

Natural Resource and Environmental Systems (2015): Grades 9, 10, 11, 12, Higher Education

Adopted 2015

**Understand and apply
the scientific principles
of an ecosystem** NRES.01

01. Describe the organization of life in an ecological system NRES.01.01

- a. Define biosphere, ecosystem, biomes, habitats NRES.01.01.A
 - b. Understand interactions of biosphere, ecosystem, biome, habitat NRES.01.01.B
 - c. Analyze factors which impact each level NRES.01.01.C
 - d. Hypothesize the impact of changing factors in a given level NRES.01.01.D
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02. Recognize the importance of biotic and abiotic organisms in an ecosystem NRES.01.02

- a. Define biotic and abiotic NRES.01.02.A
 - b. Classify abiotic and biotic organisms NRES.01.02.B
 - c. Explain the interaction of biotic and abiotic factors in an ecosystem NRES.01.02.C
 - d. Hypothesize the impact of changing factors in a given level of an ecosystem NRES.01.02.D
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03. Understand the variety of habitats and niches NRES.01.03

- a. Identify and define niche as it relates to a habitat NRES.01.03.A
- b. Match habitat/niche to specific species NRES.01.03.B
- c. Describe environmental changes and their impacts on habitats/niches NRES.01.03.C
- d. Make recommendations for habitat improvement based on different scenarios NRES.01.03.D

04. Understand the energy flow cycle in a given ecosystem NRES.01.04

- a. Identify energy sources within an ecosystem NRES.01.04.A
- b. Determine food chain tropic level NRES.01.04.B
- c. Determine the flow of energy in a food chain or food web NRES.01.04.C
- d. Analyze species changes based on food chain/food web NRES.01.04.D

05. Understand nutrient cycles and their impact on an ecological system NRES.01.05

- a. Identify nutrients that cycle in the ecosystem (carbon, nitrogen, phosphorus, water) NRES.01.05.A
- b. Identify specific components in a nutrient cycle NRES.01.05.B
- c. Diagram nutrient cycles NRES.01.05.C
- d. Model the interaction of several cycles in an ecosystem NRES.01.05.D

06. Understand the role and importance of riparian and wetland areas to maintaining a healthy ecosystem NRES.01.06

- a. Identify the location and characteristics of riparian and wetland areas NRES.01.06.A
- b. Analyze the importance of riparian and wetland areas to ecological balance NRES.01.06.B
- c. Develop best practices for creation and management of riparian and wetlands NRES.01.06.C
- d. Explain the role of government and mitigation programs in maintaining riparian and wetland areas NRES.01.06.D

07. Understand the impact of plant diseases & invasive species on the health of rangeland and forest areas NRES.01.07

- a. Identify significant plant diseases and invasive species that are impacting natural resource areas NRES.01.07.A
- b. Correlate management practices to control of plant diseases and invasive species NRES.01.07.B
- c. Identify past practices and land use that have caused the spread of plant diseases or the introduction of invasive species NRES.01.07.C
- d. Create guidelines and policies that could be implemented to control disease and invasive species NRES.01.07.D

08. Understand the impact of disease on wildlife populations NRES.01.08

- a. Identify significant diseases of wildlife that have or are impacting ecosystems NRES.01.08.A
- b. Analyze factors that increase the spread of disease through wildlife populations NRES.01.08.B
- c. Create guidelines and policies that could be implemented to control disease in wildlife populations NRES.01.08.C

09. Understand the role insects play in ecosystem balance and health NRES.01.09

- a. Identify the major orders of insects found in ecosystems NRES.01.09.A
- b. Determine the roles (helpful and harmful) that insects play in the ecosystem NRES.01.09.B
- c. Identify insects that are or have in the past played a significant role in ecosystem deterioration NRES.01.09.C
- d. Create guidelines and policies that could be implemented to control insect damage in an ecosystem NRES.01.09.D

11. Explain the role of succession in ecosystem establishment and sustainability NRES.01.11

- a. Define succession (primary, secondary, pioneer species, climax community) NRES.01.11.A
- b. Distinguish the types and process of succession/compare and contrast primary and secondary succession NRES.01.11.B
- c. Describe the progression of species after an event (natural (forest fire)/manmade (mining)) NRES.01.11.C
- d. Apply succession principals given a scenario NRES.01.11.D

Recognize the importance of navigation and the variety of navigational tools NRES.02

01. Understand topographical maps, their features and uses NRES.02.01

- a. Describe the purpose of a topographical map NRES.02.01.A
- b. Identify features of a topographical map NRES.02.01.B
- c. Utilize a map for a specific purpose (route an irrigation ditch, determine water shed, plot a route/migration) NRES.02.01.C
- d. Create a topographical map of a local area NRES.02.01.D

02. Understand the importance of the compass and orienteering NRES.02.02

- a. Identify parts of a compass and determine true north NRES.02.02.A
- b. Describe steps to accurately reading a compass NRES.02.02.B
- c. Utilize compass in combination with map NRES.02.02.C
- d. Develop a compass course NRES.02.02.D

03. Describe the functionality of global positioning systems NRES.02.03

- a. Define GPS and identify equipment used in GPS NRES.02.03.A
- b. Plot locations (way points) using GPS NRES.02.03.B
- c. Calculating area using GPS NRES.02.03.C
- d. Utilize GPS data in wild life management case studies NRES.02.03.D

04. Become familiar with modern mapping technology and software NRES.02.04

- a. Explore current mapping technologies (map tech, Google earth, GIS) NRES.02.04.A
- b. Utilize modern mapping technology NRES.02.04.B
- c. Critique modern mapping technology NRES.02.04.C
- d. Compare and contrast modern mapping technologies with traditional map navigation NRES.02.04.D

Recognize the components of wildlife management NRES.03

01. Identify local wildlife species native to Colorado NRES.03.01

- a. Identify aquatic, air land and wildlife species NRES.03.01.A
- b. Understand characteristics of species as related to their habitat NRES.03.01.B
- c. Describe taxonomic classification and labeling of wildlife species NRES.03.01.C
- d. Identify species using scientific names NRES.03.01.D

02. Understand population dynamics related to wildlife management NRES.03.02

- a. Define population, community and ecosystem. NRES.03.02.A
- b. Explain carrying capacity and limiting factors of a variety of habitats NRES.03.02.B
- c. Interpret relationships between animals (predator/prey, competition, symbiotic relationships) NRES.03.02.C
- d. Develop a population management plan for a local wildlife habitat NRES.03.02.D

03. Recognize and explain wildlife animal adaptations NRES.03.03

- a. Identify animal adaptations and their causes NRES.03.03.A
- b. Describe effects of adaptations on animal populations (camouflage can protect animals from predators) NRES.03.03.B
- c. Perform a case study on adaptation in local region NRES.03.03.C
- d. Predict future adaptations due to changes in local region NRES.03.03.D

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- 04. Recognize the affects of human interaction in the form of hunting on a wildlife area** NRES.03.04
- a. Identify the pros and cons of hunting NRES.03.04.A
 - b. Explain the utilization of hunting in population control NRES.03.04.B
 - c. Critique the economic and community impact of hunting/guiding NRES.03.04.C
 - d. Create a management plan to determine harvest rates for a local wildlife region NRES.03.04.D
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- 05. Recognize the importance of species management and management ethics** NRES.03.05
- a. Identify and describe management/interaction techniques (reintroduction/habitat development, fencing, protected species) NRES.03.05.A
 - b. Compare and contrast the different types of management NRES.03.05.B
 - c. Analyze the need for a species specific management plan in a local region NRES.03.05.C
 - d. Develop a management plan for a specific species in local region NRES.03.05.D
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Recognize the areas of resource management and understand their importance NRES.04

- 01. Understand renewable and non renewable resources and their impact on society** NRES.04.01
- a. Define and identify natural resources NRES.04.01.A
 - b. Distinguish between renewable and non-renewable resources NRES.04.01.B
 - c. Explore interconnectivity of natural resources and sustainable society NRES.04.01.C
 - d. Model sustainability in resource management NRES.04.01.D
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- 02. Apply principles of range management** NRES.04.02
- a. Identify range plants in local area (grasses, forbs, shrubs) NRES.04.02.A
 - b. Identify healthy ranges (17 keys from BLM/USDA) NRES.04.02.B
 - c. Understanding the life cycle and grazing value of range plants NRES.04.02.C
 - d. Evaluate and manage range scenarios and make recommendations on acceptable practices (AUM, stocking rate, rotations) NRES.04.02.D
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- 03. Apply principles of forestry management** NRES.04.03
- a. Explore importance of trees as natural resources NRES.04.03.A
 - b. Identify life cycles, types and species of forest ecosystems (hardwood, softwood, deciduous, coniferous) NRES.04.03.B
 - c. Describe forestry management strategies NRES.04.03.C
 - d. Assess a forest for management decision (harvest methods, clear cutting, pest management, burning, seeding, establishment) NRES.04.03.D

04. Apply principles of soil management NRES.04.04

- a. Identify soil types and locations NRES.04.04.A
 - b. Recognize soil types NRES.04.04.B
 - c. Analyze soil properties (physical characteristics, texture, ph, structure) NRES.04.04.C
 - d. Interpreting data to make soil management decisions NRES.04.04.D
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05. Apply principles of land use NRES.04.05

- a. Identify land uses (cultivation, mining, wild lands, protected lands, land fills, development) NRES.04.05.A
 - b. Understand the characteristics necessary for particular land use NRES.04.05.B
 - c. determine land use based on soil property, economic return, geographic location, topography, habitat NRES.04.05.C
 - d. Develop a plan to manage land use (conservation, development, cultivation) NRES.04.05.D
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06. Apply principles of water management NRES.04.06

- a. Identify the stages of the water cycle NRES.04.06.A
 - b. Evaluate sources and uses of water NRES.04.06.B
 - c. Understand water management (storage, distribution, irrigation, conservation, run-off control) NRES.04.06.C
 - d. Analyze impact of water management on sustainability NRES.04.06.D
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07. Apply principles of air quality management NRES.04.07

- a. Identify layers and make up of the atmosphere NRES.04.07.A
 - b. Differentiate between weather systems and weather patterns NRES.04.07.B
 - c. Understand interactions of the atmosphere as they relate to air quality NRES.04.07.C
 - d. Determine how changes in atmosphere changes the ecosystem NRES.04.07.D
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08. Appropriately manage mining and mineral resources NRES.04.08

- a. Identify valuable minerals in local area NRES.04.08.A
- b. Distinguish methods of mineral extraction and reclamation NRES.04.08.B
- c. Analyze impact of mineral extraction (economic, environmental) NRES.04.08.C
- d. Create a reclamation and extraction plan NRES.04.08.D

09. Recognize the importance and sources of energy resources NRES.04.09

- a. Define and classify energy sources (coal, oil, solar, wind, hydroelectric, geothermal, nuclear, biofuels) NRES.04.09.A
- b. Determine methods of generation, storage and distribution NRES.04.09.B
- c. Compare and contrast energy sources (available, impact, economic, ecological) NRES.04.09.C
- d. Analyze impact of utilization of different energy methods NRES.04.09.D

10. Understand the necessity and process of making resource management decisions NRES.04.10

- a. Recognize a resource management problem in local region NRES.04.10.A
- b. Compile data on a management problem in local region NRES.04.10.B
- c. Analyze compiled data on a management problem NRES.04.10.C
- d. Draw conclusions and make recommendations about a resource management problem NRES.04.10.D

Manage Human Interactions with Natural Resources NRES.05

01. Identify and understand the role of governing agencies involved in natural resources NRES.05.01

- a. Identify main governing agencies of natural resources, their history and the areas they manage NRES.05.01.A
- b. Determine how policy is made in regards to natural resources NRES.05.01.B
- c. Determine how to utilize governing agencies NRES.05.01.C
- d. Evaluate public policy/governing agencies and form personal opinions NRES.05.01.D

02. Become familiar with laws relating to water, air, land, and outdoor recreation NRES.05.02

- a. Recognize laws that impact local resources NRES.05.02.A
- b. Interpret the purpose of laws that relate to local resources NRES.05.02.B
- c. Analyze the impact laws have on local resources NRES.05.02.C
- d. Create a needs assessment for laws relating to natural resources NRES.05.02.D

03. Understand the impact of waste and pollution on resources NRES.05.03

- a. Define wastes and pollution NRES.05.03.A
- b. Identify waste treatment methods NRES.05.03.B
- c. Determine the impact of waste and pollution on the ecosystem NRES.05.03.C
- d. Analyze systems for improvement of waste and pollution management NRES.05.03.D

04. Explore concepts relating to resource quality such as air, water, and land NRES.05.04

- a. Define quality resources NRES.05.04.A
- b. Evaluate how to measure quality NRES.05.04.B
- c. Interpret data and reports related to resource quality NRES.05.04.C
- d. Determine recommendations for improvement of resource quality NRES.05.04.D

05. Resource Utilization (Outdoor Recreation) NRES.05.05

- a. Recognize outdoor recreation in local area NRES.05.05.A
- b. Identify state and national programs for management (National Parks, State Wildlife areas) NRES.05.05.B
- c. Critique outdoor areas for cost analysis NRES.05.05.C
- d. Create a local outdoor recreation program NRES.05.05.D

06. Recognize issues and events related to natural resources on a local, state and national level NRES.05.06

- a. Identify a current issue facing local resources NRES.05.06.A
- b. Compile research on an issue related to natural resources NRES.05.06.B
- c. Critique sources for validity of information NRES.05.06.C
- d. Develop and debate an opinion relating to natural resource use NRES.05.06.D