# Nooksack Valley School District/Nooksack Valley High School

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| **Course:** Environmental Biology<br>Cross Credited – 10th Grade Biology<br>Precision Exams pending school board approval for certification in Agricultural Biology | | **Total Framework Hours: 180** |
| **CIP Code: 030104** | ☒**Exploratory** ☐**Preparatory** | **Date Last Modified:1/20/2019** |
| **Career Cluster: Agriculture, Food and Natural Resources** | | **Cluster Pathway: Environmental Service Systems** |

## COMPONENTS AND ASSESSMENTS

**Performance Assessments: Investigative Question, Hypothesis, Data Set, Conclusion, Procedures, Scientific Variables , Numerous Investigations tied to standards**

**Leadership Alignment:**
Students will solve problems by asking questions and collecting data to justify and support their thinking
Students will communicate their understanding of the standards in writing and communicate with their peers
Students will collaborate with their lab groups to carry out investigations
Students will access and evaluate each other's work and new information learned with each investigation
Students will interact effectively with their small lab groups to carry out investigations
Students will be responsible to others during investigations, as everyone will have a role/job

## *Standards and Competencies*

**Unit: Inquiry Process in Science**
*Students learn how inquiry is such an important part of science. Students learn how to write an investigative questions, make a hypothesis, record an accurate data set and write a conclusion based on rubrics that help prepare them for state testing. Students also learn how to identify all variables and the attributes that make a "good investigation" as well as laboratory safety skills. Students apply this knowledge to numerous investigations throughout the year.*

| **Industry Standards and/or Competencies AFNR** | **Total Learning Hours for Unit: 10** |
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- **CRP.01.01.01.a.** Define personal responsibility and distinguish how it applies in workplace and community (e.g., make educated choices, listen and follow directions, ask for help when needed, meet expected standards, etc.).
- **CRP.04.03.02.a.** Observe and identify use of active listening strategies in formal (e.g., speeches, presentations, etc.) and informal (e.g., conversations, meetings, etc.) settings.
- **CRP.04.03.02.b.** Apply and evaluate personal level of active listening strategies in formal and informal settings.
- **CRP.08.01.01.a.** Identify and summarize steps to think critically (e.g., identify problem, gather information, brainstorm solutions, etc.).
- **CS.03.04.01.a.** Identify and differentiate the appropriate protective equipment for the safe use and operation of specific tools and equipment (e.g. PPE, etc.).
- **CS.03.04.02.a.** Identify standard tools, equipment and safety procedures related to AFNR tasks.
- **ESS.01.02.01.a.** Identify basic laboratory equipment and explain their uses.
- **ESS.01.02.01.b.** Demonstrate the proper use and maintenance of basic laboratory equipment.
- **ESS.01.02.01.c.** Calibrate and use laboratory equipment according to standard operating procedures.

| *Aligned Washington State Learning Standards* | |
|---|---|
| **Arts** | |
| **Computer Science** | |
| **Educational Technology** | |
| **English Language Arts** | *Reading Grades 11-12*<br>7. Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.<br><br>*Speaking and Listening Grades 11-12*<br>4. Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.<br>*Writing Grade 11-12*<br>4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.<br>5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.<br><br>**Range of Reading and Level of Text Complexity:**<br>CCSS.ELA-LITERACY.RST.9-10.10<br>By the end of grade 10, read and comprehend science/technical texts in the grades 9-10 text complexity band independently and proficiently. |
| **Environment & Sustainability** | |
| **Financial Education** | |
| **Health and Physical Education** | |
| **Mathematics** | |
| **Science** | |
| **Social Studies** | |

| **COMPONENTS AND ASSESSMENTS** |
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| **Performance Assessments: Atoms and Molecules, Photosynthesis Equation Lab, Chemical Equations, Light Dependent and Independent Reaction Chart, Proof of Photosynthesis Investigation, BTB Investigation, Respiration Equation Lab, Respiration Stages Chart, Respiration in Bread Lab, Anaerobic vs Aerobic, Photosynthesis and Respiration Skits** |
| **Leadership Alignment:**<br>Students will work collaboratively in pairs to sort atoms and molecules and name examples of each<br>Students will work collaboratively in pairs to use skittles to represent atoms and demonstrate the photosynthetic equation<br>Students will evaluate chemical equations to identify the inputs, outputs, energy, molecules involved and prove the Law of Conservation of Matter<br>Students will apply technology effectively to create a Light Dependent and Independent Flow Chart as well as a Respiration Stages Chart<br>Students will think and work creatively with others to design a short skit for Photosynthesis and Respiration |
| ***Standards and Competencies*** |

**Unit: Cellular Processes (Photosynthesis and Cellular Respiration)**
*Students learn the specific steps/stages of photosynthesis and respiration as well as gaining understanding of the chemical equation that allows for the processes to occur. Students will also review and be able to describe the difference between an atom and molecule and apply chemistry skills learned in 9th grade and begin learning about aerobic vs. anaerobic conditions.*

| **Industry Standards and/or Competencies AFNR** | **Total Learning Hours for Unit: 25** |
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**ESS.01.02.01.a.** Identify basic laboratory equipment and explain their uses.
**ESS.01.02.01.b.** Demonstrate the proper use and maintenance of basic laboratory equipment.
**PS.02.02.01.c.** Apply the knowledge of cell differentiation and the functions of the major types of cells to plant systems.
**PS.02.02.02.b.** Analyze root tissues and explain the pathway of water and nutrients into and through root tissues.
**PS.02.02.02.c.** Correlate the active and passive transport of minerals into and through the root system to plant nutrition.
**PS.02.02.03.a.** Identify and summarize the components and the functions of plant stems.
**PS.02.02.03.b.** Analyze and describe the difference in arrangement of vascular tissue between monocot and dicot plant stems.
**PS.02.02.04.a.** Research and summarize leaf morphology and the functions of leaves.
**PS.02.02.04.b.** Analyze how leaves capture light energy and summarize the exchange of gases.
**PS.02.03.01.a.** Summarize the importance of photosynthesis to plant life on earth and the process of photosynthesis, including the types (c3, c4, Cam), its stages (e.g., light-dependent and light independent reactions), and its products and byproducts.
**PS.02.03.02.a.** Summarize the stages of cellular respiration including their products and byproducts.

| ***Aligned Washington State Learning Standards*** | |
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| **Arts** | |
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| **Educational Technology** | |
| **English Language Arts** | *Reading Grades 11-12*<br>7. Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.<br><br>*Speaking and Listening Grades 11-12*<br>4. Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.<br>*Writing Grade 11-12*<br>4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.<br>5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.<br><br>**Range of Reading and Level of Text Complexity:**<br>CCSS.ELA-LITERACY.RST.9-10.10<br>By the end of grade 10, read and comprehend science/technical texts in the grades 9-10 text complexity band independently and proficiently. |
| **Environment & Sustainability** | |
| **Financial Education** | |

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| **Health and Physical Education** | |
| **Mathematics** | S-ID 1 Represent data with plots on the real number line (dot plots, histograms, and box plots) |
| **Science** | HS-LS1-5 Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy<br>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<br>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 |
| **Social Studies** | |

| **COMPONENTS AND ASSESSMENTS** | |
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| **Performance Assessments: Macromolecule Chart, Macromolecule Model, Formation of Macromolecules from Glucose, Hydrolysis and Dehydration Synthesis, Breakdown vs. Biosynthesis Reaction** | |
| **Leadership Alignment:**<br>Students will use and manage information to create a macromolecule chart describing composition, category, and commonality with glucose<br>Students will produce a model of a selected macromolecule (e.g. cholesterol, fructose, DNA, etc.)<br>Students will collaborate with others to discuss and organize information as to how macromolecules are formed from glucose<br>Students will made judgements and decisions on classifying reactions they have learned about into a breakdown or biosynthesis reaction and explain their thinking<br>Students will produce a model to show examples of hydrolysis and dehydration synthesis and apply them to the breakdown of glucose to form macromolecules needed to sustain life<br>Students will access and evaluate information to apply new learning to the macromolecules used in plants and learn how they assimilate the molecules | |
| ***Standards and Competencies*** | |
| **Unit: Macromolecules**<br>*This unit shows students that all macromolecules can be formed from breaking apart glucose and rearranging the atoms to form the primary macromolecules or biomolecules that sustain life. Students are taught the CHO, CHO, CHON, CHONP method to learn the structure and structure of all macromolecules. In addition, students learn that hydrolysis and dehydration synthesis are the methods in which these reactions take place. The unit ends with students applying this knowledge to a plant and its intake of water and nutrients to create macromolecules and the assimilation and use of those molecules once made.* | |
| **Industry Standards and/or Competencies AFNR** | **Total Learning Hours for Unit: 15** |
| **PS.01.03.01.a.** Identify the essential nutrients for plant growth and development and their major functions (e.g., nitrogen, phosphorous, potassium, etc.).<br>**PS.02.03.05.a.** Compare and contrast the effects of transpiration, translocation and assimilation on plants. | |
| ***Aligned Washington State Learning Standards*** | |
| **Arts** | |
| **Computer Science** | |
| **Educational Technology** | |
| **English Language Arts** | *Reading Grades 11-12*<br>7. Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.<br><br>*Speaking and Listening Grades 11-12* |

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| | 4. Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.<br>*Writing Grade 11-12*<br>4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.<br>5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.<br><br>**Range of Reading and Level of Text Complexity:**<br>CCSS.ELA-LITERACY.RST.9-10.10<br>By the end of grade 10, read and comprehend science/technical texts in the grades 9-10 text complexity band independently and proficiently. |
| **Environment & Sustainability** | |
| **Financial Education** | |
| **Health and Physical Education** | |
| **Mathematics** | |
| **Science** | 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 |
| **Social Studies** | |

| **COMPONENTS AND ASSESSMENTS** |
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| **Performance Assessments: Body System Summary, Digestive System Model, System Research and Digestive Connection, Digestive Process, Enzymes, Negative and Positive Feedback Mechanisms, Feedback Graphs, Feedback Systems and Lunch Labels, Heart Rate Investigation** |
| **Leadership Alignment:**<br>Students will think creatively to design a digestive system model<br>Students will collaborate with others in small and large group discussions<br>Students will analyze media and graphs to decipher information and identify trends<br>Students will work independently to create a body system summary and review<br>Students will communicate clearly in their small group sharing of ideas and whole class presentations<br>Students will solve problems and come up with solutions as they design a lunch that will maintain low blood sugar levels and come up with solutions to feedback charts and situations<br>Students will work on diverse teams during investigations to collect and analyze data |
| ***Standards and Competencies*** |
| **Unit: Interacting Systems**<br>*Now that students know about macromolecules and how they can be formed from glucose, students learn how interacting systems in our bodies work together to break down and assimilate nutrients. Focus is on the digestive system and its many parts that have individual functions that work together to form a system with a specific function. Students then learn how other systems work with the digestive system to sustain life of an organism. They also learn about feedback systems and how the body is always trying to maintain homeostasis and the times at when you might see negative and positive feedback.* |
| **Industry Standards and/or Competencies AFNR** — **Total Learning Hours for Unit: 15** |

**ESS.01.02.01.a.** Identify basic laboratory equipment and explain their uses.
**ESS.01.02.01.b.** Demonstrate the proper use and maintenance of basic laboratory equipment.
**AS.06.02.03.a.** Identify and summarize the properties, locations, functions and types of animal cells, tissues, organs and body systems.
**AS.06.02.03.b.** Compare and contrast animal cells, tissues, organs, body systems types and functions among animal species.

| ***Aligned Washington State Learning Standards*** | |
|---|---|
| **Arts** | |
| **Computer Science** | |
| **Educational Technology** | |
| **English Language Arts** | *Reading Grades 11-12*<br>7. Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.<br><br>*Speaking and Listening Grades 11-12*<br>4. Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.<br>*Writing Grade 11-12*<br>4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.<br>5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.<br><br>**Range of Reading and Level of Text Complexity:**<br>CCSS.ELA-LITERACY.RST.9-10.10<br>By the end of grade 10, read and comprehend science/technical texts in the grades 9-10 text complexity band independently and proficiently. |
| **Environment & Sustainability** | |
| **Financial Education** | |
| **Health and Physical Education** | |
| **Mathematics** | |
| **Science** | HS-LS1-2 Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms<br>HS-LS1-3 Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis |
| **Social Studies** | |

| **COMPONENTS AND ASSESSMENTS** |
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| **Performance Assessments: Photosynthesis and Respiration Review, Identifying Carbon, Carbon Cycle Flip Book, Carbon Cycle, Decomposition, Fossil Fuel Formation, Climate Change Research, Human Impact on Natural Resources, Carbon Cycle Connection, Regulation Research** |

**Leadership Alignment:**
Students will think creatively to design a carbon cycle model
Students will collaborate with others in small and large group discussions
Students will analyze media and graphs to decipher information and identify trends to answer questions
Students will work independently to complete a photosynthesis and respiration review
Students will communicate clearly in their small group sharing of ideas and whole class presentations
Students will solve problems and come up with solutions as they look at human impact on natural resources and climate change
Students will work on diverse teams during investigations to collect and analyze data
Students will access and evaluate as they peer assess projects
Students will apply technology effectively as they prepare their Carbon Cycle Connection Project
Students will use new information to present about a specific environmental policy or regulation

***Standards and Competencies***

**Unit: Carbon Cycle**
*This unit allows students to see how Carbon changes through different chemical, geo and biological processes to cycle through the different spheres and how it is held in reservoirs. They also learn more about climate change and human impact through real world examples, (harvesting of peat, deforestation, burning fossil fuels, etc.) Students will also learn about environmental laws and policies that are in place to help improve environmental conditions.*

| **Industry Standards and/or Competencies AFNR** | **Total Learning Hours for Unit: 20** |
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**ESS.01.02.01.a.** Identify basic laboratory equipment and explain their uses.
**ESS.01.02.01.b.** Demonstrate the proper use and maintenance of basic laboratory equipment.
**ESS.02.02.02.c.** Interpret and evaluate the impact of specific environmental service regulation policies (e.g., Clean Air Act, EISA, Clean Water Act, Superfund, etc.) on international trade.
**ESS.02.02.04.a.** Research current policies related to fracking and shale oil gas.
**ESS.03.01.03.a.** Research climate change and summarize evidence that climate change is occurring.
**ESS.03.01.03.c.** Evaluate the predicted impacts of global climate change on environmental service systems.
**ESS.03.01.04.b.** Analyze the basics of the greenhouse effect and describe how the greenhouse effect alters the earth's balance of energy.
**ESS.03.04.02.a.** Research and describe how microbial populations in an ecosystem affect carbon cycling.
**NRS.01.03.01.a.** Classify different kinds of biogeochemical cycles and the role they play in natural resources systems.
**NRS.01.03.01.b.** Assess the role that the atmosphere plays in the regulation of biogeochemical
**NRS.01.03.02.a.** Research and summarize how climate factors influence natural resource systems. cycles.

***Aligned Washington State Learning Standards***

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| **Arts** | |
| **Computer Science** | |
| **Educational Technology** | |
| **English Language Arts** | *Reading Grades 11-12*<br>7. Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.<br><br>*Speaking and Listening Grades 11-12*<br>4. Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.<br>*Writing Grade 11-12*<br>4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. |

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| | 5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.<br><br>**Range of Reading and Level of Text Complexity:**<br>CCSS.ELA-LITERACY.RST.9-10.10<br>By the end of grade 10, read and comprehend science/technical texts in the grades 9-10 text complexity band independently and proficiently. |
| **Environment & Sustainability** | |
| **Financial Education** | |
| **Health and Physical Education** | |
| **Mathematics** | |
| **Science** | 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 |
| **Social Studies** | |

| **COMPONENTS AND ASSESSMENTS** | |
|---|---|
| **Performance Assessments: Food Webs and Chains, Characteristics of Populations, Graphing Populations, Population Density, Lessons of the Kaibab, Bird Beaks Simulation, Hunting Populations Simulation, What's your niche, Natural Resource Policy Research, Sampling Methods, Field Studies, Biosecurity in our Community, Ecosystem mapping and Graphing** | |
| **Leadership Alignment:**<br>Students will think creatively to design a graphic organizer to show energy flow and matter and design a skit to show how a food web works<br>Students will collaborate with others in small and large group discussions<br>Students will analyze media and graphs to decipher information and identify trends to answer questions<br>Students will work independently to complete a research projects<br>Students will communicate clearly in their small group sharing of ideas and whole class presentations<br>Students will solve problems and come up with solutions as they look at human impact on natural resources and climate change<br>Students will work on diverse teams during investigations to collect and analyze data<br>Students will access and evaluate as they peer assess projects<br>Students will apply technology effectively as they research policies online<br>Students will use new information to present about a specific natural resource policy or regulation | |
| ***Standards and Competencies*** | |
| **Unit: Populations**<br>*Students will learn a great deal about energy transfer through ecosystems, population interactions, the value of biodiversity, niche systems, abiotic and biotic factors that affect populations, as well as human impact on wildlife populations. Students will also learn from historical events where populations were controlled and what problems arose to understand the cause and effect of changes in population sizes. Students will practice graphing and statistics to solve problems and identify trends.* | |
| **Industry Standards and/or Competencies AFNR** | **Total Learning Hours for Unit: 30** |
| **ESS.01.01.01.a**. Identify sample types and sampling techniques used to collect laboratory and field data.<br>**ESS.01.01.02.a.** Identify methods of statistical analysis commonly used in research (e.g., mean, standard deviation, standard error, error bars, etc.).<br>**ESS.01.01.02.b.** Summarize the purpose of statistical analysis methods commonly used in environmental service systems research and explain examples of their use in practice. | |

**ESS.01.01.02.c.** Utilize data analysis to identify trends in a data sample and assess the confidence that can be drawn from those conclusions.
**ESS.01.02.01.a.** Identify basic laboratory equipment and explain their uses.
**ESS.01.02.01.b.** Demonstrate the proper use and maintenance of basic laboratory equipment.
**ESS.02.01.02.b.** Analyze the specific purpose of government agencies associated with environmental service systems.
**ESS.02.01.02.c.** Evaluate the impact and effectiveness of government agencies (i.e., local, state, and federal) associated with environmental service systems (e.g., regulation of consumption, prevention of damage to natural resources systems, management of ecological interactions, etc.).
**ESS.02.02.03.a.** Examine and summarize the impact that population growth has on environmental service systems.
**ESS.02.02.03.b.** Analyze the correlation between increased population size and the need for regulation of environmental service systems.
**ESS.02.02.03.c.** Predict the impact of future population growth on the regulation of environmental service systems and evaluate how changes made today will impact future regulations.
**ESS.02.03.01.c.** Evaluate the impact of specific historical figures, or organizations, on the perception and regulation of environmental service systems.
**ESS.03.01.01.b.** Differentiate how components of the atmosphere (e.g., weather systems and patterns, structure of the atmosphere, etc.) affect environmental service systems.
**ESS.03.05.01.a.** Research the role that biodiversity plays in environmental service systems and how biodiversity can be measured.
**ESS.03.05.01.b.** Calculate the amount of biodiversity in a given area using an appropriate method (e.g., quadrat assessment, transect measurements, etc.).
**ESS.03.05.01.c.** Evaluate the biodiversity of an area and predict the impact of changing the levels of biodiversity on environmental service systems.
**ESS.03.05.02.a.** Examine and explain the role played by habitats on environmental service systems.
**ESS.03.05.02.b.** Assess the impact of the current rate of habitat loss on environmental service systems.
**ESS.03.05.03.a.** Research and explain how carrying capacities relate to environmental service systems (e.g., waste processing, rate or production of pollution, disease, etc.).
**ESS.03.05.03.b.** Assess and describe the impact of a population exceeding its carrying capacity on environmental service systems.
**ESS.03.05.03.c.** Devise a strategy for monitoring and supporting environmental service systems through management of a species' carrying capacity.
**ESS.05.01.01.a.** Examine the importance and describe applications of surveying and mapping for environmental service systems.
**AS.01.02.04.b.** Research and summarize local wildlife populations, challenges and ecological measures that are being utilized.
**AS.07.02.01.a.** Summarize the importance of biosecurity to the animal industry at multiple levels (e.g., local, state, national, global).
**AS.07.02.01.b.** Analyze procedures at the local, state and national levels to ensure biosecurity of the animal industry.
**AS.07.02.02.a.** Identify and describe zoonotic diseases including their historical significance and potential future implications.
**AS.07.02.02.b.** Analyze the health risk of different zoonotic diseases to humans and identify prevention methods.
**AS.08.02.01.a.** Research and summarize environmental conditions that impact animals (e.g., weather, sources of water, food resources, etc.).
**NRS.01.01.02.c.** Conduct analyses of ecosystems and document the interactions of living species and non-living resources.
**NRS.01.06.01.a.** Differentiate between population ecology, population density and population dispersion and describe the importance of these concepts to natural resource systems.
**NRS.01.06.01.b.** Analyze the factors that influence population density and population dispersion in natural resource systems.
**NRS.01.06.01.c.** Create a management plan for a population of a species in an ecosystem given its population ecology, population density and population dispersion in natural resource systems.
**NRS.02.03.02.a.** Research and assess how historical figures played a prominent role in shaping how natural resources are viewed and used today (e.g., Aldo Leopold, Teddy Roosevelt, John Muir, Rachel Carson, Gaylord Nelson, etc.).

| ***Aligned Washington State Learning Standards*** | |
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| **Arts** | |
| **Computer Science** | |
| **Educational Technology** | |
| **English Language Arts** | *Reading Grades 11-12*<br>7. Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.<br><br>*Speaking and Listening Grades 11-12*<br>4. Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.<br>*Writing Grade 11-12* |

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| | 4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.<br>5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.<br><br>**Range of Reading and Level of Text Complexity:**<br>CCSS.ELA-LITERACY.RST.9-10.10<br>By the end of grade 10, read and comprehend science/technical texts in the grades 9-10 text complexity band independently and proficiently. |
| **Environment & Sustainability** | |
| **Financial Education** | |
| **Health and Physical Education** | |
| **Mathematics** | S-ID 1 Represent data with plots on the real number line (dot plots, histograms, and box plots)<br>S-ID 7 Interpret the slope and the intercept of a linear model in the context of the data<br>S-IC 4 Use data from a sample survey to estimate a population mean<br>S-MD 6 Use probabilities to make fair decisions |
| **Science** | HS-LS204 Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem<br>HS-LS2-1 Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales<br>HS-LS2-2 Use mathematical representation to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales<br>HS-LS2-6 Evaluate 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<br>HS-LS2-7 Design, evaluate and refine a solution for reducing the impacts of human activities on the environment and biodiversity<br>HS-LS4-6 Create or revise a simulation to test a solution to mitigate adverse impacts on human activity on biodiversity |
| **Social Studies** | |

| **COMPONENTS AND ASSESSMENTS** |
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| **Performance Assessments: Chromosome Study, DNA Model, RNA Diagram, RNA to DNA and Comparison, Gene to Protein, Dihybrid Crosses, Genetic Crosses with 2 Traits, Natural and Artificial Breeding, Chromosome Disorders, Mitosis vs. Meiosis,** |
| **Leadership Alignment:**<br>Students will think creatively to design a variety of fish to view outcomes and probability in crossing dominant and recessive traits<br>Students will collaborate with others in small and large group discussions<br>Students will work independently to complete models of DNA and a RNA diagram for comparison<br>Students will communicate clearly in their small group sharing of ideas and whole class presentations<br>Students will solve problems and determine probabilities of offspring from genetic crosses with single and double traits as well as sex linked traits<br>Students will access and evaluate as they peer assess projects<br>Students will use new information to present about genetics to identify chromosome disorders and compare and contrast mitosis and meiosis |

| ***Standards and Competencies*** | |
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| **Unit: Genetics**<br>*Students not only learn the importance of proteins and nucleic acids but they learn the structure and function of RNA and DNA, review familiar organelles learned in 9th grade (nucleus, ribosomes etc.)and learn more about their involvement in replicating genetic material. They also learn about heredity, how to calculate probability of outcomes based on single and double trait crosses, and how to select for optimal traits when breeding for a purpose.* | |
| **Industry Standards and/or Competencies AFNR** | **Total Learning Hours for Unit: 25** |
| **ESS.01.02.01.a.** Identify basic laboratory equipment and explain their uses.<br>**ESS.01.02.01.b.** Demonstrate the proper use and maintenance of basic laboratory equipment.<br>**AS.04.02.01.a.** Summarize genetic inheritance in animals.<br>**AS.04.02.01.b.** Compare and contrast the use of genetically superior animals in the production of animals and animal products.<br>**AS.04.02.01.c.** Select and evaluate a breeding system based on the principles of genetics.<br>**AS.04.02.02.a.** Identify and summarize inheritance and terms related to inheritance in animal breeding (e.g., dominate, co-dominate, recessive, homozygous, heterozygous, etc.).<br>**AS.04.02.02.b.** Demonstrate how to determine probability trait inheritance in animals.<br>**AS.04.02.02.c.** Select and evaluate breeding animals and determine the probability of a given trait in their offspring.<br>**AS.04.03.01.a.** Identify and categorize natural and artificial breeding methods (e.g., natural breeding, artificial insemination, estrous synchronization, flushing, cloning, etc.).<br>**AS.06.02.02.a.** Examine the basic functions of animal cells in animal growth and reproduction.<br>**AS.06.02.02.b.** Analyze the processes of meiosis and mitosis in animal growth, development, health and reproduction.<br>**PS.02.02.01.b.** Compare and contrast mitosis and meiosis. | |
| ***Aligned Washington State Learning Standards*** | |
| **Arts** | |
| **Computer Science** | |
| **Educational Technology** | |
| **English Language Arts** | *Reading Grades 11-12*<br>7. Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.<br><br>*Speaking and Listening Grades 11-12*<br>4. Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.<br>*Writing Grade 11-12*<br>4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.<br>5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.<br><br>**Range of Reading and Level of Text Complexity:**<br>CCSS.ELA-LITERACY.RST.9-10.10<br>By the end of grade 10, read and comprehend science/technical texts in the grades 9-10 text complexity band independently and proficiently. |
| **Environment & Sustainability** | |
| **Financial Education** | |

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| **Health and Physical Education** | |
| **Mathematics** | S-MD 6 Use probabilities to make fair decisions |
| **Science** | HS-LS3-1 Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.<br>LS3-2 Make and defend a claim based on evidence that inheritable genetic variations may result from 1 new genetic combination through meiosis, 2 viable errors occurring during replication and/or 3 mutations caused by environmental factors<br>LS3-3 Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population |
| **Social Studies** | |

**COMPONENTS AND ASSESSMENTS**

**Performance Assessments: Taxonomy and Classification Practice, Dichotomous Keys, Unity and Diversity, Homology vs Analogy, Cladogram Analysis, Evidence for Evolution, Who Will Survive, Exploring Change, Fossil Record, Radiometric Dating, Morphed, Human Impact on Extinction,**

**Leadership Alignment:**
Students will collaborate with others in small and large group discussions and work in teams to practice dichotomous key classification
Students will analyze media and graphs to decipher information and identify trends to answer questions about common ancestry
Students will work independently to complete a research projects
Students will communicate clearly in their small group sharing of ideas and whole class presentations
Students will solve problems and come up with solutions as they look at human impact on extinction
Students will work on diverse teams to analyze data to find 3 pieces of evidence that support evolution of species over time
Students will access and evaluate as they peer assess projects
Students will use new information to determine the relative age of rocks to date fossils by means of radioactive dating

***Standards and Competencies***

**Unit: Natural Selection and Evolution**
Students will learn about natural selection as a mechanism of evolution and how scientists classify and organize living organisms and name them my means of binomial nomenclature. Students will learn to compare common anatomy and determine differences among species. They will also be able to explain 3 examples of evidence for evolution. They will learn dating techniques, comparative structures and DNA, and see examples of what scientists infer about what species once were based on strong evidence from the fossils of the organisms and the potential land/sea that it once inhabited.

**Industry Standards and/or Competencies AFNR** | **Total Learning Hours for Unit: 25**

**AS.01.01.01.b.** Evaluate and describe characteristics of animals that developed in response to the animal's environment and led to their domestication.
**AS.01.01.01.c.** Evaluate the implications of animal adaptations on production practices and the environment.
**AS.06.01.01.a.** Explain the importance of the binomial nomenclature system for classifying animals.
**AS.06.01.01.b.** Explain how animals are classified using a taxonomic classification system.
**NRS.01.01.03.a.** Summarize and classify different kinds of living species based on evolutionary traits.
**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.02.02.02.a.** Categorize the primary causes of extinction of living species due to human activity (e.g., overharvesting, habitat loss, invasive species, pollution, etc.).
**NRS.02.02.02.b.** Assess causes of extinction and describe how those causes related to loss of biodiversity.

***Aligned Washington State Learning Standards***

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| **Arts** | |
| **Computer Science** | |
| **Educational Technology** | |
| **English Language Arts** | *Reading Grades 11-12* |

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| | 7. Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.<br><br>*Speaking and Listening Grades 11-12*<br>4. Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.<br>*Writing Grade 11-12*<br>4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.<br>5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.<br><br>**Range of Reading and Level of Text Complexity:**<br>CCSS.ELA-LITERACY.RST.9-10.10<br>By the end of grade 10, read and comprehend science/technical texts in the grades 9-10 text complexity band independently and proficiently. |
| **Environment & Sustainability** | |
| **Financial Education** | |
| **Health and Physical Education** | |
| **Mathematics** | |
| **Science** | HS-LS4-1 Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence<br>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<br>HS-LS4-3 Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait trend to increase in proportion to organisms lacking this trait.<br>HSLS4-4 Construct an explanation based on evidence for how natural selection leads to adaptation of populations<br>HS-LS4-5 Evaluate the evidence supporting claims that changes in environmental conditions may result in 1) increase in the number of individuals of some species, 2) the emergence of new species over time, 3) the extinction of the other species |
| **Social Studies** | |

| **COMPONENTS AND ASSESSMENTS** |
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| **Performance Assessments: Climate Impact on Natural Resource Research, Sustainability Laws Research and Presentation, Carbon Footprint Reduction, Small Group Problems, Sustainability Debate** |
| **Leadership Alignment:**<br>Students will use new information to review major natural resources in our area and describe one to research climate change impact<br>Students will analyze media to research natural resources and impact climate change has had on them |

Students will work independently to classify and organize sustainability laws and research their effectiveness and purpose
Students will work independently and communicate clearly as they research a sustainability law and present to the class
Students will communicate clearly and solve problems as students discuss solutions to current issue in small groups
Students will think creatively to devise a plan to reduce human impact/carbon footprint
Students will work effectively in diverse teams to debate all sides of a climate change issue (modeled after the Agriculture Issues CDE)

***Standards and Competencies***

**Unit: Human Sustainability**
**Students will look at the impact that climate change has had on**

| **Industry Standards and/or Competencies AFNR** | **Total Learning Hours for Unit: 15** |
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**NRS.01.03.02.b.** Analyze the impact that climate has on natural resources and debate how this impact has changed due to human activity.
**NRS.01.03.02.c.** Assess the primary causes of climate change and design strategies to lessen its impact on natural resource systems.
**NRS.02.02.01.a.** Summarize the relationship between natural resources, ecosystems and human activity.
**NRS.02.02.01.b.** Assess and explain how different kinds of human activity affect the use and availability of natural resources (i.e., agriculture, industry, transportation, etc.).
**NRS.02.02.01.c.** Evaluate how the availability of natural resources can be improved through changes to human activity.
**NRS.02.02.03.a.** Examine and describe the manner in which modern lifestyles are related to the depletion of natural resources.
**NRS.02.02.03.b.** Identify solutions to improve the sustainability of modern lifestyles.

***Aligned Washington State Learning Standards***

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| **Arts** | |
| **Computer Science** | |
| **Educational Technology** | |
| **English Language Arts** | *Reading Grades 11-12*<br>7. Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.<br><br>*Speaking and Listening Grades 11-12*<br>4. Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.<br>*Writing Grade 11-12*<br>4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.<br>5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.<br><br>**Range of Reading and Level of Text Complexity:**<br>CCSS.ELA-LITERACY.RST.9-10.10<br>By the end of grade 10, read and comprehend science/technical texts in the grades 9-10 text complexity band independently and proficiently. |
| **Environment & Sustainability** | |
| **Financial Education** | |

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| **Health and Physical Education** | |
| **Mathematics** | |
| **Science** | HS-ESS3-3 Create a computational simulation to illustrate the relationships among the management of natural resources, the sustainability of human populations, and biodiversity<br>HS-ESS3-4 Evaluate or refine a technological solution that reduces impacts of human activities on natural resources<br>HS Ess3-6 Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified. |
| **Social Studies** | |

| **COMPONENTS AND ASSESSMENTS** | |
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| **Performance Assessments: SAE Record Keeping (record book)** | |
| **Leadership Alignment:**<br>Students will use and manage information as they maintain accurate records of an SAE project.<br>Students will manage goals and time and work independently to maintain their record book (written or electronic).<br>Students will maintain an FFA SAE. | |
| ***Standards and Competencies*** | |
| **Unit: SAE Connection/Record Keeping**<br>*Students create or improve an SAE project and learn how to maintain records using basic accounting skills and forms. Starting to implement AET online record keeping.* | |
| **Industry Standards and/or Competencies AFNR** | **Total Learning Hours for Unit: 10** |
| • **ABS.02.01.01.b.** Evaluate the implementation and appropriateness of accounting systems and procedures used for record keeping in AFNR businesses<br>• **ABS.02.01.01.c.** Select appropriate accounting systems and develop accounting procedures to maintain records for AFNR businesses | |
| ***Aligned Washington State Learning Standards*** | |
| **Arts** | |
| **Computer Science** | |
| **Educational Technology** | 2.a. Students cultivate and manage their digital identity and reputation and are aware of the permanence of their actions in the digital world.<br>2.b. Students engage in positive, safe, legal and ethical behavior when using technology, including social interactions online or when using networked devices.<br>2.d. Students manage their personal data to maintain digital privacy and security and are aware of data-collection technology used to track their navigation online.<br>5.b. Students collect data or identify relevant data sets, use digital tools to analyze them, and represent data in various ways to facilitate problem-solving and decision-making. |

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| **English Language Arts** | *Writing Grade 11-12*<br>4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.)<br>6. Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. |
| **Environment & Sustainability** | |
| **Financial Education** | *Spending and Saving 9.SS*<br>Develop a plan for spending and saving. 1. Use a plan to manage spending and achieve financial goals.<br><br>Develop a system for keeping and using financial records. 3. Investigate checking, savings, and credit card accounts<br><br>*Employment and Income 9.EI*<br>Explore job and career options. 1. Explore a career plan that aligns with personal interests, financial goals, and desired lifestyle. |
| **Health and Physical Education** | |
| **Mathematics** | |
| **Science** | |
| **Social Studies** | |

| ***21st Century Skills*** |
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| Check those that students will demonstrate in this course: |

| LEARNING & INNOVATION | INFORMATION, MEDIA & TECHNOLOGY SKILLS | LIFE & CAREER SKILLS |
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| **Creativity and Innovation**<br>☒Think Creatively<br>☒Work Creatively with Others<br>☐Implement Innovations<br><br>**Critical Thinking and Problem Solving**<br>☐Reason Effectively<br>☐**U**se Systems Thinking<br>☒Make Judgments and Decisions<br>☒Solve Problems<br><br>**Communication and Collaboration**<br>☒Communicate Clearly<br>☒Collaborate with Others | **Information Literacy**<br>☒Access and /evaluate Information<br>☒Use and Manage Information<br><br>**Media Literacy**<br>☒Analyze Media<br>☐Create Media Products<br><br>**Information, Communications and Technology (ICT Literacy)**<br>☒Apply Technology Effectively | **Flexibility and Adaptability**<br>☐Adapt to Change<br>☐Be Flexible<br><br>**Initiative and Self-Direction**<br>☐Manage Goals and Time<br>☒Work Independently<br>☐Be Self-Directed Learners<br><br>**Social and Cross-Cultural**<br>☒Interact Effectively with Others<br>☒Work Effectively in Diverse Teams<br><br>**Productivity and Accountability**<br>☐Manage Projects<br>☒Produce Results<br><br>**Leadership and Responsibility**<br>☐Guide and Lead Others<br>☒Be Responsible to Others |