

CTE Standards Unpacking
Advanced Natural Resources

Course: Advanced Natural Resources

Course Description: Advanced Natural Resources is designed to build upon the basic concepts learned in the Fundamental Natural Resources course. Advanced Natural Resources gives the student a deeper understanding of the decision-making processes that are involved in environmental and natural resource management and conservation, globally, regionally and locally. Students will specifically examine issues related to natural resource use in South Dakota. Topics will include management strategies such as assessing rangeland condition, examining forest site indices, looking at the health of fisheries and wildlife and applying ecological concepts and principles to living organisms in natural resource systems, as related to sustained yield concepts. Students will be expected to understand the importance of soils and their relationship to all ecosystems. Students will be trained to assess air and water quality standards and parameters. Energy and mineral extraction industries will be examined along with looking at determining impacts on the soil, air, and water resources. Classroom and laboratory content may be enhanced by utilizing up-to-date equipment and technology, such as Geographic Information System software to map and inventory resources in real time. Biology, statistics, algebra, English, and human relation skills will be reinforced throughout the course. Opportunities for application of clinical and leadership skills are provided by participation in FFA activities, conferences and skills competition such as sales related career development events and proficiency awards. Each student will be expected to maintain a Supervised Agricultural Experience Program/Internship.

Career Cluster: Agriculture, Food and Natural Resources

Prerequisites: Fundamental Natural Resources, Recommended: Introduction to AFNR

Program of Study Application: Advanced Natural Resources is a second pathway course in the Agriculture, Food and Natural Resources cluster, Natural Resources and Environmental Science Systems pathway. Advanced Natural Resources would follow Fundamental Natural Resources and would prepare a student to participate in a capstone experience.

<p><i>INDICATOR #ANR 1: Explore soil composition and soil management.</i></p>
<p><i>SUB-INDICATOR 1.1 (Webb Level: 2 Skill/Concept):</i> Demonstrate techniques used to classify soils.</p>
<p><i>SUB-INDICATOR 1.2 (Webb Level: Skill/Concept):</i> Explain the importance of soil conservation.</p>
<p><i>SUB-INDICATOR 1.3 (Webb Level: 4 Extended Thinking):</i> Analyze soils for agricultural and homesite uses.</p>
<p><i>SUB-INDICATOR 1.4 (Webb Level: 4 Extended Thinking):</i> Analyze existing soil surveys to develop effective management plans.</p>

<p>Knowledge (Factual):</p> <ul style="list-style-type: none"> -Soil particles -Soil profile and horizons -Parent materials -Soil permeability -Erosion causes 	<p>Understand (Conceptual):</p> <ul style="list-style-type: none"> -Understand the use of land based on geological factors (land capability classes) -Understand how erosion prevention impacts the health of the land (farm on contour, terracing, crop rotation, no-till, drainage etc.) 	<p>Do (Application):</p> <ul style="list-style-type: none"> -Create a soil ribbon -Evaluate causes of erosion -Evaluate soil structures -Test soil pH and nutrient levels for plant growth -Evaluate soil permeability -Use a clinometer
<p>Benchmarks:</p> <p><i>Students will be assessed on their ability to:</i></p> <ul style="list-style-type: none"> • Determine soil types while using a soil texture triangle. • Compete in Land and Homesite Evaluation. • Create a land management plan for various land capability classes. • Compare research related to contour farming, terracing, crop rotating, and windbreaks. • Calculate erosion loss or deposition. • Calculate slope. • Propose fertilization methods and application rates. 		
<p><i>Academic Connections</i></p>		
<p>ELA Literacy and/or Math Standard (if applicable, Science and/or Social Studies Standard):</p> <p>Math: HSF.IF.B.6 - Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.</p>	<p>Sample Performance Task Aligned to the Academic Standard(s):</p> <ul style="list-style-type: none"> -Determine the slope of a given land mass. 	

<p>INDICATOR #ANR 2: Apply ecological concepts and principles to rangeland conservation.</p>		
<p>SUB-INDICATOR 2.1 (Webb Level: 2 Skill/Concept): Summarize the interrelationships of rangeland management, the environment, wildlife management, and the livestock industry.</p>		
<p>SUB-INDICATOR 2.2 (Webb Level: 1 Recall): Discuss practices used to improve rangeland quality.</p>		
<p>SUB-INDICATOR 2.3 (Webb Level: 4 Extended Thinking): Analyze the carrying capacity in various rangelands for both wildlife species and domestic livestock.</p>		
<p>SUB-INDICATOR 2.4 (Webb Level: 1 Recall): Identify plants important to quality rangeland and determine rangeland condition.</p>		
<p>Knowledge (Factual):</p> <ul style="list-style-type: none"> -Identify the causes of resource problems -Wildlife habitats -Identify key soil and/or plant indicators for range environment -Define carrying capacity 	<p>Understand (Conceptual):</p> <ul style="list-style-type: none"> -How balanced habitats sustain healthy ecosystems -Risk management related to rangeland health -Differentiate between warm and cool season grasses 	<p>Do (Application):</p> <ul style="list-style-type: none"> -Assess rangelands for health -Design a rangeland ecosystem -Discuss rotational grazing techniques -Evaluate surface soil loss or degradation -Determine carrying capacity -Examine the edge effect between two habitat boundaries -Evaluate a habitat for food and cover
<p>Benchmarks: <i>Students will be assessed on their ability to:</i></p> <ul style="list-style-type: none"> • Create a plan to make grazing and other management changes to existing operations. • Design a rotational grazing program for cattle. • Evaluate habitats using aerial photos. • Design an experiment using warm and cool season grasses. 		

Academic Connections	
<p>ELA Literacy and/or Math Standard (if applicable, Science and/or Social Studies Standard):</p> <p>Science: HS-LS4-3 – Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait.</p> <p>English: 9-12 W.6 – Use technology, including the internet, to produce an individual writing product.</p>	<p>Sample Performance Task Aligned to the Academic Standard(s):</p> <p>-Compare and contrast habitats and discuss balanced ecosystems.</p> <p>-Use technology to create a prompt explaining various grazing systems.</p>

INDICATOR #ANR 3: Understand forest management practices.		
SUB-INDICATOR 3.1 (Webb Level: 1 Recall): Identify trees and classify to species.		
SUB-INDICATOR 3.2 (Webb Level: 4 Extended Thinking): Discuss forestry management techniques.		
<p>Knowledge (Factual):</p> <ul style="list-style-type: none"> -Identify the similarities and differences between tree species -Recognize plant characteristics -Identify insects found in forest ecosystems 	<p>Understand (Conceptual):</p> <ul style="list-style-type: none"> -Understand the importance of living things and their interactions -Understand the importance of species diversity to soil health 	<p>Do (Application):</p> <ul style="list-style-type: none"> -Use a dichotomous key to identify a species -Evaluate the use of surface and ground water within a forest system -Track insect disease outbreaks within the state -Discuss slash and burn -Prune trees

<p>Benchmarks: Students will be assessed on their ability to:</p> <ul style="list-style-type: none"> • Research disease prevention techniques. • Create a video or presentation about tree health. • Determine the health of a tree. 	
<p>Academic Connections</p>	
<p>ELA Literacy and/or Math Standard (if applicable, Science and/or Social Studies Standard):</p> <p>English: 9-12 SL.4 - Presenting information, findings, and evidence conveying a clear perspective.</p>	<p>Sample Performance Task Aligned to the Academic Standard(s):</p> <p>-Create a presentation regarding common forest management practices in the Black Hills</p>

<p>INDICATOR #ANR 4: Apply ecological concepts and principles to fisheries and wildlife in natural resources.</p>		
<p>SUB-INDICATOR 4.1 (Webb Level: 2 Skill/Concept): Identify similarities and differences among wildlife and fish species.</p>		
<p>SUB-INDICATOR 4.2 (Webb Level: 3 Strategic Thinking): Investigate wildlife management and habitat.</p>		
<p>SUB-INDICATOR 4.3 (Webb Level: 3 Strategic Thinking): Differentiate among a variety of management practices used to manage wildlife populations.</p>		
<p>SUB-INDICATOR 4.4 (Webb Level: 4 Extended Thinking): Enhance fish/wildlife habitat.</p>		
<p>Knowledge (Factual):</p> <ul style="list-style-type: none"> -Identify fish and wildlife species -Grassland management practices -Social, commercial, recreational benefits of natural resources systems -Ecological principles 	<p>Understand (Conceptual):</p> <ul style="list-style-type: none"> -Laws related to fish and wildlife -The importance of grassland management 	<p>Do (Application):</p> <ul style="list-style-type: none"> -Use dichotomous key to identify a species -Compare historical fish and wildlife trends -Improve wildlife habitats through grassland management -Relate wildlife populations to habitat quality -Discuss hunting as a

		management control -Discuss the economic impacts of hunting and fishing on South Dakota
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Benchmarks:

Students will be assessed on their ability to:

- Calculate carrying capacities.
- Research migration patterns.
- Create a brochure explaining wildlife habitat management practices.
- Design a cropland management plan for wildlife.

Academic Connections

ELA Literacy and/or Math Standard (if applicable, Science and/or Social Studies Standard):	Sample Performance Task Aligned to the Academic Standard(s):
Math: HSS.IC.B.4 - Use data from a sample survey to estimate a population mean or proportion English: 9-12 W.4 - Produce writing that is appropriate for the task or audience.	-Calculate the carrying capacity of a given species in a habitat. -Write an article discussing crop and rangeland management and its effects on wildlife populations.

INDICATOR #ANR 5: Understand air and water use, examine management practices, and develop conservation strategies.

SUB-INDICATOR 5.1 (Webb Level: 3 Strategic Thinking): Explain the government's role in regulating air and water quality.

SUB-INDICATOR 5.2 (Webb Level: 1 Recall): Define appropriate water conservation measures.

SUB-INDICATOR 5.3 (Webb Level: 4 Extended Thinking): Analyze the way in which water and air management affect the environment and human needs.

SUB-INDICATOR 5.4 (Webb Level: 3 Strategic Thinking): Measure and assess water and air quality parameters using federal, tribal, state and/or local standards.

Knowledge (Factual):	Understand (Conceptual):	Do (Application):
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<p>-Laws related to air and water conservation</p> <p>-Current government regulations</p> <p>-Clean Water Act</p> <p>-Clean Air Act</p>	<p>-The importance of air and water conservation</p> <p>-Agricultural usage and impact on ecological systems</p> <p>-The effects of water and air management on the environment and human needs</p>	<p>-Describe methods used to regulate surface water within the state</p> <p>-Discuss and debate the meandering waters</p> <p>-Develop an argument for the level of government regulation that should be placed into legislation</p> <p>-Research state and federal laws pertaining to natural resources</p> <p>-Hypothesize the effects of water and air due to human needs</p>
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Benchmarks:

Students will be assessed on their ability to:

- Map a carbon footprint.
- Collect and analyze air quality data.
- Analyze case studies on tribal water quality standards.
- Compare and contrast the differences between local, tribal, state and national standards.

Academic Connections

ELA Literacy and/or Math Standard (if applicable, Science and/or Social Studies Standard):

English:

- 1) 9-12 SL.4 - Presenting information, findings, and evidence conveying a clear perspective.
- 2) 9-12 W.1 – Write arguments to support claims, using valid reasoning and evidence.

Sample Performance Task Aligned to the Academic Standard(s):

- Present your carbon footprint map as determined by www.nature.org.
- Write a statement defending water use by the agriculture industry.

<p>INDICATOR #ANR 6: Develop plans to ensure sustainable production and processing of natural resources. (National NRS.03)</p>		
<p>SUB-INDICATOR 6.1 (Webb Level: 3 Strategic Thinking): Explain methods used to 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.)</p>		
<p>SUB-INDICATOR 6.2 (Webb Level: Skill/Concept): Compare the various production methods of alternative energy sources, both renewable and non-renewable, and their relations to economic, environmental and social sustainability.</p>		
<p>SUB-INDICATOR 6.3 (Webb Level: 4 Extended Thinking): Evaluate methods used to extract and process minerals for economic, environmental, and social sustainability.</p>		
<p>Knowledge (Factual):</p> <ul style="list-style-type: none"> -The formation of natural resources products -Processing techniques of natural resources products -Alternative energy sources -Mineral extraction process 	<p>Understand (Conceptual):</p> <ul style="list-style-type: none"> -Hunter safety and ethics -The importance between renewable and nonrenewable resources 	<p>Do (Application):</p> <ul style="list-style-type: none"> -Process natural resources products -Government regulation on alternative energy sources -Debate mining and its effects on the environment -Provide examples of environmental concerns regarding the removal of natural resources
<p>Benchmarks: <i>Students will be assessed on their ability to:</i></p> <ul style="list-style-type: none"> • Obtain certification through a Hunter's Safety Course. • Obtain certification through SD Bowhunter Course. • Debate the pros and cons of mining near a body of water. • Illustrate the mining process. • Create a presentation using lab work and models to explain the difference between renewable and non-renewable energy. 		
<p><i>Academic Connections</i></p>		

<p>ELA Literacy and/or Math Standard (if applicable, Science and/or Social Studies Standard):</p> <p>English: 9-12 SL.1 - Participate in collaborative discussion</p>	<p>Sample Performance Task Aligned to the Academic Standard(s):</p> <p>-Use parliamentary procedure to debate a topic related to sustainable production in natural resources systems.</p>
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Additional Resources

- Project Wet
- Project Wild
- Land and Range CDE Book
- NRCS
- Envirothon
- CASE Natural Resources
- US Fish and Wildlife Service
- SDGFP
- Bureau of Land Management
- Lake and Stream Ecology Workshop