Restoration Ecology 1 Course Framework

Course: Natural Resources/Conservation, General		**Total Framework Hours:** 180
CIP Code: 030101	☐ **Exploratory** ☒ **Preparatory**	**Date Last Modified:** 01/07/2022
V code(s): V010000 V030101		
Career Cluster: Agriculture, Food and Natural Resources		**Cluster Pathway:** Natural Resources Systems

Unit 1: Safety and Personal Well-being	**Total Learning Hours for Unit: 10**

Unit Summary: This unit will highlight the skills necessary to work safely and effectively on a restoration work crew

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:

- demonstrate the safe and proper use of hand tools for land and stream restoration
- demonstrate how to engage in field work (pacing, preparation, personal protective equipment) safely and properly
- successfully work on a crew (skills in listening, following directions, keeping other crew members safe)
- perform a safety assessment onsite
- show competency in basic wilderness first aid relevant to restoration work on land and around streams

Leadership Alignment: Leadership activities should include 21st Century Skills embedded in curriculum and instruction for this unit of instruction. Include leadership skills that are being taught and assessed for all students.
Suggested skills include:

- 3.B.3 Assume shared responsibility for collaborative work, and value the individual contributions made by each team member

Industry Standards and/or Competencies: **Agriculture Food and Natural Resources Standards**

ANFR Cluster Skills

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

CRP Strand (Career Ready Practices)

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

Unit 2: Land Management and Mapping **Total Learning Hours for Unit: 40**

Unit Summary: This unit will provide an overview of the different agencies engaging in restoration work as well as actual field work with these agencies. In doing this work, students will be exposed to the unique challenges each agency faces in restoring ecosystems.

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

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

- explain the goals and practices of the different agencies in WA state that manage land at the city, county, state, and federal level.
- engage in restoration work in an urban forest to understand the unique challenges including edge effect and the wilderness to people interface
- engage in restoration work on DNR land to understand the challenges unique to this agency
- engage in restoration work with USFS to understand the challenges unique to this agency
- show competency in reading maps including land use maps and topographical maps
- use a compass and GPS to locate and track

Leadership Alignment: Leadership activities should include 21st Century Skills embedded in curriculum and instruction for this unit of instruction. Include leadership skills that are being taught and assessed for all students.

Suggested skills include:

- 6.A.1 Use technology as a tool to research, organize, evaluate and communicate information
- 4.B.1 Use information accurately and creatively for the issue or problem at hand

Industry Standards and/or Competencies: **Agriculture Food and Natural Resources Standards**

NRS Strand (Natural Resource Standards)

- NRS.02.01. Analyze the interrelationships between natural resources and humans.
- NRS.02.02. Assess the impact of human activities on the availability of natural resources.
- NRS.03.02. Demonstrate cartographic skills, tools and technologies to aid in developing, implementing and evaluating natural resource management plans.

ANFR Cluster Skills

- CS.05 Describe career opportunities and means to achieve those opportunities in each of the Agriculture, Food & Natural Resources career pathways.

CRP Strand (Career Ready Practices)

- CRP.05.01. Assess, identify and synthesize the information and resources needed to make decisions that positively impact the workplace & community.
- CRP.05.02. Make, defend and evaluate decisions at work and in the community using information about the potential environmental, social and economic impacts.
- CRP.08.01. Apply reason and logic to evaluate workplace and community situations from multiple perspectives.

Aligned Washington State Academic Standards

Environment & Sustainability	

	Standard 3: Sustainability and Civic Responsibility: Students develop and apply the knowledge, perspective, vision, skills, and habits of mind necessary to make personal and collective decisions and take actions that promote sustainability.
Science	HS-LS2-7 Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.

Science and Engineering Practice	Disciplinary Core Idea	Cross Cutting Concepts
Constructing Explanations and Designing Solutions	For: HS-LS2-7 LS2.C: Ecosystem Dynamics, Functioning, and Resilience LS4.D: Biodiversity and Humans ETS1.B: Developing Possible Solutions	Stability and Change

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Unit 3: Plant Identification and Ecology **Total Learning Hours for Unit: 40**

Unit Summary: This unit will explore how a tree utilizes its environment to grow, how nonnative plants influence the ecosystem, and how an ecosystem is impacted when one or more biotic or abiotic factors change.

Performance Assessments: *These can be locally developed or use the suggested assessments below.*
Assessments will be formal and informal, written, verbal and practical. Students will be able to:

- describe the basic principles of the physiology, ecology, and pathology of trees
- identify the most common tree species in Washington state.
- describe the physiology of important non-native species in Washington state
- identify the most common nonnative species in Washington state
- investigate how organisms and populations in an ecosystem depend on and may compete for biotic and abiotic factors
- explain why and how chemicals are used in ecological work both on land and in a stream
- demonstrate a knowledge of safety protocols, mixing ratios, and calibration in pesticide application
- perform data collection using a transect and plots
- demonstrate proper use of hand tools used in restoration work including a Pulaski and sprayer

Leadership Alignment: Leadership activities should include 21st Century Skills embedded in curriculum and instruction for this unit of instruction. Include leadership skills that are being taught and assessed for all students.
Suggested skills include:

- 7.A.1 Adapt to varied roles, job responsibilities, schedules and contexts
- 4.B.1 Use information

Industry Standards and/or Competencies: **Agriculture Food and Natural Resources Standards**

NRS Strand (Natural Resource Standards)

- 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.02.03. Analyze how modern perceptions of natural resource management, protection, enhancement and improvement change and develop over time.
- NRS.04.03. Prevent or manage the introduction of ecologically harmful species in a particular region.

ANFR Cluster Skills

- CS.04. Demonstrate stewardship of natural resources in AFNR activities.
- CS.05 Describe career opportunities and means to achieve those opportunities in each of the Agriculture, Food & Natural Resources career pathways.

CRP Strand (Career Ready Practices)

- 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 Academic 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	**NGSS Standards** HS-LS2-7 Design, evaluate, and refine a solution for reducing the impact of human activities on the environment and biodiversity. HS-LS4-6 Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity. HS-LS2-6 Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem. HS-ESS3-4. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.

Science and Engineering Practice	Disciplinary Core Idea	Crosscutting Concept
Constructing Explanations and Designing Solutions	For: HS-LS2-7 LS2.C: Ecosystem Dynamics, Functioning, and Resilience LS4.D: Biodiversity and Humans ETS1.B: Developing Possible Solutions	Stability and Change
Using Mathematical and Computational Thinking	For: HS-LS4-6 LS4.C: Adaptation LS4.D: Biodiversity and Humans ETS1.B: Developing Possible Solutions	Cause and Effect

Engaging in Argument from Evidence Scientific Knowledge is Open to Revision in Light of New Evidence	For: HS-LS2-6 LS2.C: Ecosystem Dynamics, Functioning, and Resilience	Stability and Change
Constructing Explanations and Designing Solutions	For: HS-ESS3-4 ESS3.C: Human Impacts on Earth Systems ETS1.B: Developing Possible Solutions	Stability and Change Connections to Engineering, Technology, and Applications of Science Influence of Science, Engineering, and Technology on Society and the Natural World

Unit 4: Stream/Aquatic Ecology	**Total Learning Hours for Unit: 40**

Unit Summary: This unit will explore how an aquatic plant utilizes its environment to grow, how nonnative aquatic plants influence the ecosystem, and how an aquatic ecosystem is impacted when one or more biotic or abiotic factors change.

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

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

- describe the physiology of aquatic plants found in streams
- identify the most common aquatic (stream) plant species
- describe the physiology of important non-native species relevant to the restoration work in streams in Washington state
- identify the most common nonnative aquatic species in Washington state
- investigate how organisms and populations in an ecosystem depend on and may compete for biotic and abiotic factors.
- perform stream monitoring and health assessments

Leadership Alignment: Leadership activities should include 21st Century Skills embedded in curriculum and instruction for this unit of instruction. Include leadership skills that are being taught and assessed for all students.

Suggested skills include:

- 10.A.2 Prioritizes, plans and manages work to achieve the intended result

Industry Standards and/or Competencies: **Agriculture Food and Natural Resources Standards**

NRS Strand (Natural Resource Standards)

- NRS.01.04. Apply ecological concepts and principles to aquatic natural resource systems
- NRS.02.03. Analyze how modern perceptions of natural resource management, protection, enhancement and improvement change and develop over time.
- NRS.04.01. Demonstrate natural resource protection, maintenance, enhancement and improvement techniques.

CRP Strand (Career Ready Practices)

- 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.

ANFR Cluster Skills

- CS.05 Describe career opportunities and means to achieve those opportunities in each of the Agriculture, Food & Natural Resources career pathways

Aligned Washington State Academic 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	**NGSS Standards** HS-LS2-7 Design, evaluate, and refine a solution for reducing the impact of human activities on the environment and biodiversity. HS-LS4-6 Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity. HS-LS2-6 Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem. HS-ESS3-4. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.

Science and Engineering Practice	Disciplinary Core Idea	Crosscutting Concept
Constructing Explanations and Designing Solutions	For: HS-LS2-7 LS2.C: Ecosystem Dynamics, Functioning, and Resilience LS4.D: Biodiversity and Humans ETS1.B: Developing Possible Solutions	Stability and Change
Using Mathematical and Computational Thinking	For: HS-LS4-6 LS4.C: Adaptation LS4.D: Biodiversity and Humans ETS1.B: Developing Possible Solutions	Cause and Effect
Engaging in Argument from Evidence Scientific Knowledge is Open to Revision in Light of New Evidence	For: HS-LS2-6 LS2.C: Ecosystem Dynamics, Functioning, and Resilience	Stability and Change

Constructing Explanations and Designing Solutions	For: HS-ESS3-4 ESS3.C: Human Impacts on Earth Systems ETS1.B: Developing Possible Solutions	Stability and Change Connections to Engineering, Technology, and Applications of Science Influence of Science, Engineering, and Technology on Society and the Natural World

Unit 4: Career Preparation **Total Learning Hours for Unit: 10**

Unit Summary: This unit will explore why leadership and conflict resolution skills are important to future employers. Students will consider their strengths as well as their challenges. in performing restoration work.

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

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

- complete a Public Operator practice written test
- demonstrate skills in leadership and conflict resolution
- prepare a resume highlighting their work during this course
- complete a self -assessment of their contextual knowledge and approach to restoration ecology
- complete a job search in the field of restoration ecology for which they are eligible
- prepare for and participate in a mock job interview for a restoration ecology position

Leadership Alignment: Leadership activities should include 21st Century Skills embedded in curriculum and instruction for this unit of instruction. Include leadership skills that are being taught and assessed for all students.

Suggested skills include:

- 8.C.2 Demonstrates initiative to advance skill levels towards a professional level
- 8.A.2 Balance short-term and long-term goals

Industry Standards and/or Competencies: **Agriculture Food and Natural Resources Standards**

CRP Strand (Career Ready Practices)

- 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.

ANFR 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.

Aligned Washington State Academic 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.

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