



This course was developed in 2024 by the Pacific Education Institute (PEI) with funding from Career Connect Washington. Writing participants include CTE teachers representing Ferndale, Onalaska, Pioneer, and Cape Flattery school districts; Chief Leschi Tribal Compact School; The Colville Confederated Tribes; Washington Department of Fish and Wildlife; and Pacific Shellfish Institute. The writing team also included two representatives from OSPI's Office of Native Education and the math equivalency Secondary Science lead. This working document will be periodically updated while working with CTE teachers across Washington to provide local resources and relevant materials and opportunities to engage youth in learning about aquaculture and fisheries.

Introduction to Aquaculture and Fisheries CTE Framework

Course: Introduction to Aquaculture and Fisheries		Total Framework Actual Hours: 180
CIP Code: Requesting new code	<input checked="" type="checkbox"/> Exploratory <input type="checkbox"/> Preparatory	Date Last Modified: 4/16/2024
Career Cluster: Agriculture, Food and Natural Resources		Cluster Pathway: Natural Resources Systems
<p>Course Summary: This course framework introduces the scientific and algebraic principles to aquaculture and fisheries management. The course includes units on safety and well-being, stewardship and sustainability, biology and ecology of aquatic organisms, water quality and animal husbandry, data science and analysis, facility operations and maintenance, marketing, and communication, and career pathways. The course aligns with and can be used in conjunction with the Advanced Aquaculture and Fisheries framework. Students will complete a Supervised Agricultural Experience (SAE) as part of the course. The course is designed to meet requirements for 1.0 credit in lab science or 1.0 credit for Algebra 1.</p>		

Unit Information

Unit 1: Safety and Well-Being	Total Learning Hours for Unit: 10
<p>Unit Summary: This unit will highlight the physical, mental, and teamwork skills necessary to work safely and effectively onsite at a production facility or in the field.</p>	
<p>Competencies:</p> <ol style="list-style-type: none"> 1. Understand the safe and proper use of tools for aquaculture and fisheries practices (including cleaning, maintenance, and storage). 2. Engage in safe facility and field work procedures (ex: pacing, adequate food, water, sleep, and use of personal protective equipment). 	

3. Work on a crew successfully and safely (includes skills in listening, following directions, keeping other crew members safe).
4. Understand and adhere to community partner safety protocols (ex: Chemical safety in a hatchery).
5. Understand basic first aid relevant to working in a facility or in the field (ex: Recognize symptoms of hypothermia, dehydration, heat exhaustion).
6. Understand the preventive measures to avoid slips, trips, and falls.
7. Understand the principles of boater safety.

Components and Assessments

Performance Assessments: *These can be locally developed or use the suggested assessments below.*

Assessments will be formal and informal, written, verbal and practical. Students can:

- Perform facility and field work safely and properly (ex: pacing, adequate food, water, sleep, and use of personal protective equipment).
- Practice safe crew practices (includes skills in listening, following directions, keeping other crew members safe).
- Practice safe and proper hand tool use.
- Adhere to community partner's safety plans and protocols.
- Use results of online research to list preventative measures to avoid slips, trips, and falls.
- Practice first aid skills through role play activities.
- Read a weather report and make safety decisions based on forecast.
- Read a tide chart and make safety decisions based on the information (where applicable)
- Read the Study guide from the Washington Boater Education Safety Course.

Related to Supervised Agricultural Experience (SAE):

- Describe the importance of safety protocols in workplaces.
- Create a list of supplies and personal protective equipment needed to implement the final project.

Leadership Alignment:

- **3.B.3:** Assume shared responsibility for collaborative work, and value the individual contributions made by each team member **by practicing safe crew practices.**
- **4.B.1:** Use information accurately and creatively for the issue or problem at hand **by using information about weather reports, and map reading to navigate and make informed safety decisions.**
- **7.A.1:** Adapt to varied roles, job responsibilities, schedules, and contexts **in the field as a member of the crew.**
- **12.D.2:** Understanding preventive physical and mental health measures, including proper diet, nutrition, exercise, risk avoidance and stress reduction **by performing facility and field work safely and properly (ex: pacing, adequate food, water, sleep, and use of personal protective equipment).**

- **12.D.3:** Using available information to make appropriate health-related decisions **by adhering to community partner's safety plans and protocols.**

Industry Standards and/or Competencies

Name of standards: National Council for Agriculture Education

Website: <https://thecouncil.ffa.org/afnr/>

AFNR Cluster Skills

- CS.03. Examine and summarize the importance of health, safety, and environmental management systems in AFNR workplaces.

Career Ready Practices Strand

- CRP.01.01. Model personal responsibility in the workplace and community.
- CRP.09.03. Demonstrate behaviors that contribute to a positive morale and culture in the workplace and community.

Unit Information

Unit 2: Stewardship and Sustainability

Total Learning Hours for Unit: 20

Unit Summary: This unit will engage students in dialogue about sustainability and stewardship related to humans' roles in ecosystems. Sustainability concepts will be considered from First People's historical and contemporary perspectives on stewardship and sovereignty rights.

Competencies:

1. Understand *tragedy of the commons* through the lens of aquaculture and fisheries (A&F).
2. Understand the range and role of aquatic species in the larger ecosystem to enhance and maintain the environment beyond aquaculture and fisheries (A&F) systems.
3. Understand the cultural, recreational, and commercial value of farmed aquatic species.
4. Recognize the cultural importance of including words and stories from local tribal communities about A&F.
5. Be aware of current stewardship protocols for propagating, harvesting, and sustaining A&F –activities happening in Washington.
6. Recognize the role of tribal sovereignty and co-management in stewardship protocols.

Components and Assessments

Performance Assessments: *These can be locally developed or use the suggested assessments below.*

Assessments will be formal and informal, written, verbal and practical. Students can:

- Identify possible approaches to resolve conflict within 1) an organization and 2) between an organization and external partners and/or agencies.

- Engage in dialogue with peers to create stewardship-based protocols for propagating, harvesting, and sustaining A&F systems.
- Define co-management and cite an example in Washington State.
- Identify egg sharing and permitting policies to be used in A&F systems.
- Research permitting requirements to get, raise, release salmon and/or other farmed aquatic species.
- Study the following Billy Frank, Jr. quote ([quote source](#)) to answer reflection questions:
 - “I don’t believe in magic. I believe in the sun and the stars, the water, the tides, the floods, the owls, the hawks flying, the river running, the wind talking. They’re measurements. They tell us how healthy things are. How healthy we are. Because we and they are the same. That’s what I believe in.”
 - Reflection questions:
 - How can observation identify relationships between elements within natural systems?
 - How can observation identify conditions within a system (ex: Fish health)?
 - What types of measurements could we collect from one “element” described by Billy Frank, Jr.? (ex: sun, stars, tides).
- Know the species name and related story from the local tribal community for what the organism being raised.
- Demonstrate a working knowledge of propagation, harvest, and understanding how to harvest for sustainability.
- Describe how management decisions regarding propagation and/or harvest can impact the natural world both positively and negatively.
- Participate in indigenous A&F practices (ex: Harvesting or management strategies; cultural ceremonies).
- Investigate a local organization that is addressing an A&F-related community issue.

Related to SAE:

- Give examples of ways A&F professionals interact with indigenous communities.
- Include recommendations for integrating culturally responsive practices in final SAE project.

Leadership Alignment:

- **12.E.1:** Demonstrate knowledge and understanding of the environment and the circumstances and conditions affecting it, particularly as relates to air, climate, land, food, energy, water, and ecosystems **by demonstrating a working knowledge of propagation, harvest, and understanding how to harvest for sustainability.**
- **12.E.2:** Demonstrate knowledge and understanding of society’s impact on the natural world (e.g., population growth, population development, resource consumption rate, management decision, stewardship actions, etc.) **by demonstrating how management decisions regarding propagation and/or harvest can impact the natural world both positively and negatively.**

Industry Standards and/or Competencies

Name of standards: National Council for Agriculture Education

Website: <https://thecouncil.ffa.org/afnr/>

Agriculture, Food, and Natural Resources Standards: Natural Resources Sciences

- NRS.02.01. Analyze the interrelationships between natural resources and humans.
- NRS.01.02.05. c. Evaluate the non-living resources present in an area to determine the best practices for improving, enhancing and protecting an ecosystem.
- NRS.01 Plan and conduct resource management activities that apply logical, reasoned and scientifically based solutions to natural resource issues and goals.
- NRS.04. Demonstrate responsible management procedures and techniques to protect, maintain, enhance, and improve natural resources.
- NRS.02.01. Examine and interpret the purpose, enforcement, impact and effectiveness of laws and agencies related to natural resource management, protection, enhancement, and improvement (e.g., water regulations, game laws, historic preservation laws, environmental policy, etc.).
- NRS.02.05.01. c. Devise and implement a strategy for communicating a natural resources message through media.
- NRS.02.03.03. b. Analyze and document how some technological advancements changed how natural resources were used and viewed (e.g., Industrial Revolution, fossil fuels, green technology, etc.).

AFNR Cluster Skills

- CS.04.01. Identify and implement practices to steward natural resources in different AFNR systems.
- CS.04.02: Assess and explain the natural resource related trends, technologies, and policies that impact AFNR systems.
- CS.04.01: Identify and implement practices to steward natural resources in different AFNR systems.
- CS.04.02: Assess and explain the natural resource related trends, technologies, and policies that impact AFNR systems.

Career Ready Practices Strand

- CRP.04.02. Produce clear, reasoned, and coherent written and visual communication in formal and informal settings.

Aligned Washington State Learning Standards

<p><u>Mathematics</u></p>	<p>HS.DS.1 Formulate multivariable statistical investigative questions and determine how data can be collected and provide an answer, consider causality and prediction when posing the question.</p> <p>HS.DS.2 Understand the issues of bias and confounding variables when collecting data and their impact on interpretation. Understand practices for collecting and handling data, including sensitive information and concerns for privacy and how that may affect data collection.</p> <p>HS.DS.3 Create and analyze data sets and data displays, including but not limited to scatter plots, regressions, histograms, and boxplots using technology to sort or filter data, summarize, and describe relationships between quantitative variables.</p>
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	<p>HS.DS.4 Acknowledge the presence of missing data values and understand how missing values may add bias to analysis and interpretation. Examine and discuss competing explanations for data trends observed such as confounding variables. Respond to competing arguments or interpretations of the data of different community groups, paying careful attention to what conclusions the data supports.</p> <p>A.CED. A.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.</p>
<p>Science</p>	<p>HS-LS2-7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.</p> <p>HS-ESS3-6. Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.</p> <p>HS-LS2-1. Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.</p> <p>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.</p>

Unit Information

Unit 3: Biology and Ecology of Aquatic Organisms

Total Learning Hours for Unit: 20

Unit Summary: Students will explore the characteristics, habitats, and life cycles of local farmed aquatic species. They will explore methods to observe species anatomy and learn about the roles the species play in ecosystems.

Competencies:

1. Use appropriate terminology to describe anatomical features of at least one aquatic organism.
2. Understand the difference between *native*, *non-native*, and *invasive* aquatic organisms.
3. Understand basic animal taxonomy (Ex: Family, genus, species).
4. Describe the life cycle of farmed species.
5. Apply the binomial naming system for classifying animals, including an understanding of the fish stock concept.
6. Understand the features of a healthy organism and its role in the ecosystem.
7. Describe elements that determine which aquatic species can persist in an ecosystem (ex: Temperature, dissolved oxygen, pH, flow rate, light levels).

Components and Assessments

Performance Assessments:

- Describe the basic anatomy of at least one aquatic organism.
- Use photos and identification keys (including dichotomous keys) to match each species with its common and scientific name.
- Practice using appropriate terminology to describe aquatic organisms.
- Identify at least one aquatic organism in a production facility or ecosystem.
- Identify traits that allow aquatic organisms to adapt and compete for resources (ex: Morphology, growth rates, reproductive cycle).
- In small groups, create a skit, poster, or video illustrating the life cycle of a farmed organism.
- In pairs, perform a species dissection to identify basic anatomy. Sketch and label body parts and match each part to its function.
- Use a mathematical representation (ex: graph) to show the relationship between an organism's habitat requirements and the population of that organism in each system.
- Describe the niches or the roles of specific organisms in the aquatic environment.

Related to SAE:

- Use terminology and scientific names to accurately describe aquatic organisms in presentation.
- List biological and ecological factors that impact a local A&F production facility.
- Research species being managed at a local employer (ex: anatomy, terminology, physical traits).

- Select species to include in final SAE project.
- Describe how species included in SAE project impact biology and ecology of local ecosystems.

Leadership Alignment: *By working in small groups to create a skit, poster, or video illustrating the life cycle of a farmed organism, students will:*

- **1.B:** Work creatively with others.
- **3.A.1:** Articulate thoughts and ideas effectively using oral, written, and nonverbal communication skills in a variety of forms and contexts.
- **3.A.2:** Listen effectively to decipher meaning, including knowledge, values, attitudes, and intentions.
- **3.B.3:** Assume shared responsibility for collaborative work, and value the individual contributions made by each team member.
- **7.B.1:** Incorporate feedback effectively.
- **9.B.2:** Respond open-mindedly to different ideas and values.

Industry Standards and/or Competencies

Name of Standards: National Council for Agriculture Education

Website: <https://thecouncil.ffa.org/afnr/>

Agriculture, Food, and Natural Resources Standards: Natural Resources Sciences

- NRS.01.02. Classify different types of natural resources to enable protection, conservation, enhancement and management in a particular geographical region.
- NRS.01.04. Apply ecological concepts and principles to aquatic natural resource systems.

Aligned Washington State Learning Standards

<p>Mathematics</p>	<p>Relating to understanding of an organism’s habitat requirements and role in the environment:</p> <p>HS.F.LE.A.1 Distinguish between situations that can be modeled with linear functions and with exponential functions.</p> <p>HS.F.LE.B.5 Interpret the parameters in a linear or exponential function in terms of a context.</p>
<p>Science</p>	<p>HS-ESS3-6. Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.</p> <p>HS-LS2-4. Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.</p>

Unit Information

Unit 4: Water Quality and Animal Husbandry

Total Learning Hours for Unit: 20

Unit Summary: Students will explore the variables involved in maintaining acceptable water quality conditions in efficient aquaculture production and good aquatic animal husbandry practices.

Competencies:

1. Understand variables necessary to maintain water quality (ex: Nitrogen cycle, temperature, chlorine, other contaminants, filtration).
2. Understand nutritional needs of aquatic organisms or phytoplankton culture.
3. Recognize the indicators affecting animal welfare, stocking and safe handling (ex: disease, pests, nutritional needs).
4. Demonstrate safe handling and disposal of byproducts.

Components and Assessments

Performance Assessments:

- Handle organisms with correct safety and welfare under direct supervision of instructor.
- Use a water quality test to determine water quality parameters of the aquatic habitat.
- Use the 4 Cs (cool, clear, complex, clean) to describe water quality characteristics.
- Identify ingredients in feed and understand the value of those ingredients to the organism.
- Describe variables that impact quantity and type needed (ex: nutritional needs, growth rates, number of organisms, water system size).
- Calculate quantity of feed needed based on determined factors.
- Follow proper protocol for safe disposal of byproducts.
- Demonstrate proper protocol to euthanize and dispose of dying animals.
- Distinguish between healthy organisms and unhealthy organisms and signs of distress.
- Develop or revise a simulation that shows the impact of a common disease and/or pest on a specific aquatic species.
- Compare multiple shellfish growing methods. Consider the advantages and disadvantages of each method.
- Study the foundational design and functions of an A&F system to minimize environmental impact.

Related to SAE:

- List biotic and abiotic factors that impact a local A&F production facility.
- Research how aquatic organisms at a local facility depend on and may compete for biotic and abiotic resources.
- Select species to include in final project.
- Describe how selected species will impact water quality at a local facility.

Leadership Alignment:

- **2.A.1:** Use various types of reasoning (inductive, deductive, etc.) as appropriate to the situation **by comparing multiple shellfish grow-out methods and considering the advantages and disadvantages of each.**
- **2.B.1:** Analyze how parts of a whole interact with each other to produce overall outcomes in complex systems **by using a water quality test to determine water quality parameters of the aquatic habitat.**
- **2.D.2:** Identify and ask significant questions that clarify various points of view and lead to better solutions **by studying the foundational design and functions of a fishery/aquaculture system to identify those features that minimize its impact on the environment.**

Industry Standards and/or Competencies

Name of standards: National Council for Agriculture Education

Website: <https://thecouncil.ffa.org/afnr/>

Agriculture, Food, and Natural Resources Standards: Natural Resources Sciences

- NRS.03.01: Sustainably produce, harvest, process and use natural resource products (e.g., forest products, wildlife, minerals, fossil fuels, shale oil, alternative energy, recreation, aquatic species, etc.).
- NRS.04.01: Demonstrate natural resource protection, maintenance, enhancement, and improvement techniques.
- NRS.04.02: Diagnose plant and wildlife diseases and follow protocols to prevent their spread.
- NRS.04.03: Prevent or manage introduction of ecologically harmful species in a particular region.

Aligned Washington State Learning Standards

Mathematics

- HS.DS.1: Formulate multivariable statistical investigative questions and determine how data can be collected and provide an answer, consider causality and prediction when posing the question.
- HS.DS.2: Understand the issues of bias and confounding variables when collecting data and their impact on interpretation. Understand practices for collecting and handling data, including sensitive information and concerns for privacy and how that may affect data collection.
- HS.DS.3: Create and analyze data sets and displays, including scatter plots, regressions, histograms, and boxplots using technology to sort or filter data, summarize, and describe relationships between quantitative variables.
- HS.DS.4: Acknowledge the presence of missing data values and understand how missing values may add bias to analysis and interpretation. Examine and discuss competing explanations for data trends observed such as confounding variables. Respond to competing arguments or interpretations of the data of different community groups, paying careful attention to what conclusions the data supports.
- HS.S.ID: A.3 Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).

	HS.S.IC: A.1 Understand statistics as a process for making inferences about population parameters based on a random sample from that population.
<u>Science</u>	<p>HS-ESS3-4: Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.</p> <p>HS-LS2-4: Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.</p> <p>HS-LS2-7: Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.</p> <p>HS-LS4-6: Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.</p>

Unit Information

Unit 5: Data Science and Analysis

Total Learning Hours for Unit: 10

Unit Summary: Students will explore how to quantify physical and anecdotal observations to make comparisons and predictions. Students will learn best practices to collect data, make inferences, and evaluate their findings.

Competencies:

1. Recognize the value difference between *precision* and *accuracy* in accordance with scientific methods.
2. Understand the role of probability in making decisions.
3. Find and test a hypothesis for a problem under study.
4. Determine which data sets are pertinent to study.
5. Collect primary data to analyze and describe functions in A&F systems.
6. Demonstrate ability to interpret data.
7. Demonstrate ability to make inferences and justify conclusions when analyzing data.

Components and Assessments

Performance Assessments:

- Describe the difference between accuracy and precision.
- Evaluate the quality and validity of personally generated and internet sources of data.
- Collect a data set with appropriate accuracy and precision. Example data sets include tracking organismal growth, population survey, population mortality rates, water quality parameters, or accounting for the effect of water weight when assessing the mass of wet specimens or living organisms.
- Organize and manipulate data in a spreadsheet (ex: Sort, table, graph functions).
- Use probabilities to make decisions surrounding care of organisms.
- Accurately complete food check entries.
- Extract and archive data from external sources (ex: Using a public data set, make predictions of weather in an area over a growing season).

Related to SAE:

- Collect data to measure change over time based on a chosen variable.
- Use proper documentation and sourcing for final project.
- Use findings from a model to make recommendations or test a hypothesis within an A&F system.
- Create a presentation that describes data used to predict the impact of one or more variables on an A&F system.
- Utilize gathered data in final report.

Leadership Alignment:

- **2.C.4:** Interpret information and draw conclusions based on the best analysis **by accessing a data set and extract information from it**
- **4.A.1:** Access information efficiently (time) and effectively (sources) **by accurately completing food check entries**
- **4.A.2:** Evaluate information critically and competently **by using probability to make decisions surrounding care of organisms.**
- **4.B.1:** Use information accurately and creatively for the issue or problem at hand **by collecting a data set that tracks organismal growth**
- **4.B.2:** Manage the flow of information from a wide variety of sources **by inputting and analyzing data relevant to the industry's record keeping/admin needs (ex. completion of table, forms)**
- **4.B.3:** Apply a fundamental understanding of the ethical/legal issues surrounding the access and use of information **by recognizing the importance of and the difference between precision and accuracy in data science.**

Industry Standards and/or Competencies

Name of standards: National Council for Agriculture Education

Website: <https://thecouncil.ffa.org/afnr/>

Career Ready Practices Strand

- CRP.07.01. Select and implement reliable research processes and methods to generate data for decision-making in the workplace and community.

- CRP.07.02. Evaluate the validity of sources and data used when considering the adoption of new technologies, practices and ideas in the workplace and community.
- CRP.08.01. Apply reason and logic to evaluate workplace and community situations from multiple perspectives.

Aligned Washington State Learning Standards

Mathematics

- HS.DS.1: Formulate multivariable statistical investigative questions and determine how data can be collected and provide an answer, consider causality and prediction when posing the question.
- HS.DS.2: Understand the issues of bias and confounding variables when collecting data and their impact on interpretation. Understand practices for collecting and handling data, including sensitive information and concerns for privacy and how that may affect data collection.
- HS.DS.3: Create and analyze data sets and displays, including scatter plots, regressions, histograms, and boxplots using technology to sort or filter data, summarize, and describe relationships between quantitative variables.
- HS.DS.4: Acknowledge the presence of missing data values and understand how missing values may add bias to analysis and interpretation. Examine and discuss competing explanations for data trends observed such as confounding variables. Respond to competing arguments or interpretations of the data of different community groups, paying careful attention to what conclusions the data supports.
- HS.S.ID A.3: Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).
- HS.S.IC A.1: Understand statistics as a process for making inferences about population parameters based on a random sample from that population.
- HS.S.IC. B.6: Evaluate reports based on data.
- HS.S.CP. A.1: Describe events as a subset of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not).
- HS.S.CP. A.4: Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities.

Unit Information

Unit 6: Facility and Equipment Operations and Maintenance

Total Learning Hours for Unit: 30

Unit Summary: This unit will explore the operation and maintenance of basic facilities and equipment.

Competencies:

1. Demonstrate proper use of tools and equipment (ex: Pressure washer, weed eater, vehicles).
2. Know how to perform standard routine maintenance (ex: Weed eater check, gas overall maintenance, pre-operation fuel checks).
3. Understand mechanics of a pump system.
4. Identify infrastructure (ex: Wells, pumps, filtration, aeration, generators).
5. Demonstrate basic understanding of electricity concepts (volts, amps, and ohms) as covered by L&I OSHA 10 certifications.

Components and Assessments

Performance Assessments:

- Read safety manuals for equipment (pressure washer, weed eater, blower, mower) and develop a written, oral, and demonstration test from the material.
- Describe the purpose of a Material Safety Data Sheet (MSDS).
- Locate MSDS sheet in the facility.
- Draw a schematic of a pump system.
- Develop a schematic of hatchery infrastructure.
- Describe or present the schematic.
- Develop an electrical schematic to demonstrate understanding of volts, amps, and ohms.

Related to SAE:

- Design an A&F system that utilizes tools, equipment, electricity, and pumps.

Leadership Alignment: *By participating in the operations of a facility, students will:*

- 2.D.1 Solve different kinds of non-familiar problems in both conventional and innovative ways.
- 2.D.2 Identify and ask significant questions that clarify various points of view and lead to better solutions
- 7.A.1 Adapt to varied roles, jobs responsibilities, schedules, and contexts
- 7.A.2 Work effectively in a climate of ambiguity and changing priorities
- 8.B.1 Monitor, define, prioritize, and complete tasks without direct oversight

- 10.B.1 Demonstrate additional attributes associated with producing high quality products including the abilities to:
 - 10.B.1.a Work positively and ethically
 - 10.B.1.b Manage time and projects effectively
 - 10.B.1.c multi-task
 - 10.B.1.d Participate actively, as well as be reliable and punctual
 - 10.B.1.e Present oneself professionally and with proper etiquette
 - 10.B.1.f Collaborate and cooperate effectively with teams
 - 10.B.1.g Respect and appreciate team diversity
 - 10.B.1.h Be accountable for results

Industry Standards and/or Competencies

Name of standards: National Council for Agriculture Education

Website: <https://thecouncil.ffa.org/afnr/>

Cluster Skills

- CS.03.01. Identify and explain the implications of required regulations to maintain and improve safety, health and environmental management systems.
- CS.03.04. Use appropriate protective equipment and demonstrate safe and proper use of AFNR tools and equipment.

Aligned Washington State Learning Standards

Mathematics	<p>Demonstrate understanding of volts, amps, and ohms:</p> <p>HS.A.CED. A. 4: Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.</p>
Science	<p>HS-ESS3-4: Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.</p> <p>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.</p> <p>HS-PS3-5 Develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction.</p>

Unit Information

Unit 7: Communication and Marketing

Total Learning Hours for Unit: 10

Unit Summary: Students practice communicating about facility operations, understand the importance of what (what is appropriate or not) and how best to communicate about A&F operations.

Competencies:

1. Explore the meaning of digital citizenship.
2. Demonstrate ability to describe basic facility's operations to members of the public.
3. Understand the characteristics of a quality product
4. Demonstrate media literacy by identifying media formats to use to promote and communicate.

Components and Assessments

Performance Assessments:

- Identify key components of digital citizenship.
- Prepare a 30-second speech to describe a topic of interest.
- Describe a schematic describing facility operations to a peer, teacher, or community member.
- Provide a written or oral response to the request "Tell me about the program".
- Identify key features that create a quality product using a google slide presentation. Explore basic outreach/communication regarding the A/F industry and how the system resides within a larger ecosystem outside the school.

Related to SAE:

- Develop and host a student-led town hall or presentation for the city council, tribal council or other decision-making body addressing a current A&F local issue or topic.
- Identify culturally relevant species to integrate into the final project.

Leadership Alignment:

- **5.A.1** Understand both how and why media messages are constructed, and for what purposes **by identifying media formats to use to promote and communicate.**
- **5.A.2** Examine how individuals interpret messages differently, how values and points of view are included or excluded, and how media can influence beliefs and behaviors **by exploring the meaning of digital citizenship.**
- **5.A.3** Apply a fundamental understanding of the ethical/legal issues surrounding the access and use of media **by exploring the meaning of digital citizenship.**
- **3.A.1** Articulate thoughts and ideas effectively using oral, written, and nonverbal communication skills in a variety of forms and contexts **by providing a written response to the request "Tell me about the program".**

- 3.A.3 Use communication for a range of purposes (e.g. to inform, instruct, motivate and persuade) **by describing a facility's operation to members of the public.**

Industry Standards and/or Competencies

Name of standards: National Council for Agriculture Education

Website: <https://thecouncil.ffa.org/afnr/>

Agriculture, Food, and Natural Resources Standards: Natural Resources Sciences

- NRS.05.01 Communicate natural resource information to the public.

AFNR Cluster Skills

- CS.02.02. Examine the components of the AFNR systems and assess their impact on the local, state, national and global society and economy.

Career Ready Practices Strand

- CRP.01.02 Evaluate and consider the near-term and long-term impacts of personal and professional decisions on employers and community before CRP.04.01. Speak using strategies that ensure clarity, logic, purpose and professionalism in formal and informal settings.
- CRP.04.02. Produce clear, reasoned and coherent written and visual communication in formal and informal settings
- CRP.04.03. Model active listening strategies when interacting with others in formal and informal settings
- CRP.09.02. Implement personal management skills to function effectively and efficiently in the workplace (e.g., time management, planning, prioritizing, etc.).

Aligned Washington State Learning Standards

Unit Information

Unit 8: Career Pathways

Total Learning Hours for Unit: 10

Unit Summary: This unit will expose students to various career pathways in the natural resources profession and provide opportunities for students to develop and enhance their employability skills.

Competencies:

1. Outline the key components to include in applications, cover letters, and resumes.
2. Describe individual skills and experiences that are relevant to natural resource jobs.
3. Navigate the employment sections of natural resource organization websites (both public and private).
4. Learn about natural resource jobs that relate to the student's career goals.
5. Understand soft and hard skills that contribute to career success.

6. Understand the required skills, certifications and degrees required for various A&F jobs.
7. Understand the value of transferrable skills.
8. Recognize the diversity of career pathways available in aquaculture and fisheries.
9. Experience workplace environment, etiquette, and communication (on-farm conditions).

Components and Assessments

Performance Assessments:

- Complete a self-assessment to identify qualifications and reflect on opportunities for future job skill growth.
- Create a list of gained individual skills and experiences that are relevant to natural resource jobs.
- Write a resume and cover letter that integrate the skills learned through the course.
- Complete a practice job application.
- Prepare for, and participate in, a mock job interview for a natural resources position.
- Describe how course learning relates to the students' future academic and career goals.
- Research certifications, training, or postsecondary programs that relate to student's career goals.
- Conduct a job search.
- Through research or a field visit to a facility, generate a list of possible A&F jobs (both direct and indirect).
- Select one job that is matched to personal skills, talents, and career goals and that directly or indirectly involves aquaculture and fisheries and design a poster, or presentation to share with peers. Include information about workplace environment, etiquette, and how communication happens in the workplace.
- Based on career presentations by peers, identify transferrable skills necessary to perform the duties of selected A&F positions.
- Research and present more than one source of information that addresses the cultural, recreational, or commercial value of an aquatic species in Washington State.

Related to SAE:

- Present SAE project to the public and potential employers.
- List knowledge, skills, and abilities gained during the course.

Leadership Alignment:

- **3.A.1:** Students will articulate thoughts and ideas effectively using oral, written, and nonverbal communication skills in a variety of forms and contexts in ***a mock interview for a natural resources position and by selecting one career that directly or indirectly involves aquaculture and fisheries and design a poster, or presentation to share with peers.***
- **4.A.1:** Access information efficiently (time) and effectively (sources) ***by researching more than one source of information that addresses the cultural, recreational, or commercial value of an aquatic species in Washington state and present the information to your peers.***

- **4.A.2:** Evaluate information critically and competently *by identify some skills necessary to perform the duties of selected positions within the field of aquaculture and fisheries that could be transferrable to other positions (ability to work on a crew, for example).*
- **8.A.2:** Students will balance short-term and long-term goals *to create a list of gained individual skills and experiences that are relevant to natural resource jobs.*
- **8.C.2:** Students will demonstrate the initiative to advance skill levels towards a professional level by *contacting a natural resources organization to request an informational interview.*
- **8.C.4:** Students will reflect critically on past experiences to inform future progress *by completing a self-assessment to identify qualifications and reflect on opportunities for future job skill growth.*

Industry Standards and/or Competencies

Name of standards: National Council for Agriculture Education

Website: <https://thecouncil.ffa.org/afnr/>

AFNR Cluster Skills

- CS.05. Describe career opportunities and means to achieve those opportunities in each of the Agriculture, Food & Natural Resources career pathways.
- CS.05.02: Examine and choose career opportunities that are matched to personal skills, talents, and career goals in an AFNR pathway of interest.
- CRP.10.01. Identify career opportunities within a career cluster that match personal interests, talents, goals and preferences.

Career Ready Practices Strand

- CRP.01.03. Identify and act upon opportunities for professional and civic service at work and in the community.
- CRP.02.01. Use strategic thinking to connect and apply academic learning, knowledge and skills to solve problems in the workplace and community.
- CRP.04.01. Speak using strategies that ensure clarity, logic, purpose and professionalism in formal and informal settings.
- CRP.04.02. Produce clear, reasoned, and coherent written and visual communication in formal and informal settings.
- CRP.10.01. Identify career opportunities within a career cluster that match personal interests, talents, goals, and preferences.

Aligned Washington State Learning Standards

Unit Information

Unit 9: Supervised Agricultural Experience (SAE) Project

Total Learning Hours for Unit: 10

Unit Summary: Students will demonstrate their learning by completing a Supervised Agricultural Experience Project (SAE). Students will work individually and, in a group, to consider their strengths as well as their areas for future learning in performing aquaculture and fisheries work.

Competencies:

Understand the benefits of the SAE for skill development, leadership, and career success.

1. Demonstrate self-directed learning skills.
2. Describe the two types of SAES:
 - a. Foundational SAE (Career exploration & planning (high school and beyond plan), Personal financial planning and management, Workplace Safety, Employability skills for college and career readiness, agricultural or forestry literacy)
 - b. Immersion SAE (Entrepreneurship/Ownership, Placement/Internships, Research (Experimental, Analytical, Invention), School Business Enterprises, Service Learning)
3. Select an SAE topic that relates to course topics and the student's personal interests, academic goals, and career goals.
4. Develop procurement and funding plans.
5. Understand how presentation and reporting formats influence delivery of content to audiences.
6. Use systems thinking (interconnectedness, emergent properties, causality, feedback loops in an ecosystem) to develop SAE project.
7. Demonstrate flexibility.

Components and Assessments**Performance Assessments:**

- Select a final project format that effectively delivers content (ex: PowerPoint, YouTube video, report, radio public service announcement, poster, tri-fold display, brochure, map, website or blog, event, phone app, etc.)
- Write a report that investigates a topic covered in the course.
- Use Ag Experience Tracker (AET) System or equivalent utilized to track SAE Project.
- Outline the components to be used in final project:
 - Determine the goals of the SAE project.
 - Identify resources and data to be collected to meet project goals.
 - Select the types of data that will be meaningful.
 - Collect data to be used in the final project.
 - Keep records that pertain to the chosen SAE project.
 - Enter data into an Excel spreadsheet.
 - Create maps that display necessary data.
 - Cite sources that are included in the proposal.
- Prepare and deliver final project deliverables.

Leadership Alignment:

- Students will **demonstrate initiative to advance skill levels towards a professional level (8.C.2)** and **balance short-term and long-term goals (8.A.2)** as they enter their own data into the system and use Ag Experience Tracker (AET) System or equivalent utilized to track SAE project.

Industry Standards and/or Competencies

Name of standards: National Council for Agriculture Education

Website: <https://thecouncil.ffa.org/afnr/>

Agriculture, Food, and Natural Resources (AFNR) Standards: Natural Resource Science (NRS)

- NRS.03. Develop plans to ensure sustainable production and processing of natural resources.
- NRS.03.01. Sustainably produce, harvest, process and use natural resource products (e.g., forest products, wildlife, minerals, fossil fuels, shale oil, alternative energy, recreation, aquatic species, etc.).
 - NRS.03.02.01. b. Apply cartographic skills and tools and technologies (e.g., land surveys, geographic coordinate systems, etc.) to locate natural resources. Create GIS maps that show different projects in a forest and the ongoing results of those projects.

AFNR Cluster Skills

- CS.01.05. Awareness: Desire purposeful understanding related to professional and personal activities.
- CS.05. Describe career opportunities and means to achieve those opportunities in each of the Agriculture, Food & Natural Resources career pathways.

Level 2

- CS.01.05.01.b. Analyze the impact of trends and issues on the community.

Level 3

- CS.01.05.01.c. Articulate current issues that are important to the local, state, national and global communities.
- CS.01.05.02.c. Perform leadership tasks associated with citizenship.

Career Ready Practices Strand

- CRP.01.03. Identify and act upon opportunities for professional and civic service at work and in the community.
- CRP.02.01. Use strategic thinking to connect and apply academic learning, knowledge, and skills to solve problems in the workplace and community.
- CRP.04.01. Speak using strategies that ensure clarity, logic, purpose, and professionalism in formal and informal settings.
- CRP.04.02. Produce clear, reasoned, and coherent written and visual communication in formal and informal settings.
- CRP.10.01. Identify career opportunities within a career cluster that match personal interests, talents, goals and preferences.

SAE

- SAE.01.01 Students will establish and conduct Supervised Agricultural Experience Projects (SAE).
 - SAE.01.01.b. Explain the benefits of SAE projects to skill development, leadership and career success.
 - SAE.01.01.c. Explain the connection between SAE and FFA.
 - SAE.01.01.d. Explain the five types of SAE. (Entrepreneurship, Placement, Research, Exploratory, Improvement)
 - SAE.01.01.e. Explore ideas for SAE projects.

- SAE.01.01.f. Explain how SAE projects support academic achievement.
- SAE.01.01.g. Select and establish an SAE project.
- SAE.01.01.h. Explain and keep records on established SAE projects.
- SAE.01.01.i. Explain SAE project Supervision, visitation and assessment.
- SAE.01.01.l. Explain the three-circle concept for SAE, FFA Leadership, Classroom/Laboratory in an Agriculture Education Program.

Aligned Washington State Learning Standards

Mathematics

HS.DS.1 Formulate multivariable statistical investigative questions and determine how data can be collected and provide an answer, consider causality and prediction when posing the question.

HS.DS.2 Understand the issues of bias and confounding variables when collecting data and their impact on interpretation. Understand practices for collecting and handling data, including sensitive information and concerns for privacy and how that may affect data collection.

HS.DS.3 Create and analyze data sets and data displays, including but not limited to scatter plots, regressions, histograms, and boxplots using technology to sort or filter data, summarize, and describe relationships between quantitative variables.

HS.DS.4 Acknowledge the presence of missing data values and understand how missing values may add bias to analysis and interpretation. Examine and discuss competing explanations for data trends observed such as confounding variables. Respond to competing arguments or interpretations of the data of different community groups, paying careful attention to what conclusions the data supports.

Additional math standards will be based on the SAE selected by the student.

Science

Standards will be based on the SAE selected by the student.