Advisor Handbook 2019
Advisor Handbook

For the past number of years, high schools in Utah have recognized the value of the Envirothon experience. Students and their teachers become empowered by their own motivation as the Envirothon engages them in an exciting, multi-faceted study of the environment. Students involved in the Envirothon often pursue further education in environmental fields. Many Envirothon participants pursuing college degrees in various natural resource disciplines have indicated that their education choice was partly due, or strengthened by, their Envirothon experience. Many Envirothon advisors credit the Envirothon with increasing student interest and involvement in environmental sciences. To many people involved, the Envirothon is more than just a competition.

Whether a first time participant in the Envirothon or a seasoned veteran, student teams are excited to learn about the environment, their relationship with it, and how they can each work towards its protection and conservation.

This Advisor Handbook is intended to help advisors and teams become fluent in a broad range of environmental topics. Efforts were made to link regular natural resource topics, or station materials, to the current issue (which changes annually). The Handbook outlines the program guidelines of the Envirothon, as well as includes Learning Objectives and lists of references.

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Mission Statement

The Utah Envirothon motivates students to develop the knowledge and skills necessary to address complex issues and challenges associated with management of natural resources while empowering them to be active and involved citizens.
Objectives

Awareness: The Envirothon will help students cultivate an awareness of the total environment and acquire sensitivity towards its limited natural resources.

Knowledge: The Envirothon will help students develop a basic understanding of the earth’s ecological systems and the life-sustaining implication these systems have on all living things.

Attitudes: The Envirothon will help students develop attitudes, which embrace environmental sensitivity and instill the dedication to participate in activities geared towards protecting the environment.

Application: The Envirothon will help students develop skills needed to identify, investigate, and contribute to the resolution of issues and challenges in natural resource management.

Partners & Sponsors

Utah Envirothon thanks its many sponsors:
Utah Conservation Districts
Utah Department of Environmental Quality, Division of Water Quality
Utah STEM Action Center
Utah Conservation Commission
Utah FFA Association
Utah State University - College of Agriculture & Applied Sciences
Utah State University – College of Natural Resources
USDA-Natural Resources Conservation Service
Utah Department of Agriculture and Food
Utah Envirothon 2019

Teams consist of four or five members and may include an alternate. The cost to each team is $100. A Utah Envirothon team may be sponsored by a local conservation district. The sponsoring district may pay the team’s registration fee. A listing of Utah’s conservation districts is included in this handbook. Team members should bring all-weather clothing, in case of rain or snow, and sunscreen. The Utah Envirothon will provide a Utah Envirothon T-shirt, Friday night dinner, Saturday breakfast and lunch to all participating team members.

The competition is scheduled for April 26-27, 2019, in Logan, Utah. Teams participate in the oral competition on Friday night at Utah State University and rotate through five field test stations on Saturday in an outdoor setting in Cache Valley.

**Station**
- Aquatic Ecology
- Wildlife
- Soils/Land Use
- Forestry
- Soil and Water Conservation Stewardship*

(* The fifth testing station is a Current Environmental Issue which changes annually.)

<table>
<thead>
<tr>
<th>Past Years’ Current Environmental Issues</th>
<th>2005</th>
<th>2006</th>
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<tbody>
<tr>
<td>1984 Acid Rain</td>
<td>Managing</td>
<td>Water Stewardship in a Changing</td>
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<td>1985 Hazardous Waste</td>
<td>Cultural Landscapes</td>
<td>Climate</td>
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<td>1986 Solid Waste Management</td>
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<td>1987 Water Quality</td>
<td>2006</td>
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<td>1988 Farmland Preservation</td>
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<td>Alternative/renewable Energy</td>
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<td>1989 Recycling</td>
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<td>1990 Wetlands</td>
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<td>Recreational Impacts on Natural</td>
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<td>1991 Energy Sustainability</td>
<td>2008</td>
<td>Resources</td>
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<td>1992 Groundwater Urban Environment</td>
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<td>1993 Pesticides</td>
<td>2009</td>
<td>Biodiversity in a Changing World</td>
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<td>1994 Acid Rain</td>
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<td>1995 Groundwater</td>
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<td>Protection of Groundwater through</td>
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<td>1996 Greenways</td>
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<td>Environmental Planning</td>
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<td>1997 Pest Management</td>
<td>2011</td>
<td>Salt &amp; Fresh Water Estuaries</td>
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<td>1998 Watersheds</td>
<td>2012</td>
<td>Nonpoint Source Pollution: Low Impact</td>
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<td>1999 Wildfire Management</td>
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<td>Development</td>
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<td>2000 Wetland Management</td>
<td>2013</td>
<td>Sustainable Rangeland Management</td>
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<td>2001 Urban Nonpoint Source Pollution</td>
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<td>2002 Introduced Species</td>
<td>2014</td>
<td>Competition not held</td>
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<td>2003 Farmland Preservation &amp; Conservation</td>
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<td>2004 Natural Resources Management in the Urban Environment</td>
<td>2015</td>
<td>Urban Forestry</td>
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<td>2016</td>
<td>Invasive Species</td>
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<td></td>
<td>2017</td>
<td>Soil &amp; Water Conservation Stewardship</td>
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<td>2018</td>
<td>Western Rangeland Management</td>
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<td>2019</td>
<td>Agriculture &amp; Technology</td>
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The overall winners of the Utah Envirothon advance to the National Conservation Foundation (NCF) Envirothon. The Utah Envirothon will pay transportation and lodging costs. The multiple-day event will bring together and challenge Envirothon teams from over 50 U.S. states and Canadian provinces. Teams will compete for thousands of dollars in NCF Envirothon Scholarships and prizes.

**Brief History of Envirothon**

The Envirothon program began in Pennsylvania as the “Envir-Olympics” in 1979 with three counties holding competitions. 1988 marked an important year—the event had grown to include 38 teams and the program was officially changed to “Envirothon.”

**Utah Envirothon Rules & Regulations**

1. The Utah Envirothon competition shall consist of five test stations and an oral presentation. The five station subjects shall be soils/land use, forestry, wildlife, aquatic ecology and a current environmental issue. A portion of the questions will be specific to the site. The oral presentation will be based on the current environmental issue.

2. Team members must be enrolled in grades 9 through 12 for the current school year. Teams from a junior high school with members in 7th or 8th grade may compete at the Utah Envirothon and are eligible for all local awards. Should such a team place first in Utah, they will not be eligible to advance to the NCF Envirothon. In that case, the next eligible team (consisting of students in 9th – 12th grades only) will be invited to compete at the North American event.

3. Each team is encouraged to contact their local conservation district to inform them of their intent to participate in the Utah Envirothon. Please see the UACD Conservation District Directory on page 23 to find your local district.

4. Each team will consist of four or five members from the same school and/or organization. Registration forms listing the names of the 5 team members and one alternate must be submitted prior to the Utah Envirothon competition. If a team member becomes injured or ill during the competition, the Steering Committee may allow a team to compete with fewer than five members and will determine if a penalty shall be assessed to a team in the oral presentation for the absence of a complete five-member team. The team alternate may compete only if a team member is ill or injured and is unable to complete the competition.

5. All school team alternates will have the option of joining a special “alternate” team. An alternate team may not participate in the oral presentation, but will be allowed to rotate through the teaching/testing stations and participate in the testing.

6. In the event a team comprised of 7th or 8th grade students and/or alternate teams (teams with members from more than one school or organization) score high enough to place in the top three of
the five testing stations and/or the overall top three, the team will be presented an award. However, the team will not be eligible to advance to the NCF Envirothon competition.

7. Team advisors will be responsible for their team throughout the two-day event. They may rotate through the teaching/testing stations with teams other than their own. Advisors will observe only and must not interfere with station presentations or testing and may be asked to leave if they do. Teams will be escorted by Utah Envirothon volunteers between testing stations. Volunteers will also monitor activity at the testing stations.

8. Team members work together to answer test questions. They may not, however, refer to any notes and/or other materials while taking the written test.

9. Medical release and parental consent forms shall be provided for each team and alternate team members attending the event. Completed forms must be returned prior to or at the time of registration. No exceptions.

10. Transportation, lodging, and meals associated with those competing in the Utah Envirothon are the responsibility of the individual teams and/or sponsors and schools, unless otherwise specified.

11. Test station competition will be held in an outdoor setting. Team members should wear appropriate clothing. Do not wear any item of clothing that may identify your team by city, county, or school. State Envirothon T-shirts will be provided and worn by all team members during the station testing and oral presentations.

12. Cameras, video recorders, laptop computers, tape recorders or other electronic equipment are prohibited at the teaching/testing station site. This includes all cellphones, calculators, wireless devices, iPods, etc. Photographs may be taken at a distance that would not disturb participants. Allowances will be made in advance for the news media. Only a team’s advisor, or other identified individual, may video record their team during the oral presentation competition.

13. Judges’ decisions are final on all events. Formal appeals may be filed by contacting the Utah Envirothon administrative team and completing the appeals form. Written appeals will be reviewed by an appointed appeals committee. The appeals committee will consist of at least three members chosen by the Utah Envirothon Steering Committee. The decision of the appeals committee is final.

14. The team having the highest cumulative point total in all phases of the Utah Envirothon competition is eligible to attend the NCF Envirothon competition. In the event of a team tie, the team with the highest oral presentation score will be the winning team.

15. In the event the winning team cannot represent Utah at the NCF Envirothon competition, the team with the next highest score will be eligible to compete.

16. The Utah Envirothon will assist with registration, transportation expenses, and travel plans for the winning team to participate in the Canon Envirothon competition.

17. Snuff, tobacco, drugs and all alcohol are NOT permitted during any part of the competition. Weapons of any kind will NOT be tolerated. All participants are subject to all local civil laws.
18. Cheating, stealing, or vandalism of any kind will not be tolerated before, during, or after any Envirothon event.

19. Any infraction of the rules and regulations of the Utah Envirothon could result in disqualification and dismissal from the event and host site.

20. Rules and regulations of the Utah Envirothon are subject to change by the Utah Envirothon Steering Committee.

These rules and regulations were reviewed and revised in March 2019.

Overview of the Station Testing

Station testing evaluates team performance in four universal areas (soils/land use, aquatic ecology, forestry, wildlife) and a different current environmental issue each year. At each station, written tests assess each team’s knowledge of the specific resource at that site.

For example, the forestry station primarily relates to forest ecology, forest structure and composition, regional tree and plant species, and silvicultural and forestry practices; the aquatic ecology station primarily relates to aquatic ecosystems, species diversity, and aquatic resource management; the soils/land use station primarily relates to land formation, use of a soil survey, and land management practices; and the wildlife station primarily relates to wildlife ecology, conservation and management practices, regional wildlife species, and issues involving wildlife and society.

Station testing is designed to provide a challenging, hands-on opportunity for each team to demonstrate and apply their knowledge of environmental science and natural resource management.

As teams rotate through each of the five testing stations, they will experience a variety of testing formats. Most tests will include some type of identification, including wildlife tracks or mounts, bird calls, skins, fish, macroinvertebrates, trees, soil textures and soil horizons. The majority of the other questions will be in the format of matching and multiple-choice, with a few fill-in-the-blank and short answer questions. At each station, teams receive a brief introduction to the specific site. The test is usually administered by a natural resource professional with expertise in that field. Students spend 50 minutes at each testing station (25 minutes of instruction and 25 minutes of testing), and a 10-minute period for travel between stations.

Oral Presentation

The oral presentation component offers Envirothon teams a chance to address real-life environmental problems as presented through a given scenario. Participation in the oral presentation component is mandatory. It offers students a chance to hone their public speaking, problem-solving, and presentation skills, and it also helps the students prepare for the upcoming test stations.
The oral presentation component tests a team’s ability to consider an environmental issue, discuss its likely ramifications and effects, develop possible solutions, and present their findings to a panel of judges and then answer the judges’ questions during a 15-minute session. The oral component consists of a **12-minute oral presentation** and a **3-minute question/answer period** with the judges.

Prior to the event, the scenario is sent to team advisors upon receipt of the team registration materials. Teams can utilize identified resources and research new information allowing them to better prepare for their oral presentation. Teachers/advisors cannot prepare the presentation for the team.

During a 15-minute session, the teams present their recommendations to a panel of judges chosen by the Utah Envirothon administrators All. Each team is asked questions based on their recommendations and scored accordingly by the panel of judges. This is a great opportunity for students to work together and apply some of the things they have learned while studying for the Envirothon competition. They are asked to defend and explain their recommended actions. Students are not judged on what is "right" or "wrong," they are judged on their ability to think on their feet and incorporate their existing knowledge of soils/land use, aquatic ecology, wildlife, forestry and the year's current issue. The scenario is based on the current issue theme each year when applicable.

**Oral Presentation Rules**

On Friday night, each team will be allowed **12 minutes** to deliver its presentation to the panel of judges. A **3-minute question-and-answer period** will follow. During the presentation, teams will be notified of the time remaining with cards presented by a timer.

- In advance of the Utah Envirothon, each team is allowed to prepare a digital presentation, posters or a skit to enhance and illustrate their presentation. Teams must supply their own laptop and projector, or easels will be available on site; please do not bring an easel.
  - All visual aids MUST be created by students. This includes publications, maps or computer-generated information. Presentation notes can only be on 3” x 5” note cards.

- All oral presentation materials, including laptops, will be left at the registration table on Friday night at check in. Each team will pick up their materials 10 minutes before their scheduled presentation time.

- The order of team presentation will be determined by a lottery and posted on a board at the registration table on Friday evening.

- Only the presenting team, judges, timer and team advisors will be allowed in the room during the presentation. Each team may videotape their own presentation. They must provide the equipment and a person to do the taping.

- All team members must participate orally in the presentation. During oral presentations, all team members must wear a Utah Envirothon T-shirt. During oral presentations, no school or conservation district identification, either written or stated, is permitted.

- Scoring will be based on the judges’ scoring sheets. The presentation is worth a possible **200 points**. Judges will consider depth and innovation of research, understanding of environmental and socioeconomic issues, information that supports and justifies conclusions, solutions that address the concerns of all affected groups, quality of the presentation, effectiveness of visual aids, organization, and completeness.
Helpful Hints to Prepare a Team

The Envirothon competition is designed to get students involved in learning about many different natural resource management and environmental disciplines. The amount of information provided to Envirothon teams may seem overwhelming to team members and advisors. These tips are designed to help teams prepare for the Envirothon by encouraging teamwork and a multidisciplinary approach to problem solving.

- There are five study areas and five team members. Teams could assign each member an area of primary concentration and secondary concentration. This way your team will have two members knowledgeable about each study area. They would be encouraged to share the information with the others in practice sessions.
- Another way to divide the work is to have several team members focus on natural history and identification while the other members focus on the resource management issues for each study area.
- Assessing the skills of each team member will determine the best approach for each team. Remember—no resource professional can know everything.
- Teamwork is essential in the real world. Learning how to work as a team is essential to success at the Envirothon competition. Cooperative decision-making, free exchange of ideas, and information-pooling are desirable and give Envirothon much of its unique appeal.
- Make sure all team members are familiar with basic ecology terms and current environmental issues and resource concerns. They should also develop an understanding of the interrelationship between all the study areas and how the management of one resource may affect another.
- Map reading is an important skill for natural resource professionals. Each team should learn how to read and interpret a U.S. Geological Survey topographic map as an introduction to using other map resources.
- Work with local resource professionals to get students out in the field doing hands-on activities. Students are expected to know and understand techniques used by resource professionals in the field. Additionally, students will benefit from exposure to unique career opportunities in natural resource management fields.
- Teams are given one month to prepare for the oral competition. This score is worth 200 points—double what each field station test is worth. Do not underestimate the importance of preparing adequately for this portion of the competition. There are no right or wrong answers. However, students must be able to justify their proposal and decisions to the panel of judges. Please see the Oral Presentation Rules for more information.
- The Envirothon is designed to challenge students’ creativity, critical thinking, and team-building skills in a competitive format. Just remember to have fun!
Some Tips for Teaching the Envirothon Materials

1. **Arrange a visit to a local park or nature center.** Just one day or afternoon “in the field” can do wonders for bringing all of your team’s studying to life. Many environmental educators in parks and nature centers can lead hikes based around themes or concepts that you want covered with your students. Hands-on investigations, tree identification walks, stream investigations—all of these may be possible at sites near your school.

2. **Ask your Conservation District or USU Extension Office about tree and log scales, diameter tapes, topographic maps, and other available educational resources and programs.** Many conservation districts have educational resources that you can check out for use with the Envirothon.

3. **Utilize the World Wide Web.** The Envirothon web pages have updates, current events, and resources:
   - [utahenvirothon.org](http://utahenvirothon.org) — Utah Envirothon homepage
   - All of our partners’ and sponsors’ page links can be found on the Envirothon homepage.
   - [www.envirothon.org](http://www.envirothon.org) — North American Envirothon homepage

4. **Follow environmental issues in your local newspapers.** This is a great way for your students to connect all of the environmental concepts the Envirothon covers with “real life.” In every spot in Utah on every day, something is happening which affects the health of our forest ecosystems and watersheds, the quality of living for local residents, and the use of our resources. There are success stories as well as hard lessons in economics, politics, and sociology. Following a current local event in the classroom is an effective way of engaging students in informed discussions and action.

5. **Last, but certainly not least: Have fun!** One key to a meaningful environmental education experience is fun. Reading up on your local ecosystems, having an energetic discussion about a forestry issue, investigating a stream for water quality, measuring trees like professional foresters, even getting your hands “dirty” in an exposed soil profile can be fun and exciting adventures in learning. If it’s fun, you will not only get the students excited for more, but what they end up learning will probably stand a better chance of sticking with them.
Aquatic Ecology

Learning Objectives

Abiotic factors

1. Know the processes and phases for each part of the water cycle and understand the water cycle’s role in soil nutrient erosion, salinization of agricultural lands, and climatic influences.
2. Understand the concept and components of a watershed and be able to identify stream orders and watershed boundaries. Know the features of a healthy watershed and an unhealthy watershed.
3. Know how to perform and interpret chemical water quality tests and understand why aquatic organisms and water quality is affected by the physical, chemical and biological conditions of the water.
   - Basic Concepts on Watersheds (http://water.epa.gov/type/rsl/monitoring/vms21.cfm)
   - How to Read a Topographical Map and Delineate a Watershed (https://www.soilandwater.nyc/uploads/7/7/6/5/7765286/watershed_delineation.pdf)

Utah Water Quality Extension Resources:

- Watershed 101 – Watershed functions and monitoring
  https://extension.usu.edu/waterquality/learnaboutesurfacewater/watersheds/

USU WQ Extension Stream Side Science Lessons:

- Where’s the Water - Students learn about distribution of Earth’s water.
  https://digitalcommons.usu.edu/cgi/viewcontent.cgi?referer=&httpsredir=1&article=2233&context=extension_curall
- What’s in the Water - Students monitor 4 abiotic factors (pH, dissolved oxygen, turbidity and temperature).
  https://digitalcommons.usu.edu/cgi/viewcontent.cgi?referer=&httpsredir=1&article=2231&context=extension_curall
- When Things Heat Up - Students explore the relationship between water temperature and dissolved oxygen.
  https://digitalcommons.usu.edu/cgi/viewcontent.cgi?referer=&httpsredir=1&article=2232&context=extension_curall

Biotic Factors

Learning Objectives:

1. Understand the dependence of all organisms on one another and how energy and matter flow within an aquatic ecosystem.
2. Understand the concept of carrying capacity for a given aquatic ecosystem, and be able to discuss how competing water usage may affect the ability of the system to sustain wildlife, forestry and anthropogenic needs.
3. Identify common, rare, threatened and endangered aquatic species as well as Aquatic Nuisance Species (ANS) through the use of a key.
4. Know how to perform biological water quality monitoring tests and understand why these tests are used to assess and manage aquatic environments.
**Suggested Activities:**

1. Describe the habitat needs of three specific aquatic animals, and compare and contrast the flow of energy in three different aquatic food chains.
2. Create a visual display of rare and endangered aquatic species. Explain how human activities are causing species imperilment and specify actions being taken to protect these species.
3. Conduct a biological stream assessment by collecting macro-invertebrates. Stream data sheets should be used to record and analyze information. Explain why these organisms are biological indicators that help us determine the health of a stream or waterway.

- [NOAA The Endangered Species Act: Marine Species](https://www.fisheries.noaa.gov/)
- [EPA An Introduction to Freshwater Fishes as Biological Indicators, pages 3-12](https://www.epa.gov/)
- [WV Save Our Streams’ Benthic Macro-invertebrate field guide](http://dep.wv.gov/WWE/getinvolved/sos/Documents/Benthic/WVSOS_MacroIDGuide.pdf)

**Utah Water Quality Extension Resources:**

- [Utah online macroinvertebrate key](https://extension.usu.edu/waterquality/macrokey/)

**USU Water Quality Extension Stream Side Science Lessons:**

- [Who Lives in the Water?](https://digitalcommons.usu.edu/cgi/viewcontent.cgi?referer=&httpsredir=1&article=2234&context=extension_curall)
- [Missing Macroinvertebrates.](https://digitalcommons.usu.edu/cgi/viewcontent.cgi?referer=&httpsredir=1&article=2224&context=extension_curall)
- [Aquatic Invasion!](https://digitalcommons.usu.edu/cgi/viewcontent.cgi?referer=&httpsredir=1&article=2222&context=extension_curall)

**Aquatic Environments**

**Learning Objectives:**

1. Identify aquatic and wetland environments based on their physical, chemical and biological characteristics.
2. Know characteristics of different types of aquifers, and understand historical trends and threats to groundwater quantity and quality.
3. Understand societal benefits and ecological functions of wetlands.
4. Understand the functions and values of riparian zones and be able to identify riparian zone areas.
**Suggested Activities:**
1. Describe the physical, chemical and biological characteristics of a stream, river, pond, lake and wetland.
2. Explain how different types of aquifers are indicators of water quantity and water quality. Describe how subsidence and salt water intrusion are related to the falling water table in many aquifers.
3. Describe three functions of wetlands, and explain how these functions are met in the absence of wetlands.
4. Describe three functions of riparian zones and explain how the removal of or damage to the riparian zone would affect water quality and specific aquatic food chains.

- USGS Ground Water
- Wetland Functions and Values
- Benefits of Riparian Zones
- Riparian Zones: Managing Early-Successional Habitats near the Water’s Edge

**Utah Water Quality Extension Stream Side Science Lessons:**

- Wetland vs Stream Macroinvertebrates — Students compare invertebrates from 2 very different environments
- Riparian Review — Students measure riparian factors along a stream
- USU Water Quality Extension — Water Pollution Lesson Plans and activities: lesson plan, water footprint calculator, groundwater models, watershed models

**Water Protection and Conservation**

**Learning Objectives:**
1. Understand how education programs and enforcement agencies are working together to protect aquatic habitats and preventing those who use our waterways from inadvertently transporting Aquatic Nuisance Species (ANS) from one river to another.
2. Interpret major provincial and/or federal laws and methods used to protect water quality (i.e. surface and ground water). Utilize this information to propose management decisions that would improve the quality of water in a given situation.
3. Be familiar with the federal, provincial and state agencies that provide oversight of water resources, and understand that Geographic Information Systems (GIS) is a useful and important tool in the management of water resources.
4. Identify global and local sources of point and nonpoint source pollution and be able to discuss methods to reduce point and nonpoint source pollution.
5. Understand the interaction of competing uses of water for water supply, hydropower, navigation, wildlife, recreation, waste assimilation, irrigation, and industry.
6. Know the meaning of water conservation, and understand why it is important every time you turn on a faucet.

**Suggested Activities:**
1. List at least three Aquatic Nuisance Species (ANS), and describe their effects on an aquatic ecosystem. Consider what can happen when predator ANS are imported, and develop a plan for the eradication of a target ANS.
2. Cite water protection laws at a mock hearing to decide whether a permit should be given to build a new shopping mall along a river.
3. Explain how Geographic Information Systems (GIS) are being used to help communities assess water quality and watershed health information.
4. Compare water usage in different regions of Canada and the United States and propose actions to help countries strike a balance between supply and demand in order to realize maximum benefit from our water resources.
5. Design a comprehensive water conservation plan for your home and the watershed below your home. This should include groundwater replenishment, securing sediment on your property, managing nonpoint source pollution, and following the path of good quality water as it leaves your property on its way to the sea.
6. Many dams are used to provide low cost electricity at the critical time of day when there is peak demand for electricity. Today a major issue is deciding which is more important to the economy, low cost energy or improving/restoring the ecology of a river. Evaluate the issue and develop recommendations for conservation groups and utility executives

- What are Aquatic Nuisance Species (ANS)?
- ANS Task Force
- Summary of the Federal Clean Water Act: (SDWA)
- The Quality of Our Nation’s Water
- GIS and Hydrology
- Water Resources
- Polluted Runoff: Nonpoint Source Pollution
  [https://www.epa.gov/nps/basic-information-about-nonpoint-source-nps-pollution](https://www.epa.gov/nps/basic-information-about-nonpoint-source-nps-pollution)
- Water Footprint Calculator
  [https://www.watercalculator.org/?cid=1408](https://www.watercalculator.org/?cid=1408)

**Utah Water Quality Extension Stream Side Science Lessons:**

- Aquatic Invasion! — Students investigate aquatic invasive species
  [https://digitalcommons.usu.edu/cgi/viewcontent.cgi?referer=&httpsredir=1&article=2222&context=extension_curall](https://digitalcommons.usu.edu/cgi/viewcontent.cgi?referer=&httpsredir=1&article=2222&context=extension_curall)
• Water Management — Students hold a mock community meeting to explore different positions on water use, shortages, distribution and quality
  https://digitalcommons.usu.edu/cgi/viewcontent.cgi?referer=&httpsredir=1&article=2229&context=extension_curall
• Biodiversity debate — Students discuss the biological, social and economic arguments about maintaining biodiversity
  https://digitalcommons.usu.edu/cgi/viewcontent.cgi?referer=&httpsredir=1&article=2223&context=extension_curall

Forestry
Learning Objectives

Tree Physiology and Tree and Shrub
1. Know the parts and tissues of a tree, and be able to explain the growth cycle and life cycle of a tree.
2. Understand the processes of photosynthesis and respiration and how they are important to the growth and reproduction of trees.
3. Identify common tree species without a key, and identify specific or unusual trees and shrubs through the use of a key.
   • Tree Physiology
   • Parts of a Tree
   • Glossary of Tree Terms
   • How Does a Tree Grow?
   • Dichotomous Tree Identification Key

Forest Ecology
1. Know the typical forest structure: canopy, understory and ground layers and crown classes.
2. Understand forest ecology concepts and factors affecting them, including the relationship between soil and forest types, tree communities, regeneration, competition, and primary and secondary succession.
3. Identify the abiotic and biotic factors in a forest ecosystem, and understand how these factors affect tree growth and forest development. Consider factors such as climate, insects, microorganisms, and wildlife.
   • Managing Forests for Fish and Wildlife
   • Dendrochronology
   • Project Learning Tree Activity 7: Understanding Fire

Sustainable Forest Management
1. Understand the term silviculture, and be able to explain the uses of the following silviculture techniques: thinning, prescribed burning, single tree and group tree selection, shelterwood method, clear-cutting with and without seed trees, and coppice management.
2. Explain the following silviculture systems: clear-cutting, seed tree method, even-aged management, uneven-aged management, shelterwood and selection.
3. Understand the methodology and uses of the following silviculture treatments: planting, weeding, pre-commercial thinning (PCT), commercial thinning and harvesting.
4. Know how to use forestry tools and equipment in order to measure tree diameter, height and basal area.
5. Understand how the following issues are affected by forest health and management: biodiversity, forest fragmentation, forest health, air quality, aesthetics, fire, global warming and recreation.

6. Understand how forestry management practices and policy affect sustainability.

7. Understand how economic, social and ecological factors influence forest management decisions.

8. Learn how science and technology are being utilized in all aspects of forest management.
   - Woodland Management: Measuring your Forests
   - Forest Stewardship -Timber Harvesting: PSU Bulletin 7
   - Project Learning Tree Activity 8, Fire Management
   - Forest Health
   - Technology in the Forest

Trees as an Important Renewable Resource
1. Understand the importance and value of trees in urban and community settings, and know the factors affecting their health and survival.
2. Understand the economic value of forests and know many of the products they provide to people and society.
3. Explain the “Ecosystem Services” provided by trees, and understand why trees and forests are important to human health, recreation, wildlife, and watershed quality.
   - Urban and Community Forestry Program

Soils and Land Use
Learning Objectives

Physical Properties of Soil and Soil Formation
1. Understand the importance of soils and appreciate the relatively small amount of usable soil that exists on Earth.
2. Know the five soil forming factors, and understand how they influence soil properties.
3. Understand the origin and types of soil parent materials.
4. Understand basic soil forming processes: additions, losses, translocations, and transformations.
5. Recognize and understand features of Soil Profiles, and be able to use this information to determine basic soil properties and limitations.
6. Identify and describe soil characteristics (texture, structure, and color using Munsell color charts).
   - Why Soil is Important
   - How Much Soil is there?
   - From the Surface Down
   - Soil Formation and Classification
   - Factors Affecting Soil Development
   - Guide to Texture by Feel
   - Soil Field Analysis
Soil Ecosystems
1. Recognize that biological diversity is important for soil health and hence plant, human and environmental health.
2. Understand how the hydrologic, carbon and nutrient cycles relate to soil management.
3. Recognize that understanding soil ecosystems is important to soil management.
   • Instructions for making a Burlese Funnel
   • Nutrient Cycles
     o Carbon
     o Phosphorus
     o Nitrogen

Soil Biology
• The Soil Food Web
• The Food & Web Soil Health
• Bacteria
• Soil Fungi
• Soil Protozoa
• Nematodes
• Arthropods
• Earthworms
• Integrated Pest Management
• Soil Biology and Land Management

Chemical Properties of Soil and Soil Fertility
1. Understand the procedure for taking a soil sample and conducting nutrient analysis.
2. Know that plants must receive essential micronutrients and macronutrients from the soil in order to be healthy, and understand that soil fertility relates to the physical and chemical properties of the soil in addition to the quantity of nutrients.
3. Understand why soil fertility reflects the physical, chemical and biological state of the soil.
   • Soil Testing
   • Plant Nutrients
   • GLOBE Soil Fertility Protocol
   • Nutrient Management

Soil Conservation and Land Use Management
1. Compare different land uses and conservation practices and their impact on soils and erosion.
2. Understand how soil is impacted by point and nonpoint source pollution and the importance of soil management to agriculture and clean water.
3. Understand that soil management and environmental protection requires agricultural and resource managers to use spatial tools such as Geographic Information Systems (GIS), and Global Positioning Systems (GPS) in order to make the best possible resource decisions.
4. Learn about career opportunities and the role of government in the management of natural resources.
   - Urban Soil Primer
   - Soil Erosion: Causes and Effects
   - Using the Universal Soil Loss Equation (USLE)
   - Careers in Soil Science

**Web Soil Surveys & Soil Surveys**
1. Access and use published and on-line soil data and other resources to learn how land use affects soil, and the limitations of local soils.
2. Understand the eight Land Capability Classes and how they are important in determining appropriate land use.
3. Understand soil drainage classes and be able to recognize the characteristics of hydric soils and know how soils fit into the definition of wetlands.
   - Web Soil Survey: Know How to Access and Use Soil Data
   - Land Capability Classification
   - Hydric Soils
   - Site Fingerprinting

**Wildlife**

**Learning Objectives**

**Knowledge of Wild Birds, Mammals, and Herpetology**
1. Identify wildlife species using mounted specimens, skins/pelts, pictures, skulls, silhouettes, decoys, wings (waterfowl), scats, tracks, animal sounds, or other common signs. Animal tracks may be original or molds made of the prints. Wildlife signs may be real or reproduced.
2. Use a key or field guide to identify wildlife species or signs. Wildlife species or signs may be presented in any form as described above.
3. Identify general food habits (herbivore, omnivore, carnivore), habitats (terrestrial, aquatic, fossorial), and habits (diurnal, nocturnal) using skull morphology and/or teeth.
   - Smithsonian National Museum of Natural History: North American Mammals
   - Outdoor Action Guide to Animal Tracking

**Wildlife Ecology**
1. Know the meaning of “habitat,” and be able to name the habitat requirements for wildlife and the factors that affect wildlife suitability.
2. Know and understand basic ecological concepts and terminology.
3. Understand the difference between an ecosystem, community and population. Be able to explain how communities interact with their non-living surroundings to form ecosystems.
4. Understand wildlife population dynamics such as birth, mortality, age-structure, sex ratio, and mating systems. Understand the impact of limiting and decimating factors of common wildlife species on wildlife management.
5. Recognize that all living things must be well-adapted to their native environment in order to survive. Be able to identify, describe and explain the advantages of specific anatomical, physiological and/or behavioral adaptations of wildlife to their environment.

6. Know the meaning of the term “Biodiversity”, and understand why biodiversity is important to people and wildlife.

7. Understand the importance of the 3 levels of biodiversity: genetics, species and ecosystem or community, and understand the implications of biodiversity loss at each level.
   - 4-H Wildlife Project: The Wildlife Ecologist
   - Wildlife Terms: Working with Wildlife
   - Glossary of Important Wildlife Terms
   - Organization of Life: Species, Population, Communities and Ecosystems
   - Clemson University: The Basics of Population Dynamics
   - Winter Adaptations of Animals
   - Wildlife Ecology Basics

**Conservation and Management of Wildlife**

1. Know the preferred habitat types and specific habitat requirements of common wildlife species. Understand how this knowledge helps us to better protect both the land and the wildlife species that depend on it.

2. Understand the difference between biological and cultural carrying capacity, and be able to identify social and ecological considerations where human use of land conflicts with wildlife habitat needs.

3. Identify common wildlife management practices and methods that are being used to manage and improve wildlife habitat.

4. Understand the role of federal, state and provincial Fish and Wildlife Agencies in the management, conservation, protection, and enhancement of fish and wildlife and their habitats.

5. Know that all states and provinces have a hunting safety course and mandatory hunter education program developed specifically for each state or provincial government’s hunting and wildlife agency.
   - North American Migration Flyways
   - USFWS Migratory Birds and Habitat Program: Migratory Bird Treaty Act
   - Wildlife Management Concepts and Terms
   - Trapping and Furbearer Management in North American Wildlife Conservation

**Issues Involving Wildlife and Society**

1. Understand how non-native (exotic), invasive species threaten our environment and the biodiversity of many wildlife species. Understand that non-native (exotic), invasive plants impact wildlife habitat and thus have a tremendous impact on native wildlife.

2. Learn about the complexities of decision-making in making land use decisions that affect wildlife, and understand that wildlife resources are under constant pressure caused by human population growth, environmental degradation, and habitat reduction.

3. Know that Wildlife species are subject to diseases resulting from exposure to microbes, parasites, toxins, and other biological and physical agents.
4. Understand the terminology and factors that affect threatened and endangered wildlife species. Know the meaning of extinct, extirpated, endangered, threatened, candidate species and reintroduction.

5. Identify the characteristics that many extinct and endangered species possess, and be able to identify many species wildlife that are endangered and threatened.

6. Understand the role of the Endangered Species Act in helping to conserve endangered and threatened species. Know the organizations and agencies responsible for listing and protecting endangered species on global, federal, state and provincial levels.

- Introduced Species: The Threat to Biodiversity and What Can Be Done (see “learnmore” links at the end of article for additional information)
- National Wildlife Federation: Habitat Loss
- Wildfinder Database
- USGS National Wildlife Health Center: Diseases of Wildlife in the United States
- USGS Vector-borne Diseases and Zoonotic (transmitted between animals and humans) Diseases
- Endangered Species Handbook: Vanishing Species—What is Threatening Species?
- Defenders of Wildlife: Protection of Endangered Species
- USFW Service Endangered Species Act (ESA)

2019 Current Issue
Agriculture & the Environment: Knowledge & Technology to Feed the World

Key Topics & Learning Objectives

There are many articles that estimate the population of the Earth to be approximately 9-10 billion by the year 2050. One of the primary concerns for the agricultural industry is how will farmers be able to grow enough food to feed this growing population while also protecting natural resources such as soil, water, air, wildlife, and forestry resources.

Students will learn the concepts of how agriculture and all natural resource areas are interrelated, and how the use of new technologies are key to increase food production.

Key Topic #1: How agroecosystems function and the services they provide

*Learning Objective:* Understand how agroecology applies ecological principles to agricultural systems by considering productivity, ecosystem impacts, and social responsibility.

- Biodiversity conservation and agricultural sustainability: towards a new paradigm of ‘eco-agriculture’ landscapes. Please note that the blue/greyed-out sections are NOT for study for the 2019 NCF Envirothon competition and are included for context only.
- Study: Bioenergy Decisions Involve Wildlife Habitat and Land Use Trade-offs
- Could soils help save the climate?
- Ecosystem services and agriculture: tradeoffs and synergies
- Linking Ecologists and Traditional Farmers in the Search for Sustainable Agriculture

Key Topic #2: The importance of soil health as the foundation of a healthy ecosystem

*Learning Objective:* Understand the indicators of soil health, including physical, chemical, and biological properties and its role in the agroecosystem.
• Soil has a Microbiome, Too
• Soil Health Growers
• Soil Health and Soil Health Institute Featured on American Farmer TV Series (Video 9:00)
• The Hope in Healthy Soil Video Series- Chapter 3: Do not Disturb—No Till Farming (Video 3:29)
• The Hope in Healthy Soil Video Series- Chapter 5: The Benefits of Going Under “Cover” (Video 5:57)

Key Topic #3: Sustainable agriculture on large and small farm operations
Learning Objective: Define sustainable agriculture, including comparing and contrasting sustainable practices on large and small farm operations.

• Beyond conservation agriculture. Please note that the following sections are the ONLY sections for study for the 2019 NCF Envirothon competition
  o The Many Shapes of Agriculture across the Globe (p. 2)
  o Trade-offs Concerning Conservation Agriculture in Smallholder Agriculture (pp. 8-9)
  o Assessing Current Approaches to Sustainable Intensification from Systems Agronomy Perspective (pg. 10)
    o How can Systems Agronomy Move Forward? (pp. 10-11)
    o Outlooks and Challenges (p. 11)
• North Carolina Farm Family Awarded for Conservation Practices
• Why Industrial Farms Are Good for the Environment
• Organic Farming not always best for the planet
• What is Sustainable Agriculture?

Key Topic #4: Sustainable and best management farming practices that enhance and protect soil health, water quality and quantity, and biodiversity including management of insect pests, disease, and weeds
Learning Objective: Understand the importance of moving toward sustainable farming systems to conserve natural resources, mitigate climate change, reduce erosion, protect water quality and quantity, and promote pollination.
Learning Objective: Understand farm management practices to build soil organic matter, such as: composting, crop rotations, cover crops, conservation tillage, and management intensive grazing systems to improve soil health.
Learning Objective: Understand best management practices that improve water quality and reduce water use such as conservation tillage, cover crops, plant selection, precision agriculture, water reuse, and sub-surface drip irrigation.
Learning Objective: Understand integrated pest management and biological pest control techniques used to prevent insect pest, disease, and weed problems.
Learning Objective: Know the role pollinators play in farming and ways to attract them.

• A Diversity of Bees Is Good for Farming
• Cover Crops: Organic Farming
• Farming for Bees. Please note that the following pages are the ONLY pages for study in the 2019 NCF Envirothon competition (refer to page numbers in document): pp. 1-15; 26-29; 34-36
• Forest Farming can bring economic, environmental benefits to WNC

Key Topic #5: Differences of local, regional, and national foods systems that are vital to grow food for an ever-increasing world population—and the importance of each food system
Learning Objective: Describe the economic, social, and environmental benefits of sustainable agriculture to local communities, as well as to regional and global food systems.

- Can meat actually be eco-friendly?
- Sharing North Carolina Agribusiness Exports with the World
- Urban Agriculture Could Potentially Produce a Tenth of the World’s Food. Is Grass Really the Best use of Your Yard?

Key Topic #6: New technologies that help provide more efficient agriculture production

Learning Objective: Understand the role of new technology: agricultural biotechnology; precision agriculture; using UAV (drones, GIS, etc.) to increase farm efficiency for food production. Learning Objective: Understand the risks and benefits of agricultural biotechnology.

- A controversial technology could save us from starvation ... if we let it
- Battlefield
- Biotechnology Frequently Asked Questions
- Engineering Honesty: USDA Moves to Disclose “GMOs”
- Opinion: When genetic engineering is an environmentally friendly choice
- The Future of Agriculture
- Next Gen: USDA, organizations provide learning opportunities for new farmers and ranchers
- Tech Savvy
- Breaking Ground
Utah Conservation Districts

Locate your conservation district by county and then contact the assigned staff person, who will get you in touch with your soil conservation district’s chairperson.

Zone 1: (435) 753-5616, ext. 111
Vacant, Zone Coordinator
- Blacksmith Fork CD - Cache County
- North Cache CD - Cache County
- Northern Utah CD - Box Elder County
- West Box Elder CD - Box Elder County
- Rich CD - Rich County

Zone 2: (801) 629-0575, ext. 114
Loralie Cox, Zone Coordinator
- Davis CD - Davis County
- Morgan CD - Morgan County
- Weber CD - Weber County
- Grantsville CD - Tooele County
- Salt Lake CD - Salt Lake County
- Shambip CD - Tooele County

Zone 3: (801) 377-5580, ext. 120
Daniel Gunnell, Zone Coordinator
- Alpine CD - Utah County
- Kamas Valley CD - Summit County
- Summit County CD - Summit County
- Timp-Nebo CD - Utah County
- Wasatch CD - Wasatch County

Zone 4: (435) 201-0794
Tracy Balch, Zone Coordinator
- Delta CD - Millard County
- Fremont River CD - Wayne County
- Juab CD - Juab County
- Sevier County CD - Sevier County
- Millard County CD - Millard County
- Piute County CD - Piute County
- Sanpete CD - Sanpete County

Zone 5: (435) 676-8189
Tyce Palmer, Zone Coordinator
- Beaver CD - Beaver County
- Canyonlands CD - Garfield County
- Dixie CD - Washington County
- Twin Mountain CD - Beaver County
- Kane County CD - Kane County
- Upper Sevier CD - Garfield County
- E & I CD - Iron County

Zone 6: (435) 722-4621, ext. 127
Darrell Gillman, Zone Coordinator
- Daggett CD - Daggett County
- Duchesne CD - Duchesne County
- Uintah CD - Uintah County

Zone 7: (435) 381-2300 ext 113
Roger Barton, Zone Coordinator
- Grand CD - Grand County
- Green River CD - Emery County
- Price River Watershed CD - Carbon County
- San Juan CD - San Juan County
- San Rafael CD - Emery County