

Leadership Alignment: (Districts to complete for each unit)

Leadership alignment must include a unit specific project/activity that aligns with the 21st Century Leadership Skills.

Example:

- Students reason effectively, make judgments and decisions, and communicate clearly as they express their personal beliefs about the role of natural resource agencies.
- Students work creatively with others, implement innovations, manage goals and time, and apply technology effectively to develop a multiple use management plan for an ecosystem.

Industry Standards and/or Competencies:

Agriculture, Food, and Natural Resources (AFNR) Standards - Natural Resource Systems (NRS) Pathway:

NRS.01.02. Performance Indicator: Classify natural resources.

Level I: NRS.01.02.02.a. Describe morphological characteristics used to identify herbaceous plants.

Level II: NRS.01.02.02.b. Identify herbaceous plants.

NRS.02.06. Performance Indicator: Apply ecological concepts and principles to natural resource systems.

Level I: NRS.02.06.07.a. Define invasive species.

Level II: NRS.02.06.07.b. Discuss factors that influence the establishment and spread of invasive species.

Level III: NRS.02.06.07.c. Develop and implement a plan to reduce the impact of invasive species on natural resources.

NRS.01.01. Performance Indicator: Apply knowledge of natural resource components to the management of natural resource systems.

Level I: NRS.01.01.01.a. Identify natural resources.
Level II: NRS.01.01.01.b. Differentiate between renewable and nonrenewable natural resources.
Level III: NRS.01.01.01.c. Research and debate one or more current issues related to the conservation or preservation of natural resources.
NRS.02.05. Performance Indicator: Interpret laws related to natural resource management and protection.
Level II: NRS.02.05.01.b. Identify the purposes of laws associated with natural resource systems

Aligned Washington State Academic Standards

Science	**Washington Science Standards (Next Generation Science Standards):** HS-LS2-6. Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem. HS-LS2-7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity. HS-LS2-8. Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce. HS-LS4-2. Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment. HS-LS4-4. Construct an explanation based on evidence for how natural selection leads to adaptation of populations. HS-LS4-5. Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species. 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. HS-ESS3-4. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems. HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering. HS-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

Science and Engineering Practice	Disciplinary Core Idea	Crosscutting Concept

Unit 7: Air Quality	**Total Learning Hours for Unit:** 10

Unit Summary:

Competencies include:

7.1.1 The atmosphere consists of various levels defined by distinct characteristics, such as density, temperature, and chemical composition.
7.1.2 Gases found in the atmosphere, such as oxygen and nitrogen, take different forms as they move through a biogeochemical cycle.
7.1.3 An important function of the atmosphere is the natural warming of the surface of the Earth.
7.2.1 Natural occurring processes and human activity influence air quality.
7.2.2 Air quality is determined by measuring the gases and particulates that are present at various levels.
7.2.3 The greenhouse effect theory explains the potential reasons and causes of global warming.

Performance Assessments: (Districts to complete for each unit)

Example assessments for this unit include:

- Develop a concept map depicting the levels of the atmosphere and their defining characteristics.
- Compare the movement of atmospheric gases, oxygen and nitrogen to the water cycle.
- Conduct an investigation to determine air temperature at different levels over a 24-hour period.
- Monitor carbon dioxide concentrations in a classroom with different levels of ventilation.
- Measure the level of particulate matter from the air and the amount and percentage of light blocked by the particulate matter.
- Compare air quality levels for different locations, demonstrating understanding of the Air Quality Index.
- Simulate the greenhouse effect in a small-scale model.
- Research the soil, water, and air resources in the ecosystem they have chosen to study.

Leadership Alignment: (Districts to complete for each unit)

Leadership alignment must include a unit specific project/activity that aligns with the 21st Century Leadership Skills.

Example:

- Students think creatively, reason effectively, and use systems thinking to create a concept map depicting the levels of the atmosphere.
- Students make judgments and decisions, collaborate with others, and produce results to conduct an investigation regarding air temperature.

Industry Standards and Competencies

Agriculture, Food, and Natural Resources (AFNR) Standards - Natural Resource Systems (NRS) Pathway:

NRS.01.01. Performance Indicator: Apply knowledge of natural resource components to the management of natural resource systems.

Level I: NRS.01.01.01.a. Identify natural resources.
Level II: NRS.01.01.01.b. Differentiate between renewable and nonrenewable natural resources.
Level III: NRS.01.01.01.c. Research and debate one or more current issues related to the conservation or preservation of natural resources.

NRS.01.02. Performance Indicator: Classify natural resources.

Level I: NRS.01.02.03.a. Describe morphological characteristics used to identify wildlife species.
Level II: NRS.01.02.03.b. Identify wildlife species.

NRS.02.05. Performance Indicator: Interpret laws related to natural resource management and protection.

Level II: NRS.02.05.01.b. Identify the purposes of laws associated with natural resource systems. NRS.02.01.01.a. Level I: Identify hazards associated with the outdoor environment.	
Science	**Washington Science Standards (Next Generation Science Standards):** HS-LS2-7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity. HS-LS4-5. Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species. HS-ETS1-1. Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants. HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering. HS-LS2-5. Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere. HS-ESS3-4. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.

Science and Engineering Practice	Disciplinary Core Idea	Crosscutting Concept

Unit 8: Wildlife and Wildlife Management	**Total Learning Hours for Unit:** 15

Unit Summary:

Competencies include:

8.1.1 Wildlife require habitat suited to their needs, including food, water, shelter, and space, in order to thrive in a community.

8.1.2 Organisms use natural processes to adapt to their environments and increase chances of survival.

8.1.3 Human pressures on populations cause artificial selection within a population.

8.1.4 Various objectives influence the management of wildlife species.

8.1.5 Wildlife management includes improving habitat for a focal species.

Performance Assessments: (Districts to complete for each unit)

Example assessments for this unit include:

- Research the habitat requirements of an animal and write a description of those needs to be used to match an animal with its proper habitat.
- Investigate the adaptive nature of an animal, such as the beak of a bird to its environment in order to acquire food for survival.
- Predict the probability of the occurrence of qualitative traits within an animal species using Punnett Squares.
- Conduct hypothetical wildlife management decisions and identify at least four factors that can affect the size of a wildlife population.
- Research questions related to a wildlife species.

- Develop an informational brochure on one species of wildlife.
- Conduct a field study on wolves in Washington State.
- Participate in a debate on the harvesting of wildlife.

Leadership Alignment: (Districts to complete for each unit)

Leadership alignment must include a unit specific project/activity that aligns with the 21st Century Leadership Skills.

Example:

- Students work creatively with others, collaborate with others, and access and evaluate information to research habitat requirements for animals.
- Students access and evaluate information and produce results by predicting the probability of qualitative traits.

Industry Standards and/or Competencies:

Agriculture, Food, and Natural Resources (AFNR) Standards - Natural Resource Systems (NRS) Pathway:

NRS.01.01. Performance Indicator: Apply knowledge of natural resource components to the management of natural resource systems.

Level III: NRS.01.01.01.c. Research and debate one or more current issues related to the conservation or preservation of natural resources.

Level II: NRS.01.01.02.b. Describe the interdependence of organisms within an ecosystem.

NRS.01.02. Performance Indicator: Classify natural resources.

Level I: NRS.01.02.03.a. Describe morphological characteristics used to identify wildlife species.

Level II: NRS.01.02.03.b. Identify wildlife species.

Level III: NRS.01.02.03.c. Conduct a field inventory of wildlife species, and record and document findings.

NRS.02.01. Performance Indicator: Develop a safety plan for work with natural resources.

Level II: NRS.02.01.01.b. Demonstrate safety practices when working in an outdoor environment.

NRS.02.04. Performance Indicator: Demonstrate natural resource enhancement techniques.

Level I: NRS.02.04.03.a. Identify characteristics of a healthy wildlife habitat.

Level II: NRS.02.04.03.b. Identify methods of wildlife habitat improvement.

Level III: NRS.02.04.03.c. Conduct a survey of a habitat and devise a comprehensive improvement plan.

Level I: NRS.02.04.04.a. Identify characteristics of healthy rangeland.

NRS.02.05. Performance Indicator: Interpret laws related to natural resource management and protection.

Level I: NRS.02.05.01.a. Identify laws associated with natural resource systems.

Level II: NRS.02.05.01.b. Identify the purposes of laws associated with natural resource systems.

Level II: NRS.02.05.02.b. Identify issues involving mitigation of natural resources.

NRS.02.06. Performance Indicator: Apply ecological concepts and principles to natural resource systems.

Level II: NRS.02.06.06.b. Discuss factors that influence population density and population dispersion.

NRS.03.01. Performance Indicator: Produce, harvest, process and use natural resource products.

Level I: NRS.03.01.03.a. Identify wildlife species that can be sustainably harvested.

Level II: NRS.03.01.03.b. Describe techniques used in the harvesting of wildlife.

Level I: NRS.03.01.04.a. Identify products obtained from wildlife species.

Level II: NRS.03.01.04.b. Describe techniques used in the processing of wildlife.

NRS.04.02. Performance Indicator: Diagnose plant and wildlife diseases and follow protocol to prevent their spread.
Level I: NRS.04.02.02.a. Identify causes of diseases in wildlife.
Level III: NRS.04.02.02.c. Explain wildlife disease management techniques.

Aligned Washington State Academic Standards	
Science	**Washington Science Standards (Next Generation Science Standards):** HS-LS1-3. Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. HS-LS2-1. Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales. 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. HS-LS2-4. Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem. HS-LS2-6. Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem. HS-LS2-7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity. HS-LS2-8. Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce. HS-LS3-2. Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors. HS-LS4-2. Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment. HS-LS4-4. Construct an explanation based on evidence for how natural selection leads to adaptation of populations. HS-LS4-5. Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.

Science and Engineering Practice	**Disciplinary Core Idea**	**Crosscutting Concept**

Unit 9: Wetlands and Water Quality	**Total Learning Hours for Unit:** 15

Unit Summary:

Competencies include:

9.1.1 The hydrologic cycle is driven by solar energy resulting in water evaporating into the atmosphere and returning to the surface of the Earth in different forms.

9.1.2 Water is converted into a series of forms as it moves through the environment over time.

9.1.3 Lakes, rivers, and oceans are three major types of bodies of water that have characteristics influenced by climate, topography, and organisms.

9.2.1 Water quality is influenced by environmental conditions and human activities.

9.2.2 The Water Quality Index uses a series of tests, such as temperature, dissolved oxygen, pH, turbidity, and nitrates, to indicate the overall quality of a body of water.

9.2.3 Water quality determines potential uses of water, such as for drinking, irrigation for agriculture, industrial use, and recreational use.

9.2.4 The movement of water through watersheds and soil can alter the quality of water

Performance Assessments: (Districts to complete for each unit)

Example assessments for this unit include:

- Diagram the hydrologic cycle and define terms used in describing the movement of water through the cycle.
- Simulate the movement of water through the hydrologic cycle using a model system.
- Identify lakes, rivers, and oceans found in North America and research the characteristics of geography, climate, and elevation that influence those bodies of water.
- Investigate an aquatic ecosystem and research the defining characteristics of that ecosystem.
- Compare aquatic ecosystems and note differences and similarities.
- Conduct water quality tests to determine the temperature, pH, turbidity, dissolved oxygen, total solids, biochemical oxygen demand, phosphates, nitrates, and fecal coliform from a local sample of water.
- Calculate the quality of local water by completing the Water Quality Index.
- Determine the ability of different soils to filter acid rain.
- Predict and simulate how landforms influence the movement of surface water.
- Research standards for recreational use of water and determine if a watershed meets those standards.
- Conduct field study on a local wetland.
- Research laws and regulations dealing with wetlands.
- Test the quality of soil and water in a wetland area.

Leadership Alignment: (Districts to complete for each unit)

Leadership alignment must include a unit specific project/activity that aligns with the 21st Century Leadership Skills.

Example:

- Students access and evaluate information, apply technology effectively, and manage goals and time by conducting water quality tests.

Industry Standards and/or Competencies:

NRS.01.01. Performance Indicator: Apply knowledge of natural resource components to the management of natural resource systems.

Level III: NRS.01.01.01.c. Research and debate one or more current issues related to the conservation or preservation of natural resources.

Level I: NRS.01.01.02.a. Define ecosystem and related terms.

Level II: NRS.01.01.02.b. Describe the interdependence of organisms within an ecosystem.

Level III: NRS.01.01.02.c. Conduct a field study of an ecosystem, and record and document observations of species interactions.

NRS.01.02. Performance Indicator: Classify natural resources.

Level I: NRS.01.02.02.a. Describe morphological characteristics used to identify herbaceous plants.

Level II: NRS.01.02.02.b. Identify herbaceous plants.

NRS.02.01. Performance Indicator: Develop a safety plan for work with natural resources.

Level II: NRS.02.01.01.b. Demonstrate safety practices when working in an outdoor environment.

Level I: NRS.02.01.02.a. Recognize biohazards associated with natural resources.

Level II: NRS.02.01.02.b. Use appropriate techniques and equipment when working with biohazards.

Level III: NRS.02.01.02.c. Demonstrate appropriate responses for disasters involving biohazardous materials.

NRS.02.03. Performance Indicator: Measure and survey natural resource status to obtain planning data.

Level I: NRS.02.03.01.a. Describe the value of resource inventories and population studies.

Level II: NRS.02.03.01.b. Discuss the procedures for conducting resource inventories and population studies.

Level III: NRS.02.03.01.c. Conduct resource inventories and population studies to assess resource status.

NRS.02.04. Performance Indicator: Demonstrate natural resource enhancement techniques.

Level I: NRS.02.04.01.a. Identify the different kinds of streams.

Level II: NRS.02.04.01.b. Identify indicators of the biological health of a stream.

Level III: NRS.02.04.01.c. Create and implement a stream enhancement plan.

Level I: NRS.02.04.05.a. Identify natural resource characteristics desirable for recreational purposes.

Level II: NRS.02.04.05.b. Identify natural resource management techniques for improving recreation opportunities.

Level I: NRS.02.04.06.a. Identify characteristics of healthy marine and coastal natural resources.

Level II: NRS.02.04.06.b. Identify methods to improve marine and coastal natural resources.

NRS.02.05. Performance Indicator: Interpret laws related to natural resource management and protection.

Level I: NRS.02.05.01.a. Identify laws associated with natural resource systems.

Level II: NRS.02.05.01.b. Identify the purposes of laws associated with natural resource systems.

NRS.02.06. Performance Indicator: Apply ecological concepts and principles to natural resource systems.

Level I: NRS.02.06.02.a. Describe properties of watersheds and identify the boundaries of local watersheds.

Level II: NRS.02.06.02.b. Relate the function of watersheds to natural resources.

Level III: NRS.02.06.02.c. Analyze ecosystem functions of a watershed.

Level I: NRS.02.06.03.a. Compare and contrast groundwater and surface-water flow.

Level II: NRS.02.06.03.b. Explain stream hydrology and structure, and determine the different classes of streams.

Level III: NRS.02.06.03.c. Classify and predict the behavior of local streams.

Level I: NRS.02.06.04.a. Define riparian zones and riparian buffers, and explain their functions.

Level II: NRS.02.06.04.b. Identify techniques used in the creation, enhancement and management of riparian zones and riparian buffers.
Level III: NRS.02.06.04.c. Create, enhance and manage riparian zones and riparian buffers.
Level I: NRS.02.06.08.a. Describe sources of pollution and delineate between point and nonpoint source pollution.
Level II: NRS.02.06.08.b. Describe the impact of pollution on natural resources.
Level III: NRS.02.06.08.c. Create and implement a plan to prevent or limit the effects of pollution on natural resources.

NRS.03.01. Performance Indicator: Produce, harvest, process and use natural resource products.

Level I: NRS.03.01.07.a. Describe the benefits of hydroelectric generation.
Level II: NRS.03.01.07.b. Describe characteristics of sites that lend themselves to hydroelectric generation.
Level III: NRS.03.01.07.c. Describe hydroelectric generation techniques and procedures, and prepare a report on the impacts of hydroelectric dams on aquatic systems.
Level I: NRS.03.01.08.a. Identify recreational uses of natural resources.
Level II: NRS.03.01.08.b. Debate an issue related to the recreational use of natural resources.

NRS.05.01. Performance Indicator: Communicate natural resource information to the public.

Level I: NRS.05.01.01.a. Identify ways in which a message regarding natural resources may be communicated to the public.

Aligned Washington State Academic Standards

Science	**Washington Science Standards (Next Generation Science Standards):** HS-LS1-3. Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. HS-LS2-3. Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions. HS-LS2-4. Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem. HS-LS2-6. Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem. HS-LS2-7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity. HS-LS4-6. Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity. HS-ESS2-5. Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.

Science and Engineering Practice	Disciplinary Core Idea	Crosscutting Concept