

Statewide Framework Document for: 010308

Agroecology and Sustainability

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 of life science 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: Agroecology and Sustainability		Total Framework Hours: 180
CIP Code: 010308	<input checked="" type="checkbox"/> Exploratory <input type="checkbox"/> Preparatory	Date Last Modified: December 30, 2020
Career Cluster: Agriculture, Food and Natural Resources		Cluster Pathway: Natural Resources Systems
<p>Course Summary:</p> <p>Agroecology and Sustainability focuses on agricultural principles and practices that, over the long term, enhance environmental quality, make efficient use of nonrenewable resources, integrate natural biological cycles and controls, and are economically viable and socially responsible; and that may prepare individuals to apply this knowledge to the solution of agricultural and environmental problems. Includes instruction in principles of agroecology, crop and soil sciences, entomology, horticulture, animal science, weed science and management, soil fertility and nutrient cycling, applied ecology, agricultural economics, and rangeland ecology and watershed management</p> <p>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.</p> <p>SAE.01. This course will include instruction in and Student involvement in Supervised Agriculture Experience Projects (SAE).</p>		
Eligible for Equivalent Credit in: Science		Total Number of Units: 9

Unit 1: Career Exploration, Opportunities, and Readiness		Total Learning Hours for Unit: 10
<p>Performance Assessments: (Districts to complete for each unit)</p> <p><i>Example assessments for this unit include:</i></p> <ul style="list-style-type: none"> • Interview a community member working in local agriculture and/or the broader food system and report findings with a presentation. • Participate in a food system simulation exercise --“Community Build” -- to explore roles and influencing factors in the food system. • Record notes and reflections from a panel discussion of area employers. • Participate in a mock job interview. • Produce a well-written cover letter, job application, and follow-up letter. • Research potential career pathways, identifying requirements, pay scale, and job sustainability. • Record notes and reflections related to information presented in class regarding the importance of plants. • Develop a Supervised Agricultural Experience (SAE) implementation plan. 		
<p>Leadership Alignment: (Districts to complete for each unit)</p> <p><i>Leadership alignment must include a unit specific project/activity that aligns with the 21st Century Leadership Skills.</i></p> <p><i>Example:</i></p> <ul style="list-style-type: none"> • Students access information and make decisions about their futures as they consider potential career choices through research and career panels. • Through participation in the food system simulation exercise and food system worker interviews, students will engage analytical and systems thinking and demonstrate their understanding of complex interrelated systems with presentations to their peers. 		
<p>Industry Standards and/or Competencies:</p> <p>Agriculture, Food, and Natural Resources (AFNR) Standards -</p> <p>CRP.10. Plan education and career path aligned to personal goals.</p> <p>CS.05. Describe career opportunities and means to achieve those opportunities in each of the Agriculture, Food & Natural Resources career pathways.</p> <p>CS.05.01.03.a. Research and summarize specific tools (e.g., resumes, portfolios, cover letters, etc.) and processes (e.g., interviews, applications, etc.) needed to pursue a career in an AFNR pathway.</p> <p>CS.03.01. Performance Indicator: Communication: Demonstrate oral, written and verbal skills.</p> <p>CS.03.01.01.b. Select the appropriate form of technical and business writing or communication for a specific situation.</p> <p>CS.03.01.02.b. Prepare a resume.</p>		
Aligned Washington State Academic Standards		
Science	<p>HS-ESS2-2. Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems.</p> <p>HS-ESS2-6. Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.</p>	
Science and Engineering Practice	Disciplinary Core Idea	Crosscutting Concept

Unit 2: Ecological Relationships, Management, Conservation and Health		Total Learning Hours for Unit: 20
<p>Performance Assessments: (Districts to complete for each unit)</p> <p><i>Example assessments for this unit include:</i></p> <ul style="list-style-type: none"> • Define agroecology • Discuss agroecosystems and compare production, productivity, resilience, stability, reliance on human input, and sustainability, comparing natural ecosystems, and sustainable and conventional agroecosystems. • Determine locally available and renewable resources, alpha diversity, • Evaluate systems for productivity, stability, sustainability and equitability • Investigate management options of pests, diseases, and weeds • Discuss the integration of livestock into a system • Determine ways to conserve soil, water, energy, genetic resources, and capital through on-farm choices. • Determine farming practices that will reduce or eliminate environmental pollution with nitrates, toxic gases, or other materials generated by burning or overloading agroecosystems with nutrients • Review and determine ways to minimize or eliminate materials that have potential to harm the environment or the health of farmers, farm workers, and consumers. • Assess and value the overall health of an agroecosystem including human health, cultural health, environmental health, and animal and plant health 		
<p>Leadership Alignment: (Districts to complete for each unit)</p> <p><i>Leadership alignment must include a unit specific project/activity that aligns with the 21st Century Leadership Skills.</i></p> <p><i>Example:</i></p> <ul style="list-style-type: none"> • Students access and evaluate information and use and manage information, reason effectively, and make judgements and decisions while evaluating ecological relationships and systems, and determining best management practices. 		
<p>Industry Standards and/or Competencies:</p> <p>CRP.10. Plan education and career path aligned to personal goals.</p> <p>CS.05. Describe career opportunities and means to achieve those opportunities in each of the Agriculture, Food & Natural Resources career pathways.</p> <p>CS.05.01.03.a. Research and summarize specific tools (e.g., resumes, portfolios, cover letters, etc.) and processes (e.g., interviews, applications, etc.) needed to pursue a career in an AFNR pathway.</p> <p>CS.03.01. Performance Indicator: Communication: Demonstrate oral, written and verbal skills.</p> <p>Level II: CS.03.01.01.b. Select the appropriate form of technical and business writing or communication for a specific situation.</p> <p>Level II: CS.03.01.02.b. Prepare a resume.</p>		
Aligned Washington State Academic Standards		
Science	<p>Washington Science Standards (Next Generation Science Standards):</p> <p>HS-ESS2-2. Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems.</p> <p>HS-ESS2-6. Develop a quantitative model to describe the cycling of carbon among the hydrosphere,</p>	

	atmosphere, geosphere, and biosphere	
Science and Engineering Practice	Disciplinary Core Idea	Crosscutting Concept

Unit 3: The Living Soil	Total Learning Hours for Unit: 25
<p>Performance Assessments: (Districts to complete for each unit)</p> <p><i>Example assessments for this unit include:</i></p> <ul style="list-style-type: none"> • Conduct tests to determine soil texture using sense of touch, ribbon tests, and soil jars. • Examine a soil sample to determine what kinds of microorganisms are present. • Test soil permeability through "Soil Races" activity to understand the relationship between soil particle size and rate of water filtration. Students will write sample lab report to record results and draw conclusions (assessed through lab report rubric and conclusion rubric) • Conduct an experiment providing evidence for the role of organic matter related to water holding capacity of the soil through "Soil Races" activity. • Identify components commonly used in potting media through mixing own potting soil for plant production. • Learn and demonstrate ability to make simple compost piles and know benefits of composting for the soil. • Conduct a soil test to analyze nutrients, including Cation Exchange Capacity (CEC), pH, and organic matter content. • Participate in general formative assessments and summative assessments (quizzes/tests) utilized to assess student knowledge • Students will expand understanding of nutrient cycling and composting through a plant growth comparison experiment utilizing various soil structures, compost mediums, soil, and locally available bio solids • Students will compare the roles of biotic and abiotic soil components and how they interact to create structure, tilth, and hold/release nutrients 	
<p>Leadership Alignment: (Districts to complete for each unit)</p> <p><i>Leadership alignment must include a unit specific project/activity that aligns with the 21st Century Leadership Skills.</i></p> <p><i>Example:</i></p> <ul style="list-style-type: none"> • Students evaluate information based on soil test data. • Students solve problems and produce results by using learned information to construct an effective compost system. • Students work creatively with others, collaborate with others, and interact effectively with others to conduct soil tests. 	
<p>Industry Standards and/or Competencies:</p> <p>PS.01.02. Prepare and manage growing media for use in plant systems.</p> <p>PS.01.02.01.a. Identify the major components of growing media and describe how growing media support plant growth.</p> <p>PS.01.02.01.b. Describe the physical and chemical characteristics of growing media and explain the influence they have on plant growth.</p> <p>PS.01.02.02.a. Identify the categories of soil water.</p> <p>PS.01.02.02.b. Discuss how soil drainage and water holding capacity can be improved.</p> <p>PS.01.03. Develop and implement a fertilization plan for specific plants or crops.</p> <p>PS.01.03.01.a. Identify the essential nutrients for plant growth and development and their major functions (e.g., nitrogen, phosphorous, potassium, etc.)</p> <p>PS.01.03.02.a. Discuss the influence of pH and cation exchange capacity on the availability of nutrients.</p>	

PS.01.03.03.a. Collect soil and plant tissue samples using generally accepted procedures and explain how incorrect sample collection will affect the results of a laboratory analysis.

PS.01.03.05.a. Research and summarize production methods focused on soil management (e.g., crop rotation, companion planting, cover crops, etc.).

PS.03.02. Develop and implement a plant management plan for crop production.

PS.03.02.02.a. Explain the reasons for preparing growing media before planting.

PS.03.02.02.b. Prepare soil for planting with the addition of amendments.

Aligned Washington State Academic Standards

Science	HS-ESS2-2. Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth 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.	
	HS-ESS3-4. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.	
	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-ETS1-1. 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 4: Anatomy and Physiology

Total Learning Hours for Unit: 25

Performance Assessments: (Districts to complete for each unit)

Example assessments for this unit include:

- Identify the four major parts of plant structure, describe the function of the major plant parts, examine a root structure and sketch representations of the structural form for a root through drawing and written summaries.
- Identify differences between monocotyledon and dicotyledon features through art-based assignments.
- Identify the structures of seeds and plant embryos.
- Identify the characteristics of simple and compound leaves through drawing and field identification
- Explain the process plants use to produce and store food, explain why leaves are important to plants, identify the parts of a flower and explain the function for each part through lab and student drawing assignments

- Construct a model representing the parts/functions of a flower.
- Demonstrate overall understanding of anatomy/physiology through teaching elementary aged students about plant science.
- Students will utilize the growth comparison lab to compare the root structures, leaf, flower, and fruit growth of plants in soils medium.

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 use systems thinking and analyze how parts of a whole interact with each other through constructing a model of a plant and describing its functions.
- Students communicate clearly and collaborate with others as they teach fellow students about plants' processes of food production.
- Students make decisions when identifying plants by effectively analyzing plant characteristics.

Industry Standards and/or Competencies:

Agriculture, Food, and Natural Resources (AFNR) Standards

PS.01.02. Apply knowledge of plant anatomy and the functions of plant structures to activities associated with plant systems.

PS.01.02.02.a. Identify the components, the types and the functions of plant roots.

PS.01.02.02.c. Relate the active and passive transport of minerals into and through the root system to plant nutrition.

PS.01.02.03.a. Identify the components and the functions of plant stems.

PS.01.02.04.a. Discuss leaf morphology and the functions of leaves.

PS.01.02.04.b. Explain how leaves capture light energy and allow for the exchange of gases.

PS.01.02.04.c. Explain the relationships between leaf structure and functions and plant management practices.

PS.01.02.05.a. Identify the components of a flower, the functions of a flower and the functions of flower components.

PS.01.02.05.b. Identify the different types of flowers and flower forms.

PS.01.02.05.c. Apply the knowledge of flower structures to plant breeding, production and use.

PS.01.03. Apply knowledge of plant physiology and energy conversion to plant systems.

PS.01.03.01.a. Explain the basic process of photosynthesis and its importance to life on Earth.

PS.01.03.01.b. Explain requirements necessary for photosynthesis to occur and identify the products and byproducts of photosynthesis.

PS.01.03.02.a. Explain cellular respiration and its importance to plant life.

PS.01.03.02.b. Explain factors that affect cellular respiration and identify the products and byproducts of cellular respiration.

Aligned Washington State Academic Standards

Science

HS-LS1-4. Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.

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-LS2-5. 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-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.	
Science and Engineering Practice	Disciplinary Core Idea	Crosscutting Concept

Unit 5: Plant Production	Total Learning Hours for Unit: 25
<p>Performance Assessments: (Districts to complete for each unit)</p> <p><i>Example assessments for this unit include:</i></p> <ul style="list-style-type: none"> • Dissect a complete flower and identify the individual parts. • Conduct a lab related to issues involving seed dispersal including relationship between plants and animals in this process • Identify the different stages of mitosis in plant root cells. • Participate in presentations, seminars, and written summaries to understand genetic inheritance in order to learn about the role genetics plays in plant production. • Learn and then teach basic plant sexual reproduction including flower anatomy, role of pollinators, and seed dispersal. Demonstrate how to perform common asexual propagation methods, such as grafting, budding, layering, division, and cuttings properly through interactive workshop, • Compare and contrast different asexual propagation methods. • Decide the most appropriate method of asexual reproduction for different types of plant material. • Define, compare and contrast various seed types including hybrid, GMO, heirloom, F1, organic, and conventional. • Explore current bee crisis through movie and discussion. • Discuss the use of integrated pest management and beneficial insects as management tools 	
<p>Leadership Alignment: (Districts to complete for each unit)</p> <p><i>Leadership alignment must include a unit specific project/activity that aligns with the 21st Century Leadership Skills.</i></p> <p><i>Example:</i></p> <ul style="list-style-type: none"> • Students evaluate information critically and competently as they compare and contrast various reproduction strategies of plants. • Students interact effectively with others in seminars, and will manage goals and time while discussing genetic inheritance and GMOs. • Students reason effectively and use and manage information to conduct seed dispersal lab. • Students understand global issues relating to the bee crisis. • Through making judgments and decisions students identify the most appropriate method of asexual reproduction for different types of plant material. • Students communicate clearly and collaborate with others as they teach elementary aged students about basic plant sexual reproduction and flower anatomy. 	
<p>Industry Standards and/or Competencies:</p> <p>Agriculture, Food, and Natural Resources (AFNR) Standards</p>	

PS.01.02. Apply knowledge of plant anatomy and the functions of plant structures to activities associated with plant systems.

PS.01.02.01.b. Compare and contrast mitosis and meiosis.

PS.01.02.05.a. Identify the components of a flower, the functions of a flower and the functions of flower components.

PS.01.02.05.c. Apply the knowledge of flower structures to plant breeding, production and use.

PS.01.02.06.a. Explain the functions and components of seeds and fruit.

PS.01.02.06.b. Identify the major types of fruit.

PS.01.02.06.c. Apply the knowledge of seed and fruit structures to plant culture and use.

PS.03.01. Demonstrate plant propagation techniques.

PS.03.01.01.a. Explain pollination, cross-pollination and self-pollination of flowering plants.

Aligned Washington State Academic Standards

Science	Washington Science Standards (Next Generation Science Standards): HS-LS1-4. Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms. HS-LS2-8. Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce. 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 6: Food Webs and Energy Cycles	Total Learning Hours for Unit: 25
<p>Performance Assessments: (Districts to complete for each unit)</p> <p><i>Example assessments for this unit include:</i></p> <ul style="list-style-type: none"> • Learn about the food web by participating in a workshop about composting where they are introduced to concepts of bio-herd, decomposition, and nutrient cycling. • Explore the importance of Nitrogen (N), Phosphorous (P), and Potassium K for soil health, causes of nutrient deficiencies, and effect of deficiencies on plant health through potting soil workshop. • Watch videos and engage with an interactive presentation to explore carbon & nitrogen cycles. • Demonstrate their understanding of the carbon cycle by creating a diagram using materials from the farm. • Students demonstrate their understanding of the nitrogen cycle by identifying places on the farm (through a scavenger hunt activity) where nitrogen cycles through; where nitrogen might leach from the soil, or enter the environment, and by explaining what environmental impacts effect the level of nitrogen in the soil. • Students demonstrate their learning of both cycles by teaching the content to younger children during field trips. 	

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 manage projects and be responsible to others and communicate clearly while leading groups of elementary children through workshops on composting.
- Students communicate clearly and collaborate with others as they teach younger students about the carbon and nitrogen cycles and food webs.
- Students access and evaluate information by participating in class activities such as watching videos and interactive presentations.

Industry Standards and/or Competencies:

Agriculture, Food, and Natural Resources (AFNR) Standards

PS.02.03. Performance Indicator: Apply knowledge of plant physiology and energy conversion to plant systems.

PS.01.01. Performance Indicator: Determine the influence of environmental factors on plant growth.

PS.01.03. Performance Indicator: Develop and implement a fertilization plan for specific plants or crops.

PS.01.03.01.a. Identify the essential nutrients for plant growth and development and their major functions (e.g., nitrogen, phosphorous, potassium, etc.).

PS.01.03.01.b. Analyze the effects of nutrient deficiencies and symptoms and recognize environmental causes of nutrient deficiencies.

PS.01.03.06.a. Summarize the impact of environmental factors on nutrient availability (e.g., moisture, temperature, pH, etc.).

PS.01.03.06.b. Assess and describe the impact environmental factors have on a crop.

CS.06. Analyze the interaction among AFNR systems in the production, processing and management of food, fiber and fuel and the sustainable use of natural resources.

CS.06.01.01.a. Research and explain the foundational cycles in AFNR (e.g., water cycle, nutrient cycle, carbon cycle, etc.)

CS.06.01.01.c. Teach others about the impact of foundational cycles within AFNR systems.

ESS.04. Demonstrate the operation of environmental service systems (e.g., pollution control, water treatment, wastewater treatment, solid waste management and energy conservation).

ESS.04.02.03.a. Research and summarize the benefits and processes of composting.

Aligned Washington State Academic Standards

Science	HS-LS1-5. Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.		
	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-LS2-5. Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.		
Science and Engineering Practice		Disciplinary Core Idea	Crosscutting Concept

Unit 7: Working with Nature

Total Learning Hours for Unit: 20

Performance Assessments: (Districts to complete for each unit)

Example assessments for this unit include:

- Conduct lab related to common plant diseases and summarize the similarities and the differences among disease-causing agents.
- Monitor specific crops to develop an understanding of plant disease, its causes, and means of prevention and control.
- Conduct an experiment to determine the effects of greenhouse coverings on temperature.
- Research irrigation methods and compare each method to understand function and purpose.
- Use multi-media resources including "Lexicon of Food" to study major sustainable agriculture topics including seeds, CSA, local vs. organic, monoculture vs. polyculture, and permaculture.
- Review content through Jeopardy-style game reviewing major organic methods of disease and pest control (proper spacing, crop rotation, row cover, healthy soil, beneficial insects)
- Research sustainable pest prevention and control methods and debate pros and cons.
- Students will understand various composting systems including vermiculture, black soldier flies, 3 bin systems, and mycorrhizal inoculation
- Students will articulate the human impacts with nutrient cycling and closed system farming
- Students will explain the effects of crop rotations, cover crops, and animal grazing and manure cycling on nutrient cycling, nutrient management, and pest and disease control.

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:

- Through group discussions and debates, students think creatively and communicate clearly to understand the meanings and values that others discuss and to participate effectively.
- Students reason effectively to develop an understanding of plant diseases, process information, and conduct experiments
- Students make judgments and decisions as they effectively analyze and evaluate evidence, arguments, claims and beliefs in preparing to debate various pest control methods.
- Students solve problems by identifying and asking significant questions that clarify various points of view and lead to better solutions.
- Through conducting labs students analyze and evaluate results and reflect critically on outcomes and data collected.
- Through research assignments, students access and evaluate information accurately, and critically to form opinions about sustainable pest prevention and control methods.

Industry Standards and/or Competencies:

Agriculture, Food, and Natural Resources (AFNR) Standards

PS.03.02. Performance Indicator: Develop and implement a plant management plan for crop production.

PS.03.02.01.a. Explain the importance of starting with pest- and disease-free propagation material.

PS.03.03. Performance Indicator: Develop and implement a plan for integrated pest management.

PS.03.03.01.a. Identify types of plant pests and disorders.

PS.03.03.01.b. Identify major local weeds, insect pests and infectious and noninfectious plant diseases.

PS.03.03.02.a. Describe damage caused by plant pests and diseases.

PS.03.03.03.a. Describe pest control strategies associated with integrated pest management.

- PS.03.03.03.b. Describe types of pesticide controls and formulations.
- PS.03.03.04.a. Explain risks and benefits associated with the materials and methods used in plant pest management.
- PS.03.03.04.c. Evaluate environmental and consumer concerns regarding pest management strategies.
- PS.03.04. Apply principles and practices of sustainable agriculture to plant production.
- PS.03.04.01.a. Compare and contrast the alignment of different production systems (conventional and organic) with USDA sustainable practices criteria.
- PS.03.04.02.a. Summarize national/international and local/regional food production systems.
- PS.03.04.03.a. Identify and summarize impacts of environmental conditions on plants.
- PS.03.04.02.b. Compare and contrast the impact on greenhouse gas, carbon footprint of the national/international production system with local/regional production system markets.
- PS.03.01.05.b. Give examples of the risks and advantages associated with genetically modified plants.

Agriculture, Food, and Natural Resources Cluster Skill Content Standards

- CS.04. Demonstrate stewardship of natural resources in AFNR activities.
- CS.04.01. Identify and implement practices to steward natural resources in different AFNR systems.
- CS.04.01.02.a. Read and interpret the definition of sustainability and summarize how it relates to AFNR activities.
- CS.04.01.02.b. Analyze and assess sustainability practices that can be applied in AFNR systems (e.g., energy efficiency, recycle/reuse/repurpose, green resources, etc.).
- CS.04.01.01.c. Devise strategies for stewarding natural resources at home and within community.

Aligned Washington State Academic Standards		
Science	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-ESS3-2. Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources.	
	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 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

Performance Assessments: (Districts to complete for each unit)

Example assessments for this unit include:

- Apply their learning to a farm or garden and grow food for the community (food bank, cafeteria, social service agency).
- Successfully meet production goals.
- Solicit feedback from consumers (cafeteria staff, students, CSA members) on quality and presentation of produce.
- Investigate environmental influences on crop production through “farm walks” and observation journals.
- Identify how pests affect crop quality, types of pests responsible for crop predation, and specific symptoms through ‘farm walks’.
- Examine how the rate of water loss is altered by environmental conditions.
- Investigate the interactions between animals and plants to understand the role of photosynthesis in biological systems.
- Collect evidence of the dependence of photosynthesis with light.
- Examine the relationship between the rate of photosynthesis and light spectrum quality.
- Conduct an investigation determining the effects of light intensity on plant growth.
- Calculate a growing schedule for a crop started on the same date, but have three different maturity target dates.
- Design and conduct an experiment to show evidence of the effects for different variations of treatments required for seed germination.
- Review key concepts through Jeopardy-style games where teams answer questions through various methods.
- Students will compare the effects of plant spacing, interplanting, nutrient uptake, and human management on yield per foot.
- Students will learn about GAP certification and food safety and marketing.
- Students will set up a market booth at a local farmers market, community event, or the school for a day.

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 listen effectively to decipher meaning, including knowledge, values, attitudes and intentions by soliciting feedback from consumers.
- Students collaborate with others to assume shared responsibility for collaborative work, and value the individual contributions made by each team member when completing tasks in small groups or as a class.
- Students understand, negotiate and balance diverse views and beliefs to reach workable solutions, particularly in multi-cultural environments.
- Students reason effectively and make decisions when applying their knowledge, examining farm activities, and conducting investigations.
- Through implementing and evaluating the results of work and farm plans, students analyze how part of a whole interact with each other to produce overall outcomes in complex systems.
- Students produce results in a farm setting and meet production goals by working collaboratively.

Industry Standards and/or Competencies:

Agriculture, Food, and Natural Resources (AFNR) Standards

PS.01.01. Classify agricultural plants according to taxonomy systems.

PS.01.01.02.b. Identify agriculturally important plants by common names.

PS.01.02. Apply knowledge of plant anatomy and the functions of plant structures to activities associated with plant systems.

PS.01.02.05.c. Apply the knowledge of flower structures to plant breeding, production and use.

PS.01.03. Apply knowledge of plant physiology and energy conversion to plant systems.

PS.02.01: Determine the influence of environmental factors on plant growth.

PS.02.01.02.b. Determine the optimal air, temperature and water conditions for plant growth.

PS.02.02. Prepare growing media for use in plant systems.

PS.02.03. Develop and implement a fertilization plan for specific plants or crops.

PS.02.03.04.b. Calculate the amount of fertilizer to be applied and to apply the prescribed amount of fertilizer.

PS.03.01. Demonstrate plant propagation techniques.

PS.03.01.02.a. Demonstrate sowing techniques and provide favorable conditions for seed germination.

PS.03.02.: Develop and implement a plant management plan for crop production.

PS.03.02.01.b. Inspect propagation material for evidence of pests or disease.

PS.03.02.02.b. Prepare soil for planting with the addition of amendments.

PS.03.02.04.b. Monitor the progress of plantings and determine the need to adjust environmental conditions.

PS.03.02.05.a. Explain the reasons for controlling plant growth.

PS.03.02.05.b. Demonstrate proper techniques to control and manage plant growth through mechanical, cultural or chemical means.

PS.03.04. Apply principles and practices of sustainable agriculture to plant production.

PS.03.04.01.b. Describe sustainable agriculture practices and compare the ecological effects of traditional agricultural practices with those of sustainable agriculture.

PS.03.04.01.c. Prepare and implement a plan for an agricultural enterprise that involves practices in support of sustainable agriculture.

PS.03.05. Harvest, handle and store crops.

PS.03.05.01.b. Assess the stage of growth to determine crop maturity or salability and demonstrate proper harvesting techniques.

PS.03.05.02.c. Implement plans to reduce crop loss.

Aligned Washington State Academic Standards

Science	HS-LS1-3. Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.		
	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-LS2-5. 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-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

Performance Assessments: (Districts to complete for each unit)

Example assessments for this unit include:

- Explore the role of leadership in agricultural careers through research and discussions.
- Identify what is good communication in both written and verbal form within agricultural careers and develop documentation that allows them to most effectively reach specific audiences for particular purposes.
- Lead groups in various tasks
- Speak in front of class and other groups
- Co-create a community contract outlining group norms
- Give and receive constructive feedback using "Straight Talk" model
- Engage in and debrief team-building activities
- Demonstrate personal responsibility through timeliness and follow-through.
- Appreciate and show active respect for cultural diversity.
- Show their understanding of farm knowledge by giving informational farm tours to the public.

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 will interact effectively with others through team-building and group projects.
- Students will work effectively in diverse teams through practice of non-violent and collaborative communication and seeking feedback from other students via Straight Talk.
- Students will produce results in a farm setting and meet production goals by working collaboratively.
- Students will demonstrate their ability to manage goals and time while leading groups, and demonstrating timeliness and follow-through.

Industry Standards and/or Competencies:

Agriculture, Food, and Natural Resources (AFNR) Standards

CS.01.03. Performance Indicator: Vision: Establish a clear image of what the future should look like.

CS.01.05. Performance Indicator: Awareness: Desire purposeful understanding related to professional and personal activities.

CS.02.03. Performance Indicator: Professional Growth: Develop awareness and apply skills necessary for achieving career success.

CRP.01. Act as a responsible and contributing citizen and employee.

CRP.01.01.02.b. Assess personal level of responsibility and examine opportunities for improvement.

CRP.01.01.02.c. Model personal responsibility in workplace and community situations.

CRP.04.03. Model active listening strategies when interacting with others in formal and informal settings.

CRP.04.03.01.b. Apply active listening strategies (e.g., be attentive, observe non-verbal cues, ask clarifying questions, etc.).

CRP.04.03.02.c. Model active listening strategies in formal and informal settings.

CRP.09.01. Model characteristics of ethical and effective leaders in the workplace and community (e.g. integrity, self-awareness, self-regulation, etc.).

CRP.09.01.01.a. Identify and summarize the characteristics of ethical and effective leaders in workplace and community settings.

CRP.09.01.02.b. Conduct a self-assessment of personal ethical and effective leadership characteristics (e.g., relates to others, focused, integrity, etc.) and reflect upon the results to identify opportunities for improvement.

CRP.09.01.02.c. Model characteristics and actions of ethical and effective leaders in workplace and community situations (e.g., integrity, self-awareness, etc.).

CRP.12.02. Create and implement strategies to engage team members to work toward team and organizational goals in a variety of workplace and community situations (e.g., meetings, presentations, etc.).

CRP.12.02.01.a. Identify and summarize effective strategies used to engage team members to accomplish goals.

CRP.12.02.02.a. Examine and summarize workplace and community situations where it is important to engage team members to meet team and organizational goals (e.g., meetings, presentations, etc.).

CRP.12.02.01.b. Assess team dynamics and match strategies to increase team member engagement.

CRP.12.02.01.c. Create and implement novel strategies to engage team members based on the situation.

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.	
Science and Engineering Practice	Disciplinary Core Idea	Crosscutting Concept