

SC Envirothon 2024 Coaches Manual



Current Environmental Topic *Renewable Energy for a Sustainable Future*



TABLE OF CONTENTS

SOUTH CAROLINA ENVIROTHON STEERING COMMITTEE MEMBERS	2
1. INTRODUCTION AND GOALS	3
2. RESOURCES AVAILABLE TO COACHES	4
3. PARTNERS AND SPONSORS	5
4. SC ENVIROTHON COMPETITION SCHEDULE.....	6
5. HOW TO GET THERE	7
6. COMPETITION RULES	8
7. PRE-COMPETITION CHECKLIST	10
8. DAY OF THE EVENT REMINDERS.....	11
9. AWARDS AND RECOGNITION	12

LEARNING OBJECTIVES

10. SOILS.....	13
11. AQUATIC ECOLOGY	17
12. FORESTRY.....	21
13. WILDLIFE	22
14. CURRENT TOPIC	25
15. ORAL PRESENTATION SCENARIO	26
16. ORAL PRESENTATION RULES	28
17. CLARIFICATION OF JUDGING SCORESHEET.....	30
18. GLOSSARY OF ENVIRONMENTAL TERMS	34
19. LOCAL FORESTRY RESOURCES	41

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1 INTRODUCTION AND GOALS

Welcome to the 2024 South Carolina Envirothon! This manual contains information you need to know to participate in the program. Your participation will prove to be a valuable learning experience for both you as a coach and your students!

The National Conservation Foundation (NCF) Envirothon is North America's largest environmental competition for high school students. The program began in Pennsylvania in 1979 in a single county. It had such appeal that by 1988, it expanded into three states and took on a national scope. Since that time, the program has grown to include 47 states, 11 Canadian provinces, 2 Chinese delegations, and Singapore.

The first South Carolina Envirothon competition was held in 1997. The program includes an annual Coaches Training, Competition, and participation in the international NCF-Envirothon Competition. On the day of the SC Envirothon competition, **Friday, April 26, 2024**, each team will complete five written exams and perform their Oral Presentation for a panel of judges. This is a rigorous academic competition, not a field trip! The team scoring the highest overall score will be sponsored to represent South Carolina at the international NCF-Envirothon Competition scheduled for **July 28-August 3, 2024**, hosted by Hobart and William Smith Colleges in Geneva, NY.

The Envirothon is an educational experience – over the course of several months of study, participants prepare themselves for testing at the six stations. The current topic is ***Renewable Energy for a Sustainable Future***. This year's Envirothon is a tremendous opportunity to learn more about the issues surrounding this topic, while promoting teamwork and critical thinking skills in your students.

Designed to foster cooperation and teamwork, teams are tested not only on their basic knowledge in these topic areas but their ability to apply that knowledge to solve real-life problems. Problem solving and teamwork are skills that will enhance the participants' ability to take leadership roles after high school or college, no matter their chosen field or career.

The overall goal of Envirothon is to promote environmental education so that succeeding generations will be more environmentally literate and possess the skills and knowledge to make informed decisions regarding the environment.

THE ECOSYSTEMS APPROACH

The Envirothon promotes the desire of students to learn more about the environment and to apply principles of resource management and ecology. Any ecological system (ecosystem) consists of a community of living organisms and their local physical environment. The living and non-living elements of an ecosystem are connected through flows of energy and the cycling of chemical elements. No single organism, population or species can produce all of its own food and to recycle all of its metabolic products. This ecosystem concept is important because it conveys one of the key insights that we have learned from the science of ecology, everything is related to everything else.

The Envirothon also develops students' critical thinking and problem-solving skills. Environmental problems are effectively addressed by considering the interacting elements of a system, not each sector in isolation. Ecosystem management is currently the standard approach for many government, industry and community based initiatives. South Carolina Envirothon has adopted the ecosystems approach. Written tests will occur at testing stations. Each station will focus on one of the five core subject areas. However, each station will incorporate elements of the other subjects. Questions at the stations, as well as the oral presentation scenario, will be multifaceted to ensure that students will be challenged to think critically and consider "the big picture".

2 RESOURCES AVAILABLE TO COACHES

Coaches Training is held annually to assist coaches in understanding the program and best practices for preparing teams. Coaches have the opportunity to interact with station managers to gain pertinent in-depth information, learn about the current topic of the year, and competition/program logistics.

- Attendance at the training is not mandatory to bring a team to the competition, however it is highly recommended. A coach may still register a team without attending the training.
- Attending this FREE training **does not** obligate an attendee to bring a team to the competition.

SC Envirothon Training Trunks are available for coaches to borrow from local Soil and Water Conservation Districts. Trunks are filled with professional environmental tools and activities to prepare students for practical portions of the competition.

SC Envirothon Website is available with up-to-date information about program events and training resources. Resources include training videos and PDFs, registration materials, and event information. <https://www.dnr.sc.gov/education/Envirothon/>

SC Envirothon Station Managers are available to answer station specific questions. See contact information on page 2 – “2024 South Carolina Envirothon Steering Committee Members”.

NCF-Envirothon Website is available with countless resources including competition training information, event information, and access to activities such as the NCF-Envirothon iNaturalist Project. <https://envirothon.org/>

Local Soil and Water Conservation District South Carolina Soil and Water Conservation Districts are bound by county boundaries. Reach out to your local district to build a relationship, network with topic professionals, and request team sponsorship. <https://www.dnr.sc.gov/conservation/index.html>

Complimentary one year membership to the Environmental Education Association of SC (EEASC) provides environmental education resources, trainings, grants, and information on local projects and happenings. For more information, visit the website at <http://eeasc.org/>

3 PARTNERS AND SPONSORS

SC Envirothon is coordinated by SCDNR-Conservation Districts in partnership with:

SC Soil and Water Conservation Districts
SC Association of Conservation Districts
SC Conservation Districts Foundation
SC Forestry Commission
Clemson Sandhill REC

USDA - NRCS
SC Soil & Water Conservation Society
Central Carolina Technical College
Francis Marion University
Lynches River County Park

2023 Friends of SC Envirothon:

Harry Hampton Memorial Wildlife Fund
South Carolina Department of Natural Resources – Conservation Districts
South Carolina Conservation Districts Foundation
South Carolina Soil and Water Conservation Districts Society
South Carolina Forestry Foundation
SC Palmetto Pride
Abbeville Soil and Water Conservation District (SWCD)
Aiken SWCD
Beaufort SWCD
Calhoun SWCD
Chester SWCD
Chesterfield SWCD
Colleton SWCD
Dillon SWCD
Environmental Education Association of South Carolina
Fairfield SWCD
Greenville SWCD
Horry SWCD
Lancaster SWCD
Laurens SWCD
Lexington SWCD
McCormick SWCD
Newberry SWCD
Pickens SWCD
South Carolina Association of Conservation Districts
South Carolina Conservation Districts Employees Association
South Carolina FFA
Union SWCD

SC Envirothon is made possible only by the generous contributions from “Friends of the SC Envirothon”. Sponsor benefits can be found at the following website:
<https://www.dnr.sc.gov/education/Envirothon/sponsorsbenefits>. For more information, or if you desire to financially support the program, please reach out to Brooke Myres (myresb@dnr.sc.gov).

4 SC ENVIROTHON COMPETITION SCHEDULE

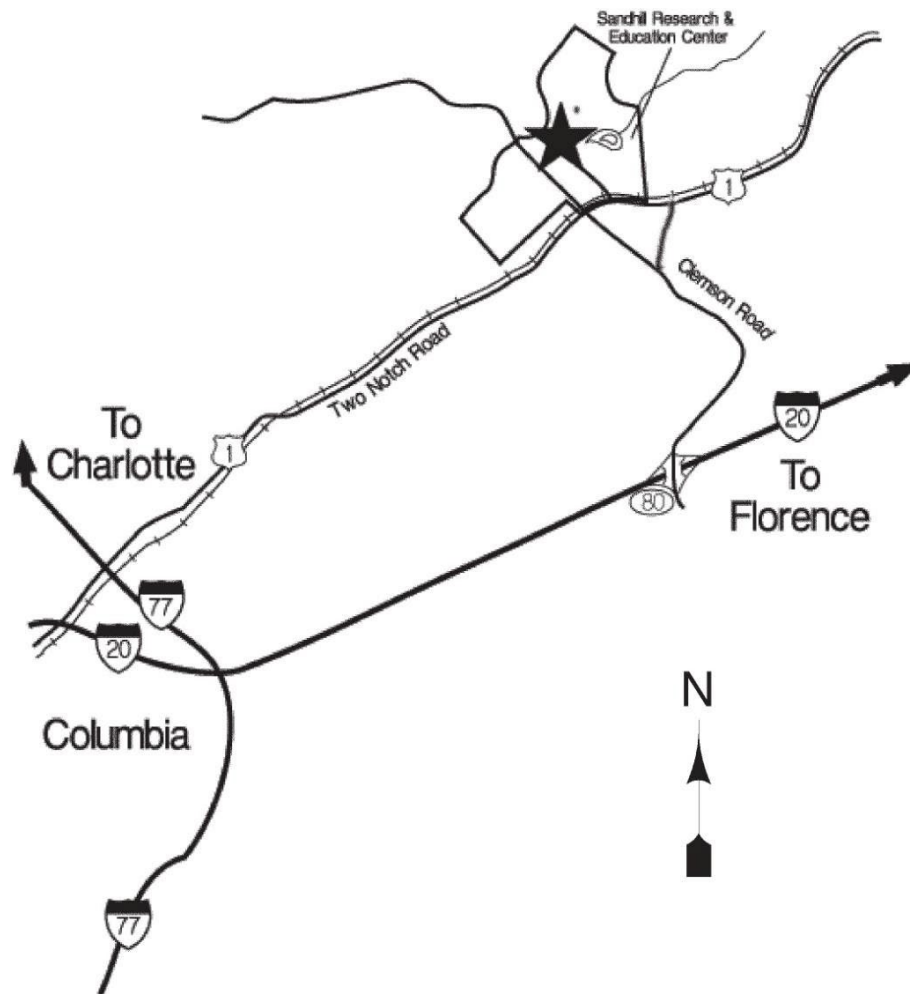
The 27th annual statewide SC Envirothon Competition will be held around the Lake House at the Clemson Sandhill Research and Education Center on **Friday, April 26, 2024**.

A schedule will be provided to registered coaches prior to the event.

SC Envirothon Competition Sample Schedule

8:00 a.m.	Volunteer Registration
8:30 a.m.	Team Registration begins, Team photos
9:30 a.m.	Opening Ceremony at Awards Stage
9:45 a.m.	Guides escort teams to first station
10:00 a.m.	Competition begins
10:30 a.m.	Horn ends Test Session #1, Teams rotate
10:35 a.m.	Test Session #2 begins
11:05 a.m.	Horn ends Test Session #2, Teams rotate
11:10 a.m.	Test Session #3 begins
11:40 a.m.	Horn ends Test Session #3, Teams rotate
11:45 a.m.	Test Session #4 begins
12:15 a.m.	Horn ends Test Session #4, Teams rotate
12:20 p.m.	Test Session #5 begins
12:50 p.m.	Horn ends Test Session #5, Teams rotate
12:55 p.m.	Test Session #6 begins
1:25 p.m.	Horn ends Test Session #6
1:30 p.m.	Lunch near Awards Stage
2:00 p.m.	Awards Ceremony

5 HOW TO GET THERE



Take I-20 to Exit 80 (Clemson Road). Take Clemson Road North past McDonald's and cross bridge over Two Notch Road. At the light take a right into the Clemson Sandhill REC complex (this is opposite the Village at Sandhill shopping mall). Follow posted signs for the Envirothon.

6 COMPETITION RULES AND OVERVIEW

1. Students in grades 9-12 or their equivalent as of January 1, 2024 are eligible to participate.
2. Teams must have at least three and not more than five members. Each team must be accompanied to the competition by a coach. Transportation arrangement to and from the competition is the responsibility of the team and their coach.
3. A school may send up to two teams to the state competition. Each team will consist of members from the same school, organization and/or association. Two schools may join together to send a joint team, but then forfeit their rights to send individual teams (an organization may not contribute members to more than one team).
4. **Only ONE alternate will be allowed per team.** Additional students will not be allowed to participate in the competition. Alternates must register at the registration table the morning of the competition to participate. Alternates **may not** wander into the competition area outside of being assigned to an alternate team if available.
5. Thirty (30) minutes will be allotted for each of the six stations during the competition.
6. There will be written questions at each of the five testing stations. Question format may be true/false, multiple choice, matching, short answer, essay, fill in the blank, or practical exercises. Teams will give a prepared oral presentation at the orals station.
7. Test questions will be taken from the SC Envirothon coach resources found on the SC Envirothon website and during the SC Envirothon Coaches Training.
8. During the competition, team members will work together to answer test questions, completing one test and submitting it to the station manager in charge of the station before moving on to the next station. Once the competition has begun, the team will rotate through all six stations **AS A TEAM**.
9. ALL team members must remain with team guides and **only** leave testing station when escorted by assigned guide. Snack stations not provided during testing, only water and sports drink.
10. The station manager in charge of the testing station has final authority with respect to the test questions and answers.
11. In the event of a tied score for first, second, or third place – the team with the highest score on the Oral Presentation will be considered the winner.
12. Oral presentations will be evaluated by a panel of five judges. The high and low score from each panel will be discarded and a team's oral presentation score will be the average of the remaining three scores.
13. The state winner is eligible to compete at the NCF-Envirothon Competition. If the state winner cannot participate, the second-place team may represent South Carolina at the NCF-Envirothon Competition.
14. In the event of a procedural dispute or question arises that is not covered in this manual or its addenda, the issue will be decided by the SC Envirothon Steering Committee.
15. Team members, coaches, and volunteers with allergies or medications must bring own supplies.

16. **Cameras, video recorders, laptops, cell phones, smart watches, tape recorders and all other electronic devices are prohibited in the vicinity of the testing stations.** Students found in the testing areas with electronic devices will have the device confiscated and team will face disqualification. Allowances are made in advance for the press and/or staff.
17. The competition will be held outside regardless of weather conditions. Team members should wear appropriate clothing (sneakers, jeans/shorts, tee shirts). If it is warm and sunny, please consider sunscreen. **(Do not wear any item of clothing that may identify your team by city, county or school.)** Competition t-shirts will be provided and must be worn during the competition.
18. **The top scoring team will be eligible to attend the NCF-Envirothon Competition.** If the first-place team is unable to attend, the second place team will be asked and so forth. As a winning team, you represent the state of South Carolina and the team is expected to prepare to attend the NCF-Envirothon Competition. Post state competition, travel plans and registration for the international event will begin. Note the dates in advance and plan to leave these dates available. **Being on a winning team of the state competition obligates the coach(es) and all original competing students of the team to this commitment.**

Any infraction of the rules will be reviewed by the Steering Committee and may become grounds for disqualification. The rules of SC Envirothon are subject to change on a majority vote of the Steering Committee. Any changes will be published and distributed prior to the SC Envirothon Competition.

7 PRE-COMPETITION CHECKLIST

The Coach is the backbone of the SC Envirothon team. This person serves to organize the team, motivate the members, and teach materials pertinent to the SC Envirothon program. Throughout the year, the coach guides the team's preparation for the competition. There are two major components of the coach's job--teaching team skills and transferring to the members a strong environmental ethic. A coach has a tremendous responsibility and is to be congratulated for making such an important contribution to the growth of the team members' knowledge and experience.

Ensure the following check-list is completed:

- _____ Close contact is maintained with the local Soil and Water Conservation District Office (contact information can be found here: <https://www.dnr.sc.gov/conservation>).
- _____ Team Registration Packets are sent in by **April 1, 2024**. Packets include a Team Registration Form, Student Participant Waivers (1 per student), and Coach Volunteer Agreements (1 per coach). Registration materials can be found here: www.dnr.sc.gov/education/Envirothon/competition
- _____ **\$175.00 Registration Fee** is paid for each registered team by registration deadline of **April 1, 2024**. Local Soil and Water Conservation Districts often sponsor local SC Envirothon teams. Ensure payment is coordinated by the registration deadline. **All registration fees are non-refundable after this date.**
- _____ Transportation has been arranged to the state competition.
- _____ All team members are familiar with rules of the competition and agree to attend the NCF-Envirothon Competition if on a winning team (summer dates must be left open).
- _____ Team is trained in each of the five test areas: Soils, Aquatics, Forestry, Wildlife, and the Current Topic.
- _____ Team has prepared their oral presentation and visual aids in accordance with the rules.
- _____ Oral presentation slideshow (pdf) has been submitted to Brooke Myres (myresb@dnr.sc.gov) by the deadline of **midnight on Sunday, April 21, 2024**.

8 DAY OF THE EVENT REMINDERS

1. **BE ON TIME!** Allow ample travel time. Arrive 30 minutes prior to registration time.
2. Report to the registration tent to receive instructions and supplies. (Coach only)
3. You will receive supplies for both you and all team members (t-shirts, nametags, promotional items etc....).
4. You must check-in your oral presentation notecards by securing them into the plastic bag provided in your supplies bag then checking them in at the oral presentation materials table (near registration). The notecards will be given back to the members of the team just prior to their presentation. Students should NOT practice their presentations or carry ANY presentation materials with them during the competition. *Please emphasize this with your students!*
5. After registering and turning in presentation notecards, move to the Awards Stage to have your team photos taken. You will be assigned a team number at registration and a poster with that number will be in your bag. Advise the team to take a photo with a student holding the team number below their waist so the number can be cropped out later.
6. After completing the team photo, you and your team are welcome to help yourselves to refreshments. Please encourage students to fill their provided water bottle and take a snack. **Lunch will not be until later in the afternoon and no snack stations will be provided during testing.** Students will need their bottle for refills during the competition. Watering holes will be set-up throughout the competition area, but no cups will be provided. This limits the amount of waste we produce during the day!
7. Everyone MUST wear their name tags (provided at Registration). Students not wearing name tags at the testing stations will potentially cause their team to be disqualified. Advisors must wear their name tags while on the grounds.
8. **COACHES MAY NOT CONSULT WITH OR ACCOMPANY THEIR TEAM ONCE THE COMPETITION HAS BEGUN!** Teams are assigned a guide to escort them between stations. Failure to follow this rule may result in disqualification.
9. Coaches are allowed to leave the grounds but must leave a number to be reached at in case of emergency and must return prior to the end of testing rotations. If you do not have a cell phone, you are asked to remain on site.
10. No pets of any type are allowed on the competition site. No alcohol, drugs or tobacco will be allowed. No smoking is allowed on the competition site.
11. Winning teams must complete necessary paperwork before leaving the competition (see Awards and Recognition).
12. **Familiarity with the rules and regulations of the competition is expected of all coaches and team members.** Ignorance of a rule is not an acceptable excuse for failure to comply.

9 AWARDS AND RECOGNITION

Awards will be presented to 1st, 2nd, and 3rd place teams, station winners, and Marc Cribb Excellent Leader Award recipient. All participants will receive an SC Envirothon t-shirt, water bottle, and promotional items.

1st Place - \$1,000 scholarship and gold medal per student, \$1,000 cash to head coach, team trophy

2nd Place - \$500 scholarship and silver medal per student, \$500 cash to head coach, team trophy

3rd Place - \$250 scholarship and bronze medal per student, \$250 cash to head coach, team trophy

Station Winners – team certificate

CLAIMING YOUR SCHOLARSHIPS AND AWARDS

After the competition ends and winners are announced, paperwork will be provided to the winners. The paperwork must be completed prior to leaving so that SC Envirothon has a record of winners' names, addresses and other information. A check will be mailed to the winning coaches approximately (4) weeks following the competition. For claiming scholarships, see the sample letter below.

SAMPLE LETTER

April __, 20__

Congratulations! As a member of the First Place Team at the 20__SC Envirothon, you have won a \$1,000 College Scholarship!

To claim your scholarship you must be enrolled in an accredited two-year or four-year college or university. Once you are registered with your school, send a written request to the address or email below:

Brooke Myres, 5 Geology Road, Columbia, SC 29212

myresb@dnr.sc.gov

Along with your letter, you must include:

- proof of enrollment (a notarized letter from the registrar or a copy of your official transcript)
- the address of the college Treasurer's Office.
- a copy of this letter

Checks will be made payable directly to the school and mailed to the Treasurer's Office. Scholarship requests take 4-6 weeks to process. Please include your school ID number if available.

Your scholarship will be available to you for five years from the date of this letter.

If you have any questions regarding your scholarship, feel free to contact Brooke Myres, at (803) 609-7051 or MyresB@dnr.sc.gov.

10 SOILS

Station Manager: Kristine Ryan, USDA-NRCS

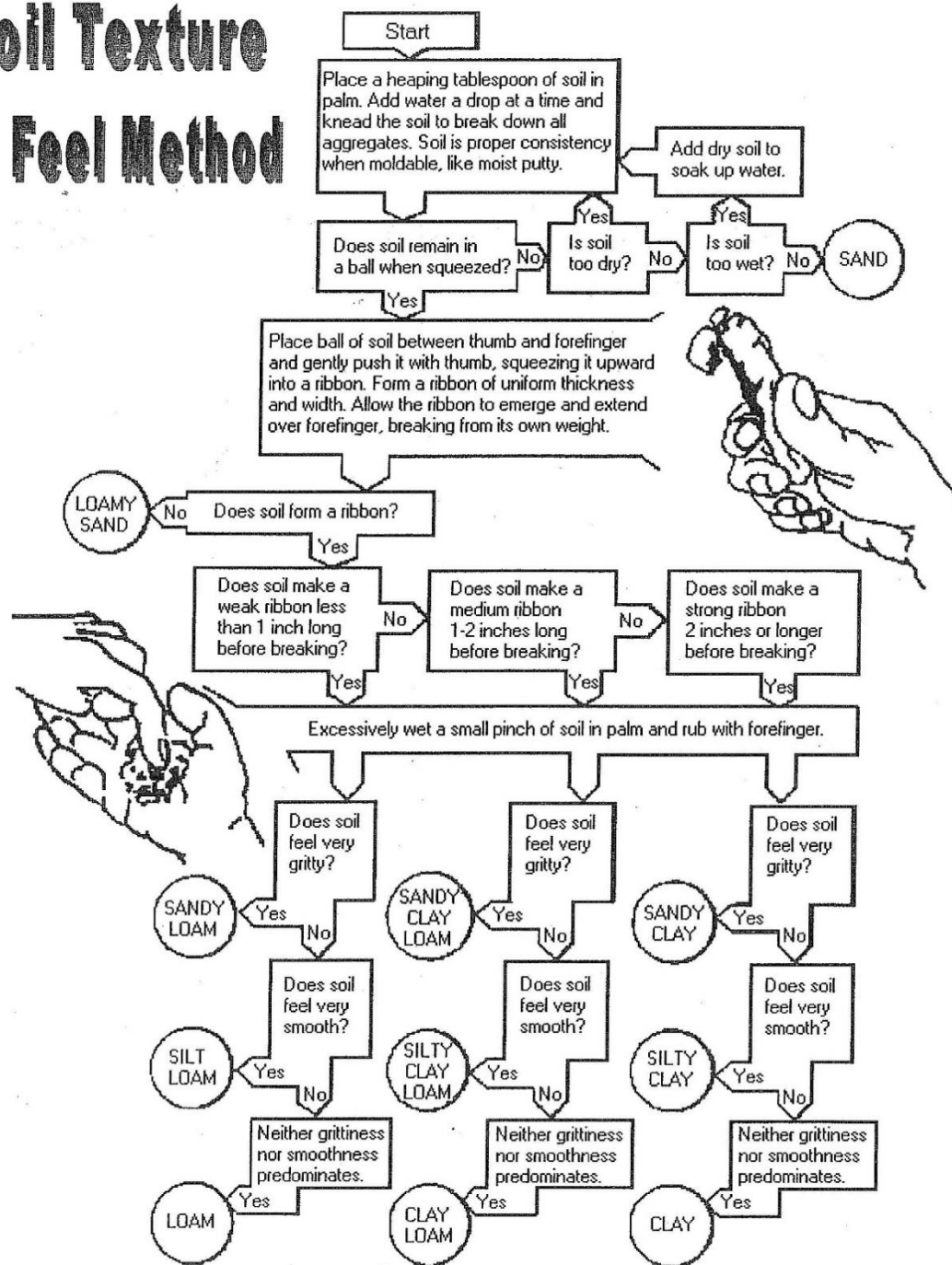
Learning Objectives:

1. Define soil, know the importance of soil, and describe basic soil properties. (ref. 3, 6, 10)
2. Explain the diagnostic significance of soil color. Be able to describe how soil color is measured and what processes produce different colors. (ref. 6, 10)
3. Know the 12 soil orders of soil taxonomy. (ref. 6, 9, 10)
4. Describe the factors which influence soil texture and structure and be able to explain how these properties influence a soil's ability to retain water and nutrients and its tendency to erode. Explain how this further influences the hydrologic and nutrient cycles in an ecosystem. (ref. 3, 6, 10)
5. Derive information from a hard copy of a soil survey book, as well as web soil survey, and explain the interaction between soil type and plant communities as well as suitability for various land use practices. Also be knowledgeable of the information and data that can be obtained from using web soil survey. (ref. 4, 6, 10)
6. Explain and/or describe the features of a soil profile, the five factors of soil formation, and the origin of soil parent materials. (ref. 1, 3, 4, 6, 10)
7. Describe various soil constituents (sand, silt, clay, organic matter) and their properties. (1, 3, 6, 10)
8. Describe South Carolina Major Land Resource Areas and what they indicate about SC geology, climate and land uses. (ref. 10)
9. List the benefits of a healthy soil and the four basic soil health principles to improve soil health and sustainability. (ref. 7, 8)
10. Understand the indicators of soil health, including physical, chemical, and biological properties and its role in the agroecosystem. (ref. 7, 8)
11. Understand the basics of the Land Capability Classification System. (ref. 3, 4, 6)
12. Identify the various types of soil erosion, factors affecting the rate of soil erosion, and best management practices and/or conservation systems used to control soil erosion. (ref. 6, 7, 8)
13. Define and list several benefits of wetlands. Also, understand soil drainage classes and recognize the characteristics of hydric soils. (ref. 2, 3, 4, 5, 6)
14. Explain how composting improves soil health and provide evidence for how composting supports water conservation efforts. (ref. 11)
15. Understand the important role soils play in home sewage treatment systems. (ref. 12)

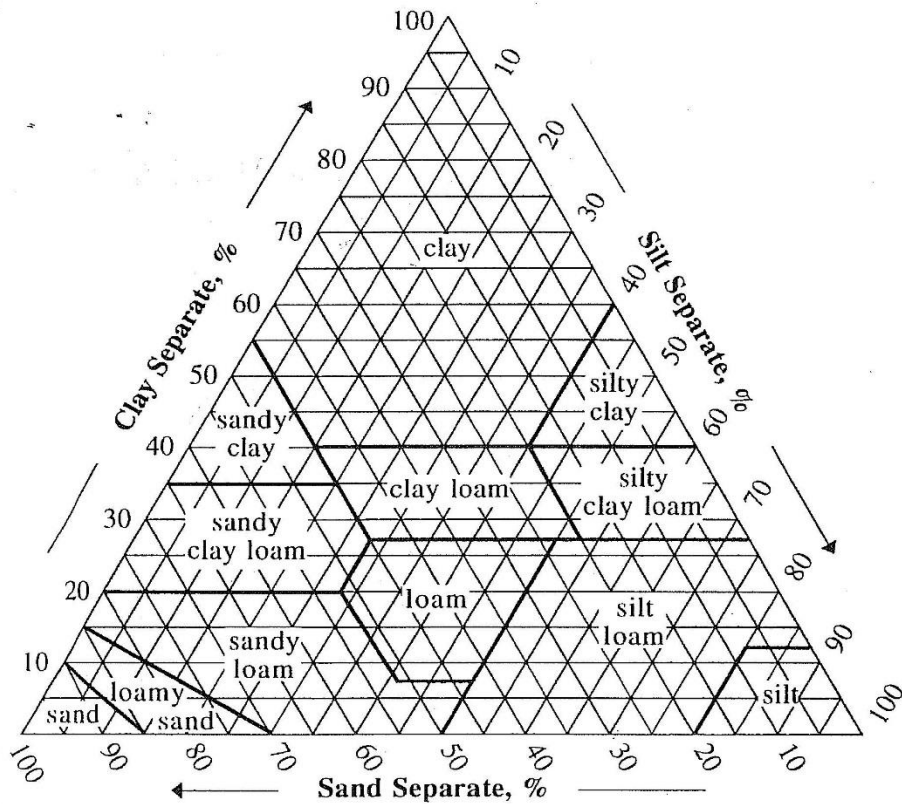
Resources/References:

1. **NRCS Web Soil Survey/Published Soil Surveys**
<https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm>
2. **NRCS Wetlands**
<https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/water/wetlands/>
3. **Soil Health**
<https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/soils/health/>
4. **Soil PowerPoint Presentation**
<http://www.dnr.sc.gov/education/Envirothon/pdf/SoilsStudyMaterial2019.pdf>
5. **Composting**
<https://www.nrdc.org/stories/composting-101#tips>
<https://nrcspad.sc.egov.usda.gov/distributioncenter/pdf.aspx?productID=46>
6. **Historical Soil Surveys**
<https://www.nrcs.usda.gov/conservation-basics/natural-resource-concerns/soil/soil-surveys-by-state>
7. **On-site Wastewater Treatment**
<https://www.cdc.gov/nceh/publications/books/housing/cha10.htm>
<https://scdhec.gov/sites/default/files/Library/Regulations/R.61-56.pdf>

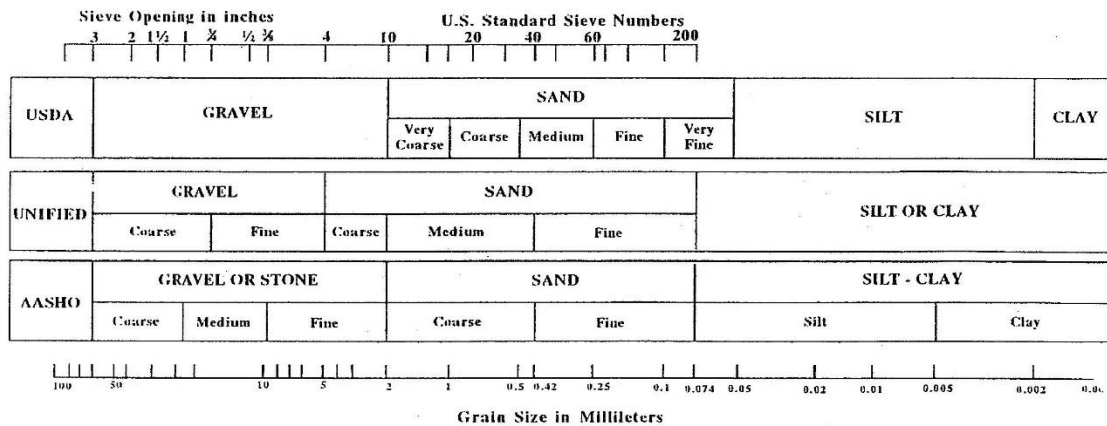
Soil Texture by Feel Method



originally published in Thien, Steve, "A flow diagram for teaching texture-by-feel analysis," *Journal of Agronomic Education*, 1979, vol. 8, pp. 54-55.



COMPARISON OF PARTICLE SIZE SCALES



11 AQUATIC ECOLOGY

Station Manager: Jeff Steinmetz - Francis Marion University

Adapted by Jeff Steinmetz from the NCF- Envirothon Guidelines

Learning Objectives

Most of these objectives come directly from the main NCF-Envirothon webpage; however, I've added a few tweaks / additional references. Below are the objectives and a list of resources. The official NCF-Envirothon curriculum guide for the Aquatic Ecology section can be found here: <https://envirothon.org/the-competition/areas-of-study/aquatic-ecology/>. There are no changes from last year; however, last year they greatly expanded the list of potential topics, and do not have the same extensive links to resources. There is no way we will be able to test your students on all of these potential topics. **The bolded topics below are the ones we will focus on for the SC Envirothon.** But know that if you have students going on to the international competition, you may need to have them study the additional topics not highlighted below.

Study Area 1: Hydrosphere

1. Describe the physical and chemical properties of water that affect aquatic ecosystems and how they do so.
2. **Diagram the water cycle and describe each component in detail.**
3. **Identify the global distribution of water (saltwater, freshwater, ice, et cetera).**
 - a. For 2&3: <https://www.usgs.gov/special-topics/water-science-school/science/water-cycle-adults-and-advanced-students>
4. Describe the major differences between freshwater and saltwater ecosystems.
5. **Identify the characteristics of estuaries and explain the importance of brackish water systems.**
 - a. <https://www.dnr.sc.gov/marine/pub/seascience/dynamic.html>
6. **Identify different types of water bodies, how they are formed, and where they are found.**
 - a. "Types of water bodies" could be a very large list, depending on how you break it down. For the SC Envirothon, focus on the main ones: oceans, lakes, rivers, wetlands.
 - i. Oceans: <https://www.noaa.gov/education/resource-collections/ocean-coasts>
 - ii. Lakes: <https://www.nalms.org/home/basics-of-lake-management/>
 - iii. Rivers: <https://www.usgs.gov/special-topics/water-science-school/science/rivers-streams-and-creeks>
 - iv. Wetlands: <https://www.nps.gov/subjects/wetlands/how.htm> and <https://www.epa.gov/wetlands/what-wetland>
7. **Differentiate the types of wetlands, describe their characteristics, and identify common species found in each**
 - a. <https://www.epa.gov/wetlands/classification-and-types-wetlands>

Study Area 2: Aquatic Ecosystems

1. Describe the structure of an aquatic ecosystem, including:
 - a. Species and communities
 - b. Abiotic components
 - c. Symbiotic relationships
 - d. **Carrying capacities**
 - i. http://en.wikipedia.org/wiki/Carrying_capacity
 - e. **Productivity**
 - i. <https://www.britannica.com/science/primary-productivity>
2. **Define an aquifer and elaborate on how aquifers relate to the local and global water supply.**
 - a. <https://www.usgs.gov/special-topics/water-science-school/science/aquifers-and-groundwater>
3. Identify the role of the water table in an ecosystem and how water tables affect human activity and water use.
4. Explain how seasonal changes in temperature, water level, flow rate, nutrient sources, nutrient availability, runoff, and inputs occur in aquatic ecosystems.
5. Describe the natural aging process of lakes and ponds.
6. **Diagram an aquatic food web and describe the flow of energy within it.**
 - a. <https://www.noaa.gov/education/resource-collections/marine-life/aquatic-food-webs>
 - b. <https://www.nalms.org/wp-content/uploads/2018/09/31-2-5.pdf>

7. **Relate the energy pyramid to different trophic levels and the total amount of energy available to consumers.**
 - a. https://en.wikipedia.org/wiki/Ecological_pyramid
8. **Determine the order of a stream and describe what the order indicates.**
 - a. https://en.wikipedia.org/wiki/Strahler_number
9. Describe the importance, functions, and characteristics of watersheds/catchment areas.
10. **Explain the role of aquatic ecosystems in biogeochemical cycles, such as the carbon, nitrogen, and phosphorus cycles.**
 - a. <https://www.britannica.com/science/biogeochemical-cycle>
11. Describe the basics of hydrology, including:
 - a. Stream/River geomorphology (Catchment area/Drainage basin, Channel, Bank, Meander, Riffle, Water Table, Thalweg, Hyporheic Zone, et cetera)
 - b. Groundwater flow
 - c. Interactions between surface water and groundwater
 - d. Impact of landscape factors on water movement
 - e. **Stratification in freshwater and saltwater systems**
 - i. <https://www.iisd.org/ela/blog/commentary/lakes-stratify-turn-explain-science-behind-phenomena/>
 - f. **Discharge and recharge for aquatic systems**
 - i. <https://www.usgs.gov/special-topics/water-science-school/science/how-streamflow-measured>
 - g. **Runoff**
 - i. <https://www.usgs.gov/special-topics/water-science-school/science/runoff-surface-and-overland-water-runoff>

Study Area 3: Organisms

1. **Describe the roles of producers, consumers, and decomposers in various aquatic ecosystems and identify their trophic levels.**
 - a. <https://flexbooks.ck12.org/cbook/cbse-biology-class-10/section/4.3/primary/lesson/producers-consumers-and-decomposers/>
 - b. <https://www.epa.gov/sites/default/files/documents/foodchainsandfoodwebs.pdf>
2. Categorize different types of aquatic plants based on their adaptations.
3. Identify the major characteristics of fish, amphibians, and other aquatic animals.
4. **Analyze physical and behavioral adaptations to aquatic environments that are common among many types of organisms, such as streamlined body shape, eye placement, countershading, et cetera.**
 - a. <https://www.britishecologicalsociety.org/wp-content/uploads/Education-adaptations-to-ponds.pdf>
5. **Describe the role of cyanobacteria in aquatic ecosystems and their role in harmful algal blooms.**
 - a. <https://www.epa.gov/cyanohabs>
6. Describe the unique life cycles of aquatic creatures, including adaptations such as anadromy, catadromy, metamorphosis, et cetera.
7. Identify the ecological niches of aquatic organisms.
8. **Explain the distinctions between species designations (such as common, rare, endangered, threatened, endemic, extirpated, and extinct) and provide examples of each type**
 - a. https://www.galapagos.org/about_galapagos/conservation-glossary/

Study Area 4: Aquatics and Society

1. Describe the basics of water quality and water quality improvement.
2. Explain the history of human impact on water quality and water resources.
 - a. **Know what fish consumption advisories are and what the common advisories are in SC**
 - i. <http://www.waterencyclopedia.com/Po-Re/Pollution-Sources-Point-and-Nonpoint.html>
 - ii. <http://water.epa.gov/polwaste/nps/whatis.cfm>
 - iii. <http://www.scdhec.gov/FoodSafety/FishConsumptionAdvisories/>
3. **Identify how major legislation protects water resources.**

4. **Identify key stakeholders, agencies, and organizations that oversee water resource protection and management (such as local conservation districts or water boards, state/provincial agencies, and national environmental and conservation agencies).**
 - a. **For 3-4:**
 - i. E.g. SC DHEC, SC DNR, U.S. EPA, USGS, etc.
 1. <https://www.scdhec.gov/environment/your-water-coast/how-dhec-measures-surface-water-quality>
 2. <https://www.scdhec.gov/environment/your-water-coast>
 3. <http://www.dnr.sc.gov/water.html>
 4. <http://www.scdhec.gov/Agency/RegulationsAndUpdates/LawsAndRegulations/Water/>
5. **Explain why it is important to take the entire watershed/catchment area into account when planning for water quality.**
 - a. <https://www.epa.gov/hwp>
6. **Identify state/provincial river basins.**
 - a. https://www.dnr.sc.gov/water/waterplan/pdf/Major_Basins_of_South_Carolina.pdf
7. **Explain how human activities upstream impact downstream water quality, and why investing in conservation upstream is important.**
8. **Identify biotic and abiotic factors that impact water quality.**
9. **Identify ecological and human demands on the water supply and provide recommendations for balancing these demands.**
10. **Describe water conservation practices and in which situations they are most effectively used.**
 - a. Homes: <https://www.epa.gov/watersense>
 - b. Agriculture: <https://cuesa.org/article/10-ways-farmers-are-saving-water>
11. **Identify causes of hypoxia and anoxia in aquatic systems, how these conditions impact the functioning of the ecosystem, and best management practices for prevention and treatment.**
12. **Describe how a disturbance to one trophic level will impact organisms in other trophic levels.**
13. **Describe cultural eutrophication and how it affects lakes and ponds.**
 - a. <https://www.nature.com/scitable/knowledge/library/eutrophication-causes-consequences-and-controls-in-aquatic-102364466/>
14. **Describe natural and human impacts on river and stream health, flow, structure, and velocity.**
15. **Recommend best management practices for improving water quality and enhancing aquatic habitat, such as riparian buffers.**
16. **Identify threats to aquatic ecosystems, such as pollution, biomagnification of toxins, erosion, development, invasive species, excess nutrients, thermal shock, et cetera.**
 - a. <https://www.colorado.edu/lab/johnson-laboratory/sites/default/files/attached-files/brv.12480.pdf>
17. **Distinguish between point and non-point source pollution and give examples and management strategies for each.**
 - a. <https://www.epa.gov/nps/basic-information-about-nonpoint-source-nps-pollution>
18. **Describe the impact of changes in climate on water quality and water resources.**
19. **Describe action that can be taken to mitigate adverse human impacts on aquatic systems.**
20. **Explain the process of ocean acidification and describe its effect on marine ecosystems.**
 - a. <https://www.noaa.gov/education/resource-collections/ocean-coasts/ocean-acidification>
21. **Describe how water can be used as a source of renewable energy.**
22. **Explain the economic, societal, and cultural impacts of water quality and quantity resource issues (such as water scarcity, damming projects, pollution disasters, et cetera).**
 - a. Understand the fight between North and South Carolina over water on Catawba River
 - i. <https://www.circleofblue.org/2011/world/north-vs-south%E2%80%94carolina-states-settle-water-dispute-without-supreme-court/>
 - ii. I've written a case study on this that you can find here:
 - iii. <https://www.nsta.org/ncss-case-study/one-glass-two-people>
23. **Describe the roles of key leaders in water quality and conservation, both historical and present (such as Marjory Stoneman Douglas, Jacques Cousteau, Amariyanna Copeny, Vanessa Nakate, et cetera).**

Study Area 5: Field Skills

1. **Identify common aquatic animal species including fish, reptiles, amphibians, and mammals.**
2. **Identify common aquatic macroinvertebrates and their pollution tolerances.**
3. **Calculate a biotic index and determine water quality for freshwater systems.**

- a. **For 1-3:**
 - i. <http://water.epa.gov/scitech/swguidance/standards/criteria/aqlife/biocriteria/index.cfm>
 - ii. https://dnr.maryland.gov/streams/Documents/dnr_bugsheet.pdf
 - iii. <http://www.epa.gov/wetlands/wetlands-monitoring-and-assessment>
4. Identify common aquatic plants and their growth zones.
5. **Identify invasive aquatic species.**
6. Utilize common water monitoring tools to determine local water quality (such as a Secchi disk, Ekman dredge, dip net, pH meter, aquatic sensors, et cetera).
7. **Interpret results of water quality monitoring measures (such as dissolved oxygen, turbidity, E. coli counts, pH, nutrient levels, et cetera) and provide recommendations for best management practices.**
 - a. http://water.epa.gov/scitech/swguidance/standards/wqslibrary/sc_index.cfm (click on SC, then on the water classification & standards regulation to open a .pdf file)
8. Utilize common technologies in water resource management (such as GPS, GIS, aquatic sensors, et cetera).
9. **Delineate a watershed using a topographic map.**
 - a. https://www.soilandwater.nyc/uploads/7/7/6/5/7765286/watershed_delineation.pdf
 - b. http://www.wvca.us/envirothon/pdf/Watershed_Delineation_2.pdf
10. Calculate relevant hydrological measures such as base flow, water volume, runoff, water balance, et cetera.
11. Calculate a water budget, including precipitation, evapotranspiration, storage, stream flow, discharge, and recharge.
12. **Interpret a hydrograph**
 - a. <https://www.bbc.co.uk/bitesize/guides/zv4r7nb/revision/1>
 - b. https://www.weather.gov/lot/hydrology_education_hydrographs

AQUATICS – List of General Resources. See Learning Objectives for specific references/links for particular topics.

EPA's Office of Water Homepage: www.epa.gov/ow
 USGS Water Science for Schools: <http://water.usgs.gov/edu/>
 USDA National Water Management Center: <http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/nwmc/>
 NRCS National Water and Climate Center: <https://www.nrcs.usda.gov/wps/portal/wcc/home/>
 SC DHEC's Bureau of Water: www.scdhec.gov/water
 SC DNR Water: <http://www.dnr.sc.gov/water.html>
 SC Office of Resilience: <https://scor.sc.gov/>
 Center for Watershed Protection: www.cwp.org
 EPA's How's My Waterway: <https://www.epa.gov/waterdata/how-my-waterway>
 American Rivers: <https://www.americanrivers.org/>

12 FORESTRY

Station Manager: James Miller - SC Forestry Commission

Learning Objectives:

1. Identify common South Carolina trees without a key.
2. Identify specific or unusual species through use of a dichotomous key.
3. Understand how wildlife diversity relates to: forest communities, forest species, forest age structure, snags and den trees, availability of food and cover, and riparian zones.
4. Understand basic forest management concepts such as: harvesting techniques, regeneration methods, and insect and disease control.
5. Be familiar with the use of a Biltmore stick, compass and other forestry tools.
6. Understand how following Best Management Practices will help protect soil and water quality.

Additional Resources:

Forest Trees of SC: <http://www.state.sc.us/forest/pubs/foresttreesofsc.pdf>

13 WILDLIFE

Station Manager: Zadok Moss – SC Department of Natural Resources

Wildlife Station objectives come directly from the NCF-Envirothon webpage. The official NCF-Envirothon curriculum guide for the Wildlife section can be found here: <https://envirothon.org/the-competition/areas-of-study/wildlife/> .

Students should be able to:

- Provide an informed opinion about current issues in wildlife conservation.
- Think critically about solutions to current wildlife conservation issues.
- Work collaboratively in a team to synthesize and apply knowledge.
- Make connections between concepts in Wildlife and the subjects of Soils and Land Use, Forestry, Aquatic Ecology, and the Current Issue.

Students will be able to:

Wildlife Biology

1. Distinguish between major taxonomic classifications of wildlife, their typical roles in ecosystems, and their habitat requirements (including mammals, birds, fish, reptiles, amphibians, and insects).
2. Identify anatomy of various wildlife species and describe the functions of anatomical parts, particularly special adaptations.
3. Explain the processes of natural selection and evolution and relate these processes to the variety of life we see on Earth today.
4. Identify the different stages in a species' life cycle and describe how each stage relates to the species' biology, behavior, adaptations, habitat requirements, and ecological niche.
5. Provide examples of physical and behavioral adaptations (such as mimicry, camouflage, freeze response, hibernation, special organs, et cetera) and how these adaptations benefit wildlife.
6. Describe the significance of migration in the life cycle of certain wildlife species.
7. Explain how the needs of a species might change throughout its life cycle, and how these changing needs are addressed in management strategies.
8. Describe the roles that circadian and seasonal rhythms play in the life cycles of different wildlife species.
9. Differentiate between a territory and a home range and discuss how each is important for wildlife species.
10. Explain the difference between generalist and specialist species and provide examples of each.

Wildlife Ecology

11. Identify the essential components of a habitat and recommend suitable habitat for local wildlife species.
12. Identify biotic and abiotic factors in ecosystems and how they are related to wildlife habitat requirements, ecosystem variation, and wildlife conservation.
13. Describe the roles of producers, consumers, and decomposers in various ecosystems and identify their trophic levels.
14. Diagram a food web and describe the flow of energy within it.
15. Relate the energy pyramid to different trophic levels and the total amount of energy available to consumers.
16. Identify the effects of various environmental impacts on the energetic relationships in food chains and webs.
17. Explain the different types and levels of biodiversity, and how they apply to ecosystems.
18. Name and describe the different types of symbiotic relationships.
19. Identify common wildlife diseases, their causes, and their effects.
20. Identify the biological and social carrying capacities for a species, along with the limiting factors that influence these numbers.
21. Describe how changes in demographic parameters (such as birth, mortality, reproduction rate, immigration, emigration, age structure, sex ratio, et cetera) affect wildlife populations.
22. Apply concepts of landscape ecology as they relate to wildlife conservation, including: a. Patterns in landscape and habitat type, and how this affects the distribution of wildlife species

- a. Use and proximity of different habitat types over the course of a species' life (migration, species that undergo metamorphosis, et cetera)
 - b. Effects of disturbance on an ecosystem and its impacts to wildlife
 - c. Habitat connectivity and the importance of wildlife corridors
 - d. Genetic diversity in species across landscapes and the importance of this genetic diversity to healthy species populations
23. Describe the different levels of ecosystem organization, including individuals, populations, communities, and ecosystems.
 24. Define an ecological niche and describe how species fulfill these different roles in an ecosystem.
 25. Describe competition between species, list examples of this relationship, and explain different strategies used by wildlife to avoid or overcome competition (such as niche partitioning, behavioral adaptations, et cetera).
 26. Describe different habitat characteristics that are important to wildlife (such as ecotones, edges, snags, downed logs, riparian areas, early successional stages, et cetera).
 27. Explain the importance of the edge effect for species diversity and wildlife habitat.
 28. Define succession and describe how each successional stage is important for different species of wildlife.
 29. Describe wildlife adaptations to unique ecosystems (such as high elevations, deserts, fire-dependent ecosystems, et cetera).
 30. Identify sources of disturbance in an ecosystem and predict how different types of disturbance may impact wildlife species.
 31. Define resilience and describe what it means for ecosystems and wildlife species.
 32. Identify the importance of major migratory flyways.
 33. Explain the importance of pollinators in natural and agricultural ecosystems.

Wildlife, Conservation, and Society

Native and Indigenous peoples have cultures and traditions that include close relationships with the environment. Native and Indigenous communities are unique, and each group has its own history, culture, Indigenous systems of science, traditional ecological knowledge, and conservation practices. The NCF-Envirothon encourages each state, province, and partner nation to consult with your local Native and Indigenous communities to highlight their unique environmental perspective in your Envirothon learning objectives, study materials, and competitions. The following Learning Objectives should be applied on a local, state/provincial, national and/or worldwide (international) scale as appropriate to each objective and the unique parameters under consideration.

34. Identify major legislation (local and national) and international agreements pertaining to wildlife and describe how they provide protection for natural resources.
35. Explain the distinctions between species designations (such as common, rare, endangered, threatened, endemic, extirpated, and extinct) and provide examples of each type.
36. Recognize important issues facing wildlife on a local, state/provincial, national and international scale, propose solutions to current problems, and evaluate viability of solutions.
37. Define keystone, umbrella, game, non-game, and indicator species and describe their roles and functions within ecosystems.
38. Explain the differences between conservation and preservation.
39. Describe the different types of wildlife reserves and what types of activities are allowed in each type.
40. Describe the role and history of hunting in wildlife management.
41. Identify positive and negative human-wildlife interactions and describe how these interactions are taken into consideration when creating management plans.
42. Define invasive and exotic species, describe their characteristics, name examples, describe how they are spread, and explain their impact on local ecosystems.
43. Describe the impact of changes in climate on wildlife and their habitats.
44. Explain the roles of local, state/provincial, national, and international agencies in wildlife protection and management.
45. Identify the costs and benefits of various wildlife management strategies (for example, a farmer sacrifices tillable acreage to maintain a wildlife buffer, losing potential crop revenue, but gaining better water quality for the farm, reducing erosion, and fostering habitat area for pollinators, quail, and other wildlife).

46. Explain the roles of local, state/provincial, national, and international agencies in prevention, control, and regulation of exotic and invasive species.
47. Describe the use of technology such as remote sensing, GPS, and GIS in wildlife management.
48. Describe the roles of key leaders in the conservation movement, both historical and present (such as Michael Werikhe, Rachel Carson, Dr. Drew Lanham, Aldo Leopold, John Muir, Christian Cooper, Corina Newsome, Jason Ward, Anna Botsford Comstock, et cetera).

Field Skills

49. Identify common local wildlife species from preserved specimens, skulls, skeletons, pelts, tracks, scat, and other animal signs without the use of a key.
50. Explain an animal's habitat, dietary requirements, and life cycle based on animal signs.
51. Identify wildlife based on communication methods (bird and frog calls, et cetera).
52. Use a field guide or dichotomous key to identify uncommon wildlife species.
53. Identify exotic and invasive species.
54. Assess a particular site for wildlife habitat and make recommendations for best management practices.
55. Recommend wildlife management practices for a variety of uses (including conservation, connectivity, and hunting) for a variety of landscapes (including grasslands, forests, croplands, wetlands, and urban settings).
56. Apply sampling methods to measure wildlife populations and interpret data gathered from population studies.
57. Interpret population and demographic models.

14 CURRENT TOPIC: RENEWABLE ENERGY FOR A SUSTAINABLE FUTURE

Station Manager: Joshua Castleberry - Central Carolina Technical College

Learning Objectives adopted from NCF-Envirothon Current Issue Study Resources:

(<https://envirothon.org/2024-ny/>)

Key Topic 1: Traditional Non-renewable Energy Sources

1. Explain how Oil, Natural Gas and Coal Systems Generate Electricity and Potential Issues with Expanding production to meet future needs.
2. Identify the environmental, social, and economic, advantages and disadvantages of each source, including short-term impacts.
3. Explain the setup and design of traditional energy infrastructure and distribution systems.

Key Topic 2: Renewable and Alternative Energy Sources

4. Explain how Solar, Wind and Hydroelectric systems generate electricity and potential issues with expanding production to meet future needs.
5. Identify the environmental, social, and economic advantages and disadvantages of each source, including short-term and long-term impacts.
6. Explain the setup and design of renewable/alternative energy infrastructure and distribution systems.

Key Topic 3: Technological Advancements and Transition Challenges

7. Describe recent technological advancements within the solar, wind and hydroelectric energy fields including infrastructure and distribution systems.
8. Describe the challenges associated with transitioning to renewable/alternative energy sources.
9. Identify solutions to the challenges associated with renewable/alternative energy, including environmental, social, and economic incentives.

Key Topic 4: Changing roles and responsibilities in making energy decisions

10. Describe how energy regulations are created at the local, state/provincial, and international levels and how these regulations impact producers and consumers.
11. Identify what energy use decisions can be made on an individual/household level.
12. Explain the accountability process for pollution/emissions related to energy generation and distribution at the local, state/provincial, and international levels.
13. Describe how financial incentive programs work in the green energy space and explain the socioeconomic and environmental impacts of carbon offset credits, renewable energy credits, and other trade-off programs.

Key Topic 5: Vulnerabilities and Opportunities

14. Identify vulnerabilities inherent with an increased demand for alternative energy sources: (such as weather conditions, Solar flares, human disruption).
15. Describe possible solutions to limit or eliminate those vulnerabilities identified.

15 ORAL PRESENTATION SCENARIO

Station Manager: Chanda Cooper, Richland SWCD

General Learning Objectives:

1. Research the scientific, political, historical and social issues surrounding the current topic. Evaluate the evidence and construct a solution for this issue.
2. Using materials and information gathered in your research construct and present your solution to a diverse judging panel of resource and communication professionals. You may use a slideshow in .pdf format as a visual aid (no audio/video or animations allowed). Each student is allowed five (5) 3.5 x 5 inch index cards to assist them during the presentation. No materials other than the aids mentioned above are allowed. **Email the finalized PDF file of your slideshow to Brooke Myres (myresb@dnr.sc.gov) by Midnight, Sunday, April 21, 2024.** Submission of the presentation prior to the competition allows for printed copies of the presentation to be given to judges. Index cards must be turned in at registration on competition day and will be returned to students just prior to presenting.
3. Respond to questions from the judging panel at the conclusion of your presentation. Questions may be direct (on the material you presented) or indirect (interpretive, based on assumed background knowledge).

Oral Presentation Scenario

Team members are asked to research issues and information surrounding the scenario below. Any source of information is allowed although teams should carefully screen their facts for accuracy and objectivity. Teams will be allowed ten (10) minutes to present, with two (2) minutes of question and answer period following the presentation. All team members must speak and participate in the presentation. A slideshow in .pdf format is allowed as a visual aid (see materials list on page 28).

Oral Presentation Written and Developed by:

Joshua Castleberry, Central Carolina Technical College

Scenario:

All characters and other entities appearing in this work are fictitious. Any resemblance to real persons, dead or alive, or other real-life entities, past or present, is purely coincidental.

Manckeville, SC is a moderately sized incorporated city in South Carolina. It has a population of around 45,000 people in the incorporated area; another 100,000 people live in the surrounding County. The city is a mixture of uses, including a reinvigorated downtown area with shopping and fine dining as well as light industrial. Housing in the city, as might be expected in an old SC town, is a mixture of smaller high-density single-family homes near the center of town (in desperate need of repair), scattered apartment complexes, and larger single-family homes with larger yards on the outskirts of town. There are small brownfields ranging from 5 to 100 acres scattered throughout the town from where population grew and industry shrank at various times before city planning was really part of the equation. The county land surrounding the city is a mixture of heavy industrial (mostly green field built in the last 30 years) and agriculture. The agriculture is a mixture of row crops (mostly soy beans/ corn in rotating years) and silviculture (primarily loblolly pine forests), with limited livestock (primarily cattle grazing).

Manckeville is large enough to be served by multiple electricity providers. Depending on where you are in town you may be served by a state-owned utility, an investor-owned utility, a co-op, or even one small municipal utility. The city mirrors the state in that the majority of the electrical generation comes from Nuclear (~50%) and natural gas (~23%).

Coal is the third largest source (~15%), but several of the power utilities have plans to phase out coal energy production in the next decade or so. The utilities hope to replace at least some of that production capacity with renewable solar, but currently the city is only getting around 3% of their energy from that source.

Like most cities in the state, Manckeville has a planning department (MPD); theirs covers the county as well. MPD's engaged and well-educated planners reach out to stakeholders whenever plans are being made. Unfortunately, public participation is low in those events and the planners just have to go with what they feel the data indicates is the best path forward.

The energy and planning issue came to a head recently. In their 10-year plan, MPD had zoned some row crop ag land in the county just north of town for solar farming. In the public meetings there was no push back; most likely because the meeting was attended exclusively by environmentally minded townsfolk who were most interested in reducing their electric bill and reducing coal burning in the state. After the plan passed, the economic development branch of the MPD worked hard to recruit a company to develop and build a solar farm in that zone. Their hard work paid off and Solar Farms for America (SFFA) expressed interest in building a 50-acre solar farm at the very edge of that zone. This would more than double the input of solar into the system, raising it to about 7% of the town's electricity from solar. Per legal requirements, Manckeville town council posted notice of hearing to allow SFFA to begin construction. That little yellow sign posted on the property drew an immediate and fierce backlash from the agricultural community.

Local farmers, already under pressure from encroaching development as the town is growing outward as the population continues to grow, viewed SFFA as an existential threat to their continued existence. They were concerned that they would be losing productive ground (the area zoned for solar farms has some of the best soils in the county for row crops), that the infrastructure needed for solar farms might interfere with their production processes, and even that the existence of a solar farm in an adjacent field may bring additional scrutiny and difficulty to their process (there was a rumor, for example, that dust from harvesting may have to be regulated so that the solar panels didn't get dirty, thus increasing the complexity and cost of harvest for the farmer even further). There was enough grass roots pushback that at a contentious council meeting with lots of fierce input from stakeholders, the motion was narrowly defeated. SFFA will not be able to build where they wanted to.

The current situation is that MPD is frustrated because all of their hard work, based on the info that they had, has been for nothing. City folks are mad at the farmers because from their perspective the farmers swooped in at the last hour and killed a good idea. The farmers are mad because from their perspective they are out there working hard to support the community and that same community is attacking them from every angle. SFFA is unhappy because the resources they invested in this project seem like they aren't going to pay off. All of the grants that they have access to (to make their investment in a solar farm worthwhile) come from electric utilities and require large scale (50 acres or more) sites. Agriculture is a significant portion of Manckeville's (and South Carolina's) economy. Everyone needs electricity, and our current power infrastructure is under a number of pressures from different angles. Problems that seem like they could have been avoided at the beginning seem to have halted any forward progress and destroyed trust among groups.

You group IS Manckeville Council. You are elected officials tasked with supporting the needs of all of your constituents. You ran for election because you believe in your heart of hearts that you can make a positive difference. This is an election year and you do want to run for reelection. Normally at this point I would give you some options to choose from. Unfortunately, sometimes life doesn't come with someone giving you options. Sometimes you have to look at the big picture and come up with your own direction. In this scenario YOU are the leaders. You have direct control over some stakeholder groups (as a council you can direct MPD what to do), but telling someone what to do isn't always leadership. Other stakeholder groups (the farmers and the solar farm proponents) can and will hold you accountable for your decisions.

Councilmembers, the ball is in your court. How do we move forward from here?

16 ORAL PRESENTATION RULES

Materials allowed for Oral Presentations:

Teams may use a slideshow in .pdf format as a visual aid (no audio/video or animations allowed). Each student is also allowed up to five (5) 3.5 x 5 inch index cards to assist them during the presentation. No materials other than the aids mentioned above are allowed. Email the finalized PDF file of your slideshow to Brooke Myres (myresb@dnr.sc.gov) by midnight on Sunday, April 21, 2024. Submission of the presentation prior to the competition allows for printed copies of the presentation to be given to judges. Index cards must be turned in at registration on competition day and will be returned to students just prior to presenting.

Scoring Procedures:

A panel of judges with expertise in the current topic, natural resource management and public communication will score the presentation of each team using the score sheet found at the end of this section of the manual. Also included is a detailed explanation of the scoring procedure. In accordance with National Conservation Foundation Envirothon procedure, the highest and lowest scores will be dropped and the remaining three scores averaged. This average will be the team's score for Oral Presentation.

Teams are allowed 10 minutes to present but are stopped at 12.5 minutes to allow for questions and answers. The following outlines the scores allocated based on length of presentation:

2.5 – 5.5 minutes 2 points
5.5 – 7.5 minutes 3 points
7.5 – 9.5 minutes 4 points
9.5-10.5 minutes 5 points
10.5-12.5 minutes 4 points

Teams will be notified when there are 5 minutes remaining, 1 minute remaining, and 30 seconds remaining in their presentation time.

South Carolina Envirothon
Judges Scoring Sheet for Team Oral Presentations

Team Number: _____

Judge's Initials: _____

Scale for Scoring:

0 = not at all

6 = good

2 = poorly

8 = excellent

4 = fair

10 = outstanding

PART 1: Preparation and Presentation (60 Points Max.)**PART 1 Total:** _____**A. How well did the presentation address or identify:**

The interrelationship between natural resources, different management strategies and human health and well-being	0	2	4	6	8	10
All the stakeholders affected	0	2	4	6	8	10
Relevant influences on or by the major resource areas (soil, water, forestry, wildlife)	0	2	4	6	8	10
Knowledge of new technologies/science that addresses the issues	0	2	4	6	8	10
Other environmental problems related to the issue	0	2	4	6	8	10

B. References:

Were references and resources cited in the presentation?	0	2	4	6	8	10
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PART 2: Application of the Data (80 Points Max.)**PART 2 Total:** _____

Team demonstrated a solid understanding of the political issues related to the problem	0	2	4	6	8	10
Team demonstrated a solid understanding of the environmental issues related to the problem	0	2	4	6	8	10
Team demonstrated a solid understanding of the economic issues related to the problem	0	2	4	6	8	10
Team demonstrated a solid understanding of the social/cultural issues related to the problem	0	2	4	6	8	10
Team presented ONE viable opinion/solution to the problem, addressing the resource issue	0	2	4	6	8	10
All main parts of the presentation were clearly stated and supported	0	2	4	6	8	10
Solution(s) presented address(es) the long-term sustainability of the resources	0	2	4	6	8	10
The land-use decision proposed addresses the concerns of all the stakeholders	0	2	4	6	8	10

PART 3: Quality of the Presentation (40 Points Max.)**PART 3 Total:** _____

Presentation was well organized with a clear introduction and a strong conclusion	0	2	4	6	8	10
Participants enhanced the presentation with eye contact, gestures, voice inflection and originality	0	2	4	6	8	10
Visual aids were used to support major points	0	2	4	6	8	10
Questions from the judging panel were answered logically and concisely	0	2	4	6	8	10

PART 4: Required Elements (20 Points Max.)**PART 4 Total:** _____

Two points for each team member that participated in the oral presentation	0	2	4	6	8	10
Up to five points if the presentation was completed within the allotted time (only worth 5 points)	0	1	2	3	4	5
Up to five points if a viable plan (solution) was presented (only worth 5 points)	0	1	2	3	4	5

17 CLARIFICATION OF JUDGING SCORE SHEET

In order to ensure the consistency of judging, the following guidelines have been prepared. In general, the point values can be interpreted as follows (see a more detailed analysis for each category below):

- 0- Not at all.
- 2- Major misconceptions or gaps; ineffective, inadequate, inappropriate.
- 4- Some misconceptions or flaws; minimally effective, somewhat appropriate.
- 6- Complete, and accurate; effective, adequate and appropriate.
- 8- Complete, very detailed, logical, ideas well supported and well organized; highly effective, all details appropriate.
- 10- Profound, in-depth, done in an insightful manner; extremely effective, points to an extremely effective strategy.

AN EXPANSION OF EACH SECTION OF THE JUDGING SHEET:

PART I: PREPARATION AND PRESENTATION OF THE PLAN (60 POINTS MAX)

A. How well did the presentation address or identify:

1. The interrelationship between the environment, natural resources, and different natural resource management strategies?

- 0- Not at all.
- 2- Major flaws or misconceptions in the interrelationships.
- 4- Identified most of the key interrelationships but had some misconceptions or gaps
- 6- Identified key interrelationships appropriately and adequately, along with appropriate management strategies.
- 8- Presents major and minor interrelationships and management strategies in a clear and effective manner with supporting evidence.
- 10- Addresses all interrelationships and develops a most effective combination of management strategies in a logical, insightful and well defended manner addressing all aspects of the problem.

2. All the different players/interest groups affected by the problem?

- 0- No players identified.
- 2- Only one or two players identified with major flaws in their interests or who is affected.
- 4- Most of the players and their interests presented with some misconceptions or gaps.
- 6- All the major players identified appropriately with their viewpoints accurately expressed.
- 8- Major and minor players identified and their interests are accurately expressed in a well organized manner.
- 10- Very comprehensive analysis of the players and their needs and interests, done in a well-organized and insightful manner clearly conveying the complexity of the issue. Done in a clear and very logical presentation.

The judging criteria for section A, 3-5 is similar. Use the following criteria for these sections: 3- 5. How well did the presentation address or identify: 3) The major natural resources areas (aquatics, forestry, soils, wildlife), 4) new alternatives/technologies that address the topic's issues, 5) the specific environmental problem (the oral scenario)?

- 0- None at all.
- 2- Many of the issues involved are not covered or major misconceptions in addressing these issues.
- 4- All the main issues (where appropriate) are addressed but there are misconceptions or gaps in how they are addressed.
- 6- All key issues (where appropriate) are addressed in an adequate manner.
- 8- Major and minor issues (where appropriate) are addressed in a detailed and appropriate and logical manner with support information.
- 10- All major and minor issues affected (where appropriate) are addressed in a multidisciplinary manner. The analysis is profound, in-depth, done in an insightful manner. All issues addressed are done utilizing extremely effective strategies.

B. Were references and resources cited in the team presentation?

- 0- None cited
- 2- Only one or two sources are cited or citations are inappropriate for their use.
- 4- Several resources cited, however there are gaps in the citations
- 6- Four or five resources cited and used appropriately.
- 8- Adequate resources cited from several different viewpoints supporting the major points of the presentation.
- 10- All points are supported with citations from many different viewpoints. Citations and resources used shows in-depth research and a desire to investigate all major areas of concern. Citations listed in an organized fashion.

PART II APPLICATION OF DATA (80 points maximum)

The format of the judging in sections A-D is very similar. For sections A-D judges can use the following criteria. The team demonstrated a solid understanding of: A) political, B) ecological/environmental, C) economic, D) social and cultural issue(s) related to the problem.

- 0- No A- political, B- ecological/environmental, C- economic, D- social and cultural issues considered.
- 2- Only a few of the considerations are mentioned or their understanding of the issues has major flaws.
- 4- Most of the major considerations are presented and addressed, however there are some misconceptions or gaps in the presentation.
- 6- All the major considerations are identified and addressed in an appropriate manner.
- 8- A detailed presentation of the considerations is given in a well-supported and organized manner. A high level of understanding is also exhibited in the question and answer period.
- 10- The analysis of the issues is very complete and in-depth. These issues are presented in a well thought- out and insightful manner which shows a complete understanding of the considerations and how they should be addressed. A high level of understanding is also exhibited in the question and answer period.

E. The team presented ONE viable solution to the problem addressing the resource issue.

- 0- No plan presented.
- 2- The plan has major flaws and is inadequate or inappropriate.
- 4- The plan presented has numerous minor flaws with gaps in the topics it addresses.
- 6- The plan addresses all the key concerns and provides a reasonable solution to the problem.
- 8- The plan provided covers the concerns of the problem very completely, and is presented in a detailed, logical and well organized manner.
- 10- The plan provided addresses all the aspects of the problem in an elegant, in-depth manner. The solution developed is insightful, very effective, and efficient.

F. The main parts were clearly stated and supported, (conclusion was clearly defined and convincing).

- 0- No supporting details for the conclusions reached.
- 2- Supporting details are severely flawed, confusing, or have large gaps in the presentations. The conclusion does not match the material presented.
- 4- Some of the supporting details are provided but have some misconceptions or have several gaps. The conclusion is unclear or unconvincing.
- 6- All the main points are clearly stated with supporting details. The conclusion matches the supporting details.
- 8- The presentation is organized in a very logical manner. All the major and minor points are supported accurately and covers the topic completely. The conclusion clearly comes from the body of the presentation and is very convincing. This includes clearly showing how the conclusion was reached after considering the alternatives.
- 10- The body of the presentation clearly lays out the details of the conclusion with supporting details. This is done in a highly effective manner. The presentation is insightful and detailed leading to a most convincing conclusion. This includes clearly showing how the conclusion was reached was an extremely effective solution.

G. Solution in the presentation has potential to be applied or implemented with long term sustainability to natural resources.

- 0- No solution is provided.
- 2- The solution presented is unrealistic or has major misconceptions or flaws.
- 4- The solution presented Is somewhat workable but contains some misconceptions or flaws.
- 6- The solution presented is workable and presents solutions to short-term and long-term problems. The solution is adequate and accurate. It covers all the major areas of concerns.
- 8- The solution presented is detailed, complete and realistic. It provides for the long-term sustainability of natural resources in a cost effective manner, and addresses all the concerns.
- 10- The solution presented provides an insightful, multidisciplinary approach to the problem. All natural resource concerns are dealt with in a manner which allows for short-term concerns and long-term sustainability. The solution proposed clearly supports how it addresses all the concerns by utilizing an extremely effective alternative.

H. Did the solution reflect or address the concerns of all affected groups and issues?

- 0- No attempt was made to address the concerns of affected groups and issues.
- 2- The needs of most groups affected or issues have not been addressed.
- 4- The needs of most groups have been considered but many have not been addressed adequately.
- 6- The needs of most groups and issues have been addressed in an adequate fashion.
- 8- The needs of all the groups and issues have been addressed in a complete and detailed manner.
- 10- The needs of all the groups and issues have been addressed by combining the common interests in the most effective manner while not jeopardizing the long-term sustainability of the environment, and balancing political, economic, social and cultural concerns. This is done in a detailed and insightful manner that shows sensitivity to the needs of all groups affected.

PART III QUALITY OF THE PRESENTATION (40 points maximum)

A. Presentation was well organized with a clear introduction and strong conclusion.

- 0- No introduction or conclusion.
- 2- Introduction and/or conclusion are very hard to follow with very little organization in the presentation.
- 4- Introduction and/or conclusion are somewhat difficult to follow. Minimal organization in the rest of the presentations.
- 6- Clear introduction and strong conclusions. Adequate organization throughout the presentation.
- 8- Clear introduction and strong conclusion. The presentation has a very logical flow and is very well organized.
- 10- Excellent organization throughout. The presentation is very easy to follow and compelling. The organization enhances the understanding and keeps one's full attention throughout the presentation.

B. Participants enhanced the presentation (eye contact, gestures, voice inflection, originality, exhibited professionalism, etc.).

- 0- No attempt to engage the audience was made - monotone voice, no eye contact, etc.
- 2- Very limited presentation skills for a majority of the presenters, leading to an ineffective presentation.
- 4- Several of the presenters have limited presentation skills.
- 6- All the presenters do an adequate job of presenting, using the skills listed above.
- 8- All the presenters utilize good presentation skills, leading to an effective presentation.
- 10- Extremely effective presentation skills, used appropriately in a variety of ways leading to a creative and highly effective presentation.

C. Visual aids were used to make major points and show conclusions (visual aids should be correct, eye appealing, readable, neat, etc.).

- 0- No visuals were used.
- 2- Visuals are unreadable, messy, or contain major flaws in the information.
- 4- Visuals contain minor flaws or do not convey the major points or conclusions completely.
- 6- Visuals convey the major points and conclusion in an adequate manner, no spelling errors, readable, neat and appealing.
- 8- Visuals convey the major points and conclusions (including all the features listed above) in a particularly eye catching manner.
- 10- Creative and very effective use of visuals to convey the major points and conclusions. Visuals greatly enhance the presentation and are used in a highly appropriate manner.

D. Questions were answered logically and concisely by all team members participating.

- 0- No questions answered.
- 1- Answers contain many major misconceptions or gaps.
- 2- Answers contain some misconceptions or flaws.
- 3- Answers are accurate and adequate. All the team members are involved in answering the questions.
- 4- Answers given by all the members are concise and organized in a logical manner. All the details are appropriate.
- 5- Questions are answered in an insightful manner (as well as being logical and concise). The answers show an in-depth understanding of the material.

PART IV REQUIRED ELEMENTS (20 points)

A. Add up to ten points for each team member's participation in the presentation (Each team member gets up to 2 points for equal oral participation in presentation. (For each team member: 0- No participation, 1- limited participation, 2- full participation).

B. Add 5 points if the presentation was within the 9.5-10.5 timeframe. Teams are allowed 10 minutes to present but are stopped at 12.5 minutes to allow for questions and answers. Add 2 points if the presentation was within 2.5 – 5.5 minutes, 3 points if it was between 5.5 – 7.5 minutes, 4 points if it was between 7.5 – 9.5 minutes, 5 points if it was between 9.5-10.5 minutes, and 4 points if it is between 10.5-12.5 minutes. Teams will be notified when there is 5 minutes remaining, 1 minute remaining, and 30 seconds remaining in their presentation time.

C. Add up to five points if the presentation accomplished the task of presenting a plan.

- 0- No plan presented.
- 1- Plan with major misconceptions or gaps.
- 2- Plan with some misconceptions or flaws.
- 3- Plan is complete and accurate.
- 4- Plan is complete, very detailed, logical, well supported and well organized.
- 5- Plan is profound, in-depth, insightful and extremely effective.

18 GLOSSARY OF ENVIRONMENTAL TERMS:

Acclimatization: A process of adaption of an introduced species and their offspring in a new environment.

Adaptation: Changes in an organism's physiological structure or function or habits that allow it to survive in new surroundings.

Agronomic: relating to the scientific study of soil management, land cultivation, and crop production.

Algal bloom: A condition which occurs when excessive nutrient levels and other physical and chemical conditions facilitate rapid growth of (usually) phytoplankton algae in aquatic or marine systems. Factors that foster algal bloom formation and growth include: temperature, light, pH, the availability of nutrients, lack of competition from other micro-organisms, and the absence of predators. Typically, only one or a few species are involved and the bloom is recognized by discoloration of the water resulting from the high density of pigmented cells. Algae that die and sink to the bottom stimulate growth of decomposers, especially bacteria. Decomposition can result in the depletion of oxygen in the deeper water layers, and these conditions may result in fish kills or replacement with less valuable species more tolerant of higher phosphorus and lower oxygen levels. Algal blooms may also be of concern as some species of algae produce neurotoxins. At the high concentrations reached during blooms, these may cause death if affected water is ingested.

Anadromous fish: born in fresh water, spends most of its life in the sea and returns to fresh water rivers, streams, and/or lakes to spawn. [Salmon](#), smelt, shad, striped bass, and [sturgeon](#) are common examples.

Anaerobe: An organism that can only exist in the absence or near-absence of gaseous or dissolved oxygen.

Aquatic: Animals that live predominantly or entirely in water.

Aquifer: any permeable geological formation, be it a layer of soil, sand, gravel, or rock, containing and/or conducting ground water that will yield usable quantities of water for wells, springs, streams, impoundments etc. Some productive aquifers are in fractured rock (carbonate rock, basalt, or sandstone). The study of water flow in aquifers and the characterization of aquifers is hydrogeology.

Arboreal: describes a species that lives in trees.

Archaeology: study of past human cultures by examining the materials remains and other deposits left at archaeological sites such as shell rings and mounds. Trained professionals only conduct archaeology, but opportunities to visit with archaeologists often arise.

Artifact: An object that has been manipulated by human hands into a tool or implement.

Assimilative capacity of water: the natural ability of a body of water to use and decompose potential [pollutants](#) without harmful effects to the [environment](#) and without damage to aquatic life or humans who consume the water. In environmental permitting, the assimilative capacity of a water body is defined as the maximum amount of pollutant load that can be discharged without impairing water quality for its designated best usage.

Basal Area: A measurement of the cross-sectional area of a stand of trees at 4.5 feet aboveground expressed in square feet per acre (ft²/ac).

Benthic Organism: Any organism that lives in or near the bottom of a water body.

Biltmore Stick: This scaling tool is a straight wooden stick graduated for direct readings of tree diameters and heights. The stick allows you to measure the diameter at a point 4.5 feet above stump height and also the merchantable height in terms of 16 foot logs. With these two measurements, the board foot volume of the tree may be determined. The actual volume table is printed on the stick.

Bioaccumulation/Biomagnification: The accumulation of a harmful substance such as a radioactive element, a heavy metal, or an organochlorine in an organism, especially an organism that forms part of the food chain. The process by which a concentration of a substance increases as it moves up the food chain.

Biodiversity I: Refers to the variety and variability among living organisms and the ecological complexes in which they occur. Diversity can be defined as the number of different items and their relative frequencies. For biological diversity, these items are organized at many levels, ranging from complete ecosystems to the biochemical structures that are the molecular basis of heredity. Thus, the term encompasses different ecosystems, species, and genes

Biodiversity II: The variation of life forms within a given ecosystem, biome, or for the entire Earth. Biodiversity is often used as a measure of the health of biological systems. The biodiversity found on Earth today consists of many millions of distinct biological species, which is the product of nearly 3.5 billion years of evolution.

Bioenergy: Energy derived from biofuel.

Biofuel: Any fuel derived from biomass. Agricultural products specifically grown for conversion to biofuels include corn and soybeans. Research and development is currently being conducted to improve the conversion of non-grain crops, such as switchgrass and a variety of woody crops, to biofuels.

Biological Carrying Capacity: The equilibrium between the availability of habitat and the number of animals of a given species the habitat can support over time.

Biological control: Control method involving a biological control agent that is a natural enemy of a target pest.

Biological integrity: is "the ability to support and maintain a balanced, integrated, and adaptive community of organisms having a species composition, diversity and functional organization comparable to those of natural habitats within a region" ([Karr, J. R. and D. R. Dudley. 1981](#)). Biological integrity is equated with pristine conditions, or those conditions with no or minimal disturbance. The reference condition is commonly associated with biological integrity, and the threshold is some proportion of the reference condition.

Biological Oxygen Demand (BOD): An indirect measure of the concentration of biologically degradable material present in organic wastes. It usually reflects the amount of oxygen consumed in five days by biological processes breaking down organic waste.

Biomass: Organic material made from plants and animals, containing stored energy from the sun. Biomass is a renewable energy source because we can always grow more trees and crops, and waste will always exist. Some examples of biomass fuels are wood, crops, manure, and some garbage.

Biophilic Design: Biophilia is a term popularized by E.O. Wilson to describe the extent to which humans are hard-wired to need connection with nature and other forms of life. More specifically, Wilson describes it this way: "Biophilia...is the innately emotional affiliation of human beings to other living organisms. Innate means hereditary and hence part of ultimate human nature." (Wilson, 1993, p.31). *Biophilic design* then, recognizes the need for healing gardens and spaces in hospitals and workspaces, and for homes and apartments that provide abundant daylight, natural ventilation, plants and greenery.

Browse: Leaves, buds, twigs, etc. of shrubs or trees that are eaten by wildlife.

Buffer Strip: A relatively undisturbed section of forest adjacent to an area requiring special attention or protection such as a stream or lake.

Carnivore: An animal anatomically and physically adapted to eating animal material for its main diet component.

Carrying Capacity: 1. In recreation management, the amount of use a recreation area can sustain without loss of quality. 2. In wildlife management, the maximum number of animals or plants an area can support during a given period.

Catadromous fish: fish that live in fresh water, and breed in the ocean. The most remarkable catadromous fishes are freshwater eels of genus *Anguilla*, whose larvae drift from spawning grounds in the Sargasso Sea, sometimes for months or years, before entering freshwater rivers and streams as juveniles referred to as glass eels or elvers.

Cave: Any natural cavity or series of cavities beneath the surface of the earth. Such cavities are usually classed as caves only if they are large enough to permit entrance by humans. The term is generally synonymous with cavern and is commonly applied also to wind- or water-eroded rock cavities.

Chiefdom: Highest level of social organization reached by prehistoric Native Americans. Chiefdom usually has status differences, depends on an agricultural economy, build monumental architecture such as mounds.

Community: All of the populations of different species that live in the same area and interact with one another.

Competition: The struggle for survival that occurs when organisms, trees, vegetation or wildlife all make similar demands on environmental resources such as food or sunlight.

Coral Bleaching: A process in which corals expel the algal cells (zooxanthellae) that normally live within their tissue. These algae give corals their characteristic brownish color, and once they have been expelled, the white skeleton shows through a coral's transparent tissue, giving it a bleached white appearance.

Corridor: A pathway which serves as a conduit for wildlife to move from one patch of land to another, which can also be as small as a brushy fencerow or as large as a streamside management zone. Areas of continuous habitat that permit animals to travel securely from one habitat to another.

Cover: A description of the protection and seclusion afforded by a combination of vegetation and topography. Some types of cover are: brood, escape, nesting, roosting and winter cover.

Cryptogenic species: Species that are neither clearly native nor exotic.

Cultural Carrying Capacity: The number and type of a given species that people will tolerate over time.

Diadromous Fish: Fish that travel between salt and fresh water.

Dichotomous Key: A two branched key that can help you quickly identify trees in the field. Leaves are used for the identifying characteristics. Each line in the key has two choices. Read the descriptions on these two lines and decide which fits your tree best. The choosing between two characteristics continues through the key until identification is complete.

Dissolved Oxygen (DO): The oxygen freely available in water, vital to fish and other aquatic life and for the prevention of odors. DO levels are considered a most important indicator of a water body's ability to support desirable aquatic life. Secondary and advanced waste treatment are generally designed to ensure adequate DO in waste-receiving waters.

Diurnal: Animal behavior characterized by activity during the daytime with a period of sleeping or inactivity during the night.

Ecofact: A non-artifact such as pollen, animal bones, and shellfish remains, antler tine or carving, carbonized materials such as wood, nuts, corn or other plant remains.

Ecological Site: A distinctive kind of land with specific soil and physical characteristics that differs from other kinds of land in its ability to produce distinctive kinds and amounts of vegetation and in its ability to respond similarly to management actions and natural disturbances.

Ecosystem: The interacting system of a biological community and its non-living environmental surroundings.

Ecotone: A habitat created by the juxtaposition of distinctly different ecological zones containing different habitats such as an edge habitat or a zone of transition between habitat types. For example, the intertidal zone is an ecotone occurring at the intersection between the subtidal zone and dry land. An ecotone often contains species characteristic of both overlapping habitat types as well as other species occurring only within the zone itself.

Electricity: The flow of electrical power or charge and is a secondary energy source. The energy sources we use to make electricity can be renewable or non-renewable, but electricity itself is neither renewable nor non-renewable.

Endemic: Plant or animal species that is native to a particular area; sometimes they can only be found in that one particular geographic area. **Endemic:** A species or taxonomic group that is restricted to a particular geographic region because of such factors as isolation or response to soil or climatic conditions.

Energy Conservation: The practice of decreasing the quantity of energy used while achieving a similar outcome of end use.

Endangered Species: A species of native fish, wildlife, or plants found by the Secretary of the Interior to be threatened with extinction because its habitat is threatened with destruction, drastic modification, or severe curtailment, or because of over exploitation, disease, predation, or other factors its survival requires assistance.

Environmental Justice: The fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.

Eutrophication: The process by which lakes, ponds, and streams become enriched with inorganic plant nutrients, especially phosphorus and nitrogen. This process happens naturally over a long period of time as dead organic matter accumulates, and is one step in the normal succession of the freshwater ecosystem. Cultural or artificial eutrophication occurs when human activity such as sewage effluent or leachate from fertilized fields causes a lake, pond, or fen to become over-rich in organic and mineral nutrients, which speed up plant and algal growth and eventually increases the plant and algal death rates. The bacterial decomposition of the dead plants and algae consumes the oxygen dissolved in water, sometimes suffocating fish and other aquatic plant and animal life.

Extirpated species: A species that has been destroyed or removed completely and no longer exists in a particular area, region, or habitat. The species, however, may exist elsewhere.

Feature: Features are of great interest to archaeologists. Features can be large like mounds or shell rings, or small like a posthole for a prehistoric house or a deposit of periwinkle shells within a shell ring. A hearth used 800 years ago to heat a clay walled hut is yet another type of feature.

Fecal Coliform Bacteria: Bacteria found in the intestinal tracts of mammals. Their presence in water or sludge is an indicator of pollution and possible contamination by pathogens.

Fecundity: The quality or power of producing offspring. The inherent reproductive potential of a species.

Feedstock: A substance used as a raw material in an industrial process. Biomass feedstocks include herbaceous and woody energy crops, agricultural food and feed crops, agricultural crop wastes and residues, wood wastes and residues, aquatic plants, and other waste materials including some municipal wastes.

Fossil Fuel: A general term for buried combustible geologic deposits of organic materials, formed from decayed plants and animals that have been converted to crude oil, coal, natural gas, or heavy oils by exposure to heat and pressure in the earth's crust over hundreds of millions of years.

Fossorial: Animals that live predominantly or entirely underground.

Genetic Diversity: A level of biodiversity that refers to the total number of genetic characteristics in the genetic makeup of a species.

Geomorphology: the branch of geology that examines the earth's topographic features including their classification, description, nature, origin, development, and relationships to underlying structures, as well as the history of geologic changes as recorded by these surface features. Geomorphology can be used to provide predictive power for activities such as stream restoration.

Geothermal Energy: Taps into heat underneath the Earth's crust to boil water that is then used to drive electric turbines to heat buildings, homes, or in other non-electrical purposes.

Grazing Management: The manipulation of grazing and browsing animals to accomplish a desired result.

Ground Water: The supply of fresh water found beneath the Earth's surface usually in aquifers, which supply wells and springs. Because ground water is a major source of drinking water, there is growing concern over contamination from leaching agricultural or industrial pollutants or leaking underground storage tanks.

Habitat: The physical area where an organism lives. A place where a plant or animal naturally lives and grows.

Hectare: A metric measurement for land area. 1 hectare = 10,000 square meters, or about 2.5 acres. (abbreviation: ha).

Herbivore: An animal anatomically and physically adapted to eating plant material for its main diet component.

Home Range: The geographic area to which an animal generally restricts its activities.

Homestead Act of 1862: An act passed by Congress in 1862 promising ownership of a 160-acre tract of public land to a citizen or head of a family who had resided on and cultivated the land for five years after the initial claim.

Human-wildlife conflict: any interaction between humans and wildlife that results in negative impacts on human social, economic or cultural life, on the conservation of wildlife populations, or on the environment.

Hybrid: Offspring resulting from a cross between two different species (or genetically distinct individuals within the same species) that may be naturally occurring or the result of controlled crosses, or being genetically modified.

Hydrogen: The most abundant element in the universe, and an important factor in our energy future. Hydrogen fuel cells can produce power without emitting any pollutants; their only byproducts are water and heat. Hydrogen can both carry and store energy and can be used in a wide variety of applications, including portable devices that use batteries, transportation vehicles, and a number of stationary power sources.

Hydropower: The capture of the energy of moving water for some useful purpose. Hydropower plants capture the energy of falling water to generate electricity. A turbine converts the kinetic energy of falling water into mechanical energy. Then a generator converts the mechanical energy from the turbine into electrical energy.

Impaired Streams: Streams that do not meet the water quality standards set by the state based on classified uses (ie. fishing, swimming, shellfish).

Indicator Species: Plants or animals whose abundance and health are a reflection of environmental quality and conditions.

Indigenous: originating, growing, occurring in and characteristic of a particular region or environment.

Infrastructure: The basic network or foundation of capital facilities or community investments which are necessary to support economic and community activities.

Injurious species: An introduced species that causes economic or environmental harm to humans.

Instream flow: the amount of water needed to adequately provide for downstream uses occurring within a stream channel. These users cover some or all of the following uses: human drinking water, aquatic habitat, recreation, wetlands, navigation, hydropower, riparian vegetation, and water quality, including waste assimilation. Flow is measured in volume of water per unit of time, usually cubic feet per second (cfs). This gauges the amount of water flowing past a point in the river at a given time.

Integrated pest management (IPM): pest management approach that considers the life cycle of a targeted species and intervenes in reproduction, growth, or development to reduce pest populations to a level not harmful to crops. IPM also works to maintain populations of beneficial insects.

Invasive species: an invasive species is a species that does not naturally occur in a specific area and whose introduction does or is likely to cause economic or environmental harm, or harm to human health. Invasive species become a nuisance through rapid spread and increase in numbers, often to the detriment of native species.

Karst: The typical surface terrain of a limestone region, characterized by an abundance of sinkholes, disappearing streams, exposed rock outcrops or ledges, and underground caverns.

Keystone Species: A keystone is the stone at the top of an arch that supports the other stones and keeps the whole arch from falling. A keystone species is a species on which the persistence of a large number of other species in the ecosystem depends; a species that plays a critical role in maintaining the structure of an ecological community and whose impact on the community is greater than would be expected based on its relative abundance or total biomass.

Late Archaic Period: a period from roughly 5000-3000 years ago. During this time complex hunter-gatherer tribal societies began to construct shell rings, fashion pottery vessels and live a semi sedentary lifeway.

Limiting Factor: A condition whose absence or excessive concentration is incompatible with the needs or tolerance of a species or population, and which may have a negative influence on their ability to thrive. Any ingredient of habitat that is deficient and prevents a species from increasing.

Mast: fruits or nuts used as a food source by wildlife. Hard mast is the fruit or nuts of trees such as oaks, beech, walnut, chinquapin, and hickories. Soft mast includes the fruits and berries of dogwood, viburnums, elderberry, huckleberry, spice bush, grape, raspberry, and blackberry.

Microclimate: A small area (such as a cove) that has different physical characteristic (such as soils, soil moisture, soil fertility, exposure to sunlight) than its surrounding landscape. Because of these differences, microclimates create unique habitats that support plants and animal species that are uncommon in the surrounding landscape.

Mississippian period: a period from 1000 to four hundred years ago. During this time earthen mound building, corn agriculture, and complex societies living in permanent villages were ruled by hereditary chiefs.

Mound: Artificially constructed village feature constructed of baskets loads or dirt, shaped like a truncated cone and used as a platform for chief's houses temples or both.

Naturalized: To establish a self-sustaining population of exotic species in the wild outside of its natural range.

Nocturnal: Animal behavior characterized by activity during the night with a period of sleeping or inactivity during the daytime.

Non-Point Source of Pollution: Diffuse pollution sources (i.e. without a single point of origin or not introduced into a receiving stream from a specific outlet). The pollutants are generally carried off the land by storm water. Common non-point sources are agriculture, forestry, urban, mining, construction, dams, channels, land disposal, saltwater intrusion, and city streets.

Non-renewable: Energy resources, such as coal, oil and natural gas that cannot be replenished by nature as fast as they have been used. It took hundreds of millions of years to form many of these resources and they are in limited supply.

Nuclear Energy: Energy in the nucleus (core) of an atom. There is enormous energy in the bonds that hold atoms together. Nuclear energy can be used to make electricity, but first the energy must be released. It can be released from atoms in two ways: nuclear fusion (when atoms combine) and nuclear fission (when atoms split).

Omnivore: An animal with the ability to eat and survive on both plant and animal matter.

Osmosis: The movement of water molecules across a selectively permeable membrane from an area of low solute concentration (high water potential) to an area of high solute concentration (low water potential). Osmosis will occur whenever the water concentrations are different on either side of a differentially permeable membrane.

Organic Production Systems: An ecological production management system that promotes and enhances biodiversity, biological cycles and soil biological activity.

Pastureland: Grazing lands comprised of introduced or domesticated native forage species that are used primarily for the production of livestock. They receive periodic renovation and/or cultural treatments such as tillage, fertilization, mowing, weed control and may be irrigated. They are not in rotation with crops.

Pathway: Mode by which a species establishes and continues to exist in a new environment.

Photosynthesis: a biochemical process in which plants, algae, and some bacteria use chlorophyll to harness the energy of light to synthesize life sustaining organic compounds such as carbohydrates. Ultimately, nearly all living things depend on energy produced from photosynthesis for their nourishment, making it vital to life on Earth. It is also responsible for producing the oxygen that makes up a large portion of the Earth's atmosphere. Plants use carbon dioxide gas and water to produce glucose and oxygen gas in accordance with the following formula: $12\text{H}_2\text{O} + 6\text{CO}_2 + \text{light} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6$ (glucose) + $6\text{O}_2 + 6\text{H}_2\text{O}$.

Pollination: The act of transferring pollen grains from the male anther of a flower to the female stigma.

Population: A group of organisms belonging to the same species that live in the same area and interact with one another.

Precocial: Newly hatched birds that are covered with down and are capable of moving around when first hatched, as opposed to altricial which are born naked and helpless.

Rangeland: Land on which the plant community is comprised of predominately native or indigenous grasses, grass-like (e.g. sedges), forbs and/or shrubs. Rangeland includes natural grasslands, savannas, shrublands, most deserts, tundra, alpine communities, coastal marshes and wet meadows.

Renewable Energy: Any sustainable energy source that comes from the natural environment. The most common forms of renewable energy are solar, wind, water or hydro, biomass and geothermal energy. Renewable energy sources are maintained or replaced by nature, relatively quickly, after use.

Riparian Buffer: Planting of trees, shrubs, grasses that catch pollutants in both surface and groundwater before those pollutants reach a water body, such as a stream or lake. Riparian buffers also improve fish and wildlife habitats.

Riparian Corridor: Part of a floodplain situated closest to the channel, or taking place along the bank of a river.

Salt-water wedge: A wedge-shaped intrusion of ocean saltwater into a fresh-water estuary or tidal river; it slopes downward in the upstream direction, and salinity increases with depth because of higher density. During a rising tide, the sea water forces its way upstream beneath the seaward flow of freshwater.

Sedimentation: The removal of large volumes of soil from the land, and their deposition in waterways.

Shell Ring: Artificial deposit of shell occurring as a ring, crescent, horseshoe shape or mound of shell and other artifacts and ecofacts.

Solar Power: The technology of obtaining usable energy from the light of the sun. Solar energy is the solar radiation that reaches the earth and can be converted directly or indirectly into other forms of energy, such as heat and electricity.

- **Active Solar Systems:** Use solar collectors and additional electricity to power pumps or fans to distribute the sun's energy. The heart of a solar collector is a black absorber which converts the sun's energy into heat. The heat is then transferred to another location for immediate heating or for storage for use later.
- **Passive Solar Systems:** Do not use any mechanical equipment to move the sun's energy. This technique uses building elements such as walls, windows, floors and roofs, in addition to exterior building elements and landscaping, to control heat generated by solar radiation.
- **Photovoltaic Solar Systems:** Photovoltaic (PV) cells convert sunlight to electricity. PV cells are semiconductor devices, usually made of silicon, which contain no liquids, corrosive chemicals or moving parts. They produce electricity as long as light shines on them, require little maintenance, do not pollute and operate silently.

Stocking Rate: The amount of land area allocated to each animal unit for the entire grazing period in one year.

Sustainability and Sustainable Living: The ability to achieve continuing economic prosperity while protecting the natural systems of the planet and providing a high quality of life for its people.

Synanthropization: refers to the adaptation of animal populations to human-created conditions.

Synurbization: denotes an adjustment within animal populations to specific conditions of the urban environment, in connection with regular existence (often breeding) in the wild state.

Terrestrial: Animals that live predominantly or entirely on land.

Tidal freshwater marsh: freshwater marshes close enough to coasts to experience significant tides but far enough upriver or in the estuary to be beyond the reach of oceanic salt water. This set of circumstances usually occurs where fresh river water runs to the coast and where the morphology of the coast amplifies the tide as it moves inland.

Tidal Power: Achieved by capturing the energy contained in moving water mass due to tides. Two types of tidal energy can be extracted: kinetic energy of currents between ebbing and surging tides and potential energy from the difference in height between high and low tides.

Traditional Energy: The sources and methods we currently use to generate stable, inexpensive, and readily available supplies of energy.

Unintentional introduction: An unintended introduction made as a result of a species utilizing humans or human delivery systems as vectors for dispersal outside its natural range.

Urban Forests: ecosystems composed of trees and other vegetation that provide cities and municipalities with environmental, economic and social benefits. They include street and yard trees, vegetation within parks and along public right of ways, water systems, fish and wildlife.

Urbanization: refers to changes in landscape (environment) caused by urban development

Whole-farm Planning: A holistic approach to farm management used to identify and prioritize environmental issues on a farm without compromising the farm business.

Wildlife Openings: Openings maintained to meet food or cover needs for wildlife. They may contain native vegetation or planted crops and can be maintained by burning, disking, mowing, planting, or fertilizing.

Wind Power: The conversion of wind energy into more useful forms, usually electricity using wind turbines (machines for converting the kinetic energy in wind into mechanical energy).

19 LOCAL FORESTRY RESOURCES

Society of American Foresters

+ FORESTERS WITH S. C. FORESTRY COMMISSION TO CONTACT FOR WOODLAND EXAMINATIONS, TIMBER STAND IMPROVEMENT, TREE PLANTING, TIMBER MARKING, URBAN FORESTRY ASSISTANCE, ETC

County	Forester	Phone	Business Address
Abbeville	Michael McGill	(864)374-7111	1803 Dixie Drive, Hodges, SC 29653
Aiken	Anneta Pritchard	(803)300-3010	1555 Richland Avenue, Suite 200, Aiken, SC
29801			
Allendale	Anneta Pritchard	(803)259-3373	7695 Highway 64, Barnwell, SC 29812
Anderson	Trey Cox	(864)225-9701	P.O. Box 1041, Anderson, SC 29621
Bamberg	Anneta Pritchard	(803)259-3373	7695 Highway 64, Barnwell, SC 29812
Barnwell	Anneta Pritchard	(803)259-3373	7695 Highway 64, Barnwell, SC 29812
Beaufort	Nathan Rutherford	(843)538-3708	413 Sidneys Road, Walterboro, SC 29488
Berkeley	Drake Carroll	(843)899-2221	1668 Main Street, Bonneau, SC 29431
Calhoun	Stephen Crown	(803)534-3543	353 Fire Tower Road, Orangeburg, SC 29118
Charleston (Upper)	Molly Sanford	(843)571-0136	1820 Savannah Highway, Suite A2, Charleston, SC
29407			
Charleston (Lower)	Molly Sanford	(843)571-0136	1820 Savannah Highway, Suite A2, Charleston, SC
29407			
Cherokee	Roy Boyd	(803)325-1926	2790 Fire Tower Road, Rock Hill, SC 29730
Chester	Roy Boyd	(803)325-1926	2790 Fire Tower Road, Rock Hill, SC 29730
Chesterfield	James Brunson	(843)498-6918	16222 Highway 1, Patrick, SC 29584
Clarendon	Ryan Bean	(803)494-8488	5500 Wedgefield Highway, Wedgefield, SC 29168
Colleton	Nathan Rutherford	(843)538-3708	413 Sidneys Road, Walterboro, SC 29488
Darlington	James Brunson	(843)498-6918	16222 Highway 1, Patrick, SC 29584
Dillon	Eric West	(843)423-3722	136 Airport Court, Mullins, SC 29574
Dorchester	Drake Carroll	(843)899-2221	1668 Main Street, Bonneau, SC 29431
Edgefield	Stephen Patterson	(864)445-7031	122 Firetower Road, Saluda, SC 29138
Fairfield	Chase Folk	(803)276-0205	39 General Henderson Road, Newberry, SC 29108
Florence	Chet Foyle	(843)382-8761	596 I.M. Graham Road, Kingstree, SC 29556
Georgetown	Chet Foyle	(843)382-8761	596 I.M. Graham Road, Kingstree, SC 29556
Greenville	Trey Cox	(864)225-9701	P.O. Box 1041, Anderson, SC 29621
Greenwood	Michael McGill	(864)374-7111	1803 Dixie Drive, Hodges, SC 29653
Hampton	Nathan Rutherford	(843)538-3708	413 Sidneys Road, Walterboro, SC 29488
Horry	Eric West	(843)382-8761	596 I.M. Graham Road, Kingstree, SC 29556
Jasper	Nathan Rutherford	(843)538-3708	413 Sidneys Road, Walterboro, SC 29488
Kershaw	Justin Smith	(843)498-6918	16222 Highway 1, Patrick, SC 29584
Lancaster	Justin Smith	(843)498-6918	16222 Highway 1, Patrick, SC 29584
Laurens	Michael McGill	(864)374-7111	1803 Dixie Drive, Hodges, SC 29653
Lee	Ryan Bean	(803)494-8488	5500 Wedgefield Highway, Wedgefield, SC 29168
Lexington	Jeff Riggins	(803)276-0205	39 General Henderson Road, Newberry, SC 29108
McCormick	Stephen Patterson	(864)445-7031	122 Firetower Road, Saluda, SC 29138
Marion	Eric West	(843)423-3722	136 Airport Court, Mullins, SC 29574
Marlboro	James Brunson	(843)498-6918	16222 Highway 1, Patrick, SC 29584
Newberry	Chase Folk	(803)276-3823	39 General Henderson Road, Newberry, SC 29108
Oconee	Trey Cox	(864)225-9701	P.O. Box 1041, Anderson, SC 29621
Orangeburg	Stephen Crown	(803)534-3543	353 Fire Tower Road, Orangeburg, SC 29118
Pickens	Trey Cox	(864)225-9701	P.O. Box 1041, Anderson, SC 29621
Richland	Jeff Riggins	(803)276-0205	39 General Henderson Road, Newberry, SC 29108
Saluda	Stephen Patterson	(864)445-7031	122 Firetower Road, Saluda, SC 29138
Spartanburg	Jon Barker	(864)583-3438	725 Highway 56 South, Spartanburg, SC 29302
Sumter	Ryan Bean	(803)494-8488	5500 Wedgefield Highway, Wedgefield, SC 29168
Union	Chase Folk	(803)276-0205	39 General Henderson Road, Newberry, SC 29108
Williamsburg	Chet Foyle	(843)382-8761	596 I.M. Graham Road, Kingstree, SC 29556
York	Roy Boyd	(803)325-1926	2790 Fire Tower Road, Rock Hill, SC 29730
Urban Foresters			
Coastal	Frances Waite	(843)571-0136	1820 Savannah Highway, Suite A2, Charleston, SC
29407			
Pee Dee		(843)365-8140	1949 Industrial Park Rd, Room 140, Conway, SC
29526			
Piedmont		(864)374-7111	1803 Dixie Drive, Hodges, SC 29653
Stewardship Foresters			
Coastal	Vaughn Spearman	(843)538-3708	413 Sidneys Road, Walterboro, SC 29488
Pee Dee	Lynn Leclair	(843)662-5571	113 Forestry Commission Drive, Florence, SC
29501			
Piedmont	Jaime Jones	(803)276-0205	39 General Henderson Road, Newberry, SC 29108
BMP Foresters			
Coastal	Alan Bowen	(843)538-3708	413 Sidneys Road, Walterboro, SC 29488
Pee Dee	Tonya Smith	(843)382-8761	596 I.M. Graham Road, Kingstree, SC 29556
Piedmont		(864)374-7111	1803 Dixie Drive, Hodges, SC 29488
Midlands	Holly Welch	(803)667-0867	39 General Henderson Road, Newberry, SC 29108
Regional Foresters			
Coastal	Calvin Bailey	(843)538-3708	413 Sidneys Road, Walterboro, SC 29488
Pee Dee	Mike Ney	(843)662-5571	113 Forestry Commission Drive, Florence, SC

29501 Piedmont	Tom Patton	(803)276-0205	39 General Henderson Road, Newberry, SC 29108
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Forest Directors

Manchester	Harvey Belser	(803)494-8196	6740 Headquarters Road, Wedgefield, SC 29168
Sand Hills	Brian Davis	(843)498-6478	16218, Highway 1, Patrick, SC 29584
Harbison	Trip Miller	(803)896-8893	5500 Broad River Road, Columbia, 29212

Forest Inventory Analysis Crews

Coastal	Phil Dunham	(843)908-2283	413 Sidneys Road, Walterboro, SC 29488
	Gretchen Spaulding	(843)908-2283	413 Sidneys Road, Walterboro, SC 29488
Pee Dee 29501	Dustin Gibbons	(843)430-5399	113 Forestry Commission Drive, Florence, SC
	Clay Chaplin	(843)430-5399	113 Forestry Commission Drive, Florence, SC
29501			
Piedmont (Newberry)	Westley Bouknight	(803)940-0655	39 General Henderson Road, Newberry, SC 29108
	Dena Jacob	(803)940-0655	39 General Henderson Road, Newberry, SC 29108

Southern Pine Beetle Foresters

Coastal East 29407	Molly Sanford	(843)571-0136	1820 Savannah Highway, Suite A2, Charleston, SC
Coastal West		(803)943-3915	P.O. Box 486, Hampton, SC 29924
Pee Dee East	Eric West	(843)423-3722	136 Airport Court, Mullins, SC 29574
Pee Dee West	Justin Smith	(843)498-6918	16222 Highway 1, Patrick, SC 29584
Piedmont East	Jeff Riffin	(803)276-0205	39 General Henderson Road, Newberry, SC 29108
Piedmont West	Stephen Patterson	(864)374-7111	122 Fire Tower Road, Saluda, SC 29138

SOUTH CAROLINA FORESTRY COMMISSION FORESTRY UNIT SUPERVISORS

<u>Coastal Region</u>	<u>Unit Supervisors</u>	<u>Phone</u>	<u>Business Address</u>
Santee East	Walt Woodrum	(803)534-3543	353 Fire Tower Road, Orangeburg, SC 29118
Edisto West	Pete Stuckey	(803)943-3915	P.O. Box 486, Hampton, SC 29924
<u>Pee Dee Region</u>			
Black River East	Ron Holt	(843)382-8761	596 I.M. Graham Road, Kingstree, SC 29556
Lynches River West 29168	Kenny Robertson	(803)494-8488	5500 Wedgefield Highway, Wedgefield, SC
<u>Piedmont Region</u>			
Piedmont East 29108	Brad Bramlett	(803)276-0205	39 General Henderson Road, Newberry, SC
Piedmont West	Michael Weeks	(864)878-6134	P.O. Box 391, Pickens, SC 29671



Society of American Foresters

Map of SAF Chapters in South Carolina

Contact the SAF chapter chair in your area for:

- 1 Help in preparing students for Envirothon
- 2 Assistance in finding forestry tools
- 3 Financial help (a chapter may help sponsor your school's group)

Notes: