



# 2013 Envirothon Coaches Handbook



DNR

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## A Natural Challenge!



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Assistant State Conservationist  
USDA-Natural Resources Conservation  
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# 1. Introduction and Goals

Welcome to the 2013 South Carolina Envirothon. This handbook contains information you will need to know to participate in this event. We are sure your participation will be beneficial and prove to be a valuable learning experience.

The Envirothon is an integrated education experience. Over the course of several months of study participants prepare themselves for testing in the six stations. The current topic is ***Sustainable Rangeland Management***. This year's Envirothon is a tremendous opportunity to learn more about the issues surrounding this topic while promoting team work 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 what their chosen field or career.

The Envirothon began in Pennsylvania in 1979 in a single county. The program had such appeal that by 1988, it had expanded into three states and had taken on a national scope. Since that time, the program has grown to include 45 states and 10 Canadian provinces.

The overall goal of the 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

One goal of Envirothon is to promote 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 is able to 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.

Another goal of Envirothon is for students to develop 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. The 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".

Questions regarding the SC Envirothon may be directed to Marc Cribb, Land, Water & Conservation Division of the South Carolina Department of Natural Resources (803)734-6367 or [CribbM@dnr.sc.gov](mailto:CribbM@dnr.sc.gov).

## 2. Quick Facts Sheet for Teachers and Administrators

The Envirothon is North America's largest environmental competition for high school students.

The SC Envirothon was first formally endorsed by SC Superintendent of Education, Inez Tenenbaum in November of 1999 as a worthwhile educational experience.

A Coaches' Workshop will be held Saturday, February 2, 2013 to assist teachers in preparing their teams. Teachers will receive resource packets and attend classes in each of the six testing areas (Soils, Forestry, Aquatics, Wildlife, Oral Presentation and the Current Topic).

Attendance at the training is not mandatory. A coach may still register a team without attending the training, but it is recommended as in-depth information pertinent to each competition station is provided. A coach also does not have to register a team if he/she attends the training.

On the day of the Envirothon competition, May 3, 2013, each team will complete five written exams and perform their Oral Presentation for a panel of judges. (This is a rigorous academic test, not a field trip!)

The team scoring the highest overall will go on to represent the state at the North American Envirothon scheduled for August 4<sup>th</sup> – 9<sup>th</sup>, 2013, in Bozeman, Montana. The Montana State University will be hosting the Envirothon.

## 3. Sponsors

The South Carolina ENVIROTHON is conducted in partnership with:

SC Soil and Water Conservation Districts  
SC Department of Natural Resources  
SC Forestry Commission  
SC Department of Education  
Clemson University – Sandhills Research and Education Center  
USDA - Natural Resources Conservation Service  
Soil & Water Conservation Society - SC Chapter  
Central Carolina Technical College  
Francis Marion University  
Environmental Discovery Center

Major funding is provided by the SC Conservation Districts Foundation and the Harry Hampton Memorial Wildlife Fund. Additional funding is provided by individual Conservation Districts and by "Friends of the ENVIROTHON" (individuals, industry, and businesses). For more information, or if you desire to financially support the South Carolina ENVIROTHON, please contact your local Soil & Water Conservation District.

**All of the Conservation Districts of South Carolina (see page 43 for contact information)**

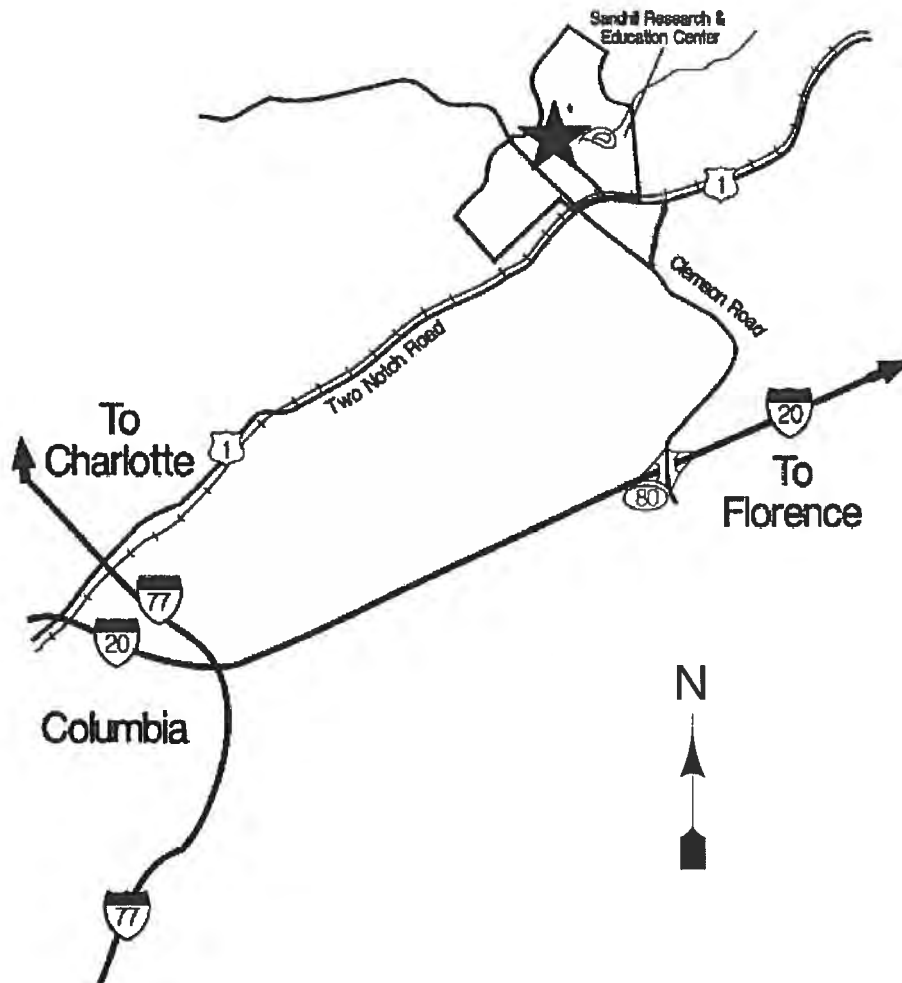
## 4. The State Competition

The 17th annual statewide Envirothon competition for South Carolina will be held at the Clemson Institute at Sandhill Research & Education Center, Columbia, on Friday, May 3, 2013.

### SC Envirothon Schedule

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

## 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 Sandhill complex (this is opposite the Village at Sandhill shopping mall). Follow posted signs for the Envirothon or Children's Garden.

*For more information contact:*

**Sandhill Research and Education Center and the Clemson Institute for  
Economic & Community Development**  
900 Clemson Rd. Columbia, South Carolina 29224-3205  
Telephone: (803) 788-5700 Fax: (803) 736-4418

## 6. Rules for Competitors

1. Students in grades 9-12 or their equivalent as of January 1, 2013 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 or advisor. Transportation to and from the competition is the responsibility of the team and their coach/sponsors.
3. A school may send up to two teams to the state competition. Each team will consist of members from the same school, organization and/or association. Two schools may join together to send a joint team, but then forfeit their rights to send individual teams (a school 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 as such 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.
5. Thirty (30) minutes will be allotted for each of the five testing stations during the competition as well as the oral presentation station.
6. There will be written questions at each of the five testing stations. Question format may be true/false, multiple choice, matching, fill in the blank, or practical exercises.
7. Test questions will be taken from the information in the suggested references provided to coaches by the Envirothon Committee.
8. During the competition, team members will work together to answer the test questions, completing one test and submitting it to the resource professional 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. The resource professional in charge of the testing station has final authority with respect to the test questions and answers.
10. 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. Further rules are documented and available to determine winners in the event a tie still exists.
11. 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.
12. The state winner is eligible to compete at the North American Envirothon. If the state winner cannot participate, the second place team may represent South Carolina in the North American competition.
13. In the event a procedural dispute or question arises that is not covered in this manual or its addenda, the issue will be decided by a committee made up of the resource persons assigned to the testing stations and the Envirothon Coordinator.
14. Team members (or others with the teams) with allergies or medications must bring their own supplies.
15. Cameras and video recorders, laptops, and tape recorders are prohibited in the vicinity of the testing stations. Allowances will be made in advance for the press.
16. The competition will be held outside regardless of the weather. Team members should wear appropriate clothing (sneakers, jeans/shorts, tee shirts). If it is warm and sunny, please consider sun screen. **(Do not wear any item of clothing that may identify your team by city, county or school.)**

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



## 7. Coach Pre-Competition Checklist

The Coach is the backbone of the Envirothon team. This person serves to organize the team, motivate the members, and present materials pertinent to the Envirothon. 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.

Maintain close contact with the local Conservation District Office (a directory is included in this handbook). Ensure the following check-list is completed:

- \_\_\_\_\_ \$100.00 Registration Fee paid and participation confirmed with local Soil & Water Conservation District by the registration deadline of **April 12<sup>th</sup>, 2013**. **All registration fees are non-refundable.**
- \_\_\_\_\_ Transportation has been arranged to the state competition.
- \_\_\_\_\_ Coach has sent in the Team Registration Form listing who the team members will be by the **April 12<sup>th</sup>, 2013** deadline. Make sure all the team members have sent in both the medical and photo release forms. Failure to do so may be grounds for disqualification.
- \_\_\_\_\_ Team members are familiar with rules of the competition.
- \_\_\_\_\_ Team members are 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.

## 8. Day of the Event Reminders

1. **BE ON TIME!** Allow ample travel time. Arrive 30 minutes prior to your assigned registration time.
2. Report to the registration tent to receive instructions and supplies. (Coach only)
3. You will receive supplies for both you, and all of your team members (t-shirts, nametags, promotional items etc...).
4. You must place your oral presentation materials, including student note cards, into the plastic bag provided in your supplies, and have someone at registration check it in. The materials will be given back to the members of the team just prior to their presentation time. In an effort to be fair, students should not be practicing their presentations with note cards or any other 'cheat-sheets' during the competition. Please emphasize this with your students!
5. You will then be asked to appear at the Awards Stage to have your team photos taken. You will be assigned a team number at registration and a poster with that number will also be in your bag. Take the photo with students holding the team number below their waist so the number can be cropped out at a later time.
6. From the stage area, you are welcomed to help yourselves to refreshments provided by the SC Envirothon Steering Committee. Please encourage your students to take a drink, a bottle of water, and a snack since lunch will not be until later in the afternoon and no other snack stations will be provided. Also, students will need their bottle of water 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, so please help us in our efforts to be 'green'!
7. Everyone **MUST** wear their name tags (provided at Registration). Persons not wearing name tags at the testing stations will cause their teams to be disqualified. Advisors must wear their name tags if they remain on the Institute's grounds. You are allowed to explore the opposite side of the Institute where the lake house is, but staff must be able to identify you.
8. **COACHES MAY NOT CONSULT WITH OR ACCOMPANY THEIR TEAM ONCE THE COMPETITION HAS BEGUN!** Failure to follow this rule may result in disqualification.
9. Coaches are allowed to leave the Institute grounds, but you must leave a number that you can be reached at in case of emergency. If you do not have a cell phone, you are asked to remain on site.
10. No pets of any type 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 given in the form of a scholarship to the college or university of the recipient's choice. All participants will receive an Envirothon T-Shirt and promotional items.

- 1st Place - \$500 per student, \$500 coach**
- 2nd Place - \$250 per student, \$250 coach**
- 3rd Place - \$125 per student, \$125 coach**

### **CLAIMING YOUR SCHOLARSHIPS AND AWARDS**

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

#### ***SAMPLE LETTER***

*May \_\_, 20\_\_*

**Congratulations! As a member of the First Place Team at the 20\_\_ SC Envirothon, you have won a \$500 College Scholarship!**

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

**Marc Cribb PO Box 167 Columbia, SC 29201**

**Along with your letter, you must include:**

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

Checks will be made payable directly to the school and mailed to the Treasurer's Office. Scholarship requests take 4-6 weeks to process.

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

If you have any questions regarding your scholarship, feel free to contact Marc Cribb, at (803) 734-6367 or email him at [CribbM@dnr.sc.gov](mailto:CribbM@dnr.sc.gov)

## 10. Soils

Station Managers: Jackie Reed & Myra Jones — USDA-NRCS

### Learning Objectives:

1. Explain the diagnostic significance of soil color. Be able to describe how soil color is measured and what processes produce different colors.
2. Be familiar 12 soil orders of soil taxonomy.
3. 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 tendency to erode. Explain how this further influences the hydrologic and nutrient cycles in an ecosystem.
4. Derive information from a soil survey and explain the interaction between soil type and plant communities as well as suitability for various land use practices.
5. Explain the features of a soil profile, the five factors of soil formation and the origin of soil parent materials.
6. Describe the characteristics of wetland soils and explain where wetlands are found and why.
7. Describe various soil constituents (sand, silt, clay, organic matter) and their properties. Relate these properties to soil fertility nitrogen (N), phosphorus (P), potassium (K), calcium (Ca), soil pH and nutrient cycles.
8. Be able to give an overview of soils of the world including environmental factors of soil formation, natural vegetation types and soil fertility, and world geology.
9. Be able to describe South Carolina Landform Regions and what they indicate about SC geology, climate and land uses.
10. Be able to identify soil limitations found in rangeland that makes it unsuitable for cropping.

## **Flow Diagram for Estimating Soil Texture by Feel**

Start: Take approximately 25 grams of soil and wet by adding water in small amounts. Knead to break down all aggregates until soil is plastic and moldable, like moist putty.

Step 1: Try to form a ribbon of uniform thickness and width by gently pushing the soil between thumb and forefinger. Allow the ribbon to emerge and extend over the finger, breaking from its own weight.

A: Soil does not ribbon - coarse texture

B: Soil does ribbon -What is the length of the ribbon?

B1: If the ribbon is over 2 inches long: fine texture

B2: If the ribbon is 1 to 2 inches long: moderately fine texture B3: If the ribbon is less than 1 inch long:

Go to Step 2

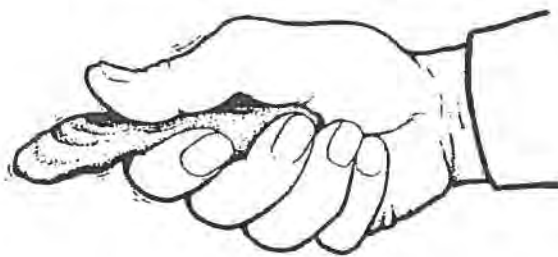


Step 2: Excessively wet a small pinch of the soil in your palm and rub with forefinger.

C: Is the soil gritty?

C1: The soil is not gritty - medium texture

C2: The soil is gritty - moderately coarse texture



Courtesy Oklahoma Extension Service

## Definitions of Land Characteristics or Factors

### SURFACE TEXTURE

Texture of the surface soil is the proportion of sand, silt, and clays that make-up the topsoil. Surface texture will be judged from a sample in a box designated as topsoil.

NOTE: It is necessary to moisten soil to distinguish between different textures. -

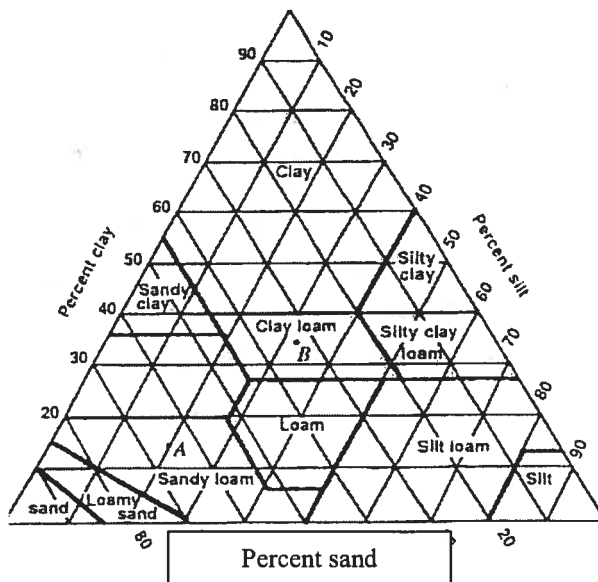
**Coarse texture:** Soils are loose, very friable, and the individual grains can be readily seen or felt. It forms no ribbon. Feels extremely gritty when rubbed between fingers. Squeezed when dry, it will fall apart as pressure is released. When moist, a mold may be formed that is unstable and crumbles as the soil is handled. Soil textures classified as coarse include loamy sands and sands.

**Moderately coarse texture:** Soils feel gritty but contain silt and clay to make moist soil hold together. The individual sand grains can readily be seen and felt. Squeezed when dry, it will form a mold that breaks readily upon handling. If squeezed when moist, a mold can be formed that can be carefully handled without breaking. It forms no ribbon or very poor ribbon. The ribbon is less than 1 inch long and soil is gritty. Soil textures classified as moderately coarse-textured include sandy loam and fine sandy loam.

**Medium texture:** Soils have a slightly smooth or floury feel when moist. Squeezed when dry, it forms a mold that will bear careful handling. The mold formed by squeezing when moist can be handled freely without breaking. When the moistened soil is squeezed out between thumb and forefinger, it will form a poor ribbon. Soil textures classified as medium texture include very fine sandy loam, loam, silt loam, and silt.

**Moderately fine texture:** Soils usually break into clods or lumps when dry. Moist soil squeezed out between thumb and forefinger will form a 1- to 2-inch ribbon. The sandy clay loam texture has a slightly gritty feel when moist. Soil textures classified as moderately fine texture include clay loam, sandy clay loam, and silty clay loam.

**Fine texture:** Clay soils. Feels very sticky or plastic when wet. Will ribbon or leaf out when rubbed between thumb and forefinger (2-inch +) that will support itself. Sandy clay texture may have a slightly gritty feel when moist. Soil textures classified as fine texture include sandy clay, silty clay, and clay.



**Soils Web Links:**

<http://soils.cals.uidaho.edu/soilorders/>

<http://www.pollutionissues.com/Na-Ph/Nonpoint-Source-Pollution.html>

<http://www.epa.gov/owow/NPS/lid/>

<http://www.oneplan.org/Range/RangeSoil.asp>

<http://www.envirothon.org/curriculum-guidelines.html>

# 11. Aquatics

**Station Manager: Jeff Steinmetz - Francis Marion University**

## Learning Objectives:

Adapted by Jeff Steinmetz from the North American Envirothon Guidelines

Most of these objectives come directly from the main Envirothon webpage; however, I've added a few tweaks / additional references. Below are the objectives and a list of additional resources. The official Envirothon curriculum guide for the different sections can be found here: <http://www.envirothon.org/curriculum-guidelines.html>. There are some excellent resource links available on this guide, so I tried not to repeat those below. The links below are primarily *additional* resources you may find helpful.

### Key Point 1: Abiotic Factors

1. Learning Objective 1: Understand the water cycle
  - a. Know how it relates to erosion, salinization and climate change
    - i. <http://www.nytimes.com/gwire/2009/05/14/14greenwire-climate-change-water-shortages-conspire-to-cre-12208.html?pagewanted=all>
    - ii. <http://ga.water.usgs.gov/edu/watercycle.html>
2. Learning Objective 2: Know what a watershed is
  - a. Know how to delineate a watershed and identify stream order
    - i. <http://water.epa.gov/type/watersheds/whatis.cfm>
    - ii. <http://www.nh.nrcs.usda.gov/technical/Publications/Topowatershed.pdf>
    - iii. <http://www.cotf.edu/etc/modules/waterq/wqphymethods.html>
3. Learning Objective 3: Understanding water chemistry
  - a. Know how to interpret water chemistry tests
    - i. Temperature, pH, dissolved oxygen, biological oxygen demand (BOD), conductivity, turbidity, nitrate, nitrite, ammonia, phosphate, total phosphorous, mercury, PCBs
      1. [http://water.epa.gov/scitech/swguidance/standards/wqslibrary/sc\\_index.cfm](http://water.epa.gov/scitech/swguidance/standards/wqslibrary/sc_index.cfm) (click on the water classification & standards regulation to open a .pdf file)
  - b. Know how biological organisms and water chemistry are affected by these parameters

### Key Point 2: Biotic Factors

1. Learning Objective 1: Understand food webs
  - a. Know how to construct a food web
  - b. Know how matter and energy flow through a food web
    - i. <http://www.marietta.edu/~biol/biomes/ecosystems.htm#Energyflowthroughtheecosystem3>
2. Learning Objective 2: Carrying capacity
  - a. Know what carrying capacity is and how it relates to animal populations
  - b. Know how competing water usages could affect the carrying capacity of stream organisms, riparian forests and human needs
    - i. [http://en.wikipedia.org/wiki/Carrying\\_capacity](http://en.wikipedia.org/wiki/Carrying_capacity)
3. Learning Objective 3: Taxonomy
  - a. Know how to identify common native and invasive stream organisms (especially macroinvertebrates and fish) using a dichotomous key
    - i. <http://people.virginia.edu/~sos-iwla/Stream-Study/Key/MacroKeyIntro.HTML>
    - ii. [www.dnr.state.md.us/streams/pdfs/dnr\\_bugsheet.pdf](http://www.dnr.state.md.us/streams/pdfs/dnr_bugsheet.pdf)
    - iii. <http://www.dnr.sc.gov/freshwater.html>



4. Learning Objective 4: Biotic Water Quality
  - a. Know how organisms can be used to test water quality, e.g., using an Index of Biotic Integrity (IBI) or similar test
  - b. Know why these may be preferable over water chemistry tests
    - i. <http://water.epa.gov/scitech/swguidance/standards/criteria/aqlife/biocriteria/index.cfm>
    - ii. [www.dnr.state.md.us/streams/pdfs/dnr\\_bugsheet.pdf](http://www.dnr.state.md.us/streams/pdfs/dnr_bugsheet.pdf)
    - iii. <http://water.epa.gov/scitech/monitoring/rsl/bioassessment/ch08b.cfm>

### Key Point 3: Aquatic Environments

1. Learning Objective 1: Habitats
  - a. Be able to identify various aquatic environments (wetland, lake, stream, estuary) based on physical, chemical and/or biological characteristics
2. Learning Objective 2: Aquifers
  - a. Know the characteristics of different types of aquifers
  - b. Know the current threats to groundwater supplies
    - i. <http://ga.water.usgs.gov/edu/earthgwaquifer.html>
    - ii. <http://water.usgs.gov/ogw/aquiferbasics/>
3. Learning Objective 3: Wetland function
  - a. Know the ecological function and society benefit of wetlands
    - i. <http://www.epa.gov/owow/wetlands/facts/fact4.html>
4. Learning Objective 4: Riparian Zones
  - a. Know what riparian areas are and their function and use
    - i. <http://www.tva.gov/river/landandshore/stabilization/benefits.htm>

### Key Point 4 – Water Protection and Conservation

1. Learning Objective 1: Preventing invasive species
  - a. Know how enforcement agencies and educational programs can help prevent the spread of aquatic invasive species
    - i. <http://www.dnr.sc.gov/water/envaff/aquatic/index.html>
2. Learning Objective 3: Government law and policy
  - a. Know the federal and state laws that protect aquatic habitats
    - i. E.g. Safe Drinking Water Act, Clean Water Act, etc.
      1. <http://www.epa.gov/lawsregs/laws/cwa.html>
      2. <http://www.epa.gov/lawsregs/laws/sdwa.html>
3. Learning Objective 2: Government agencies and GIS
  - a. Know the federal and state agencies involved in water protection and regulation
    - i. E.g. SC DHEC, SC DNR, U.S. EPA, USGS, etc.
      1. <http://www.scdhec.gov/environment/water/>
      2. <http://www.dnr.sc.gov/water.html>
      3. <http://www.scdhec.gov/environment/water/laws.htm>
  - b. Understand that Geographic Information Systems (GIS) is a useful and important tool in water management
    - i. [http://www.esri.com/Industries/water\\_resources](http://www.esri.com/Industries/water_resources)
4. Learning Objective 4: Pollution
  - a. Know what point and non-point sources of pollution are and be able to give examples of each
  - b. Know some common sources of both point and nonpoint pollution
  - c. Know how both types of pollution can be reduced
  - d. Know what fish consumption advisories are and what the common advisories are in SC
    - i. <http://www.denvergov.org/WaterQualityProgram/WaterQualityImportance/PointvsNonpointSourcePollution/tabid/424850/Default.aspx>
    - ii. <http://water.epa.gov/polwaste/nps/whatis.cfm>
    - iii. <http://www.scdhec.gov/environment/water/fish/index.htm>

5. Learning Objective 5: Water use
  - a. Know the major uses of water in the United States
    - i. <http://water.usgs.gov/watuse/>
  - b. Know how overuse of water can impact both wildlife and human communities
    - i. Understand the fight between North and South Carolina over water on Catawba River
      1. I've written a case study on this that you can find here:  
[http://sciencecases.lib.buffalo.edu/cs/collection/detail.asp?case\\_id=603&id=603](http://sciencecases.lib.buffalo.edu/cs/collection/detail.asp?case_id=603&id=603)
6. Learning Objective 6: Water conservation
  - a. Understand what water conservation is, and why it's important every time you turn on a faucet.
    - i. <http://www.epa.gov/oaintrnt/water/>

## **12. Forestry**

**Station Manager: James "Trip" Miller - SC Forestry Commission**

### **Learning Objectives:**

1. Identify common South Carolina trees without a key.
2. Identify specific or unusual species through the 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 the value of trees in urban/suburban settings and the factors affecting their health and survival.
7. Understand how following Best Management Practices will help protect soil and water quality.

## **13. Wildlife**

### **Station Manager: Jennifer Majors - Environmental Discovery Center**

Sustainable Rangeland Management: Achieving a balance between Traditional Agricultural Uses with Non-Agricultural uses on Montana Rangelands

#### **Learning Objectives:**

1. Understand and define basic ecological terms.
2. Know the preferred habitat types and specific habitat requirements of common wildlife species. Understand how this knowledge helps us to better protect both the land and the wildlife species that depend on it.
3. Identify wildlife species using mounted specimens, skins/pelts, pictures, skulls, silhouettes, decoys, wings (waterfowl), scats, tracks, animal sounds, or other common signs.
4. Identify general food habits (herbivore, omnivore, carnivore), habitats (terrestrial, aquatic, fossorial), and habits (diurnal, nocturnal) using skull morphology and/or teeth.
5. Learn about the complexities of decision-making in making land use decisions that affect wildlife, and understand that wildlife resources are under constant pressure caused by human population growth, environmental degradation, and habitat reduction.
6. Know that wildlife species are subject to diseases resulting from exposure to microbes, parasites, toxins, and other biological and physical agents.
7. Understand how non-native (exotic), invasive species threaten our environment and the biodiversity of many wildlife species. Understand that non-native (exotic), invasive plants impact wildlife habitat and thus have a tremendous impact on native wildlife.
8. Understand the importance of the three levels of biodiversity: genetics, species and ecosystem or community, and understand the implications of biodiversity loss at each level.
9. Understand the difference between biological and cultural carrying capacity, and be able to identify social and ecological considerations where human use of land conflicts with wildlife habitat needs.
10. Understand the terminology and factors that affect threatened and endangered wildlife species. Know the meaning of extinct, extirpated, endangered, threatened, candidate species and reintroduction.
11. Identify the characteristics that many extinct and endangered species possess, and be able to identify many species wildlife that are endangered and threatened.
12. Understand wildlife population dynamics such as birth, mortality, age-structure, sex ratio, and mating systems. Understand the impact of limiting and decimating factors of common wildlife species on wildlife management.
13. Understand the role of the Endangered Species Act in helping to conserve endangered and threatened species. Know the organizations and agencies responsible for listing and protecting endangered species on global, federal, state and provincial levels.

## 14. CURRENT TOPIC

### **Sustainable Rangeland Management: Achieving a balance between Traditional Agricultural Uses with Non-Agricultural uses on Montana Rangelands**

#### **Station Managers: Joshua Castleberry - Central Carolina Technical**

**Background:** Rangeland in Montana and across the nation contributes immensely to a sustainable agricultural economy. Montana's number one "industry" is agricultural production, and the number two "industry" is tourism. Rangeland provides forage and habitat for domestic livestock and wildlife. Recently there has been increasing demands on the rangeland for a multi use concept. Multi use includes hunting, precious metals, fuel (gas, coal) exploration and recreational uses such as; access to fishing, bird-watching, hiking, snowmobiling, cross-country skiing, trail bike/ATV riding. Today, management methodologies vary greatly while attempting to balance rangeland uses that result in maximized benefits to all.

Montana alone has approximately 93.2 million acres. Rangeland in Montana is located in the short grass prairie and mountain regions. Of that, there are approximately 36.3 million acres of Private Rangeland, 31.2 million acres of Public Rangeland, 3.7 million acres of Dryland Pasture, and 454,000 acres of Irrigated Pasture. Rangeland and Pastureland in Montana would comprise about 70% of the total land area – this would include the prairies, mountain parklands, forested areas with 25% or less canopy openings, alpine plant communities, wetlands, introduced tame pastures - dryland and irrigated.

**History:** Rangeland has seen major changes from the large bison herds on the prairies during the 1800's, to the homesteading days during the early 1900's, to the multi uses and management of today's rangeland. Native prairie once covered nearly a quarter of the continental United States, providing a home for specially adapted, diverse plant and animal life. Prairie ecosystems thrive on the intermittent disturbance brought by frequent fire and the irregular mosaic of vegetation carved out by the periodic passage of native grazers (bison, elk, mule deer, white-tailed deer, and antelope). These disturbance and subsequent renewal have shaped the life cycle of every native prairie organism. As our knowledge of Rangeland has increased, it became evident that what helps the rancher is often good for wildlife. In this grazing-dependent ecosystem, many species of both plants and animals rely on the presence of large grazing animals. Properly managed rangeland can provide a sustainable agriculture economy and healthy rangelands for future generations.

#### **Definitions:**

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

- 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.
- Grazing Management – the manipulation of grazing and browsing animals to accomplish a desired result.
- 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.
- Stocking Rate – the amount of land area allocated to each animal unit for the entire grazing period in one year.
- 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.

### Key Topics

1. Basic rangeland and pastureland knowledge, to include: identification of state grass, plant I.D. and definitions, importance of grazing lands in Montana.
2. Range Ecology Processes – definition of ecological sites (soil – plant relationships), ecological processes (energy flow, nutrient cycle, water cycle and plant succession).
3. Rangeland and pastureland management – stocking rates/carrying capacity, general types of grazing systems, improvement practices (fencing and water development), wetland, riparian and upland communities
4. Basic knowledge of livestock and wildlife interactions, forage preferences, forage overlap, and habitat requirements.

### **LEARNING OBJECTIVES**

1. Define rangeland and pastureland, percentage of state encompassed by rangeland and pastureland, importance of grazing lands.
2. Identify state grasses of Montana, differentiate between plant types (grass, forb, shrub, and trees), identify parts of a grass and/or grass like species.
3. Define rangeland ecological sites, understand ecological process, understanding of all definitions inclusion to all key topic areas.
4. Understanding of basic rangeland and pastureland management concepts, i. e. grazing systems, stocking rates, and rangeland improvements.
5. Understanding of Best Management Practices (BMPs) on rangeland and pastureland and how different communities (wetland, riparian, and upland areas) interact.
6. Recognize different classes of livestock and understand their interaction with wildlife species.
7. Understanding of the historical use of the land by humans, domestic livestock and wildlife and its effect on the plant community.
8. Understanding the rights of the private landowner and citizens' rights to public land.

## 15. Oral Presentation

Station Manager: Sam Ward and Chanda Cooper

### 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 communications professionals using no more than 2 visual aids.
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

#### Instructions:

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. Two visual aids will be allowed.

#### Scenario

It's a little hard for us to picture, but American Bison (*Bison bison*) and Elk (*Cervus canadensis*) used to range naturally across the Piedmont Prairies of South Carolina. Early explorers, including Hernando DeSoto, described the Carolina Piedmont as "Grand Savannas" and mentioned many flora and megafauna that we associate with prairie ecosystems today. While many of the prairie flora still exist in that region today (now relegated to marginal existence in rights-of-way) the megafauna have been extirpated from the state; surviving in the prairies out West. So what happened to this native ecosystem? Early European settlers preferred these open ecosystems for settlements because there were fewer trees to remove in order to build up the settlement. Thus they appropriated these open spaces from the Native Catawba people and converted them to agricultural fields and pastures. Fire suppression, ecotone alteration, hunting, and other habitat changes took their toll. The elk and bison disappeared from the South Carolina landscape by the early 1800s.

Fast forward to the present. It is 2013, and at least one group of South Carolinians is interested in restoring large portions of the upstate to their prairie roots. Leading the charge is the Greenville based group Ecosystem and Landscape Kinesiology, or ELK. ELK's mission is to "Reestablish viable South Carolina Prairie ecosystems from the grasses to the elk". ELK has the backing of a number of prominent scientists, naturalists, and politicians. One group of representatives has filed a bill in the SC House of Representatives on behalf of ELK. Currently in the House Agriculture, Natural Resources, and Environmental Affairs Committee; H.R. 1234 is a bill "To develop partnerships and generate funds to establish a process in order to rehabilitate Prairie ecosystems to the levels seen prior to the 1800s"

Not all of the news is purpletop and muhly grass, however. Many groups in the upstate oppose the new bill. Some scientists aren't convinced that South Carolina has the undeveloped area necessary for a viable prairie ecosystem to return. Many businesses are worried that the "funds" would come from higher taxes. Many private land owners are also worried that changes would affect their farms, silviculture, and recreational land uses.

**You are the top rated environmental consultation firm in the state. As such the House Agriculture, Natural Resources, and Environmental Affairs Committee has asked you to prepare a report. They want to know if this bill should be killed or passed to the floor for a vote. Remember that you have the ear of the committee. If you have any amendments to suggest now is the time to do it. Remember to support ANY recommendations that your group makes with good data. The good ladies and gentlemen of the committee will have to answer to their constituents for whatever they pass on to the full House. As you do your research ask yourself these questions:**

- 1. Is there enough open space in the upstate to recreate a viable prairie ecosystem?**
- 2. If there is enough open space, who owns it? Will it be acquired by the state as state land, or would public-private partnerships work better?**
- 3. How will this project be funded?**
- 4. Who will have access to the ecosystem once it is established? Will it be like a state park where education and entertainment are the primary focus, like a state forest where multiple uses are allowed (including potentially grazing land for cattle farmers), or something entirely different?**
- 5. Which agencies and/or NGOs should take the lead?**



# Oral Presentation Rules

## Materials allowed for visual displays:

Teams are limited to two (2) standard pieces of white poster-board (24"x30") prepared with markers, crayon, construction paper, tape, string, cut-out pictures, etc. No three dimensional creations are allowed (posters must be able to be stacked and stored compactly). You may use both sides of the poster, but you are limited then to 1 poster board.

No presentation aids or materials other than the posters and index cards specified below will be permitted at the presentation. Students will be allowed five (5) 3.5 x 5 inch index cards each to assist them during the presentation. No materials other than the aids mentioned above will be allowed.

## Scoring procedures:

A panel of judges with expertise in the current topic, natural resource management and public communications 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 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 to scores allocated based on length of presentation:

2.5 – 5.5	minutes	4 points
5.5 – 7.5	minutes	6 points
7.5 – 9.5	minutes	8 points
9.5-10.5	minutes	10 minutes
10.5-12.5	minutes	8 points

Teams will be notified when there is 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: \_\_\_\_\_

Team Final Score: \_\_\_\_\_

Judge's Initials: \_\_\_\_\_

**PART 1: Preparation and Presentation (60 Points Max.) Circle Score Below and post total here \_\_\_\_\_**

**A. How well did the presentation address or identify:**

- |   |                     |
|---|---------------------|
| 1. The interrelationship between natural resources, different management strategies and human health and well-being | 0 2 4<br>6 8 10     |
| 2. All the stakeholders affected  | 0 2 4 6 8 10        |
| 3. Relevant influences on or by the major resource areas (soil, water, forestry, wildlife)                          | 0 2 4 6 8 10        |
| 4. Knowledge of new technologies/science that addresses the issues  | 0 2 4 6 8 10        |
| 5. Other environmental problems related to the issue  | 0 2 4 6 8 10        |
| <b>B. Were references and resources cited in the presentation?</b>  | <b>0 2 4 6 8 10</b> |

**PART 2: Application of the Data (80 Points Max.) Circle Score Below and post total here \_\_\_\_\_**

- |   |              |
|---|--------------|
| 1. Team demonstrated a solid understanding of the political issues related to the problem       | 0 2 4 6 8 10 |
| 2. Team demonstrated a solid understanding of the environmental issues related to the problem   | 0 2 4 6 8 10 |
| 3. Team demonstrated a solid understanding of the economic issues related to the problem        | 0 2 4 6 8 10 |
| 4. Team demonstrated a solid understanding of the social/cultural issues related to the problem | 0 2 4 6 8 10 |
| 5. Team presented ONE viable opinion/solution to the problem, addressing the resource issue     | 0 2 4 6 8 10 |
| 6. All main parts of the presentation were clearly stated and supported                         | 0 2 4 6 8 10 |
| 7. Solution(s) presented address(es) the long-term sustainability of the resources              | 0 2 4 6 8 10 |
| 8. 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.) Circle Score Below and post total here \_\_\_\_\_**

- |  |              |
|--|--------------|
| 1. Presentation was well organized with a clear introduction and a strong conclusion                   | 0 2 4 6 8 10 |
| 2. Participants enhanced the presentation with eye contact, gestures, voice inflection and originality | 0 2 4 6 8 10 |
| 3. Visual aids were used to support major points   | 0 2 4 6 8 10 |
| 4. Questions from the judging panel were answered logically and concisely                              | 0 2 4 6 8 10 |

**PART 4: Required Elements (20 Points Max.) Circle Score Below and post total here \_\_\_\_\_**

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

**SECTION SCORES:**      **PART 1 (60 Max.) \_\_\_\_\_**

**PART 2 (80 Max.) \_\_\_\_\_**

**PART 3 (40 Max.) \_\_\_\_\_**

**PART 4 (20 Max.) \_\_\_\_\_**

**TOTAL \_\_\_\_\_ (place final score at top of page)**

**Scale for Scoring:**

- 0 = not at all
- 2 (1) = poorly
- 4 (2) = fair
- 6 (3) = good
- 8 (4) = excellent
- 10 (5) = outstanding

## 16. A Clarification of the Envirothon Judging 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.
- 2- Answers contain many major misconceptions or gaps.
- 4- Answers contain some misconceptions or flaws.
- 6- Answers are accurate and adequate. All the team members are involved in answering the questions.
- 8- Answers given by all the members are concise and organized in a logical manner. All the details are appropriate.
- 10- 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 up to five points if the presentation was accomplished in the allotted time scale and the team made effective use of their time. (1 pt.- presentation lasted 1-2 minutes, 2 pts.- presentation lasted 3-4 minutes, 3 pts.- presentation significantly over time limit (>6 minutes), 4 pts.- presentation within ( $\pm$ ) 1 minute of the allotted time, 5 pts.- presentation within ( $\pm$ ) 30 seconds of the allotted 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.

## 17. Glossary of Environmental Terms:

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

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

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

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

**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.

**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:** 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 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.

**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.

**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 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.

**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.

**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.

**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.

**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.

**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 in large numbers. 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.

**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.

**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).

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

**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.

**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.

**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.

**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.

**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.

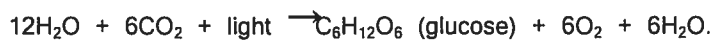
**Non-renewable:** Energy resources, such as coal, oil and natural gas that cannot be replenished by nature as fast as they have been used. It took hundreds of millions of years to form many of these resources and they are in limited supply.

**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).

**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.

**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:



**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.

**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.

**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.

**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.

**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.

**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).

## 18. Bibliography and On-Line Resources

### GENERAL

**North American Envirothon** - [www.envirothon.org](http://www.envirothon.org)

**Academy of Natural Sciences** - *choose the article index*  
<http://www.acnatsci.org/erd/ea>

**Clemson University Cooperative Extension Service**  
*- choose Public Service Activities - Extension*  
<http://www.clemson.edu/>

**Environmental Literacy Council**  
<http://www.enviroliteracy.org/>

**Librarians Index to the Internet**  
<http://sunsite.berkeley.edu/InternetIndex/>

**Scientific American: Ask the Experts**  
<http://www.sciam.com/askexpert/>

**South Carolina Department of Health and Environmental Control**  
<http://www.state.sc.us/dhec>

**South Carolina Department of Natural Resources**  
<http://www.dnr.state.sc.us>

**South Carolina Forestry Commission**  
<http://www.state.sc.us/forest>

**South Carolina State Library**  
<http://www.state.sc.us/scsl/>

**Environmental Education Link**  
<http://www.nceet.snre.umich.edu>

**Environmental Protection Agency - Acting Locally - Information for Citizens**  
<http://www.epa.gov/epahome/acting.htm>

**Internet Public Library - click on both biology and environmental science**  
<http://www.ipl.org/ref/RR/static/sci0000.html>

**Teaching KATE (Kids About The Environment)**  
<http://www.teachingkate.org>

**USDA Natural Resources Conservation Service**  
<http://www.nrcs.usda.gov/>

**U.S. Geologic Survey** - has biology and geology information and sources  
<http://www.usgs.gov/>

**South Carolina Legislature**  
<http://www.Leginfo.state.sc.us>

**Soil and Water Conservation Society** - *click on Public Policy and Organization Links*  
<http://www.swcs.org>

**EPA National Service Center for Environmental Publications**  
<http://www.epa.gov/ncepihom/>

## Bibliography

### SOILS

**Bryn Mawr College, Dept. Geology teaching module on soil formation**  
<http://www.brynmawr.edu/Acads/Geo/Soil/ProcessHome.html>

**Earth and Sky, geology and astronomy, ask an expert, Feature articles**  
<http://www.earthsky.com>

**National Soil Survey Center**

<http://www.statlab.iastate.edu/soils/nsdaf/>

**USDA NRCS Technical References**

[http://www.ftw.nrcs.usda.gov/tech\\_ref.html](http://www.ftw.nrcs.usda.gov/tech_ref.html)

**USDA NRCS World Soil Resources Website**

<http://www.nhq.nrcs.usda.gov/WSR/>

**Dr. Soils Surfs - a searchable index of soils webpages**

<http://www.agri.upm.edu.my/jst/drsoil.html>

**How to Measure Soil Texture (low tech and easy)**

[http://weather.nmsu.edu/Teaching\\_Material/soil456/soiltexture/soiltext.htm](http://weather.nmsu.edu/Teaching_Material/soil456/soiltexture/soiltext.htm)

**University of Florida Cooperative Extension (excellent explanation of soil texture triangle and field determination techniques)**

[http://edis.ifas.ufl.edu/scripts/htmlgen.exe?DOCUMENT\\_SS169](http://edis.ifas.ufl.edu/scripts/htmlgen.exe?DOCUMENT_SS169)

**United Nations Environment Program (global soil database - see data access section)**

<http://grid2.cr.usgs.gov/>

**NRCS Web Soil Survey -** <http://websoilsurvey.nrcs.gov/app/>

**S.K.Worm -** <http://www.nrcs.usda.gov/FEATURE/education/squirm/skworm.html>

### AQUATICS

**EPA's Office of Water Homepage:** [www.epa.gov/ow](http://www.epa.gov/ow)

**DHEC's Bureau of Water:** [www.scdhec.gov/water](http://www.scdhec.gov/water)

**USGS Water Science for Schools:** [www.ga.water.usgs.gov/edu](http://www.ga.water.usgs.gov/edu)

**Center for Watershed Protection:** [www.cwp.org](http://www.cwp.org)

**Surf your watershed:** [www.epa.gov/surf](http://www.epa.gov/surf)

**Know your watershed:** [www.ctic.purdue.edu](http://www.ctic.purdue.edu)

**Ohio State NPS Pollution primer:** [www.ag.ohio-state.edu/~ohioline/aex-fact/0465.html](http://www.ag.ohio-state.edu/~ohioline/aex-fact/0465.html)

**SC Home\*A\*Syst - program for reducing Household NPS**  
<http://virtual.clemson.edu/groups/waterquality/HOMASYS.HTM>

**CIESE Collaborative Projects - Global Water Sampling Project (background, procedures, and expected test result ranges for water quality tests)**  
<http://www.k12science.org/curriculum/waterproj/watersamplingtests.shtml>

**Stream Study (aquatic macroinvertebrates and sampling procedures)**  
<http://wsrv.clas.virginia.edu/~sos-iwla/>

**Groundwater** <http://www.groundwater.org>

## Bibliography

**The Hydrologic Cycle** – online meteorology guide

[http://ww2010.atmos.uiuc.edu/\(Gh\)/guides/mtr/hyd/home.rxml](http://ww2010.atmos.uiuc.edu/(Gh)/guides/mtr/hyd/home.rxml)

**Groundwater Basics from the Groundwater Primer**, Purdue University

<http://www.purdue.edu/dp/envirossoft/groundwater/src/basics.htm#menu>

**How to delineate a watershed** (and read a topographic map) (NH NRCS)

[http://www.nh.nrcs.usda.gov/technical/WS\\_delineation.htm](http://www.nh.nrcs.usda.gov/technical/WS_delineation.htm)

**Congressional Research Service Report** – Safe Drinking Water Act Amendments of 1996

<http://cnie.org/NLE/CRSreports/water/h2o-17.cfm>

**EPA's Watershed Academy Web**: Introduction to the Clean Water Act(html version),

<http://www.epa.gov/watertrain/cwa/> (pdf version, 4.3MB, 70 pages)

<http://www.epa.gov/watertrain/pdf/IntrotoCWA.pdf>

### General Water Quality

<http://aquanic.org/publicat/state/ga/trout.htm>

<http://gf.state.wy.us/habitat/aquatic/index.asp>

<http://aquanic.org/publicat/state/il-in/as-503.htm>

<http://www.extension.umn.edu/distribution/naturalresources/components/DD6946e.html>

<http://www.lib.noaa.gov/docaquua/basicaquua.html>

<http://www.riparianbuffers.umd.edu/manuals/correll.html>

<http://www.riparianbuffers.umd.edu/manual.html>

[http://www.geoscientific.com/technical/tech\\_references\\_pdf\\_files/BC%20Instream%20Flow%20Guidelines%20for%20Fish.pdf](http://www.geoscientific.com/technical/tech_references_pdf_files/BC%20Instream%20Flow%20Guidelines%20for%20Fish.pdf)

<http://edis.ifas.ufl.edu/FA001>

<http://waterdata.usgs.gov/nwis/qw>

[www.water.usgs.gov/owq/](http://www.water.usgs.gov/owq/)

[http://wqic.nal.usda.gov/nal\\_display/index.php?info\\_center=7&tax\\_subject=596](http://wqic.nal.usda.gov/nal_display/index.php?info_center=7&tax_subject=596)

<http://pubs.usgs.gov/fs/fs-027-01/>

### Aquatic Biodiversity

[www.lib.iastate.edu/collections/db/fifiwo.html](http://www.lib.iastate.edu/collections/db/fifiwo.html)

[http://news.lib.ncsu.edu/vetmed/2010/01/10/fish-fisheries-aquatic-biodiversity-world\\_wide-update/](http://news.lib.ncsu.edu/vetmed/2010/01/10/fish-fisheries-aquatic-biodiversity-world_wide-update/)

[www.nature.org/initiatives/freshwater/resources/art17025.html](http://www.nature.org/initiatives/freshwater/resources/art17025.html)

<http://gapanalysis.nibi.gov>

[www.biologicaldiversity.org](http://www.biologicaldiversity.org)

## **Instream Flows**

[www.instreamflowcouncil.org](http://www.instreamflowcouncil.org)

[www.ncwater.org/About\\_DWR/Water\\_Projects\\_Section/Instream\\_Flow/welcome.html](http://www.ncwater.org/About_DWR/Water_Projects_Section/Instream_Flow/welcome.html)

[www.epa.gov/owow/watershed/wacademy/acad2000/river/](http://www.epa.gov/owow/watershed/wacademy/acad2000/river/)

[www.americanrivers.org/library/reports-publications/instream-flow-toolkit.html](http://www.americanrivers.org/library/reports-publications/instream-flow-toolkit.html)

<http://www.nrb.state.vt.us/wrp/docs/shipp/VT%20Eflows%20Presentations2.pdf>

[http://www.nap.edu/openbook.php?record\\_id=111978page=32](http://www.nap.edu/openbook.php?record_id=111978page=32)

## **FORESTRY**

**Learning Objective Resources ( see page 40 – Society of American Foresters)**

- 1 Identify Common Trees: *Tree Identification for SC*
- 2 Identify trees with a key: *Tree Identification, A Guide to Helping Your Students Learn Tree ID*
- 3 Understand wildlife habitat...*Forest Mgt. & Wildlife*
- 4 Understand forest management....*Managing the Family Forest in the South: The Natural Role of Fire*
- 5 Be able to use Biltmore stick *Making & Using Your Own Cruiser Stick*
- 6 Understand urban tree value: *Benefits of Urban Trees*
- 7 Understand BMP's *Forestry BMP's*

**Natural role of fire:** [http://www.floridaforestservice.com/publications/fires\\_natural\\_role.html](http://www.floridaforestservice.com/publications/fires_natural_role.html)

**Tree Identification for South Carolina:** <http://www.state.sc.us/forest/refree.htm>

**Managing the Family Forest in the South:** [http://library.rawlingsforestry.com/fs/managing\\_the\\_family\\_forest/](http://library.rawlingsforestry.com/fs/managing_the_family_forest/)

**South Carolina's Best Management Practices:** <http://www.state.sc.us/forest/rbfrc.htm>

## **WILDLIFE**

**Nearctica: natural history of North America**

<http://www.nearctica.com/index.htm>

**U.S. Fish and Wildlife Service - Endangered species website**

<http://www.fws.gov/r9endspp/endspp.html>

**USFWS - National Wildlife Refuge System Management**

<http://refuges.fws.gov/wildlife.html>

**USFWS - Southeast Region**

<http://www.fws.gov/r4eao/>

**National Wildlife Federation**

<http://www.nwf.org/>

**South Carolina Wildlife Federation**

<http://www.scwf.org/>

**National Audubon Society's explanation of the Endangered Species Act**

<http://www.audubon.org/campaign/esa/Basics.htm>

**Wild Pro - electronic encyclopedia for wildlife**

[www.wildlifeinformation.org](http://www.wildlifeinformation.org)



## 19. Partner Offices

### Society of American Foresters

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

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

**Regional Foresters**

Coastal	Calvin Bailey	(843)538-3708	413 Sidneys Road, Walterboro, SC 29488
Pee Dee	Mike Ney	(843)662-5571	113 Forestry Commission Dr, Florence, SC 29501
Piedmont	Tom Patton	(803)276-0205	39 General Henderson Road, Newberry, SC 29108

**Forest Directors**

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

**Forest Inventory Analysis Crews**

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

**Southern Pine Beetle Foresters**

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

## SOUTH CAROLINA FORESTRY COMMISSION

### FORESTRY UNIT SUPERVISORS

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



## Society of American Foresters

### Map of SAF Chapters in South Carolina

Contact the SAF chapter chair in your area for:

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

## 20. USDA-NRCS, SCDNR & Conservation District County Offices

### Abbeville District Office

394 Highway 28 By-Pass Abbeville, SC 29620  
(864) 459-5419, ext. 3

### Aiken District Office

1555 Richland Avenue, Suite 400 Aiken, SC 29801  
(803) 649-4221, ext. 3

### Allendale District Office

398 Barnwell Highway, Rm.113 Allendale, SC 29810  
(803) 584-4234, ext. 3

### Anderson District Office

1521 Pearman Dairy Road Anderson, SC 29625  
(864) 224-4201

### Bamberg District Office

3828 Main Highway Bamberg, SC 29003  
(803) 245-4311, ext. 3

### Barnwell District Office

100 Fuldner Road Barnwell, SC 29812  
(803) 259-7144

### Beaufort District Office

817 Parris Ave.  
P.O. Box 70 Port Royal, SC 29935  
(843) 522-8100

### Berkeley District Office

P.O. Box 6122, 1003 Hwy 52 Moncks Corner, SC 29461  
(843) 719-4146

### Calhoun District Office

904 F.R Ruff Dr. Ste. 104  
P.O. Box 528 St. Matthews, SC 29135  
(803) 874-3337, ext. 3

### Charleston District Office

4045 Bridge View Drive, Suite C-204 North Charleston, SC 29405  
(843) 727-4160, ext. 3

### Cherokee District Office

1252 Overbrook Drive, Suite 5 Gaffney, SC 29341  
(864) 489-7150

### Chester District Office

744 B. Wilson Street Chester, SC 29706  
(803) 581-1908, ext. 3

### Chesterfield District Office

106 Scotch Road Chesterfield, SC 29709  
(843) 623-2187, ext. 3

### Clarendon District Office

9B West Rigby Street Manning, SC 29102  
(803) 435-2612, ext. 3

### Colleton District Office

531 Robertson Blvd., Suite B Walterboro, SC 29488  
(843) 549-1821, ext. 3

### Darlington District Office

300 Russell Street, Rm. 228 Darlington, SC 29532  
(843) 393-0483, ext. 3

### Dillon District Office

1212 Commerce Drive  
P.O. Box 609 Dillon, SC 29536  
(843) 774-8641 or 9577

### Dorchester District Office

5809 W. Jim Bilton Blvd. St. George, SC 29477  
(843) 563-3218, ext. 3

### Edgefield District Office

304 Gray Street Edgefield, SC 29824  
(803) 637-3220, ext. 3

### Fairfield District Office

155 South Congress Street Winnsboro, SC 29180  
(803) 635-4831

### Florence District Office

215 Third Loop Rd. Ste. 400 Florence, SC 29505  
(843) 669-9686, ext. 3

### Georgetown District Office

1837 N. Fraser Street Georgetown, SC 29440  
(843) 546-7808

### Greenville District Office

301 University Ridge, Suite 3900 Greenville, SC 29601  
(864) 467-2755

### Greenwood District Office

115 Enterprise Court, Ste. A-1 Greenwood, SC 29649  
(864) 229-3004, ext. 3

### Hampton District Office

1005 Elm Street, East Hampton, SC 29924  
(803) 943-2586, ext. 3

### Horry District Office

1949 Industrial Park Road, Rm. 125 Conway, SC 29526  
(843) 365-7923

### Jasper District Office

406 W. Main St. Rm 128 Ridgeland, SC 29936  
(843) 726-7611, ext. 3

### Kershaw District Office

1126 Little Street Camden, SC 29020  
(803) 432-2576

### Lancaster District Office

1771-A 521 Bypass South Lancaster, SC 29720  
(803) 286-4455

### Laurens District Office

221 A Laurens Street Laurens, SC 29360  
(864) 984-6921

### Lee District Office

129 Fairview Avenue Bishopville, SC 29010  
(803) 484-6325

### Lexington District Office

123 Park Road Lexington, SC 29072  
(803) 359-3165, ext. 3

### Marion District Office

119 Palmetto Pointe Dr. Ste. A Marion, SC 29571  
(843) 423-1742

### Marlboro District Office

210 Throop Street Bennettsville, SC 29512  
(843) 479-4552

### McCormick District Office

P.O. Box 1958 McCormick, SC 29835  
(864) 852-2594

### Newberry District Office

719 Kendall Road Newberry, SC 29108  
(803) 276-0032, ext. 3

**Oconee District Office**

301 W. South Broad Street Walhalla, SC 29691  
(864) 638-2213, ext. 3

**Orangeburg District Office**

1550 Henley Street, NE, Rm. 103 Orangeburg, SC 29115-5020  
(803) 534-2409, ext. 3

**Pickens District Office**

P.O. Box 245 144 McDaniel Avenue Pickens, SC 29671  
(864) 878-6155

**Richland District Office**

2020 Hampton Street, Rm. 3044  
P.O. Box 192 Columbia, SC 29202  
(803) 576-2080

**Saluda District Office**

201 East Church Street Saluda, SC 29138  
(864) 445-8118

**Spartanburg District Office**

105 Corporate Drive Ste. G Spartanburg, SC 29306  
(864)814-2471

**Sumter District Office**

1975 Castlerock Dr. Sumter, SC 29153  
(803) 905-7650, ext. 3

**Union District Office**

200 S. Mountain Street  
P.O. Box 1136 Union, SC 29379  
(864) 429-2801

**Williamsburg District Office**

502 Martin Luther King Jr. Ave Kingstree, SC 29556  
(843) 354-9621

**York District Office**

1460 E. Alexander Love Hwy. York, SC 29745  
(803) 684-3137, ext. 101

# Notes: