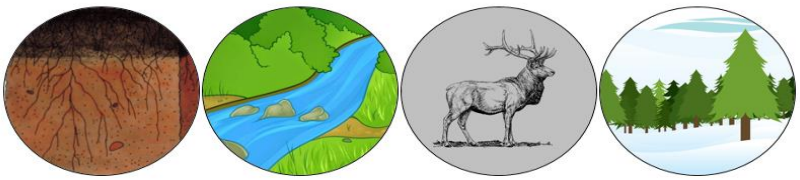
2018 Core Topics



2018 NCF Envirothon Study Guide


ENVIROTHON
IDAHO 2018

Table of Contents:

UNITED STATES NATIONAL CURRICULUM LINKS

U.S. National Standards Science Grades 9-12

Ecosystems: Interactions, Energy, and Dynamics

HS-LS2-1. Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.

HS-LS2-2. Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.

HS-LS2-4. Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.

HS-LS2-5. Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.

HS-LS2-6. Evaluate the claims, evidence, and reasoning for how the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.

HS-LS2-7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.

HS-LS2-8. Evaluate the evidence for the role of group behavior in individual and species' chances to survive and reproduce.

Biological Evolution: Unity and Diversity

HS-LS4-4. Construct an explanation based on evidence for how natural selection leads to adaptation of populations.

HS-LS4-5. Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.

HS-LS4-6. Create or revise a simulation to test a solution for mitigating adverse impacts of human activity on biodiversity. **Earth's Systems**

HS-ESS2-5. Plan and conduct an investigation of the properties of water and its effects on earth materials and surface processes.

HS-ESS2-6. Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.

HS-ESS3. Examine Earth and Human Activity.

HS-ESS3-2. Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.

HS-ESS3-3. Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.

HS-ESS3-4. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.

Engineering Design

HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.

HS-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

HS-ETS1-4. Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

1.0 SOIL AND LAND USE

1.1. *Key Topics*

1. Management strategies for improving soil function on rangeland
2. Soil formation and development
3. Soil Function, soil properties, and their interpretations
4. Soil-Plant relationships

1.2. *Learning Objectives*

Information and examples provided will help Envirothon teams understand the following:

1. How to describe and classify soils
2. Physical and chemical properties of soils
3. Making soil and land use interpretations
4. Nutrient, carbon, and water cycles
5. Soil function and ways to improve function through Best Management Practices (BMPs)
6. The importance of biodiversity and soil ecosystems
7. Soil erosion processes as well as their causes and effects
8. How soil surveys are made, what they contain, how they can be used, and what their limitations are
9. Land capability classifications
10. Ecological Site Descriptions – links between soils and plants
11. Soil testing and testing for soil health
12. How soil health affects rangeland health

1.3. *Soil Properties*

Soils have characteristics such as texture, pH, bulk density, organic matter, and many others. These soil properties are used to describe, classify, and interpret soils information for better land use management.

Soil has both inherent and dynamic properties and qualities. Inherent soil quality is a soil's natural ability to function. For example, sandy soil drains faster than clayey soil. Deep soil has more room for roots than soils with bedrock near the surface. These characteristics do not change easily.

Dynamic soil quality is how soil changes depending on how it is managed. Management choices affect the amount of soil organic matter, soil structure, soil depth, and water and nutrient holding capacity. One goal of soil health research is to learn how to manage soil in a way that improves soil function. Soils respond differently to management depending on the inherent properties of the soil and the surrounding landscape. (NRCS - Soil Health, n.d.)

1.4. *Soil Health*

Soil health, also referred to as soil quality, is defined as the continued capacity of soil to function as a vital living ecosystem that sustains plants, animals, and humans. This definition speaks to the importance of managing soils so they are sustainable for future generations. To do this, we need to remember that soil contains living organisms that perform functions required to produce food and fiber when they are provided the basic necessities of life—food, shelter, and water.

Only "living" things can have health, so viewing soil as a living ecosystem reflects a fundamental shift in the way we care for our nation's soils. Soil isn't an inert growing medium, but rather is teaming with billions of bacteria, fungi, and other microbes that provide the foundation of an elegant symbiotic ecosystem. Soil is an ecosystem that can be managed to provide nutrients for plant growth, absorb and hold rainwater for use during dryer periods, filter and buffer potential pollutants leaving our fields, serve as a firm foundation for agricultural activities, and provide habitat for soil microbes to flourish and diversify to keep the ecosystem running smoothly (NRCS - Soil Health, n.d.).

1.5. *Soil Function*

Healthy soil gives us clean air and water, bountiful crops and forests, productive grazing lands, diverse wildlife, and beautiful landscapes. Soil does all this by performing five essential functions:

1. Regulating water - Soil helps control where rain, snowmelt, and irrigation water goes. Water and dissolved solutes flow over the land or into and through the soil.
2. Sustaining plant and animal life - The diversity and productivity of living things depends on soil.
3. Filtering and buffering potential pollutants - The minerals and microbes in soil are responsible for filtering, buffering, degrading, immobilizing, and detoxifying organic and inorganic materials, including industrial and municipal by-products and atmospheric deposits.
4. Cycling nutrients - Carbon, nitrogen, phosphorus, and many other nutrients are stored, transformed, and cycled in the soil.
5. Physical stability and support - Soil structure provides a medium for plant roots. Soils also provide support for human structures and protection for archeological treasures.

(NRCS - Soil Health, n.d.)

Rangeland health and soil quality are interdependent. Rangeland health is characterized by the functioning of both the soil and the plant communities. The capacity of the soil to function affects ecological processes, including the capture, storage, and redistribution of water. It also affects the growth of plants and the cycling of plant nutrients (USDA-NRCS Soil Health - Resources & Publications; Note 3: Rangeland Soil Quality Information Sheets, 2017).

1.6. *Soil Survey*

A soil survey is a detailed report on the soils of an area. The soil survey has maps with soil boundaries, photos, descriptions, and tables of soil properties and features. Soil surveys are used by farmers, real estate agents, land use planners, engineers, and others who desire information about the soil resource (USDA-NRCS, Soil Survey, n.d.).

1.7. *Soil Conservation and Stewardship*

The iconic shots from the Dust Bowl Era of the 1930s featured massive black clouds looming over communities, farmhouses, and ranches. Such images are unforgettable. Intensive farming practices started during World War I, combined with a sustained period of drought, and having no erosion reducing techniques, created one of the worst natural disasters in our nation's history. In response

to this disaster, the federal government created the Soil Conservation Service as part of the US Department of Agriculture in 1935. The federal government pushed for states to enact laws and create local conservation districts to manage and improve conservation efforts at the local level (IASCD, n.d.).

1.7.1. Soil and Water Conservation Districts

Idaho saw its first soil conservation district law passed on March 1, 1939, and the first conservation districts were formed in 1940. These were Latah, Bear Lake, Portneuf, Squaw Creek, and Mayfield (later Elmore). Today, Idaho has 50 conservation districts that function as the primary entities to provide assistance to private landowners and land users in the conservation, sustainment, improvement, and enhancement of Idaho's natural resources. (IASCD, n.d.)

1.7.2. Idaho Soil and Water Conservation Commission

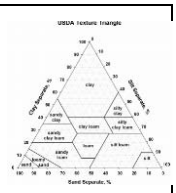
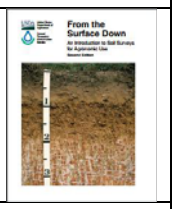
The Idaho Soil and Water Conservation Commission focuses on conservation in the Idaho Way—through voluntary stewardship rather than regulatory mandates. The Commission promotes responsible stewardship by providing cost sharing and technical expertise for conservation projects on private land throughout Idaho. Proactive, non-regulatory projects are beneficial because they address issues of concern and help avoid costly lawsuits and onerous regulations. (Idaho SWCC, n.d.)

1.7.3. Natural Resources Conservation Service

On April 27, 1935 Congress passed Public Law 74-46, in which it recognized that "the wastage of soil and moisture resources on farm, grazing, and forest lands . . . is a menace to the national welfare" and established the Soil Conservation Service (SCS) as a permanent agency in the USDA. In 1994, SCS's name was changed to the Natural Resources Conservation Service to better reflect the broadened scope of the agency's concerns. In doing so, Congress reaffirmed the federal commitment made more than eighty years to the conservation of the nation's soil and water resources. That commitment continues today. (USDA-NRCS History, n.d.)

1.8. *Resources*

The following recommended resources are intended to guide you in gaining an understanding and perspective on the key topics, learning objectives, and help your team prepare for the 2018 Envirothon competition.

Texture by Feel, Dr. Dirt, K-12 Teaching Resources http://www.doctordirt.org/files/dr-dirt/texture-feel.pdf	
From the Surface Down, *USDA – Natural Resources Conservation Service* https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_053238.pdf	
Idaho NRCS Soil Health Assessment Card, *USDA – Natural Resources Conservation Service* https://www.nrcs.usda.gov/wps/PA_NRCSConsumption/download?cid=stelprdb1261704&ext=pdf	
Profiles in soil health - Building Healthy Rangeland Soil; Adaptive grazing minimizes disturbance, increases plant diversity, *USDA – Natural Resources Conservation Service* https://www.nrcs.usda.gov/wps/PA_NRCSConsumption/download?cid=nrcseprd353825&ext=pdf	
Soil Quality Technical Note 3: Rangeland Soil Quality Information Sheets https://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/resource/#etc 1. Introduction (PDF, 1MB) 2. Indicators for Assessment and Monitoring (PDF, 1MB) 3. Aggregate Stability (PDF, 2MB) 4. Compaction (PDF, 1.5MB) 5. Infiltration (PDF, 1MB) 6. Organic Matter (PDF, 2MB) 7. Physical and Biological Soil Crusts (PDF, 1MB) 8. Soil Biota (PDF, 2MB) 9. Water Erosion (PDF, 2MB) 10. Wind Erosion (PDF, 2MB)	

Soil Quality Posters - Rangeland Soil Quality Poster, *USDA – Natural Resources Conservation Service* https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_054355.pdf	
Video Resource - Soil Health and Production Benefits of Mob Grazing – Conservationwebinars.net http://www.conservationwebinars.net/webinars/soil-health-and-production-benefits-of-mob-grazing/?searchterm=rangeland%20soil%20health	
Video Resource - Understanding Soil Quality Impacts on Soil Functions and Other Resource Concerns – Conservationwebinars.net http://www.conservationwebinars.net/webinars/understanding-soil-quality-impacts-on-soil-functions/?searchterm=soil%20quality	
Video Resource - Integrating Livestock into a Cropping System for Sustainability and Soil Health - Conservationwebinars.net http://www.conservationwebinars.net/webinars/integrating-livestock-into-a-cropping-system/?searchterm=rangeland	

2.0 WATER RESOURCES & AQUATIC ECOLOGY

2.1. *Key Topics*

1. Water quantity, quality, and conservation
2. Aquatic and riparian environments on rangeland
3. Aquatic biota – water quality indicators

2.2. *Learning Objectives*

Information and examples provided will help Envirothon teams understand the following:

1. How to identify aquatic and riparian biota (macroinvertebrates, vertebrates, aquatic/riparian plants, etc.).
2. How current and past rangeland management and water use has affected water quality and riparian ecosystems.
3. Water quality and how the riparian and wetland restoration/enhancement BMPs used on rangeland improves and protect watersheds.
4. How the water cycle functions and how different types of rangeland management affect it.
5. How to perform a water quality and water-body assessment.
6. Who monitors surface water within Idaho? How is it done and why?

2.3. *Water Resources and Conservation*

Because every living thing needs water to survive, water is one of our most important resources. Water conservation means using less water and recycling used water so that it can be used again. This type of program is important because water conservation helps save energy, protect wildlife, and prevent people from using amounts of water that cannot be replaced with rain.

Conserving water and using it efficiently to avoid waste is essential in ensuring that we have adequate water supplies today and into the future. Scientists have discovered that there is no more water on Earth now than there was when the planet was first formed. With this information, it becomes clear that we have a responsibility to use the water we have wisely. This can be as simple as each of us making small changes in our daily lives.

Water conservation encompasses the policies, strategies, and activities made to manage fresh water as a sustainable resource, to protect the water environment, and to meet current and future human demands.

2.3.1. Water Quality

Water quality can be thought of as a measure of the suitability of water for a particular use based on selected physical, chemical, and biological characteristics (USGS Water Science School, n.d.).

2.3.2. Water Quantity

The ability to calculate the typical amount of water needed for a specific task is important in water management planning. Water rights are limited to the quantity of water that can be beneficially used (IDWR - Water Use Information, n.d.).

2.3.3. Ground Water

Ground water is a key resource supporting many aspects of Idaho's way of life. It replenishes our streams and rivers and provides fresh water for irrigation, industry, and communities. In addition, ground water supplies 95% of the state's drinking water. As Idaho's population grows, so does the need for clean, usable ground water (Idaho DEQ - Water Quality, n.d.).

2.3.4. Surface Water

Surface water consists of rivers, streams, lakes, reservoirs, and wetlands. These waters not only provide great natural beauty, but they supply the water necessary for drinking, recreation, industry, agriculture, and aquatic life as well (Idaho DEQ - Water Quality, n.d.).

2.4. *Aquatic Ecology*

2.4.1. Aquatic and Riparian Environments

A Riparian zone is known as the buffer between land and stream. Plant habitats and communities along the river are called riparian vegetation. Riparian zones are important in ecology, environmental management, and civil engineering because of their role in soil conservation, habitat biodiversity, and the influence they have on aquatic ecosystems,

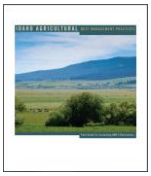
including sagebrush steppe, rangelands, grasslands, woodlands, wetlands , or even non-vegetative areas.

2.4.2. Biota

Biota is the animal and plant life of a particular region, geographical location, or geological period. Biota are responsible for the ecosystem health and for the different cycles of life to take place.

2.5. *Resources*

The following recommended resources are intended to guide you in gaining an understanding and perspective on the key topics, learning objectives, and help your team prepare for the 2018 Envirothon competition

Key to Macroinvertebrate Life in the River, *University of Wisconsin-Extension* http://clean-water.uwex.edu/pubs/pdf/riverkey.pdf	
Habitat Assessment Data Sheet, *Idaho Department of Environmental Quality* **See Addendum 1a*	
Idaho's Beneficial Use Reconnaissance Program: Working to maintain the quality of our streams, rivers, and lakes. https://www.deq.idaho.gov/media/594809-beneficial_use_reconn_program.pdf	
The Water Cycle, *USGS* https://water.usgs.gov/edu/downloads/watercycle/watercycle.pdf	
Idaho Agricultural Best Management Practices: Field Guide for Evaluating BMP Effectiveness, *Idaho Soil and Water Conservation Commission – Chapter 6: Riparian and Wetland (pg. 48 – 56)* https://swc.idaho.gov/media/17068/bmp_april2013-sml.pdf	
Video Resource - Cheap and Cheerful Stream and Riparian Restoration: Beaver Dam Analogues as a Low-cost Tool, *Conservationwebinars.net* http://www.conservationwebinars.net/webinars/cheap-and-cheerful-stream-and-riparian-restoration-beaver-dam-analogues-as-a-low-cost-tool	

Additional online resources: The USGS Water Science School https://water.usgs.gov/edu/waterquality.html Idaho Department of Water Resources https://www.idwr.idaho.gov/ Watershed Academy, EPA https://www.epa.gov/watershedacademy	

3.0 WILDLIFE

3.1. *Key Topics*

1. Wildlife identification
2. Wildlife habitat and ecology
3. Wildlife management strategies

3.2. *Learning Objectives*

Information and examples provided will help Envirothon teams understand the following:

1. Identifying wildlife by sight, sound, tracks, or scat
2. Ecological concepts
3. The importance of biodiversity
4. Wildlife management concepts
5. What a species conservation status is and what species are protected in Idaho
6. What issues arise with managing wildlife within multiple land-use areas

3.3. *Wildlife Habitat and Ecology*

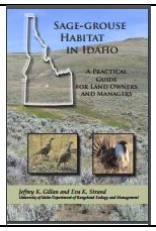
A biological community is made up of two or more populations of different species inhabiting a area. The natural environment in which a species or a group of species live in. The more extensive definition of wildlife focusing on the conservation of organisms and various species of wildlife. (Toran, n.d.)

3.4. *Management*

Management of species to control and improve populations and biodiversity. Management in most states fall under the jurisdiction of the respective departments of Fish and Game. Game management is important to ensure species diversity and numbers remain relevant. Management also helps to control numbers and overcrowding.

3.5. *Resources*

The following recommended resources are intended to guide you in gaining an understanding and perspective on the key topics and learning objectives. They will also help your team to prepare for the 2018 Envirothon competition.

Grazing Management In Perspective: A Compatible Tool For Sage Grouse Conservation, *Sage Grouse Initiative* http://www.sagegrouseinitiative.com/wp-content/uploads/2017/08/SGI-Science-to-Solutions-Grazing-Management-In-Perspective-Aug-2017.pdf	
Sage-Grouse Habitat in Idaho: A Practical Guide for Land Owners and Managers, *University of Idaho Department of Rangeland Ecology and Management (pg. 8-14)* http://www.sagegrouseinitiative.com/wp-content/uploads/2013/08/SGI_FieldGuides-Idaho.pdf	
Idaho Pollinator Habitat: Assessment Form and Guide – Farms and Agricultural Landscapes, *The Xerces Society* http://www.xerces.org/wp-content/uploads/2015/07/Poll-HAG_Idaho_July2015_web.pdf	
Fish and Game helps landowners help wildlife https://idfg.idaho.gov/blog/2017/04/helping-landowners-help-wildlife	

4.0 FORESTRY

4.1. *Key Topics*

1. Basic forest inventorying and assessment
2. BMPs used to manage Idaho forests
3. The roles forests play in local ecosystems
4. Wildfire management
5. Tree Identification (using a Key)

4.2. *Learning Objectives*

Information and examples provided will help Envirothon teams understand the following:

1. How to identifying common native trees and shrubs of Idaho
2. The Best Management Practices used to manage Idaho forests for stand health, harvesting, roads, water quality, and reforestation
3. Forest wildfire effects on the environment and the effects of fire suppression
4. Understand the functions of Idaho forests, watersheds, economy, wildlife habitat, etc.
5. Current conditions of Idaho's Forest Industry
6. Benefits of trees and shrubs within different land uses: urban, rural, crop and pasture, and rangeland and forests?

4.3. *Inventory and Assessment*

An inventory is a cornerstone of forest stewardship planning that not only ensures your forest is healthy and productive, but ensures that it can meet your objectives as a landowner for years to come. After all, to assess the needs of your forest and plan for the future, you have to know what forest resources you have. A forest inventory will help you quantify what you have and identify needs and opportunities to better forest health, wildlife habitat, timber production, aesthetics, and carbon storage. An inventory will give you insights into species composition, tree density, basal area, volume, and will help you document change (e.g., growth and mortality) in your forest over time (Pacific Northwest Extension).

4.4. *Identify Common Trees of Idaho*

Using a key identify the most common trees in Idaho forests. Tree characteristics like rooting habit, shade, soil type and PH, leaves, bark, fruiting structure, climatic zones all help in identifying tree species.

4.5. *Resources*

The following recommended resources are intended to guide you in gaining an understanding and perspective on the key topics, learning objectives, and help your team prepare for the 2018 Envirothon competition:

Idaho Forestry Best Management Practices Field Guides, *University of Idaho Extension* • BMPs and Water Quality • Idaho Watersheds • Working Forests • Forest Roads • Stream Crossings • Timber Harvesting • Postharvest Activities • Hazardous Substances http://www.uidaho.edu/extension/idahoforestrybmps/topic-areas	
Fire Ecology, *Eco-Link publication of the Temperate Forest Foundation* http://www.idahoforests.org/img/pdf/eco/FireEcology.pdf	
Idaho forest Products Commission http://www.idahoforests.org/ownall.htm http://www.idahoforests.org/health1.htm http://www.idahoforests.org/fhealth1.htm http://www.idahoforests.org/img/pdf/treesofidaho.pdf	

5.0 ENVIROTHON RESOURCES AND SOCIAL MEDIA

The following recommended resources are intended to keep you up-to-date with the 2018 Idaho Envirothon Competition. They will help to ensure that you are aware of any changes or any additional resources that may become available to better help you and your team prepare for the 2018 Envirothon competition.

5.1. *Websites*

www.envirothon.org

www.idahoenvirothon.weebly.com

5.2. *Social Media*

Idaho Envirothon Facebook Page

Idaho Envirothon Instagram Page

@Idahoenvirothon2018

6.0 WORKS CITED

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Bureau of Land Management. (n.d.). Retrieved from https://www.blm.gov/

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Rangelandswest- Careers and Education. (n.d.). Retrieved from https://rangelandswest.org/careersandeducation/

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USDA-NRCS Soil Health - Resources & Publications; Note 3: Rangeland Soil Quality Information Sheets. (2017). Retrieved from https://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/resource/#etc

USDA-NRCS, Soil Health. (n.d.). Retrieved from https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/soils/health/

USDA-NRCS, Soil Survey. (n.d.). Retrieved from https://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/survey/

"The mission of the North American Envirothon is to develop knowledgeable, skilled, and dedicated citizens who have an understanding of natural resources and are willing and prepared to work towards achieving and maintaining a balance between the quality of life and the quality of the environment."

–National Conservation Foundation