



This framework was developed in 2024 by the Pacific Education Institute (PEI) with funding from a grant from EPA and USFS through Spokane Conservation District. Writers from East Valley School District (Spokane), West Valley School District, and Spokane Public Schools, Spokane Community College, Spokane Conservation District, The Spokane Tribe of Indians, Washington State University Extension, Washington Department of Natural Resources Urban Forestry staff, Forest Health Watch, OSPI’s Office of Native Education, OSPI’s Associate Director of Secondary Math collaborated to develop this framework. The framework will be periodically updated with CTE teachers across Washington to provide local resources and relevant materials and opportunities to engage youth in learning about urban and community forestry.

Course Information		
Course: Introduction to Urban and Community Forestry		Total Framework Actual Hours: 180
CIP Code: Requesting new code from OSPI.	<input checked="" type="checkbox"/> Exploratory <input type="checkbox"/> Preparatory <i>Preparatory courses are best built with a min. of 140 hours.</i>	Date Last Modified: 7/24/2024
Career Cluster: Agriculture, Food & Natural Resources		Cluster Pathway: Natural Resource Systems
Course Summary: This course introduces scientific and algebraic principles of urban and community forestry to the student. The course includes units on safety, well-being and teamwork; trees and people; plant identification and anatomy, tree health, tree planting, remote sensing and data analysis, and career pathways. The course aligns with the Advanced Urban and Community Forestry 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 science or 1.0 credit for Algebra 1.		

Unit Information	
Unit 1: Safety, Well-Being, and Teamwork	Total Learning Hours for Unit: 10
Unit Summary: This unit highlights the skills necessary to work safely and effectively on a tree planting, maintenance and removal work crew with emphasis on building teamwork skills.	

Competencies:

1. Understand the safe and proper use of tools for urban and community forestry (UCF) practices (including cleaning, maintenance, and storage).
2. Engage in safe field work procedures (ex: pacing, adequate food, water, sleep, and use of personal protective equipment, road rights-of-way).
3. Work on a crew successfully and safely (includes skills in listening, following directions, keeping other crew members safe).
4. Adhere to community partner safety plans and protocols.
5. Know basic first aid relevant to working with urban tree planting.
6. Know the Leave No Trace principles and low ecological impact practices.
7. Be able to use basic navigation skills.
8. Demonstrate teamwork skills while participating as part of a work crew.

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 field work safely and properly (ex: pacing, adequate food, water, sleep, and use of personal protective equipment, road rights-of-way).
- Describe PPE list for UCF work (including sturdy boots, safety glasses, hardhat, reflective vest, gloves).
- Adhere to safe crew practices (includes skills in listening, following directions, keeping other crew members safe).
- Practice respectful communication while working as part of a crew.
- Practice safe and proper hand tool use.
- Adhere to community partner's safety plans and protocols.
- Participate in a safety meeting that addresses apparent hazards (ex: cliffs, power lines, poisonous plants).
- Practice first aid skills through role play activities.
- Use Leave No Trace and low ecological impact practices in the field.
- Locate trees and describe locations using Google Maps or other tools.
- Read a weather report and make safety decisions based on forecast.
- Using case studies, lead a discussion about how to respond in workplace safety scenarios.
- Observe tree removal, noting the decisions that go into a safe protocol.

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:

- Students will **adapt to varied roles, job responsibilities, schedules, and contexts (7.A.1)** in the field as a member of the crew.
- Students will **use information (4.B.1)** about weather reports, and map reading to navigate and make informed safety decisions.

- Students will **assume shared responsibility for collaborative work, and value the individual contributions made by each team member (3.B.3)** when working on a field crew.
- Students will **communicate with others and collaborate with others (1.B, 3.B)** while adhering to safe crew practices and working as part of a crew.

Industry Standards and/or Competencies

Name of standards: Agriculture, Food, and Natural Resources (AFNR) Standards: Natural Resource Science (NRS), Cluster Skills, Career Ready Practices (CRP)

Website:

https://www.nj.gov/agriculture/ag_ed/classroom/AFNR_Standards_v2_0__FINAL.pdf

AFNR Standards: NRS

- NRS.03. Develop plans to ensure sustainable production and processing of natural resources.
- NRS.03.02. Demonstrate cartographic skills, tools and technologies to aid in developing, implementing and evaluating natural resource management plans.
- NRS.03.02.01.a. Summarize how to use maps and technologies to identify directions and land features, calculate actual distance and determine the elevations of points.
- NRS.03.02.01.b. Apply cartographic skills and tools and technologies (e.g., land surveys, geographic coordinate systems, etc.) to locate natural resources.

AFNR Cluster Skills

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

CRP Strand

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

Aligned Washington State Learning Standards

Mathematics

Science

HS-LS2-7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.

Unit Information

Unit 2: Trees and People

Total Learning Hours for Unit: 40

Unit Summary: In this unit, students explore the diverse relationships people have with trees and their own relationship with them. The students will consider the social benefits of trees and how equitable decisions are made in a community both for the people living there and the trees themselves.

Competencies:

1. Recognize the interdependent relationships between trees and people.
2. Recognize the interconnection of ecological, social, and economic systems.
3. Understand the social and ecosystem benefits of trees.
4. Describe human relationships with trees in the context of a historical timeline.
5. Identify individual, tribal, city, state, and commercial sustainability practices that impact communities and trees.
6. Understand the goals and practices of land managers at local tree planting sites.
7. Respond open-mindedly to different ideas and values regarding trees.
8. Respect cultural differences while working with people from a range of social and cultural backgrounds.
9. Understand the importance of using data to inform decisions concerning trees in an urban setting.
10. Understand how land management practices influence decisions about trees.

Components and Assessments

Performance Assessments:

- Engage in UCF-related activities in urban or suburban areas to understand site-specific challenges (ex: Edge effect, wilderness-to-people interface).
- Describe a personal relationship with trees through a group discussion, essay, or other reflective format. Guiding questions may include:
 - Describe an early memory that relates to trees.
 - How have trees impacted your life?
- Using Socratic Seminar, discuss the social benefits of trees in an urban or community setting. Guiding questions may include:
 - How do urban and community trees impact my community?
 - How do urban and community trees impact social determinants of health?
 - What types of information should an organization consult when choosing species to plant in a specific neighborhood (ex: percent of renters vs. homeowners, socioeconomic considerations, community goals or public initiatives, previous tree planting projects, other local community organizations)?
- Identify features of dominant local species that play into traditional and contemporary relationships with plants. Prompt questions include:
 - How does the selected species connect us to food value, ecosystem benefits, medicine, construction, product utility, and/or emotional-spiritual benefits)?
- Describe the characteristics of natural vs. built ecosystems.

- Research and prepare a computer simulation on human relationships with trees in the context of a historical timeline.
- Compile findings of individual, tribal, city, state, and commercial sustainability practices regarding trees in written form.
- Evaluate how a community prioritizes the presence and care of trees. Present findings to the class considering the economic demographics of the community as well as the environment (ex: Is the proposed planting site large enough for the proposed tree and plant species?).
- Through role play, practice responding to ideas and values different from your own by choosing a differing opinion and proposing a new idea that solves the problem. (ex. Owner: I don't like the mess trees make so I don't want a tree in my yard. Response: I understand. Would you be open to planting a tree that does not drop its leaves in the fall?).
- Evaluate the "right tree for the right place" based on selected community-based factors (ex: percentage of renters vs. homeowners, community values, functions of the proposed location).
- Use a climate data set (ex: Rainfall, winter lows temperatures, summer high temperatures, USDA zone) to show how this data does or does not support the community's decision to plant a certain species of tree.
- Engage in dialogue with peers to create stewardship-based protocols for propagating, planting, and maintaining trees in UCF settings.

Related to SAE:

- Engage in UCF-related work with local employers, agencies, tribal lands, and organizations to explore the challenges unique to each agency.
- List ways the SAE project supports land manager's objectives.
- Include recommendations for integrating culturally responsive practices in final SAE project.

Leadership Alignment:

- Students will be **open and responsive to new and diverse perspectives; incorporate group input and feedback into the work (1.B.2) and analyzing and evaluating major alternative points of view (2.C.2)** by responding to ideas and values different from your own by choosing a differing opinion and proposing a new idea that solves the problem.
- Students will **identify and ask significant questions that clarify various points of view and lead to better solutions (2.D.2)** by engaging in UCF-related work with local employers, agencies, tribal lands, and organizations to explore the challenges unique to each agency.
- Students will **respect cultural differences and work effectively with people from a range of social and cultural backgrounds (9.B.1) and leverage social and cultural differences to create new ideas and increase both innovation and quality of work (9.B.3)**. by evaluating the "right tree for the right place" based on selected community-based factors (ex: percentage of renters vs. homeowners, community values, functions of the proposed location).
- Students will **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 (12.E.1)** by using a climate data set (ex: Rainfall, winter lows temperatures, summer high temperatures, USDA zone) to show how this data does or does not support the community's decision to plant a certain species of tree.
- Students will **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.) (12.E.2)** by engaging in dialogue with peers to create stewardship-based protocols for propagating, planting, and maintaining trees in UCF settings.

Industry Standards and/or Competencies

Name of standards: Agriculture, Food, and Natural Resources (AFNR)
Career Cluster Content Standards

Website:
https://www.nj.gov/agriculture/ag_ed/classroom/AFNR_Standards_v2_0__FINAL.pdf

AFNR Standards: NRS

- NRS.02.01.02.b. Analyze the specific purpose of agencies associated with natural resources systems.
- NRS.02.03.01.a. Summarize and categorize the different social considerations in regard to the use of natural resources (e.g., public versus private, laws and regulations, economics, green technologies, etc.)
- NRS.02.04.01.a. Compare and contrast how the economic value of a natural resource affects its availability
- NRS.02.05.03.a. Examine and describe how communication can be used to influence behavior, call people to action and instill a sense of civic behavior related to the conservation, management, enhancement and improvement of natural resource

CRP

- CRP.04.01.01.a. Identify and categorize strategies for ensuring clarity, logic, purpose and professionalism in verbal and non-verbal communication (e.g., vocal tone, organization of thoughts, eye contact, preparation, etc.).
- CRP.09.01.02.a. Reflect upon and summarize situations where ethical and effective leadership characteristics were needed and/or personally demonstrated (e.g., motivation, empathy, etc.).
- CRP.08.02.02.a. Identify and summarize steps in the decision-making process to solve workplace and community problems.

Aligned Washington State Learning Standards

Mathematics

- N.Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
- N.Q.A.2 Define appropriate quantities for the purpose of descriptive modeling.
- N.Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
- A.SSE.A.1 Interpret expressions that represent a quantity in terms of its context.

	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.
Science	<p>HS-LS2-2. Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.</p> <p>HS-ESS3-3. Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.</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>

Unit Information

Unit 3: Plant Identification and Anatomy

Total Learning Hours for Unit: 30

Unit Summary: This unit explores the skills necessary to identify the trees and other plants common in a local urban forest. A working knowledge of the terms used to describe the various fauna is also covered.

Competencies:

1. Use appropriate terminology to identify basic plant parts and plant life cycles.
2. Know the basic functions of various plant parts.
3. Understand the difference between native, non-native, invasive, and noxious plants.
4. Understand basic plant taxonomy (ex: Family, genus, species).
5. Understand that there are different plant naming systems (ex: scientific, common, and indigenous).
6. Understand the importance of environmental factors on plants (ex: sunlight, temperatures, water availability, water quality, pollutants, soil, sun exposure).
7. Understand the importance of knowing enough about a tree to adhere to the industry standard of "right tree, right place".

Components and Assessments

Performance Assessments:

- Describe basic tree anatomy characteristics and their respective functions at a local UCF site.
- Answer guiding questions that include:
 - What is the tree built to do efficiently from a human perspective?
 - How does this information impact decision-making as to placement in an urban and community setting?

- Use tree characteristics and field identification keys (including dichotomous keys) to identify a plant at a local UCF site.
- In small groups, create a skit, poster, or video illustrating the life cycle of a tree.
- Explain the difference between native, non-native, and noxious plants in an urban setting.
- Identify 10 or more dominant, regional trees or shrubs by common name.
- In pairs, perform a species dissection to identify basic anatomy. Sketch and label body parts and match each part to its function.
- Collect and press identifying plant parts of local, dominant species (fall: leaves, buds, and fruits; spring: flowers).
- Create an herbarium of local flora.
- Participate in traditional land use practices (ex: planting or harvest techniques).
- Participate in a plant identification assessment in which parts of collected plants, images of plants, and/or diagrams are used to assess students' knowledge of local species
- Identify characteristics to determine differences between evergreen vs. deciduous plants and needle-bearing vs. broad-leaf plants.
- Create a visual resource (video or poster) that presents dominant species with their identifying characteristics during different seasons.
- Identify and study culturally relevant plant resources with the help of local elders and tribal representatives and present learning to student team.
- Design a mock plant sign that presents various, regional names for one species (including scientific and common names, at a minimum; include indigenous names as research allows).
- Assess an existing or hypothetical tree planting site for appropriate environmental factors (including sunlight, water, and soil).
- Use a mathematical representation (ex: graph) to show the relationship between an organism's habitat requirements and the population of that organism in each ecosystem. Describe the niches or the roles of specific organisms in the environment.

Related to SAE:

- Use terminology and scientific names to accurately describe forests, trees, and vegetation in final presentation.
- List biological and ecological factors that impact a local tree planting project.
- Research species being managed by a local employer (ex: anatomy, terminology, physical traits).
- Select species to include in final SAE project.
- Describe how species included in SAE project will impact biology and ecology of local ecosystems.

Leadership Alignment:

- Students will **use digital technologies (computers, PDAs, media players, GPS, etc.), communication/networking tools and social networks appropriately to access, manage, integrate, evaluate and create information to successfully function in a knowledge economy (6.A.2)** by creating a visual resource (video or poster) that presents dominant species with their identifying characteristics during different seasons.
- Students will **work creatively with others (1.B)** by participating in a plant identification assessment in which parts of collected plants, images of plants, and/or diagrams are used to assess students' knowledge of local species

- Students will **assume shared responsibility for collaborative work, and value the individual contributions made by each team member (3.B.3), incorporate feedback effectively (7.B.1), and respond open-mindedly to different ideas and values (9.B.2)** by participating in small groups, to create a skit, poster, or video illustrating the life cycle of a tree.

Industry Standards and/or Competencies

Name of standards: Agriculture, Food, and Natural Resources (AFNR) Career Cluster Content Standards

Website:

https://www.nj.gov/agriculture/ag_ed/classroom/AFNR_Standards_v2_0__FINAL.pdf

AFNR: NRS

- NRS.01.01.03.a. Summarize and classify different kinds of living species based on evolutionary traits.
- NRS.01.02. Classify different types of natural resources to enable protection, conservation, enhancement and management in a particular geographical region.
- NRS.01.02.01.a. Research and examine the characteristics used to identify trees and woody plant

Aligned Washington State Learning Standards

Relating to understanding of an organism’s habitat requirements and role in the environment:

HS.F.LE.A.1 Distinguish between situations that can be modeled with linear functions and with exponential functions.

HS.F.LE.B.5 Interpret the parameters in a linear or exponential function in terms of a context.

N.Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

N.Q.A.2 Define appropriate quantities for the purpose of descriptive modeling.

N.Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

A.SSE.A.1 Interpret expressions that represent a quantity in terms of its context.

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.

A.REI.D.10 Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).

Mathematics

	<p>F.IF.B.4 For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship.</p> <p>F.IF.B.5 Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.</p>
Science	<p>HS-LS2-2. Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.</p> <p>HS-LS1-3. Plan and investigate to provide evidence that feedback mechanisms maintain homeostasis.</p> <p>HS-LS1-2. Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.</p>

Unit Information

Unit 4: Tree Health

Total Learning Hours for Unit: 20

Unit Summary: In this unit, students explore the physical, biological and cultural interactions that impact tree health.

Competencies:

1. Understand the importance of environmental factors on tree health (ex: Sunlight, temperature, water quality, nitrogen, diseases, pests, and pathogens).
2. Know how to assess basic tree health.
3. Be able to describe the relationship between soils (type, volume, texture) and plants in the context: of planning, planting, and caring for a tree.
4. Recognize the interaction between trees (ex: Competition for resources; shading younger trees; warning signals in the presence of disturbance, pests, and diseases).

Components and Assessments

Performance Assessments:

- Describe the basic physiology of a plant at a local tree planting site.
- Identify traits that allow trees to adapt and compete for resources (ex: Allelopathy, growth rates, seed viability and germination).
- Identify overall tree health based on tree form and die back or leaf color.

- Identify symptoms of poor health (ex: Chlorosis) through observations and measurements from a distance and up close
- Describe the basic soil types (sand, silt, and clay) and relevancy to tree requirements for survival (water retention, nutrient-holding capacity).
- Perform a soil ribbon texture test and explain the results.
- Describe physical factors (other than soil) that can affect tree health and identify trees in a community that serve as examples.
- Describe biological factors that can affect tree health and identify trees in a community that serve as examples.
- Describe cultural factors that can affect tree health and identify trees in a community that serve as examples.
- Perform tree health monitoring and assessments to collect data (ex: canopy cover, growth rates, density, survival rates).
- Distinguish between healthy and unhealthy organisms by identifying signs of distress.

Related to SAE:

- Use terminology and scientific names to accurately describe trees in final presentation.
- List biotic and abiotic factors that impact a local tree planting site.
- Research how organisms and populations at a local tree planting site depend on and may compete for biotic and abiotic resources.
- Describe how species included in final project will respond to conditions at chosen site.

Leadership Alignment:

- **Students will use various types of reasoning (inductive, deductive, etc.) as appropriate to the situation (2.A.1)** to create a maintenance protocol for selected species that includes monitoring, diagnosing, and treating anticipated diseases, pests, and pathogens.
- Students will **analyze how parts of a whole interact with each other to produce overall outcomes in complex systems (2.B.1)** by describing cultural, biological, physical factors that affect tree health
- Students will **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 (12.E.1)** by researching how organisms and populations at a local tree planting site depend on and may compete for biotic and abiotic resources.
- Students will **investigate and analyze environmental issues and make accurate conclusions about effective solutions (12.E.4)** by describing how species included in the final project will respond to conditions at the chosen site.

Industry Standards and/or Competencies

Name of standards: Agriculture, Food, and Natural Resources
(AFNR) Career Cluster Content Standards

Website:

https://www.nj.gov/agriculture/ag_ed/classroom/AFNR_Standards_v2_0__FINAL.pdf

AFNR: NRS

- NRS.01.05. Apply ecological concepts and principles to terrestrial natural resource systems.
- NRS.04.01: Demonstrate natural resource protection, maintenance, enhancement, and improvement techniques.
- NRS.04.01.05.a. Identify and categorize characteristics of natural resources that make them desirable for recreational purposes.
- NRS.04.02: Diagnose plant and wildlife diseases and follow protocols to prevent their spread.
- NRS.04.02.01.a. Classify causes of diseases in plants and the correct authorities to whom some diseases should be reported.
- NRS.04.03.01.a. Categorize harmful and beneficial insects, as well as signs of insect damage to natural resource.

- NRS.04.03.02.a. Identify and classify invasive species common to a particular region.
- NRS.04.03.03.a. Research and summarize strategies and benefits of preventing the introduction of harmful species to a particular region.

AFNR Cluster Skills

- CS.04. Demonstrate stewardship of natural resources in AFNR activities.

CRP Strand

- CRP.02.01. Use strategic thinking to connect and apply academic learning, knowledge and skills to solve problems in the workplace and community.
- CRP.04.03. Model active listening strategies when interacting with others in formal and informal settings.
- CRP.09. Model integrity, ethical leadership and effective management.

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, taking into account correlation versus causation.

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>A.REI.D.10 Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).</p> <p>F.IF.B.4 For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship.</p>
<p>Science</p>	<p>HS-ESS3-4: Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.</p> <p>HS-LS2-2. Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales</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-ESS3-4. 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>

Unit Information

Unit 5: Tree Planting

Total Learning Hours for Unit: 20

Unit Summary: This unit gives students the opportunity to practice the skills needed to properly plant a tree.

Competencies:

1. Know the proper transplanting techniques to industry standards for both deciduous and coniferous trees.
2. Know the proper post-transplanting steps and care.
3. Understand the human or ecological purpose and required functions of trees (ex: Street tree vs. fruit tree) in a given location.
4. Utilize best management practices for long term tree establishment.

Components and Assessments

Performance Assessments:

- Participate in tree planting activities.
- Demonstrate a working knowledge of tree propagation techniques.
- Dig a hole to meet the proper depth and width of the root system.
- Prepare root system (no J-root, girdling) for transplanting to proper depth at root flare.
- Apply correct amount of water to transplant seedling (i.e. “watering in”) and be able to calculate how much water is being applied and will be needed to sustain the seedling
- Install staking to provide stability.
- Apply adequate mulch to retain moisture and weed suppression.
- Participate in indigenous UCF practices (ex: planting ceremonies, practice using indigenous planting tools).

Related to SAE:

- Give examples of ways UCF professionals can interact with indigenous communities when preparing to plant and planting trees.

Leadership Alignment:

- Students will **analyze how parts interact to produce overall outcomes in complex systems (2.B.1)** by performing each step necessary to successfully plant a tree for sustainable growth
- Students will **demonstrate ability to work effectively and respectfully with diverse teams (3.B.1)** by participating in indigenous UCF practices (ex: planting ceremonies, practice using indigenous planting tools).
- Students will **assume shared responsibility for collaborative work, and value the individual contributions made by each team member (3.B.3)** and **work effectively in a climate of ambiguity and changing priorities (7.A.2)** while planting trees.

Industry Standards and/or Competencies

Name of standards: Agriculture, Food, and Natural Resources (AFNR) Career Cluster Content Standards

Website:

https://www.nj.gov/agriculture/ag_ed/classroom/AFNR_Standards_v2_0__FINAL.pdf

AFNR: NRS

- NRS.01.05. Apply ecological concepts and principles to terrestrial natural resource systems.
- NRS.04.01: Demonstrate natural resource protection, maintenance, enhancement, and improvement techniques.

Aligned Washington State Learning Standards

Mathematics

F.LE.A.1 Distinguish between situations that can be modeled with linear functions and with exponential functions.

	<p>F.LE.B.5 Interpret the parameters in a linear or exponential function in terms of a context.</p> <p>F.A.1.a Determine an explicit expression, a recursive process, or steps for calculation from a context.</p>
Science	<p>HS-LS2-2. Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales</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-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>

Unit Information	
Unit 6: Remote Sensing and Data Analysis	Total Learning Hours for Unit: 40
<p>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. This unit will focus on data collection and data analysis to provide students with the necessary tools to implement data driven urban forest practices. Students will use linear relationships to make decisions around planting, replacement, and other management decisions and use remote sensing to evaluate tree canopy.</p> <p>*The red addendums in the competencies below indicate the unit this competency could be taught per the teacher's discretion.</p>	
<p>Competencies:</p> <ol style="list-style-type: none"> 1. Be familiar with the data included in a tree inventory – Trees and People unit 2. Understand how industry-standard sample methods are used to extrapolate full stand composition – Trees and People unit 3. Understand the purpose of a basic planting site analysis (ex. How much water is available and therefore what kind of tree to plant as well as other ecosystem benefits that this tree needs to provide?) - Tree Planting unit 4. Be able to use a map or GPS to locate a tree – Tree Planting unit 5. Reflect on how climate change data will impact future decisions regarding the urban and community forests in a community – Trees and People unit 	
Components and Assessments	
<p>Performance Assessments:</p>	

- 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 plant growth, population survey, population mortality rates,
- Convert between and use imperial and metric systems in preparing for tree planting
- Organize and manipulate data in a spreadsheet (ex: Sort, table, graph functions).
- Use probabilities to make decisions surrounding care of trees.
- Extract and archive data from external sources to make predictions of weather in an area over a growing season.
- Use iTree to estimate potential environmental benefits of existing or newly planted trees over time.
- Using Excel, collect data on tree characteristics in a local neighborhood (use a local tree inventory as a guide) and compare data to the community tree inventory data.
- Use DBH to estimate tree size and explore how this data informs a community's plans for tree removal/new planting.
- Participate in setting up sample and/or transect plots to extrapolate full stand composition of a local community forest.
- Explore the risk factors of trees based on height/age/life span and proximity to a target.
- Use coordinate points (a legal description and/or a waypoint in GIS) to locate a tree.
- Participate in a planting site analysis considering all the different data points required to make an informed decision as to the "right tree, right place".
- Investigate how a community is using climate change models to inform decisions regarding their urban and community forests.
- Use Excel to record measurements of the life cycle of a tree and/or shoot measurement across varieties and describe how this data can inform decision making.

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.
- Use maps, GPS, and other tools to define the boundaries of a local restoration site that will be used in the final project.

Leadership Alignment:

- Students will **use various types of reasoning (inductive, deductive, etc.) as appropriate to the situation (2.A.1) and interpret information and draw conclusions based on the best analysis (2.C.4)** by using a climate data set (rainfall, winter lows, summer highs, etc.) to show how this data supports the community's decision to plant a certain species of tree.
- Students will **access information efficiently (time) and effectively (sources) (4.A.1)** by accurately completing tree health inventories.
- Students will **evaluate information critically and competently (4.A.2)** by using probability to make decisions surrounding care of organisms.

- Students will **use information accurately and creatively for the issue or problem at hand (4.B.1)** by collecting a data set that tracks organismal growth.
- Students will **manage the flow of information from a wide variety of sources (4.B.2)** by inputting and analyzing data relevant to the industry's record keeping/admin needs (ex. completion of table, forms).
- Students will **apply a fundamental understanding of the ethical/legal issues surrounding the access and use of information (4.B.3)** by recognizing the importance of and the difference between precision and accuracy in data science.

Industry Standards and/or Competencies

Name of standards: Agriculture, Food, and Natural Resources (AFNR) Career Cluster Content Standards

Website:

https://www.nj.gov/agriculture/ag_ed/classroom/AFNR_Standards_v2_0__FINAL.pdf

AFNR: NRS

- NRS.03.02.01.a. Summarize how to use maps and technologies to identify directions and land features, calculate actual distance and determine the elevations of points.

CRP

- CRP.05.01.03.a. Classify the types of information (e.g., data, research, procedures, regulations, etc.) and resources (e.g., human, financial, technology, time, etc.) that may be used to make workplace and community decision.
- CRP.07.01. Select and implement reliable research processes and methods to generate data for decision-making in the workplace and community.
- CRP.07.01.01.a. Identify and summarize reliable research processes and methods used to generate data for decision-making.
- 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 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, taking into account correlation versus causation.

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.

A.REI.D.10 Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).

F.IF.B.4 For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship.

G.GMD.A.3 Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.

S.ID.A.1 Represent data with plots on the real number line (dot plots, histograms, and box plots).

S.ID.A.2 Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.

S.ID.B.6 Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.

	<p>S.ID.C.7 Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.</p> <p>S.CPA.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.</p> <p>S.CPA.5 Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations.</p>
Science	<p>HS-LS2-2. Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.</p> <p>HS-ESS3-5. Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems.</p>

Unit Information

Unit 7: 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 restoration ecology jobs.

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.

Related to SAE:

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

Leadership Alignment:

- Students will **balance short-term and long-term goals (8.A.2)** by describing how course learning relates to the students' future academic and career goals.
- Students will **demonstrate initiative to advance skill levels towards a professional level (8.C.2)** by completing a self-assessment to identify qualifications and reflect on opportunities for future job skill growth and creating a list of gained individual skills and experiences that are relevant to natural resource jobs.

Industry Standards and/or Competencies

Name of standards: Agriculture, Food, and Natural Resources (AFNR) Career Cluster Content Standards

Website:

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AFNR Cluster Skills

- CS.05 Describe career opportunities and means to achieve those opportunities in each of the Agriculture, Food & Natural Resources career pathways.
- CRP.10.01. Identify career opportunities within a career cluster that match personal interests, talents, goals and preferences.

CRP

- 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.

Aligned Washington State Learning Standards

Environment & Sustainability

Standard 1: Ecological, Social, and Economic Systems -- Students develop knowledge of the interconnections and interdependency of ecological, social, and economic systems. They demonstrate

	<p>understanding of how the health of these systems determines the sustainability of natural and human communities at local, regional, national, and global levels.</p> <p>Standard 2: The Natural and Built Environment -- Students engage in inquiry and systems thinking and use information gained through learning experiences in, about, and for the environment to understand the structure, components, and processes of natural and human-built environments.</p>
Science	

Unit Information	
Unit 8: Supervised Agricultural Experience (SAE) Project	Total Learning Hours for Unit: 10
<p>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 and areas for future learning in performing restoration work.</p>	
<p>Competencies:</p> <ol style="list-style-type: none"> 1. Understand the benefits of the SAE for skill development, leadership, and career success. 2. Understand the connection between SAE and FFA. 3. Describe the two types of SAE: <ol style="list-style-type: none"> 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) 4. Select an SAE topic that relates to course topics and the student's personal interests, academic goals, and career goals. 5. Develop procurement and funding plans. 6. Understand how presentation and reporting formats influence delivery of content to audiences. 7. Use systems thinking (interconnectedness, emergent properties, causality, feedback loops in an ecosystem) to develop SAE project. 8. Demonstrate flexibility. 9. Demonstrate self-directed learning skills. 	
Components and Assessments	
<p>Performance Assessments:</p> <ul style="list-style-type: none"> • 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.
- Prepare and deliver final project deliverables.

Leadership Alignment:

- Students will **demonstrate initiative to advance skill levels towards a professional level (8.C.2), balance short-term and long-term goals (8.A.2), and monitor, define, prioritize and complete tasks without direct oversight (8.B.1)** by completing an SAE.

Industry Standards and/or Competencies

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Website: https://www.nj.gov/agriculture/ag_ed/classroom/AFNR_Standards_v2_0__FINAL.pdf

AFNR 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.

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.

CRP

- 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

Environment & Sustainability

Standard 1: Ecological, Social, and Economic Systems -- Students develop knowledge of the interconnections and interdependency of ecological, social, and economic systems. They demonstrate understanding of how the health of these systems determines the sustainability of natural and human communities at local, regional, national, and global levels.

Standard 2: The Natural and Built Environment -- Students engage in inquiry and systems thinking and use information gained through learning experiences in, about, and for the environment to understand the structure, components, and processes of natural and human-built environments.

Science

HS-ESS3-4. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.

	HS-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.
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