

Colorado AFNR Course Scope and Sequence

Course Name	Range Ecology		Course Details	Level 4 course in the Natural Resources/Environmental Science Pathway	
			Course = 0.50 Carnegie Unit Credit		
Course Description	This course expands student learning to the principles of rangeland ecology. Students will gain knowledge in career development, leadership, personal development, communications, ecology, and resource management.				
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 #	18505	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 Rangeland	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 types of range plants and how they impact range health	12%	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	NRS.01.02.02.a. Research and examine the characteristics used to identify herbaceous plants. NRS.01.02.02.b. Apply identification techniques to determine the species of an herbaceous plant.	

		NRS.04. Demonstrate responsible management procedures and techniques to protect, maintain, enhance, and improve natural resources.	<i>WHST.11-12.2</i> <i>WHST.9-10.7</i> <i>WHST.11-12.7</i> <i>WHST.9-10.9</i> <i>WHST.11-12.9</i> <i>MATH: MA.HS.N.Q.A</i> <i>SCIENCE: SC.HS.3.9</i> NRS.04.01. Demonstrate natural resource protection, maintenance, enhancement and improvement techniques. <i>ELA: RST.11-12.8</i> <i>RW.H2.1.2</i> <i>SCIENCE: SC.HS.3.9</i> <i>SC.HS.3.11</i>	NRS.01.02.02.c. Evaluate the species of herbaceous plants present to assess the health of an ecosystem (e.g., presence of native versus invasive plants, biodiversity, etc.). NRS.04.01.04.a. Identify and categorize characteristics of healthy rangeland. NRS.04.01.04.b. Assess and apply methods of rangeland improvement. NRS.04.01.04.c. Evaluate and revise a rangeland management plan.	
Unit 3: Understand the relationship biogeochemical cycles impact on rangeland	12%	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. <i>ELA: RST.11-12.1</i> <i>RST.11-12.7</i> <i>RST.11-12.8</i> <i>WHST.9-10.2</i> <i>WHST.9-10.2</i> <i>WHST.9-10.7</i> <i>WHST.11-12.7</i> <i>WHST.9-10.9</i> <i>WHST.11-12.9</i> <i>MATH: MA.HS.N.Q.A</i>	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.	

			<u>SCIENCE: SC.HS.3.9</u> NRS.01.03. Apply ecological concepts and principles to atmospheric natural resource systems. <u>ELA: RST.11-12.1</u> <u>RST.11-12.7</u> <u>RST.11-12.8</u> <u>MATH: MA.HS.N.Q.A</u> <u>MA.HS.S.ID.A</u> <u>MA.HS.S.IC.A.</u> <u>MA.HS.S.IC.B</u> <u>SCIENCE: SC.HS.3.4</u> <u>SC.HS.3.7</u> <u>SC.HS.3.11</u> <u>SC.HS.3.12</u>	NRS.01.03.01.a. Classify different kinds of biogeochemical cycles and 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 soil management and the relationship to the types of successions.	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. <u>ELA: RST.11-12.1</u> <u>RST.11-12.7</u> <u>RST.11-12.8</u> <u>MATH: MA.HS.S.ID.A</u> <u>MA.HS.S.IC.A</u> <u>MA.HS.S.IC.B</u> <u>SCIENCE: SC.HS.3.11</u> <u>SC.HS.3.9</u>	NRS.01.05.01.a Research and describe the stages of ecological succession. NRS.01.05.01.b. Analyze and summarize examples of stages of succession. NRS.01.05.01.c. Evaluate the stages of succession present in an ecosystem and predict which species will become more prevalent through future stages of succession. NRS.01.05.04.a. Compare and contrast techniques associated with soil management (e.g., soil survey and interpretation, erosion control, etc.).	

				NRS.01.05.04.b. Analyze a plot of land in order to determine which soil management techniques would be most applicable. NRS.01.05.04.c. Devise a soil management plan to minimize erosion and maximize biodiversity, plant productivity, and the formation of topsoil.	
Unit 5: Discuss the challenge of invasive species and the relationship of the economic effects of Rangeland	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.02. Analyze the interrelationships between natural resources and humans.	NRS.01.06. Apply ecological concepts and principles to living organisms in natural resource systems. ELA: RST.11-12.1 RST.11-12.8 WHST.9-10.2 WHST.11-12.2 WHST.9-10.5 WHST.11-12.5 WHST.9-10.7 WHST.11-12.7 WHST.9-10.9 WHST.11-12.9 SCIENCE: SC.HS.2.12 SC.HS.2.13 SC.HS.3.11 NRS.02.04. Examine and explain how economics affects the use of natural resources. ELA: RST.11-12.1 RST.11-12.8 RST.11-12.7 WHST.11-12.2	NRS.01.06.02.a. Research and summarize examples of invasive species. NRS.01.06.02.b. Analyze factors that influence the establishment and spread of invasive species and determine the appropriate steps to prevent or minimize the impact of invasive species. NRS.01.06.02.c. Evaluate the presence and impact of invasive species on natural resources in a given area and devise a plan to prevent, control or eliminate invasive species from that habitat. NRS.02.04.01.b. Assess whether economic value increases or decreases the conservation, protection, improvement and enhancement of natural resources.	

			<i>WHST.11-12.7</i> <i>WHST.11-12.8</i> <i>WHST.11-12.9</i> <i>RW.H2.1.2</i> <u><i>SCIENCE: SC.HS.3.9</i></u>	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.	
Unit 5: Analyzing the impacts of humans on Rangelands	12%	NRS.02. Analyze the interrelationships between natural resources and humans.	NRS.02.02. Assess the impact of human activities on the availability of natural resources. <u><i>ELA: RST.11-12.1</i></u> <i>RST.11-12.2</i> <i>RST.11-12.7</i> <i>RST.11-12.8</i> <i>WHST.9-10.2</i> <i>WHST.11-12.2</i> <i>WHST.9-10.7</i> <i>WHST.11-12.7</i> <u><i>MATH: MA.HS.N.Q.A</i></u> <u><i>SCIENCE: SC.HS.2.6</i></u> <i>SC.HS.3.9</i> <i>SC.HS.3.11</i> <i>SC.HS.3.12</i>	NRS.02.02.01.a. Summarize the relationship between natural resources, ecosystems and human activity. NRS.02.02.01.b. Assess and explain how different kinds of human activity affect the use and availability of natural resources (i.e., agriculture, industry, transportation, etc.). NRS.02.02.01.c. Evaluate how the availability of natural resources can be improved through changes to human activity. NRS.02.02.02.a. Categorize the primary causes of extinction of living species due to human activity (e.g., overharvesting, habitat loss, invasive species, pollution, etc.). NRS.02.02.02.b. Assess causes of extinction and describe how those causes	

				related to loss of biodiversity NRS.02.02.02.c. Devise a strategy for preventing the loss of species and biodiversity that takes into account the primary causes of species extinction from human activity. NRS.02.03.01.a. Summarize and categorize the different social considerations in regards to the use of natural resources (e.g., public versus private, laws and regulations, economics, green technology, etc.). NRS.02.03.01.b. Analyze how social considerations can affect the use and sustainability of natural resources.	
Unit 6: Develop management plans to increase Range health	5%	NRS.04. Demonstrate responsible management procedures and techniques to protect, maintain, enhance, and improve natural resources.	NRS.04.03. Prevent or manage introduction of 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	NRS.04.03.02.a. Identify and classify invasive species common to a particular region. NRS.04.03.02.b. Analyze signs of the spread of invasive species, identify if it needs to be reported to authorities and determine which authorities it should be reported to.	

			MA.HS.S.IC.A MA.HS.S.IC.B SCIENCE: SC.HS.2.6 SC.HS.2.13 NRS.04.04. Manage fires in natural resource systems.	NRS.04.03.02.c. Create a management plan to reduce spread of harmful invasive species 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.04.04.02.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.	
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Academic Standards Alignment

Colorado CTE courses are required to integrate academic and essential skills into course content. The following academic standards have been identified as aligned to this course and should be integrated throughout instruction.

[CO CTE Academic Standards Resources](#) (Rubrics, integration strategies, etc)

[CDE Colorado Academic Standards Online](#) (Online standards lookup tool)

Standard 1: Oral Expression and Listening

Prepared Graduate 1: *Collaborate effectively as group members or leaders who listen actively and respectfully; pose thoughtful questions, acknowledge the ideas of others; and contribute ideas to further the group's attainment of an objective.*

Students collaborate to assess rangeland health, evaluate grazing management strategies, develop conservation plans, investigate ecological relationships, and solve rangeland management challenges through field investigations and project-based learning.

Standard 2: Reading for All Purposes

Prepared Graduate 4: *Read a wide range of informational texts to build knowledge and to better understand the human experience.*

Students analyze ecological studies, grazing management plans, soil surveys, vegetation inventories, conservation policies, watershed assessments, and scientific research to understand sustainable rangeland management practices.

Prepared Graduate 5: *Understand how language functions in different contexts, command a variety of word-learning strategies to assist comprehension, and make effective choices for meaning or style when writing and speaking.*

Students develop and apply specialized vocabulary related to rangeland ecology, carrying capacity, succession, forage production, watershed management, invasive species, grazing systems, soil health, biodiversity, and ecosystem management to communicate effectively in range ecology settings.

Standard 3: Writing and Composition

Prepared Graduate 6: *Craft arguments using techniques specific to the genre.*

Students evaluate grazing systems, rangeland improvement practices, invasive species management, conservation strategies, and land use decisions, defending recommendations using scientific evidence, field observations, and ecological data.

Prepared Graduate 7: *Craft informational/explanatory texts using techniques specific to the genre.*

Students develop rangeland management plans, grazing plans, vegetation assessments, conservation proposals, and technical reports explaining ecological processes, sustainable land management practices, and resource conservation using scientific evidence.

Standard 4: Research Inquiry and Design

Prepared Graduate 10: *Gather information from a variety of sources; analyze and evaluate its quality and relevance; and use it ethically to answer complex questions.*

Students research plant communities, grazing systems, forage production, soil and watershed health, invasive species, ecological succession, conservation practices, and rangeland management strategies to develop evidence-based plans that protect and enhance rangeland ecosystems.

Note: *Mathematics and Science standards will be added in the future. Visit the [Colorado Academic Standards](#) page for the most current version.*