



Nooksack Valley High School Outdoor Ecology

Course: Outdoor Ecology		Total Framework Hours: 90
CIP Code: 030101	<input checked="" type="checkbox"/> Exploratory <input type="checkbox"/> Preparatory	Date Last Modified: 3/23/2022
Career Cluster: Agriculture, Food and Natural Resources		Cluster Pathway: Natural Resources/Conservation

To duplicate this blank table (for additional units), select the table, select copy, place cursor below the first table, and select paste.

COMPONENTS AND ASSESSMENTS	
Performance Assessments: Tree Identification Boards Scientific Names and Binomial Nomenclature Tree and Tool Identification Quiz Quizlet Tree Id and Tool Id	
Leadership Alignment: Work creatively with others, use and manage information to produce a tree identification board Work independently and be self directed learners to learn scientific names. FFA Natural Resources CDE and Forestry CDE	
Standards and Competencies	
Unit: Tree and Tool Identification	
Industry Standards and/or Competencies	Total Learning Hours for Unit: 10
·AFNR Standards Natural Resources AFNR Standards NRS.01.02. Classify different types of natural resources in order to enable protection, conservation, enhancement and management in a particular geographical region NRS.01.02.01.a. Research and examine the characteristics used to identify trees and woody plants. NRS.01.02.01.b. Apply identification techniques to determine the species of a tree or woody plant.	
Aligned Washington State Learning Standards	
Arts	
Computer Science	
Educational Technology	
English Language Arts	
Environment & Sustainability	

Financial Education	
Health and Physical Education	
Mathematics	
Science	<p>HS.Natural Selection and Evolution</p> <p>HS-LS4-4. Construct an explanation based on evidence for how natural selection leads to adaptation of populations.</p> <p>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.</p> <p style="text-align: center;">Connections to Nature of Science</p> <p>Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena</p> <ul style="list-style-type: none">▪ A scientific theory is a substantiated explanation of some aspect of the natural world, based on a body of facts that have been repeatedly confirmed through observation and experiment and the science <p>Disciplinary Core Ideas</p> <p>LS4.B: Natural Selection</p> <ul style="list-style-type: none">⊞ Natural selection occurs only if there is both (1) variation in the genetic information between organisms in a population and (2) variation in the expression of that genetic information—that is, trait variation—that leads to differences in performance among individuals. (HS-LS4-2),(HS-LS4-3)⊞ The traits that positively affect survival are more likely to be reproduced, and thus are more common in the population. (HS-LS4-3) <p>LS4.C: Adaptation</p> <ul style="list-style-type: none">⊞ Evolution is a consequence of the interaction of four factors: (1) the potential for a species to increase in number, (2) the genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for an environment’s limited supply of the resources that individuals need in order to survive and reproduce, and (4) the ensuing proliferation of those organisms that are better able to survive and reproduce in that environment. (HS-LS4-2)⊞ Natural selection leads to adaptation, that is, to a population dominated by organisms that are anatomically, behaviorally, and physiologically well suited to survive and reproduce in a specific environment. That is, the differential survival and reproduction of organisms in a population that have an advantageous heritable trait leads to an increase in the proportion of individuals in future generations that have the trait and to a decrease in the proportion of individuals that do not. (HS-LS4-3),(HS-LS4-4)⊞ Adaptation also means that the distribution of traits in a population can change when conditions change. (HS-LS4-3)⊞ Changes in the physical environment, whether naturally occurring or human induced, have thus contributed to the expansion of some species, the emergence of new distinct species as populations diverge under different conditions, and the decline—and sometimes the extinction—of some species. (HS-LS4-5)

COMPONENTS AND ASSESSMENTS		
Performance Assessments: Legal Land Description of school properties Compass course Triangulation to find location with compass GPS waypoints, tracks, and routes Finding a corner section with map and compass ArcGIS Online Assessments ArcGIS Online and ArcGIS Pro mapping school properties for timber growth		
Leadership Alignment: Work independently and be self directed learners in finding the section corner on Sumas Mt. using a map and compass. Work creatively and implement innovations, Access and evaluate information, use and manage information and apply technology effectively on the ArcGIS Pro and ArcGIS Online project.		
Standards and Competencies		
Unit: Mapping and GIS		
Industry Standards and/or Competencies		Total Learning Hours for Unit: 20
·AFNR Natural Resources Standards NRS.03.02. Demonstrate cartographic skills, tools and technologies to aid in developing, implementing and evaluating natural resource management plans NRS.03.02.01.a. Summarize how to use maps and technologies to identify directions and land features, calculate actual distance and determine the elevations of points. NRS.03.02.01.b. Apply cartographic skills and tools and technologies (e.g., land surveys, geographic coordinate systems, etc.) to locate natural resources. NRS.03.02.01.c. Evaluate the availability of and threats to natural resources using cartographic skills, tools, and technologies (e.g., spread of invasive species, movement of wildlife populations, changes to biodiversity of edge of habitat versus interior, etc.). · ArcGIS Standards Import a basemap with different features Add layers to a map from a geodatabase Create a dataset using MS Excel and .csv to import into a map Use Geostatistical Wizard for Interpolability. Use GPS Unit to identify and find waypoints		
Aligned Washington State Learning Standards		
Arts		
Computer Science	3A-A-2-1 3A-D-5-17	Design and develop a software artifact working in a team. Create computational models that simulate real-world systems (e.g., ecosystems, epidemics, spread of ideas).
Educational Technology	1.1.1 1.2.1	Generate ideas and create original works for personal and group expression using a variety of digital tools. Communicate and collaborate to learn with others.

	1.3.2 Locate and organize information from a variety of sources and media. 1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results.
English Language Arts	
Environment & Sustainability	
Financial Education	
Health and Physical Education	
Mathematics	<p>Mathematical Practices</p> <ol style="list-style-type: none"> 1 Make sense of problems and persevere in solving them 2 Reason abstractly and quantitatively. 4 Model with mathematics. 5 Use appropriate tools strategically. 6 Attend to precision. 7 Look for and make use of structure. 8 Look for and express regularity in repeated reasoning.
Science	
Social Studies	

COMPONENTS AND ASSESSMENTS	
Performance Assessments: Watershed Mapping project Hirst Decision Discussion Critical Areas and Forest Practices Act Illustrated GIS Watershed mapping analysis project Water Quality class project – DO, pH, Fecal coliform, Nitrate, Turbidity, Phosphate, temperature, flow, TDS, Conductivity, water flow on Nooksack River and a tributary.	
Leadership Alignment: Students will analyze media, think creatively, and implement innovations as they participate in a discussion about the Hirst Decision and water quality and quantity issues in the Nooksack Watershed. Students will collaborate and work creatively with others, access and evaluate information, use and manage information, and apply technology effectively as they complete their watershed mapping project using ArcGIS Pro and ArcGIS Online. Students will manage project, produce results, work independently as well as with others in completing water quality measurements and habitat assessments.	
Standards and Competencies	
Unit: Watershed Management and Water Quality	
Industry Standards and/or Competencies	Total Learning Hours for Unit: 30
·AFNR Natural Resources Standards NRS.01.04. Apply ecological concepts and principles to aquatic natural resource systems. NRS.01.04.01.a. Summarize the roles and properties of watersheds. NRS.01.04.01.b. Assess the function of watersheds and their effect on natural resources. NRS.01.04.01.c. Evaluate and defend the importance of watersheds to ecosystem function. NRS.01.04.02.a. Examine and describe the importance of groundwater and surface water to natural resources. NRS.01.04.02.b. Analyze how different classifications of ground and surface water affect ecosystem function. NRS.01.04.02.c. Devise and apply strategies to manage, protect, enhance or improve sources of groundwater or surface water based on its properties. NRS.01.04.03.a. Compare and contrast riparian zones NRS.01.05 Apply ecological concepts and principles to terrestrial natural resource systems. NRS.01.05.02.a. Compare and contrast the impact of habitat disturbances and habitat resilience. NRS.01.05.02.b. Analyze and summarize examples of habitat disturbances and habitat resilience. NRS.01.05.02.c. Interpret signs of habitat disturbances and resilience in an ecosystem and use these signs to assess the health of an ecosystem. NRS.01.02. Classify different types of natural resources in order to enable protection, conservation, enhancement and management in a particular geographical region NRS.01.02.04.a. Research and examine the characteristics used to identify aquatic species NRS.01.02.04.b. Apply identification techniques to determine the species of an aquatic organism.	
Aligned Washington State Learning Standards	
Arts	
Computer Science	
Educational Technology	
English Language Arts	
Environment & Sustainability	

Financial Education	
Health and Physical Education	
Mathematics	
Science	<p>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.</p> <p>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.</p> <p>HS-LS2-4. Use a mathematical representation to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.</p> <p style="text-align: center;">Disciplinary Core Ideas</p> <p>LS1.C: Organization for Matter and Energy Flow in Organisms</p> <ul style="list-style-type: none"> • The process of photosynthesis converts light energy to stored chemical energy by converting carbon dioxide plus water into sugars plus released oxygen. (HS-LS1-5) • As a result of these chemical reactions, energy is transferred from one system of interacting molecules to another and release energy to the surrounding environment and to maintain body temperature. Cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and new compounds are formed that can transport energy to muscles. (HS-LS1-7) <p>LS2.B: Cycles of Matter and Energy Transfer in Ecosystems</p> <ul style="list-style-type: none"> • Photosynthesis and cellular respiration are important components of the carbon cycle, in which carbon is exchanged among the biosphere, atmosphere, oceans, and geosphere through chemical, physical, geological, and biological processes. (HS-LS2-5) <p>HS-LS2-7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.*</p> <p>Science and Engineering Practices</p> <ul style="list-style-type: none"> 📖 Design, evaluate, and refine a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations. (HS-LS2-7) 📖 Evaluate the claims, evidence, and reasoning behind currently accepted explanations or solutions to determine the merits of arguments. (HS-LS2-6) 📖 Evaluate the evidence behind currently accepted explanations or solutions to determine the merits of arguments. (HS-LS2-8) <p>Disciplinary Core Ideas</p> <p>LS2.A: Interdependent Relationships in Ecosystems</p> <ul style="list-style-type: none"> 📖 Ecosystems have carrying capacities, which are limits to the numbers of organisms and populations they can support. These limits result from such factors as the availability of living and nonliving resources and from such challenges such as predation, competition, and disease. Organisms would have the capacity to produce populations of great size were it not for the fact that environments and resources are finite. This fundamental tension affects the abundance (number of individuals) of species in any given ecosystem. (HS-LS2- 1),(HS-LS2-2)
Social Studies	

COMPONENTS AND ASSESSMENTS	
Performance Assessments: Fish Id Quiz Dissection of trout Calculations regarding fish growth rates and feeding rates Scale samples Hatchery vs. Wild Issues project Fish Chart	
Leadership Alignment: Students will work independently, manage goals and time, and be self directed learners and use systems thinking while they research hatchery vs. wild debate.	
Standards and Competencies	
Unit: Fisheries Management	
Industry Standards and/or Competencies	Total Learning Hours for Unit: 30
AFNR Natural Resources Standards NRS.03 Develop plans to ensure sustainable production and processing of natural Resources <ul style="list-style-type: none"> NRS.03.01.02.a. Research and describe methods by which wildlife can be sustainably harvested (e.g., controlled harvests, hunting licenses, regulations, etc.). NRS.03.01.02.b. Assess and apply techniques used to harvest wildlife in regards to sustainability, practicality and other factors. NRS.03.01.02.c. Develop a method for the sustainable harvest of wildlife species. NRS.02.04. Examine and explain how economics affects the use of natural resources. <ul style="list-style-type: none"> NRS.02.04.02.a. Research the impact of the use of natural resources on local, state and national economies (e.g., outdoor recreation, energy production, preservation, etc.). NRS.02.04.02.b. Assess the importance of the use of natural resources on local, state and national economies. NRS.01 Plan and conduct natural resource management activities that apply logical, reasoned, and scientifically based solutions to natural resource issues and goals. <ul style="list-style-type: none"> NRS.01.01.02.a. Summarize the components that comprise all ecosystems NRS.01.01.03.a. Summarize and classify different kinds of living species based on evolutionary traits. NRS.01.01.02.b. Analyze the interdependence of organisms within an ecosystem (e.g., food webs, niches, impact of keystone species, etc.) and assess the dependence of organisms on nonliving components (climate, geography, energy flow, nutrient cycling, etc.). NRS.01.01.03.b. Analyze how biodiversity develops through evolution, natural selection and adaptation; explain the importance of biodiversity to ecosystem function and availability of natural resources. NRS.01.01.02.c. Conduct analyses of ecosystems and document the interactions of living species and non-living resources. NRS.01.01.03.c. Evaluate biodiversity in ecosystems and devise strategies to enhance the function of an ecosystem and the availability of natural resources by increasing the level of biodiversity. 	
Aligned Washington State Learning Standards	
Arts	
Computer Science	
Educational Technology	
English Language Arts	
Environment & Sustainability	
Financial Education	
Health and Physical Education	
Mathematics	Mathematical Practices 1 Make sense of problems and persevere in solving them 2 Reason abstractly and quantitatively. 4 Model with mathematics. 5 Use appropriate tools strategically. 6 Attend to precision.

<p>Science</p>	<p>HS Structure and Function Students who demonstrate understanding can: HS-LS1-1. Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells. HS-LS1-2. Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.</p> <p>Disciplinary Core Ideas LS1.A: Structure and Function</p> <ul style="list-style-type: none"> Systems of specialized cells within organisms help them perform the essential functions of life. (HS-LS1-1) All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins, which carry out most of the work of cells. (HS-LS1-1) (Note: This Disciplinary Core Idea is also addressed by HS-LS3-1.) Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level. (HS-LS1-2) Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system. (HS-LS1-3) <p>Structure and Function</p> <ul style="list-style-type: none"> Investigating or designing new systems or structures requires a detailed examination of the properties of different materials, the structures of different components, and connections of components to reveal its function and/or solve a problem. (HS-LS1-1) <p>Stability and Change</p> <ul style="list-style-type: none"> Feedback (negative or positive) can stabilize or destabilize a system. (HS-LS1-3) <p>HS. Interdependent Relationships in Ecosystems 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.</p> <p>Science and Engineering Practices</p> <p>Design, evaluate, and refine a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations. (HS-LS2-7)</p> <p>Engaging in Argument from Evidence</p> <p>Engaging in argument from evidence in 9–12 builds from K–8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about the natural and designed world(s). Arguments may also come from current scientific or historical episodes in science.</p> <p>Evaluate the claims, evidence, and reasoning behind currently accepted explanations or solutions to determine the merits of arguments. (HS-LS2-6)</p> <p>Evaluate the evidence behind currently accepted explanations or solutions to determine the merits of arguments. (HS-LS2-8)</p> <p>Disciplinary Core Ideas LS2.A: Interdependent Relationships in Ecosystems</p> <ul style="list-style-type: none"> Ecosystems have carrying capacities, which are limits to the numbers of organisms and populations they can support. These limits result from such factors as the availability of living and nonliving resources and from such challenges such as predation, competition, and disease. Organisms would have the capacity to produce populations of great size were it not for the fact that environments and resources are finite. This fundamental tension affects the abundance (number of individuals) of species in any given ecosystem. (HS-LS2-1),(HS-LS2-2) <p>LS2.C: Ecosystem Dynamics, Functioning, and Resilience</p> <ul style="list-style-type: none"> A complex set of interactions within an ecosystem can keep its numbers and types of organisms relatively constant over long periods of time under stable conditions. If a modest biological or physical disturbance to an ecosystem occurs, it may return to its more or less original status (i.e., the
----------------	--

	<p>ecosystem is resilient), as opposed to becoming a very different ecosystem. Extreme fluctuations in conditions or the size of any population, however, can challenge the functioning of ecosystems in terms of resources and habitat availability. (HS-LS2-2),(HS-LS2-6)</p> <p>⊞ 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. (HS-LS2-7)</p> <p>LS2.D: Social Interactions and Group Behavior</p> <p>⊞ Group behavior has evolved because membership can increase the chances of survival for individuals and their genetic relatives. (HS-LS2-8)</p> <p>LS4.C: Adaptation</p> <p>⊞ Changes in the physical environment, whether naturally occurring or human induced, have thus contributed to the expansion of some species, the emergence of new distinct species as populations diverge under different conditions, and the decline—and sometimes the extinction—of some species. (HS-LS4-6)</p> <p>LS4.D: Biodiversity and Humans</p> <p>⊞ Biodiversity is increased by the formation of new species (speciation) and decreased by the loss of species (extinction). (secondary to HS-LS2-7)</p>
Social Studies	

The 21st Century Skills should be taught and assessed throughout the course. This table should be included at the end of this document.

21st Century Skills		
Check those that students will demonstrate in this course:		
<p>LEARNING & INNOVATION</p> <p>Creativity and Innovation</p> <p><input type="checkbox"/> Think Creatively</p> <p><input checked="" type="checkbox"/> Work Creatively with Others</p> <p><input checked="" type="checkbox"/> Implement Innovations</p> <p>Critical Thinking and Problem Solving</p> <p><input checked="" type="checkbox"/> Reason Effectively</p> <p><input checked="" type="checkbox"/> Use Systems Thinking</p> <p><input checked="" type="checkbox"/> Make Judgments and Decisions</p> <p><input checked="" type="checkbox"/> Solve Problems</p> <p>Communication and Collaboration</p> <p><input type="checkbox"/> Communicate Clearly</p> <p><input checked="" type="checkbox"/> Collaborate with Others</p>	<p>INFORMATION, MEDIA & TECHNOLOGY SKILLS</p> <p>Information Literacy</p> <p><input checked="" type="checkbox"/> Access and /evaluate Information</p> <p><input checked="" type="checkbox"/> Use and Manage Information</p> <p>Media Literacy</p> <p><input checked="" type="checkbox"/> Analyze Media</p> <p><input type="checkbox"/> Create Media Products</p> <p>Information, Communications and Technology (ICT Literacy)</p> <p><input checked="" type="checkbox"/> Apply Technology Effectively</p>	<p>LIFE & CAREER SKILLS</p> <p>Flexibility and Adaptability</p> <p><input checked="" type="checkbox"/> Adapt to Change</p> <p><input checked="" type="checkbox"/> Be Flexible</p> <p>Initiative and Self-Direction</p> <p><input checked="" type="checkbox"/> Manage Goals and Time</p> <p><input checked="" type="checkbox"/> Work Independently</p> <p><input checked="" type="checkbox"/> Be Self-Directed Learners</p> <p>Social and Cross-Cultural</p> <p><input checked="" type="checkbox"/> Interact Effectively with Others</p> <p><input checked="" type="checkbox"/> Work Effectively in Diverse Teams</p> <p>Productivity and Accountability</p> <p><input checked="" type="checkbox"/> Manage Projects</p> <p><input checked="" type="checkbox"/> Produce Results</p> <p>Leadership and Responsibility</p> <p><input checked="" type="checkbox"/> Guide and Lead Others</p> <p><input checked="" type="checkbox"/> Be Responsible to Others</p>