CareerClusters® PATHWAYS TO COLLEGE & CAREER READINESS
Agriculture, Food & Natural Resources

Learning that works for Colorado CTE®

Colorado AFNR Course Scope and Sequence

Course Name	**Forestry Management**		**Course Details** **Course = 0.50 Carnegie Unit Credit**	Level 3 course in the Natural Resources/Environmental Science Pathway	
Course Description	A course for students pursuing careers in Natural Resources and Environmental Sciences. This course expands student learning to the principals of forestry. Students will gain knowledge in career development, leadership, personal development, communications, ecology, biology and temporal forest environments.				
Note:	This is a suggested scope and sequence for the course content. The content will work with any textbook or instructional resource. If locally adapted, make sure all essential knowledge and skills are covered.				
SCED Identification #	18502	Schedule calculation based on 60% of a semester instructional time. Scope and sequence allows for additional time for guest speakers, student presentations, field trips, remediation, or other content topics.			
All courses taught in an approved CTE program must include Essential Skills embedded into the course content. The Essential Skills Framework for this course can be found at **https://www.cde.state.co.us/standardsandinstruction/essentialskills**					
Unit Number, Title and Brief Description	Suggested % of Instructional Time	CTE or Academic Standard Alignment	Competency / Performance Indicator	Outcome / Measurement	CTSO Integration
Unit 1: Analyze the different elements in an Ecosystem and the relationship of those interactions in relation to Forestry Management	8%	**NRS.01.** Plan and conduct natural resource management activities that apply logical, reasoned and scientifically based solutions to natural resource issues and goals.	**NRS.01.01.** Apply methods of classification to examine natural resource availability and ecosystem function in a particular region. *ELA: RST.11-12.1* *RST.11-12.8* *WHST.9-10.2* *WHST.11-12.2* *WHST.9-10.9* *WHST.11-12.9*	**NRS.01.01.01.a.** Summarize and classify the different kinds of natural resources using common classification schemes (e.g., living versus non-living, renewable versus nonrenewable, native versus introduced, etc.). **NRS.01.01.02.a.** Summarize the components that comprise all ecosystems. **NRS.01.01.02.b.** Analyze the interdependence of organisms within an ecosystem (e.g., food webs, niches, impact of keystone species, etc.) and	

				assess the dependence of organisms on nonliving components (climate, geography, energy flow, nutrient cycling, etc.). **NRS.01.01.02.c.** Conduct analyses of ecosystems and document the interactions of living species and non-living resources. **NRS.01.01.03.b.** Analyze how biodiversity develops through evolution, natural selection and adaptation; explain the importance of biodiversity to ecosystem function and availability of natural resources. **NRS.01.01.03.c.** Evaluate biodiversity in ecosystems and devise strategies to enhance the function of an ecosystem and the availability of natural resources by increasing the level of biodiversity.	
Unit 2: Identifying different species and variety of plants and how the impact on forest health.	8%	**NRS.01.** Plan and conduct natural resource management activities that apply logical, reasoned and scientifically based solutions to natural resource issues and goals.	**NRS.01.02.** Classify different types of natural resources in order to enable protection, conservation, enhancement and management in a particular geographical region. *ELA: RST.11-12.1* *RST.11-12.7* *RST.11-12.8* *WHST.9-10.2* *WHST.11-12.2* *WHST.9-10.7*	**NRS.01.02.01.a.** Research and examine the characteristics used to identify trees and woody plants. **NRS.01.02.01.b.** Apply identification techniques to determine the species of a tree or woody plant.	

		NRS.04. Demonstrate responsible management procedures and techniques to protect, maintain, enhance, and improve natural resources.	*WHST.11-12.7* *WHST.9-10.9* *WHST.11-12.9* *MATH: MA.HS.N.Q.A* *SCIENCE: SC.HS.3.9* **NRS.04.01.** Demonstrate natural resource protection, maintenance, enhancement and improvement techniques. *ELA: RST.11-12.8* *RW.H2.1.2* *SCIENCE: SC.HS.3.9* *SC.HS.3.11*	**NRS.04.01.02.a.** Identify and categorize characteristics of a healthy forest. **NRS.04.01.02.b.** Assess and apply the methods used to improve a forest stand.	
Unit 3: Understand the relationship biogeochemical cycles impact on woodland areas.	8%	**NRS.01.** Plan and conduct natural resource management activities that apply logical, reasoned and scientifically based solutions to natural resource issues and goals.	**NRS.01.02**. Classify different types of natural resources in order to enable protection, conservation, enhancement and management in a particular geographical region. *ELA: RST.11-12.1* *RST.11-12.7* *RST.11-12.8* *WHST.9-10.2* *WHST.9-10.2* *WHST.9-10.7* *WHST.11-12.7* *WHST.9-10.9* *WHST.11-12.9* *MATH: MA.HS.N.Q.A* *SCIENCE: SC.HS.3.9* **NRS.01.03.** Apply ecological concepts and principles to atmospheric natural resource systems.	**NRS.01.02.05.a.** Research and examine the characteristics used to identify non-living resources (e.g., soil types, climate, geography, etc.). **NRS.01.02.05.b.** Apply identification techniques to determine the types of non-living resources in an area. **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.01.03.01.a.** Classify different kinds of biogeochemical cycles and	

			ELA. RST.11-12.1 RST.11-12.7 RST.11-12.8 MATH: MA.HS.N.Q.A MA.HS.S.ID.A MA.HS.S.IC.A. MA.HS.S.IC.B SCIENCE: SC.HS.3.4 SC.HS.3.7 SC.HS.3.11 SC.HS.3.12	the role they play in natural resources systems. **NRS.01.03.01.b.** Assess the role that the atmosphere plays in the regulation of biogeochemical cycles. **NRS.01.03.01.c.** Evaluate and make recommendations to lessen the impact of human activity on the ability of the atmosphere to regulate biogeochemical cycles.	
Unit 4: Understanding the roles of resource inventories and populations in forestry	5%	**NRS.01.** Plan and conduct natural resource management activities that apply logical, reasoned and scientifically based solutions to natural resource issues and goals.	**NRS.01.02.** Classify different types of natural resources in order to enable protection, conservation, enhancement and management in a particular geographical region. ELA: RST.11-12.1 RST.11-12.7 RST.11-12.8 WHST.9-10.2 WHST.9-10.2 WHST.9-10.7 WHST.11-12.7 WHST.9-10.9 WHST.11-12.9	**NRS.01.02.06.a.** Research the purpose and value of resource inventories and population studies. **NRS.01.02.06.b.** Apply procedures for conducting resource inventories and population studies. **NRS.01.02.06.c.** Conduct an assessment of the resource inventories or population in a given area.	
Unit 5: Understanding different harvesting methods in relationship to sustainable forestry	8%	**NRS.01.** Plan and conduct natural resource management activities that apply logical, reasoned and scientifically based solutions to natural resource issues and goals.	**NRS.01.05.** Apply ecological concepts and principles to terrestrial natural resource systems. ELA: RST.11-12.1 RST.11-12.7 RST.11-12.8 MATH: MA.HS.S.ID.A MA.HS.S.IC.A	**NRS.01.05.03.a.** Compare and contrast techniques associated with sustainable forestry (e.g., timber stand improvement, diversity improvement, reforestation, etc.). **NRS.01.05.03.b.** Analyze a forest in order to determine	

			MA.HS.S.IC.B *SCIENCE: SC.HS.3.11* *SC.HS.3.9*	which forestry techniques would improve that habitat. **NRS.01.05.03.c.** Devise a forest management plan that improves the habitat while sustainably maximizing the amount of timber that can be harvested.	
		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.). *ELA: RST.11-12.8* *SCIENCE: SC.HS.3.9* *SC.HS3.11*	**NRS.03.01.01.a.** Summarize forest harvesting methods. **NRS.03.01.01.b.** Assess harvesting methods in regards to their economic value, environmental impact, and other factors. **NRS.03.01.01.c.** Develop a forest harvesting plan that ensures economic, environmental and social sustainability.	
Unit 6: Exploring the relationship between Government Agencies, human interactions, and Forestry Management	8%	**NRS.02.** Analyze the interrelationships between natural resources and humans.	**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.02.03.** Analyze how modern perceptions of natural resource management, protection, enhancement, and	**NRS.02.01.01.c.** Evaluate the impact of laws associated with natural resources systems (e.g., mitigation, water regulations, carbon emissions, game limits, invasive species, etc.). **NRS.02.03.02.a.** Research and assess how historical figures played a prominent role in shaping how natural resources are viewed and	

			improvement change and develop over time.	used today (e.g., Aldo Leopold, Teddy Roosevelt, John Muir, Rachel Carson, Gaylord Nelson, etc.). **NRS.02.03.02.b**. Examine and describe the relationship between current trends in natural resource systems and historical figures that played a prominent role in shaping how natural resources are viewed and used today. **NRS.02.03.02.c.** Anticipate and predict how society's views and use of natural resources will continue to change as a result of historical figures and trends in modern society.	
Unit 7: Analyzing the Economic impact of Forestry	8%	**NRS.02.** Analyze the interrelationships between natural resources and humans.	**NRS.02.04.** Examine and explain how economics affects the use of natural resources. *ELA: RST.11-12.1* *RST.11-12.7* *RST.11-12.8* *WHST.11-12.2* *WHST.11-12.7* *WHST.11-12.8* *WHST.11-12.9* *RW.H2.1.2* *SCIENCE: SC.HS.3.9*	**NRS.02.04.01.a.** Compare and contrast how the economic value of a natural resource affects its availability. **NRS.02.04.01.b.** Assess whether economic value increases or decreases the conservation, protection, improvement and enhancement of natural resources. **NRS.02.04.01.c.** Devise a plan to improve the conservation, protection, improvement and enhancement of natural resources based on	

				economic value and practices. **NRS.02.04.02.a.** Research the impact of the use of natural resources on local, state and national economies (e.g., outdoor recreation, energy production, preservation, etc.). **NRS.02.04.02.b.** Assess the importance of the use of natural resources on local, state and national economies. **NRS.02.04.02.c.** Anticipate and predict how changes to the availability of natural resources because of human activity may impact a local, state and national economy.	
		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.). *ELA: RST.11-12.8* *SCIENCE: SC.HS.3.9 SC.HS.3.11*	**NRS.03.01.07.a.** Research and summarize how recreational uses of natural resources can be changed to improve sustainability. **NRS.03.01.07.b.** Assess different options for improving the sustainability of outdoor recreation based on its impact on natural resources and likelihood of acceptance. **NRS.03.01.07.c.** Evaluate an example of outdoor recreation and develop	

				suggestions for how that activity can be made more sustainable in a manner that is acceptable to those who take part in that activity.	
Unit 8: Understand Plant Diseases and their impact on the ecosystem	8%	**NRS.04.** Demonstrate responsible management procedures and techniques to protect, maintain, enhance, and improve natural resources.	**NRS.04.01.** Demonstrate natural resource protection, maintenance, enhancement and improvement techniques. *ELA: RST.11-12.8* *RW.H2.1.2* *SCIENCE: SC.HS.3.9* *SC.HS.3.11* **NRS.04.02.** Diagnose plant and wildlife diseases and follow protocols to prevent their spread. *ELA: RST.11-12.7* *RST.11-12.8* *WHST.11-12.2* *WHST.11-12.7* *WHST.11-12.8* *WHST.11-12.9* *MATH: MA.HS.N.Q.A* *SCIENCE: SC.HS.2.6* **NRS.04.03**. Prevent or manage introduction of	**NRS.04.01.02.a.** Identify and categorize characteristics of a healthy forest. **NRS.04.01.02.b.** Assess and apply the methods used to improve a forest stand. **NRS.04.01.02.c.** Create a timber stand improvement plan for a forest. **NRS.04.02.01.a.** Classify causes of diseases in plants and the correct authorities to whom some diseases should be reported. **NRS.04.02.01.b.** Analyze a plant disease based on its symptoms, identify if the disease needs to be reported to authorities and determine which authorities it should be reported to. **NRS.04.02.01.c.** Create a management plan to reduce infection and the spread of plant diseases in natural resource systems. **NRS.04.03.01.a.** Categorize harmful and beneficial insects, as well	

			ecologically harmful species in a particular region *ELA: RST.11-12.1* *RST.11-12.7* *RST.11-12.8* *WHST.9-10.5* *WHST.11-12.5* *WHST.9-10.7* *WHST.11-12.7* *MATH: MA.HS.N.Q.A* *MA.HS.S.ID.A.* *MA.HS.S.IC.A* *MA.HS.S.IC.B* *SCIENCE: SC.HS.2.6* *SC.HS.2.13*	as signs of insect damage to natural resources. **NRS.04.03.01.b.** Analyze signs of insect infestation, identify if it needs to be reported to authorities and determine which authorities it should be reported to. **NRS.04.03.01.c.** Create a management plan to reduce spread of harmful insects in natural resource systems.	
Unit 9: Implement a fire mitigation plan	4%	**NRS.04.** Demonstrate responsible management procedures and techniques to protect, maintain, enhance, and improve natural resources.	**NRS.04.04**. Manage fires in natural resource systems.	**NRS.04.04.01.a.** Differentiate between desirable and undesirable fires and research the role fire plays in a healthy ecosystem. **NRS.04.04.01.b.** Assess and apply techniques used to fight wildfires, manage prescribed fires and ensure human safety. **NRS.04.04.01.c.** Develop a prevention plan for harmful fires for a particular region. **NRS.04.04.02.a.** Research and summarize how fire management techniques have evolved. **NRS.04.04.02.b**. Assess the effectiveness of techniques previously and	

				currently used to prevent harmful fires. **NRS.04.04.02.c.** Anticipate and predict how fire management techniques will evolve in the future.	

CAS Academic Standards Alignment: Online Version: https://www.cde.state.co.us/apps/standards/**;** Download version: https://www.cde.state.co.us/apps/standards/

Reading, Writing, and Communicating:

- RW.HS2.1.2 – Integrate credible, accurate information into appropriate media and formats to meet an audience's needs.
- RST.11-12.1 – Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
- RST.11-12.7 – Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
- RST.11-12.8 – Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
- WHST.9-10.2 – Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
- WHST.11-12.2 – Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
- WHST.9-10.7 – Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
- WHST.11-12.7 - Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
- WHST.9-10.9 – Draw evidence from informational texts to support analysis, reflection, and research.
- WHST.11-12.9 – Draw evidence from informational texts to support analysis, reflection, and research.

Math:

- MA.HS.S-ID.A – Interpreting Categorical & Quantitative Data: Summarize, represent, and interpret data on a single count or measurement variable.
- MA.HS.S.IC.A - Making Inferences & Justifying Conclusions: Understand and evaluate random processes underlying statistical experiments.
- MA.HS.S-IC.B – Making inferences & Justifying Conclusions: Make inferences and justify conclusions from sample surveys, experiments, and observational studies.
- MA.HS.N-Q.A – Quantities: Reason quantitatively and use units to solve problems.

Science:

- SC.HS.2.6 – A complex set of interactions determine how ecosystems respond to disturbanes.
- SC.HS.2.13 – Humans have complex interactions with ecosystems and have the ability to influence biodiversity on the planet.
- SC.HS.3.4 – Earth's systems, being dynamic and interacting, cause feedback effects that can increase or decrease the original changes, and these effects occur on different time scales, from sudden to very long term tectonic cycles.
- SC.HS.3.7 – The role of radiation from the sun and its interactions with the atmosphere, ocean, and land are the foundational for the global climate system. Global climate models are used to predict future changes, including changes influences by human behavior and natural factors.
- SC.HS.3.9 – Resource availability has guided the development of human society and use of natural resources has associated costs, risks, and benefits.
- SC.HS.3.11 – Sustainability of human societies and the biodiversity that supports them requires responsible management of natural resources, including the development of technologies.
- SC.HS.3.12 – Global climate models used to predict future climate change continues to improve our understanding of the impact of human activities on the global climate system.

Essential Skills:

Problem Solver:

- Critical Thinking and Analysis: The ability to apply a deliberate process of identifying problems, gathering information, and weighing possible solutions, including: making choices rooted in understanding patterns, cause-and-effect relationships, and the impacts that a decision can have on the individual and others.

Community Member:

- Civic Engagement: The ability to develop and apply knowledge, skills, and habits gained from experiences – within communities of diverse perspectives – to address issues, affect change, and/or solve problems.
- Global and cultural awareness: the ability to collaborate with individuals from diverse backgrounds and/or cultures to address national and global issues, and to develop complex, appropriate, and workable solutions.

Communicator:

- Data Literacy: The ability to identify, collect, evaluate, analyze, interpret, present and protect data.

Empowered Individual:

- Self-Management: The ability to manager one's emotions, thoughts, and behaviors effectively in different situations and to achieve goals and aspirations, including: the capacity to delay gratification, manage stress, stay positive and accountable, and feel motivation & agency to accomplish personal/collective goals.

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