



# Using State Soil Project in Soil Science Education

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## ABSTRACT

A state soil is one of many symbols (e.g. tree, flower, bird etc.) adopted by citizens to be recognized as an important item to their state. We have developed a set of laboratory exercises, assignments and exams utilizing the State Soil, from States across America, that gives students an opportunity to practice interpretation of soil series descriptions, taxonomic classes, soil forming factors, soil physical and chemical properties. Sixty seven Clemson University students from various fields (horticulture, forestry, agricultural mechanization and agricultural education) had a hands-on experience with the State Soil Project during CSENV 202: Soils course taught in the spring 2006. Student responses to the laboratory exercises were strongly positive, both in terms of how the State Soil Project helped them understand a range of soil science topics as well as their practical applications. Incorporation of the State Soil Project into agricultural education should have a significant impact on the quality of soil science education and training.

## INTRODUCTION

- There are many symbols states use to represent themselves (e.g. flower, bird, tree);
- Symbols are often adopted after a concerted effort by citizens (Shearer and Shearer, 2001);
- A state soil is a soil that has special significance to a particular state. Each state in the United States has selected a state soil, twenty of which have been legislatively established ([http://soils.usda.gov/gallery/state\\_soils/](http://soils.usda.gov/gallery/state_soils/));
- A soil series name generally is derived from a town or landmark in or near the area where the soil was first recognized ([http://soils.usda.gov/gallery/state\\_soils/](http://soils.usda.gov/gallery/state_soils/)).

## Examples of State Symbols

The California grizzly bear

The Florida State Soil - Myakka



© Tom Myers Photography



<http://www.mo15.nrcs.usda.gov/features/gallery/myakka.html>

## OBJECTIVES

The objectives were to develop a set of exercises and exams using State Soil data to aid soil science education by combining theoretical knowledge with practice, and to make learning about soil science more entertaining.

## MATERIALS AND METHODS

### Computing Requirement

These exercises were conducted in a GIS computer lab equipped with personal computers (Pentium 2.8 GHz processors and a dedicated 128MB video card).

## MATERIALS AND METHODS

### Course Background

Crop and Soil Environmental Science (CSENV) 202, Soils, is a 4-credit course in the Department of Entomology, Soils and Plant Sciences at Clemson University, Clemson SC (Clemson University, 2006-2007). The course consisted of three 1-hour lectures followed by a 2-hour laboratory each week. Maximum capacity is 72 students for the course and 18 students for each laboratory section.

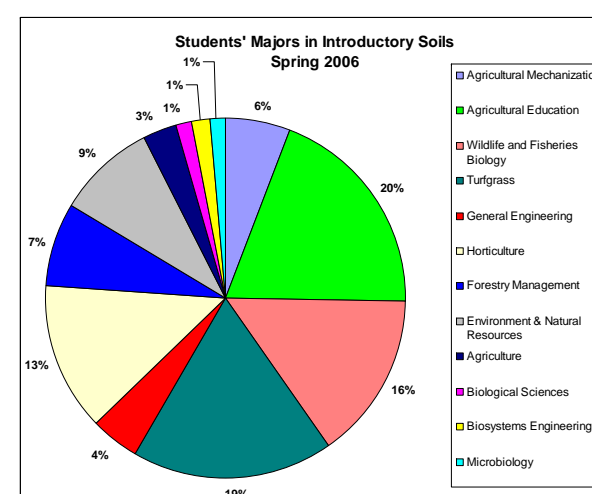


Figure 1. Percentages of students' majors in Spring 2006 (67 students).

The course is an introductory course that introduces world soil resources, soil formation, classification, and mineralogy. A strong emphasis of the course is on understanding basic soil chemical and physical properties. Other topics that are covered are soil microorganisms, plant nutrients, and fertilization (<http://www.gis.clemson.edu/elena/SoilsandEnvironment3.htm>).

### Laboratory Exercises

An inspiration for these laboratory exercises was the Smithsonian Soils Exhibit that will be located in the National Museum of Natural History in Washington, DC (Fig. 2; Kamps, 2005). The exhibit will contain one soil monolith from each state to highlight the diversity of soils within the United States. The monoliths were donated from USDA Natural Resources Conservation Service (NRCS) monolith collection created in honor of the 100th Anniversary of National Soil Survey. Each student was randomly assigned a state soil, as defined by the USDA/NRCS, to further investigate through laboratory exercises. Each Student created a State Soil Folder containing applicable materials related to their investigation of the assigned state soil.



Figure 2. Smithsonian Soil Exhibit floor plan (<https://www.soils.org/smithsonian/floorplan.html>).

## RESULTS AND DISCUSSION

The purpose of State Soil project is to use the State Soils to help students understand soil taxonomy (Fig. 3), soil development and soil chemical and physical properties through a series of exercises (Table 1).

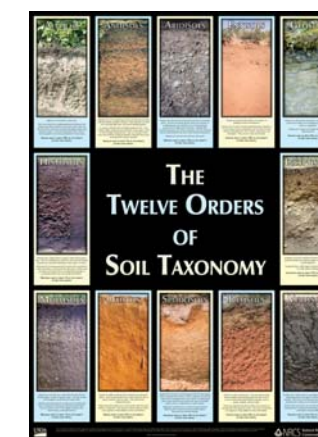


Figure 3. The poster of 12 soil orders ([http://soils.usda.gov/technical/soil\\_orders/](http://soils.usda.gov/technical/soil_orders/))

Table 1. Summary of objectives and tasks for laboratory exercises and exams.

### Assignment 1

**Objective:** To find assigned state soil and identify the soil order it belongs to;

**Task:** Navigate to the State Soil website ([http://soils.usda.gov/gallery/state\\_soils/](http://soils.usda.gov/gallery/state_soils/)) and print 1-2 pages of State Soil description.

### Assignment 2

**Objective:** To identify six soil forming factors (parent material, climate biota, topography, time, land use) from the soil series description;

**Task:** Navigate to Soil Series Name Search website (<http://ortho.ftw.nrcs.usda.gov/cgi-bin/osd/osdnamequery.cgi>), enter state soil series name and print your state soil series description. Write a report with a paragraph on each soil forming factor.

### Assignment 3

**Objective:** To identify soil physical properties (texture, structure, consistence, and drainage and permeability) from the soil series description;

**Task:** Write a report with a paragraph on each soil physical property.

### Assignment 4

**Objective:** To identify soil chemical properties from the soil series description;

**Task:** Write a report with a paragraph on each soil chemical property.

### Assignment 5

**Objective:** To decode the taxonomic class and explain the meaning of their derivatives, connotation of formative elements and major characteristics;

**Task:** Write one-page report.

### Exam

Professor randomly picked and printed a soil series description from Soil Series Name Search and asked questions related to major topics discussed in the course.

## RESULTS AND DISCUSSION

Table 2. Students' responses to the question of what was their favorite part of the unit where the State Soil Project was used.

"My favorite part was doing the State Soils. Not only did it help me to learn about other states, but it helped me learn the vocabulary that went along with this unit, which I think helped me study, prepare, and better understand."

"I liked best doing the State Soil Project so far. It helped me learn a lot of the concepts in soil science."

"I enjoyed the assignments that went along with the State Soil Folder the best. They were very interesting and taught me a lot."

"I like researching our State Soils."

"I like what we did in lab finding soils from anywhere in the country and being able to describe them. I think it will be very useful in years to come."

"I like the State Soil Project because it made what we were learning in class practical. It was a good way of practicing what we learned. This makes reading soil series descriptions less challenging."

"I liked learning about different State Soils and how to interpret the NRCS soil descriptions."

"I enjoyed the State Soil Project. I enjoyed learning about soils from other states and how they differ from South Carolina soils."

"I like how the class is taught in a useful manner. Learning by becoming familiar with soil series and conducting soil samples is a great way to make the material relevant and useful. I learned information that I can actually apply to my farm and home."

## CONCLUSIONS

Judging from students' responses and comments, the exercises used in the State Soil Project were a valuable educational component of the course.

## ACKNOWLEDGEMENTS

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