

SC Envirothon 2025 Coaches Manual

Current Environmental Topic

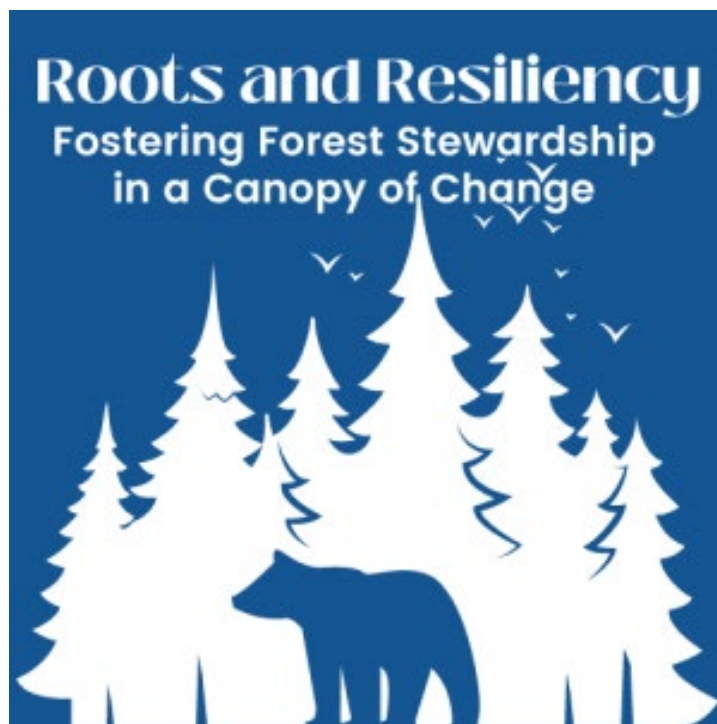


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2025 South Carolina Envirothon Steering Committee Members

Dr. Josh Castleberry, Chair

*Central Carolina Technical College, Sumter
Soil and Water Conservation District (SWCD)*

Joy Sullivan, Vice Chair

*South Carolina Association of Conservation
Districts (SCACD)*

Barbara Padget, Treasurer/Secretary

Lexington SWCD, SCACD

Kellee Melton, Past Chair

*USDA – Natural Resources Conservation
Service (NRCS)*

Brooke Myres, Current Coordinator

*SC Department of Natural Resources
(SCDNR) – Conservation Districts
myresb@dnr.sc.gov*

Marc Cribb, Past Coordinator

SCACD

Hugh Caldwell, Member

*Richland SWCD, Soil and Water
Conservation Society*

Jennifer Majors, Member

Lynches River County Park

SC Envirothon Station Managers

James "Trip" Miller, Forestry

*SC Forestry Commission
JMiller@scfc.gov*

Kristine Ryan, Soils

*USDA – NRCS
Kristine.Ryan@usda.gov*

Dr. Jeff Steinmetz, Aquatics

*Francis Marion University
JSteinmetz@fmarion.edu*

Zadok Moss, Wildlife

*SCDNR-Wildlife and Freshwater Fisheries
MossZ@dnr.sc.gov*

Dr. Joshua Castleberry, Current Topic

*Central Carolina Technical College
CastleberryJS@cctech.edu*

Chanda Cooper, Orals

*SC Department of Environmental Services
Chanda.Cooper@des.sc.gov*

1 INTRODUCTION AND GOALS

Welcome to the 2025 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 most states, Canadian provinces, 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 25, 2025**, 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 20-26, 2025**, hosted by Mount Royal University in Calgary, Alberta, Canada.

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 ***Roots and Resiliency: Fostering Forest Stewardship in a Canopy of Change***. 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 – “2025 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 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:

Harry Hampton Memorial Wildlife Fund
SC Soil and Water Conservation Districts
SC Association of Conservation Districts
SC Conservation Districts Foundation
SC Forestry Commission
SC Department of Environmental Services

USDA - NRCS
Clemson Sandhill REC
SC Soil & Water Conservation Society
Central Carolina Technical College
Francis Marion University

2024 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
NCF-Envirothon
US Forest Service
SC Palmetto Pride
Central Carolina Technical College
Francis Marion University
Richland Soil and Water Conservation District
South Carolina Forestry Commission
USDA-NRCS
Abbeville Soil and Water Conservation District (SWCD)
Aiken SWCD
Chester SWCD
Colleton SWCD
Darlington SWCD
Environmental Education Association of South Carolina
Fairfield SWCD
Horry SWCD
Lancaster SWCD
Laurens SWCD
Lexington SWCD
South Carolina Energy Office
South Carolina Association of Conservation Districts
South Carolina FFA
South Carolina Sustainable Forestry Initiative State Implementation Committee
Spartanburg SWCD
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.html>. 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

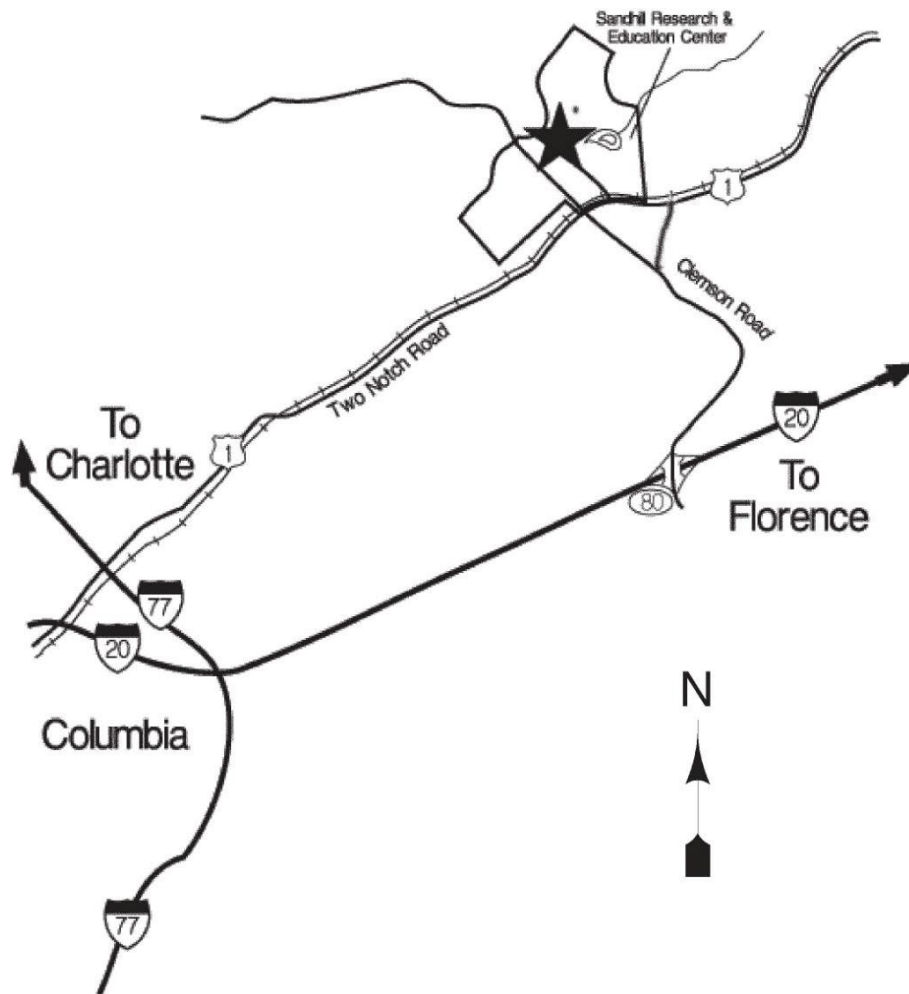
The 28th annual statewide SC Envirothon Competition will be held around the Lake House at the Clemson Sandhill Research and Education Center on **Friday, April 25, 2025**.

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). Gate codes will be sent to registered attendees ahead of the competition.

6 COMPETITION RULES AND OVERVIEW

While it is the intent of the SC Envirothon Steering Committee to provide a consistent experience for all teams, the SC Envirothon Competition is an outdoor, rain-or-shine event and is subject to all manner of inconsistencies, including sudden rain, background noise, visual distractions, wildlife sightings on the competition field, and technological failures involving the laptop, TV, or clicker at the oral presentation station. In the event of a technological failure at the oral presentation station, students should be prepared to present to the judges using a printed copy of their slideshow for reference.

1. Students in grades 9-12 or their equivalent as of January 1, 2025 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 program 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 form one program and 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. **If an accommodation is needed by a team member, such as a medical condition or a need based on an Individual Education Plan (IEP), 504 Accommodation Plan, or any other law-abiding accommodation allowed by the school, the SC Envirothon Steering Committee will consider the accommodation. Accommodation requests must be received no later than the competition registration deadline so that committee has adequate time for consideration. If an unexpected accommodation arises, notify the committee as soon as possible for consideration.**
10. ALL team members must remain with team guides and **only** leave testing station when escorted by assigned guide. Snack stations are not provided during testing, only water and sports drink.

11. The station manager in charge of the testing station has final authority with respect to the test questions and answers.
12. 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.
13. 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.
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 **March 31, 2025**. 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: <https://www.dnr.sc.gov/education/Envirothon/competition.html>
- _____ **\$175.00 Registration Fee** is paid for each registered team by registration deadline of **March 31, 2025**. 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 20, 2025**.

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. Coach will receive supplies for both themselves and all team members (t-shirts, nametags, promotional items etc....).
4. Coach must check-in oral presentation notecards by securing them into the plastic bag provided in supply 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 students!*
5. After registering and turning in presentation notecards, move to the Awards Stage to have team photos taken. Teams will be assigned a team number at registration and a poster with that number will be in supply 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, teams are welcome to help themselves 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 phone number 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 the Marc Cribb Exceptional Leader Award recipient. All participants will receive an SC Envirothon t-shirt, water bottle, and promotional items.

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

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

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

Station Winners – team certificate

CLAIMING PRIZE MONEY

After the competition ends and winners are announced, paperwork will be provided to the top three teams explaining how to claim prize money. The paperwork must be completed and returned to SC Envirothon Coordinator in order for prize money to be distributed. SC Envirothon must keep a record of winners. A check will be mailed to the winners approximately (4) weeks following the completion of paperwork.

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. Be familiar with 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. Be familiar with the Major Land Resource Areas in South Carolina. (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 basics of the Land Capability Classification System. (ref. 3, 4, 6)
11. 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)
12. Explain how composting improves soil health and provide evidence for how composting supports water conservation efforts. (ref. 11)
13. Understand the important role soils play in home sewage treatment systems. (ref. 12)

Resources/References:

NRCS Web Soil Survey/Published Soil Surveys <https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm>

NRCS Wetlands <https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/water/wetlands/>

Soil Health <https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/soils/health/>

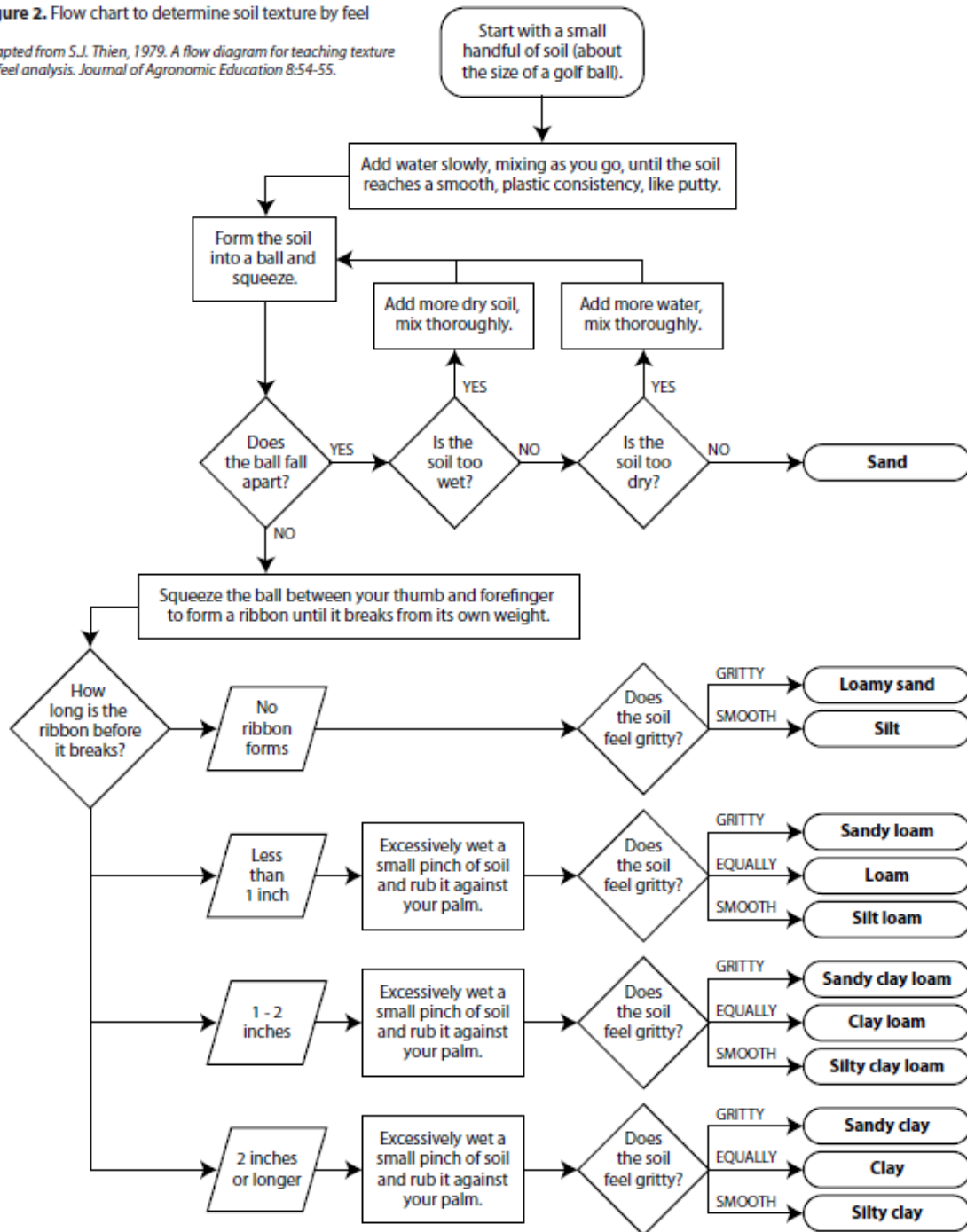
Soil PowerPoint Presentation <http://www.dnr.sc.gov/education/Envirothon/pdf/SoilsStudyMaterial2019.pdf>

Composting <https://www.nrdc.org/stories/composting-101#tips>;
<https://nrcspad.sc.egov.usda.gov/distributioncenter/pdf.aspx?productID=46>

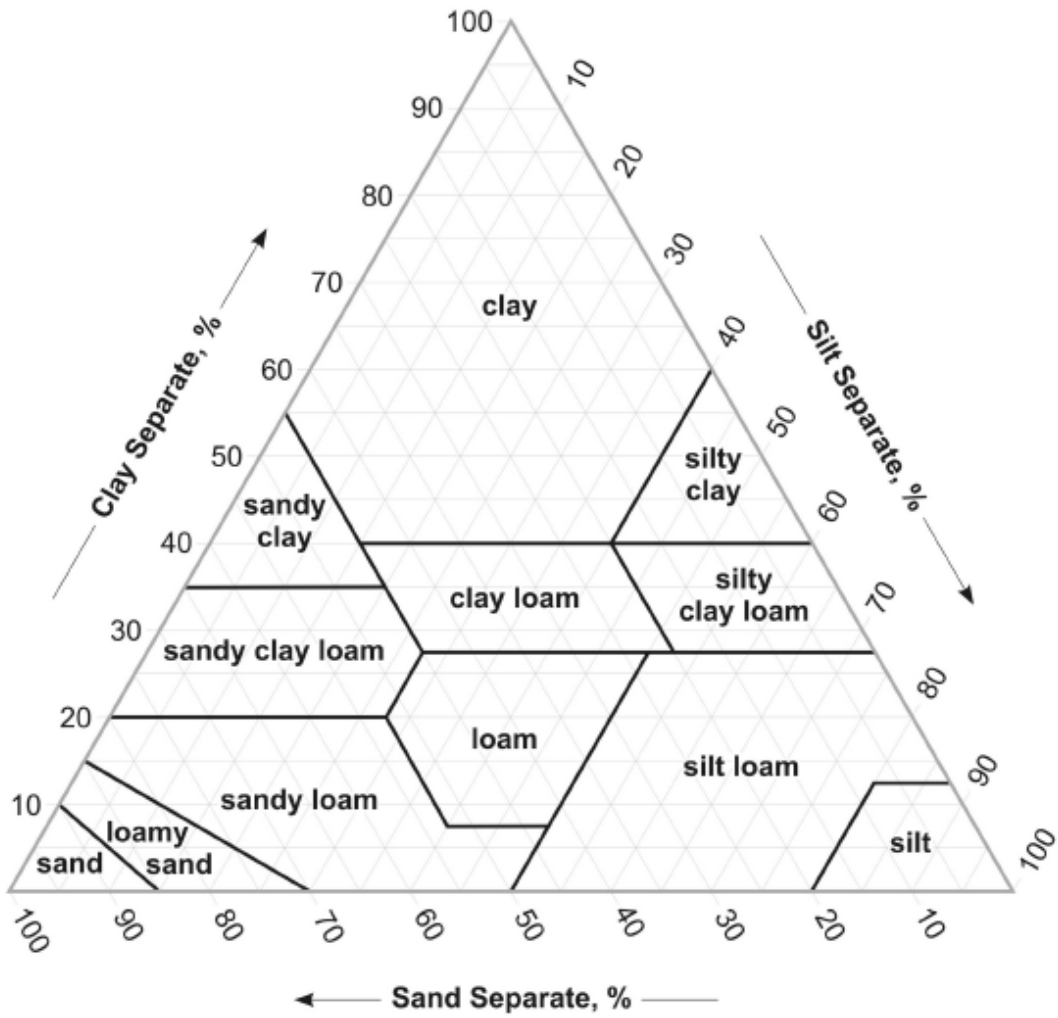
Historical Soil Surveys <https://www.nrcs.usda.gov/conservation-basics/natural-resource-concerns/soil/soil-surveys-by-state>

Figure 2. Flow chart to determine soil texture by feel

Adapted from S.J. Thien, 1979. A flow diagram for teaching texture by feel analysis. *Journal of Agronomic Education* 8:54-55.



Soil Textural Triangle



https://www.nrcs.usda.gov/Internet/FSE_MEDIA/nrcs142a2_050242.i0a

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. Be aware that the national competition guideline has 62 distinct learning objectives! I have shortened that down to 27, but if you're curious, or if your team wins and goes to the international competition, you'll want to check out the full list of all 62 learning objectives. 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/>. Below is the shortened list of objectives for the SC Envirothon Competition and some useful links for learning about those objectives.

Study Area 1: Hydrosphere

1. 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>
2. Differentiate the types of wetlands, describe their characteristics, and identify which are common in SC
<https://www.epa.gov/wetlands/classification-and-types-wetlands>

Study Area 2: Aquatic Ecosystems

3. Describe the structure of an aquatic ecosystem, including:
 - a. Carrying capacities
 - i. http://en.wikipedia.org/wiki/Carrying_capacity
 - b. Productivity
 - i. <https://www.britannica.com/science/primary-productivity>
4. Define an aquifer and elaborate on how aquifers relate to the local and global water supply. <https://www.usgs.gov/special-topics/water-science-school/science/aquifers-and-groundwater>
5. Diagram an aquatic food web and describe the flow of energy within it. <https://www.noaa.gov/education/resource-collections/marine-life/aquatic-food-webs>; <https://www.nalms.org/wp-content/uploads/2018/09/31-2-5.pdf>
6. Determine the order of a stream and describe what the order indicates. https://en.wikipedia.org/wiki/Strahler_number
7. Describe the basics of hydrology, including:
 - a. Stratification in freshwater and saltwater systems <https://www.iisd.org/ela/blog/commentary/lakes-stratify-turn-explain-science-behind-phenomena/>
 - b. Discharge and recharge for aquatic systems <https://www.usgs.gov/special-topics/water-science-school/science/how-streamflow-measured>
 - c. Runoff <https://www.usgs.gov/special-topics/water-science-school/science/runoff-surface-and-overland-water-runoff>

Study Area 3: Organisms

8. Describe the roles of producers, consumers, and decomposers in various aquatic ecosystems and identify their trophic levels. <https://flexbooks.ck12.org/cbook/cbse-biology-class-10/section/4.3/primary/lesson/producers-consumers-and-decomposers/>; <https://www.epa.gov/sites/default/files/documents/foodchainsandfoodwebs.pdf>
9. Describe the role of cyanobacteria in aquatic ecosystems and their role in harmful algal blooms. <https://www.epa.gov/cyanojobs>
10. Explain the distinctions between species designations (such as common, rare, endangered, threatened, endemic, extirpated, and extinct) and provide examples of each type https://www.galapagos.org/about_galapagos/conservation-glossary/

Study Area 4: Aquatics and Society

11. 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 <https://des.sc.gov/programs/bureau-water/aquatic-science/fish-consumption-advisories>
12. Identify how major legislation protects water resources.
 - a. Clean Water Act: <https://www.epa.gov/laws-regulations/summary-clean-water-act>
13. 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: E.g. SC DES, SC DNR, U.S. EPA, USGS, etc.
 - i. <https://des.sc.gov/programs/bureau-water>
 - ii. <http://www.dnr.sc.gov/water.html>
 - iii. <https://des.sc.gov/programs/bureau-water/aquatic-science/how-scdes-measures-surface-water-quality>
14. Explain why it is important to take the entire watershed/catchment area into account when planning for water quality. <https://www.epa.gov/hwp>
15. Identify state/provincial river basins. https://www.dnr.sc.gov/water/waterplan/pdf/Major_Basins_of_South_Carolina.pdf
16. 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>
17. Describe cultural eutrophication and how it affects lakes and ponds. <https://www.nature.com/scitable/knowledge/library/eutrophication-causes-consequences-and-controls-in-aquatic-102364466/>
18. Recommend best management practices for improving water quality and enhancing aquatic habitat, such as riparian buffers. <https://www.nrcs.usda.gov/plantmaterials/idpmstn7248.pdf>
19. 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>
 - b. <http://www.waterencyclopedia.com/Po-Re/Pollution-Sources-Point-and-Nonpoint.html>
 - c. <http://water.epa.gov/polwaste/nps/whatis.cfm>

20. 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:
 1. <https://www.nsta.org/ncss-case-study/one-glass-two-people>

Study Area 5: Field Skills

21. Identify common fish in SC <https://www.dnr.sc.gov/fish/pdf/FreshwaterFishPocketGuide.pdf>
22. Identify common aquatic macroinvertebrates and their pollution tolerances.
23. Calculate a biotic index and determine water quality for freshwater systems.
 - a. For 22-23:
 - 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> .
24. Identify common invasive aquatic species in SC. <https://des.sc.gov/sites/des/files/DNR/SCAISplan.pdf>
25. 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.
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)
26. Delineate a watershed using a topographic map. http://www.wvca.us/envirothon/pdf/Watershed_Delineation_2.pdf
27. Interpret a hydrograph <https://www.bbc.co.uk/bitesize/guides/zv4r7nb/revision/1;>
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 DESs Bureau of Water: <https://des.sc.gov/programs/bureau-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:

South Carolina Forestry Commission Foresters available for assistance (project, stewardship, and urban). They can be sources of information and advice for local teams. To find your local foresters follow this link and choose your county: <https://www.scfc.gov/about-us/contacts/>.

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

Estimating the volume of a standing tree using a scale stick

<https://content.ces.ncsu.edu/estimating-the-volume-of-a-standing-tree-using-a-scale-biltmore-stick>

<https://forestry.ces.ncsu.edu/wp-content/uploads/2019/07/scale-stick-template.pdf?fwd=no>

Using a basal area angle gauge:

<https://extension.msstate.edu/publications/using-the-msu-basal-area-angle-gauge#:~:text=This%20is%20the%20correct%20procedure%20for%20using%20the,10%20%28the%20BAF%20of%20the%20angle%20gauge%29.%20>

<https://blogs.clemson.edu/fnr/2021/08/20/homemade-devices-to-determine-basal-area/>

Managing the Family Forest in SC: <https://www.fs.usda.gov/research/treesearch/49889>

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/> .

WILDLIFE BIOLOGY

1. 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.
2. Provide examples of physical and behavioral adaptations (such as mimicry, camouflage, freeze response, hibernation, special organs, et cetera) and how these adaptations benefit wildlife.
3. Explain how the needs of a species might change throughout its life cycle, and how these changing needs are addressed in management strategies.
4. Differentiate between a territory and a home range and discuss how each is important for wildlife species.
5. Explain the difference between generalist and specialist species and provide examples of each.

WILDLIFE ECOLOGY

6. Identify the essential components of a habitat.
7. Name and describe the different types of symbiotic relationships.
8. Identify common wildlife diseases, their causes, and their effects.
9. Describe the different levels of ecosystem organization, including individuals, populations, communities, and ecosystems.
10. Define an ecological niche and describe how species fulfill these different roles in an ecosystem.
11. Describe different habitat characteristics that are important to wildlife (such as ecotones, edges, snags, downed logs, riparian areas, early successional stages, et cetera).
12. Define succession and describe how each successional stage is important for different species of wildlife.
13. Describe wildlife adaptations to unique ecosystems (such as high elevations, deserts, fire-dependent ecosystems, et cetera).
14. Identify sources of disturbance in an ecosystem and predict how different types of disturbance may impact wildlife species.
15. Explain the importance of pollinators in natural and agricultural ecosystems.

WILDLIFE, CONSERVATION, AND SOCIETY

16. Identify major legislation (local and national) and international agreements pertaining to wildlife and describe how they provide protection for natural resources.
17. Explain the distinctions between species designations (such as common, rare, endangered, threatened, endemic, extirpated, and extinct) and provide examples of each type.
18. Recognize important issues facing wildlife on a local, state/provincial, national and international scale.
19. Define keystone, umbrella, game, non-game, and indicator species.
20. Explain the differences between conservation and preservation.
21. Define invasive and exotic species, describe their characteristics, name examples, describe how they are spread, and explain their impact on local ecosystems.
22. Identify the roles of key leaders in the conservation movement, both historical and present (such as Rachel Carson, Aldo Leopold, John Muir, Teddy Roosevelt, et cetera).

FIELD SKILLS

23. Identify common local wildlife species from preserved specimens, pelts, or pictures without the use of a key.
24. Explain an animal's habitat, dietary requirements, and life cycle based on animal signs.
25. Identify wildlife based on communication methods (bird calls, etc)

14 CURRENT TOPIC: ROOTS AND RESILIENCY: FOSTERING FOREST STEWARDSHIP IN A CANOPY OF CHANGE

Station Manager: Joshua Castleberry - Central Carolina Technical College

Learning Objectives adopted from NCF-Envirothon Current Issue Study Resources: <https://envirothon.org/2025-alberta/study-resources/>

Key Topic #1: Climate Change Projections

1. Describe the causes of climate change, including the greenhouse effect.
2. Explain the impacts of climate change on the environment, as well as social and economic impacts both locally and globally.
3. Explain the concept of Canada's Representative Concentration Pathway models and what they imply for the future climate.
4. Differentiate types of climate models and the various components that enable models to project future conditions.

Key Topic #2: Forest Health in a Changing Climate

5. Explain how globalization has enabled the spread of invasive insect species and impacted the world's forests.
6. Describe how wildfire impacts the hydrology, wildlife, and soils of forest communities.
7. Describe the conditions of drought as it relates to forest ecosystems, and identify how increasing drought severity and frequency impacts global forests.
8. Explain the biology and impacts of typical forest insect pests such as Mountain pine beetle, Spruce beetle, Spruce budworm, Forest tent caterpillar, Emerald ash borer, and Asian longhorn beetle.
9. Describe biology and impacts of typical forest diseases such as Western gall rust, Armillaria root rot, needle casts and needle rusts.
10. Describe how the prevalence and spread of forest pests and diseases are expected to shift with climate change.

Key Topic #3: Inherent Rights of Indigenous Peoples to Land Stewardship

11. Identify differences between Indigenous worldviews and Western worldviews regarding land stewardship.
12. Identify and summarize the core themes within the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP).
13. Explain why some countries did not sign on to the original adoption of UNDRIP in 2007 and why some of those countries joined UNDRIP later.
14. Describe how land-based learning and Traditional Knowledge systems can contribute to improved land use, forest management, and mitigation strategies.
15. Describe how Indigenous stewardship and traditional ecological knowledge could help meet global conservation goals.

Key Topic #4: Vulnerability Assessments and Adaptation Strategies

16. Describe a forest vulnerability assessment, including its purpose and steps.
17. Assess forest conditions and apply climate change adaptation strategies to support sustainable forest management.
18. Analyze the benefits and drawbacks of various climate change adaptation strategies for forests, including assisted species migration, selective breeding, and /or afforestation.
19. Define adaptive capacity in relation to vulnerable flora and fauna of forest communities.
20. Distinguish how various ecozones face differing levels of vulnerability and explain which ecological factors drive this vulnerability.

Key Topic #5: Legislation and Regulations

21. Describe how governments determine if forest harvesting levels will be sustainable in the future with climate change.
22. Explain how natural disturbances such as wildfires, windstorms, droughts, and hail storms impact the forest industry's total annual harvest quota.
23. Describe how forest certification can be used as a global tool to manage forests sustainably.
24. Identify key takeaways of the 2015 Paris Agreement and how the commitments made influence forest sustainability.
25. Explain the main goals of the 2022 Kunming-Montreal Protocol and the positive impacts this agreement could have on forest sustainability.

Key Topic #6: The Boreal Forest

26. Describe an ecozone or ecological land classification, and identify how different types are anticipated to shift based on climate change projections.
27. Identify ecosystem services provided by boreal forest ecosystems, including environmental, economic, social, and cultural values.
28. Differentiate the types of wetlands found in the boreal forest, explain their importance, and describe the anticipated effects from a changing climate on these ecosystems.
29. Identify boreal forest-dependent species, and explain how climate change may threaten their populations.
30. Analyze the wildfire regime in the boreal forest and describe how it is changing in response to climatic shifts.

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 20, 2025.** 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.

A small group of not-for-profit organizations across the state of South Carolina have been observing a number of trends that seem to be coming to a juxtaposition. These organizations have pooled their resources to see if they can do anything about the problem/ opportunity that they are seeing in SC. The supergroup is calling themselves Palmetto Alliance of Conservation and Economic Organizations (Palmetto ACE Orgs).

California had a record number of acres burned by wildfire in 2020 with around 4.4 million acres from over 9,000 different fires. Currently this year (2025), over 60,000 acres have already burned. This can be attributed at varying degrees to a number of complex issues, though the general consensus among Palmetto ACE Orgs is that there simply hasn't been enough resources in California to overcome the backlog of necessary prescribed burning associated with a large populated state with decades of fire suppression as a land management policy.

Palmetto ACE Orgs also notes that coastal tourism in SC generates \$27.9 Billion in revenue annually. Changes in climate (especially increased storm intensity and frequency, though also sea level rise) threaten to negatively impact that dollar amount.

After pooling resources, Palmetto ACE Orgs has \$1.5 Million that they would like to award in grant funds. These funds will be awarded to multiple projects as indicated in the RFP below:

Request for Proposals (RFP)

Adapting Carbon Credit Models for Southeastern Land Practices

Introduction

Palmetto ACE Orgs invites proposals for projects aimed at adapting existing carbon credit models for forestry to better align with the unique land management practices of the southeastern United States. This includes both contemporary land-use practices and traditional land stewardship approaches of Southeastern Tribal Nations. Our goal is to create equitable, effective, and regionally appropriate carbon credit methodologies that recognize the ecological, cultural, and economic value of these practices.

Background

Current carbon credit frameworks are largely focused on large-scale forestry practices and do not fully accommodate the diverse land management systems prevalent in the Southeast, including agroforestry, prescribed burns, silvopasture, and regenerative agriculture. Additionally, Indigenous land stewardship practices—such as controlled burning, mixed-species planting, and cultural resource management—are undervalued within these models despite their demonstrated ecological benefits. By bridging this gap, we aim to create opportunities for landowners and Tribal Nations to participate meaningfully in carbon markets.

Scope of Work

We seek proposals that will:

1. Provide scalable land practices that increase ecological and economic resiliency of the Palmetto State.
2. Assess the limitations of existing carbon credit models when applied to southeastern land practices and Tribal land stewardship.
3. Develop methodologies to adapt or expand these models to include practices such as:
 - Prescribed burns and fire management.
 - Agroforestry and silvopasture systems.
 - Regenerative agricultural techniques.
 - Traditional ecological knowledge (TEK) practices of Southeastern Tribes.
4. Propose mechanisms to ensure accessibility and equitable participation for small landowners and Tribal Nations.
5. Pilot or simulate the adapted models on representative southeastern landscapes.
6. Provide recommendations for integrating these methodologies into existing carbon credit programs.

Eligibility

This RFP is open to nonprofit organizations, research institutions, Tribal Nations, universities, and private entities with expertise in carbon markets, land management, ecology, or related fields (including from organizations within Palmetto ACE Orgs). Collaborative proposals, particularly those that include Tribal leadership or partnerships with Tribal organizations, are highly encouraged.

Proposal Requirements

Proposals should include:

- A detailed project plan, including objectives, methodology, and timeline.
- A description of the team's qualifications and relevant experience.
- A budget and justification for requested funds.
- Letters of support from any partnering organizations or Tribes.

Timeline

- **RFP Issued:** 1 February 2025
- **Proposal Submission Deadline:** Finalists will be asked to present at the SC Envirothon 25 April 2025
- **Award Notification:** During the SC Envirothon 25 April 2025
- **Project Start Date:** July 1, 2025

Budget

One project will be funded at \$1,000,00 and two projects will be funded at \$250,000

Evaluation Criteria

Proposals will be evaluated based on:

- Alignment with the objectives of the RFP.
- Feasibility and innovation of the proposed methodology.
- Qualifications of the project team.
- Potential for scalability and impact.

For questions or additional information, please contact Josh Castleberry, Dean Professional Studies at Central Carolina Technical College. 803-778-6663

We look forward to receiving your proposals and working together to advance carbon credit models that recognize and reward the vital contributions of southeastern land practices and Tribal stewardship.

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 20, 2025. 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 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 microorganisms, 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).

Notes: