Colorado CTE

# 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

**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

**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

**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

**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

## 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

**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

**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

**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

**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

**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

**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