Where Have All the Soils Students Gone?

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ABSTRACT Where have all the soils students gone? Several articles have been published recently discussing the decline in undergraduate student enrollment in soil science. Those who work directly with these students have known that this trend has existed for many years. At first we thought this trend was temporary. Now we realize that this declining trend is real. The trend is national and international in scope. In the United States the National Academy of Sciences through the National Committee for Soil Science was interested in learning more about undergraduate programs and formed a subcommittee to study the declining enrollment of students interested in soil science. The results of the subcommittee's work and other national and international commentaries on this subject lead to this article. Therefore, the article has the following objectives: (1) to present the information obtained by the subcommittee on undergraduate education of soil scientists, (2) to state the perception of soil science, (3) to discuss how the lack of undergraduate students in soil science affects the quality of graduate students, (4) to offer possible ways to increase the enrollment of students in our courses and as majors, and (5) to question the future of our science. This downward trend has a domino effect. With few undergraduate students, graduate students are coming from other disciplines without the foundation soils courses; soil science departments are being eliminated or combined, thus losing identity; employees are not given the title of soil scientist so the public doesn't see this discipline as potential employment; and statistically, the majority of soil scientists are "mature" (>50 years old).

articles

The title "Where Have All the Soil Students Gone?" was paraphrased from the Pete Seeger[1] song "Where Have All the Flowers Gone?"

Where have all the flowers gone?
Long time passing
Where have all the flowers gone?
Long time ago
Where have all the flowers gone?
Girls have picked them every one
When will they ever learn?
When will they ever learn?

Several articles have been published recently concerning the future of soil science in the United States and abroad (Hartemink et al., 2008; Hansen et al., 2007; Baveye et al., 2006). These concerns have also been discussed by the National Academy of Sciences (NAS)–National Committee for Soil Science (NCSS).

In 1998 the NAS established the NCSS. This was a giant step for soil science because the NAS recognized soil science as a distinctive discipline. The discussion on undergraduate soil science education began from a debate on soil science graduate students. The committee engaged in conversation about the lack of preparedness the graduatestudents were exhibiting in their chosen science. A comment was made that most graduate students do not receive their undergraduate degree in soil science. Thus, many graduate students lacked the fundamental coursework common to undergraduate programs.

So, why are so many graduate students not coming from the undergraduate programs? The attention was then placed on the status of undergraduate programs in the United States. One answer is we are attracting students from other disciplines. The other answer is that we do not have many undergraduate students majoring in soil science. So the question was raised: Why don't we have students interested in our science? To answer this question the NCSS formed a subcommittee named "National Trends in Undergraduate Soil Science Education" in 2003 to investigate this concern.

The function of the subcommittee was "to develop recommendations which will enhance the number and quality of students enrolling in soil science as a major." Members of the subcommittee represented, as nearly as possible, the various areas of soil science that have an interest in undergraduate education. Therefore, the members were selected to represent 1862 and 1890 land-grant universities, non–land-grant universities, the private and public sectors, as well as representation from across the United States.

The subcommittee reviewed enrollments across the

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Abbreviations: ASA, American Society of Agronomy; CALS, College of Agricultural and Life Sciences; CSREES, Cooperative State Research, Education, and Extension Service; NAS, National Academy of Sciences; FFA, Future Farmers of America; NCSS, National Committee for Soil Science; SLO, San Luis Obispo; SSSA, Soil Science Society of America; SWS, Soil and Water Science; UF, University of Florida.

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country and perception of the major to determine the potential to increase numbers, and the near future of the major. Discussions centered on the core curriculum, number of students taking the courses, and is there a need for the major and if so how to increase interest in the major. For the most part the subcommittee determined the declining trend in soil science majors is a national issue. This article is a summary of their specific findings as well as what is occurring with the soil science major nationally and internationally.

Preparedness of Soil Science Graduate Students

The discussion of the NCSS subcommittee on undergraduate programs began with a concern about the preparedness of soil science graduate students. Many of us who received our advanced degrees in soil science also received our Bachelor's degree in that major or a closely associated one (e.g., agronomy with an emphasis on soils). Today, graduate students are coming to us with various undergraduate backgrounds. The students received their undergraduate degrees in sociology, political science, and English. These students are not majoring in science-orientated disciplines. Other students come from, for example, chemistry, biology, and geology backgrounds. All of these graduate students have one thing in common. They lack the extensive and intensive undergraduate coursework in soil science. This is not to say that these individuals are not outstanding students. It is that they do not have the fundamental educational background in soils common at the undergraduate level. In the past, graduate schools allowed graduate students to take undergraduate classes and get graduate credits for them. This is no longer true. Therefore, some universities have created undergraduate/graduate "combined" courses to meet the needs of these graduate students.

The combined courses are taught together; same time in the same classroom. In some of the soils courses taught this way, the graduate students may have different exams and/or a term project. The point is that the graduate students are being taught the same information as the undergraduate students, but getting graduate credit for it. Some students ask, "Are the undergraduates getting a graduate education or are the graduate students getting an undergraduate education?" In either case, the students' perception is that no one is getting taught at their level.

The result is that the graduate student is obtaining graduate credit, but is not getting a graduate education. Trying to "catch-up" at the graduate-level is very difficult to do. What is more disturbing is that these students may graduate with an advanced degree, never having taken an "advance course" in soil science. Is this the future of soil science? As it looks now, yes. Since we have so few undergraduate students across the country majoring in soil science, the graduate students have become the backbone of our science. But are they truly prepared?

Can you imagine a Ph.D. student with no background in soils (B.S. and M.S. degree in some other area) who finishes his/her degree program with very few "soils" courses? This can happen and has happened. It is up to the student and his/her Ph.D. committee to select which courses will be taken. Thus, no specific courses are required for a Ph.D. degree. In theory, students could take courses in numerous departments without taking a course in soil science. This is especially true when soil science went from an agricultural to environmental emphasis. Thus, as Lal (2007) stated, "… graduate programs in soil science were further marginalized by the creation of multidisciplinary environmental science graduate programs…"

Perception of the Major

Soil science, as an area in which a student can major, is not on today's high school and college-age students' radar screen. The major is associated with "agriculture," where it resides at many universities. At the University of Florida (UF), a survey (n = 2164 responding) was completed asking incoming freshman and transfer students how they made a decision on what to major in (Rocca and Washburn, unpublished data, 2004). The vast majority (70%) of the responses indicated that they used the degree program information on the website as the main source of information. Another question asked was, "As you think about your intended major, how influential were the following factors when making your decision regarding which university to attend?" Ranked number one by the respondents was "career opportunities available"; the last one ranked was "number of students in major."

Another challenge we face in the perception of the major is the fact that many parents make the decision for their child on what to major in. This is based on what they, the parents, majored in when they went to college. Universities—and especially what is offered to specialize in—have changed tremendously since the parents attended college. Luckily, these students, after they have been in school for a semester and away from their parents, realize that today's universities offer many more choices. It is at this time the student changes his/her major.

Trying to change the perception of soil science is very difficult to do. Even within the soil science community we are raising questions as to what clientele we serve. Soil science colleagues within departments may be split between "agricultural" and "environmental" issues. So, the question is how do we change or correct the perception the public has about soil science when we have different interpretations of the science?

The perception is evident when we visit the names of departments and majors across the country (Table 1). Names are quite diverse. The University of Wisconsin still has the name Department of Soil Science, whereas at the University of California-Davis soil science is in the Department of Land, Air, and Water Resources. Finding the soil science major is even more difficult because of the various names it is given. Several of the major land-grant universities (e.g., Cornell University, Iowa State University, and University of Illinois) do not offer a major but a concentration/specialization/track in soil science.

Table 1. Various names of selected departments/schools with "soil science" curriculum.

University	Department/school name	Major	Concentration/specialization/track
Arizona	Soil, Water, and Environmental Science	environmental science	soil science
Auburn	Agronomy and Soils	agronomy and soils	
UC Davis	Land, Air, and Water Resources	soil and water science	
UC Riverside	Environmental Science	environmental science	environmental science–soil science
Colorado State	Soil and Crop Sciences		environmental soil science
Cornell	Crop and Soil Sciences	science of natural and environmental systems	physical science (soil, air, and water)
Florida	Soil and Water Science	soil and water science	
Iowa State	Agronomy		soil and environmental science
Illinois	Natural Resources and Environment Sciences	natural resources and environment science	soil and water science
Kansas State	Agronomy	soil and environmental science	
Maryland	Environmental Science and Technology Program		soil and watershed science
New Mexico State	Plant and Environmental Sciences	soil science	
Ohio State	Environment and Natural Resources	environmental science	soil science
Oklahoma State	Plant and Soil Sciences	plant and soil science	
Oregon State	Crop and Soil Science	soil resource management	
Purdue	Agronomy	environmental soil science	
Virginia Tech	Crop and Soil Environmental Sciences	crop and soil environmental science	soil–environmental sciences
Washington State	Crop and Soil Sciences	soil science	environmental soil science
Wisconsin	Soil Science	soil science	

Potential to Increase Numbers

The need to increase the number of students majoring in soil science was first discussed by Taskey (1994) when California Polytechnic State University, San Luis Obispo (SLO) (non–land-grant university) Soil Science Program and Department were challenged to change. In the late 1980s, SLO experienced a severe decline in enrollment and the program was chosen for potential removal. The elimination of the undergraduate program also raised administrative questions as to the need for the Soil Science Department. The faculty responded by creating a new program with existing resources and the enrollment increased from a low of 44 to 120 students within 2 years.

How can other universities increase the number of students interested in majoring in soil science? There are three general sources to recruit; high school students, transfer students, and on-campus students. I will begin the discussion with recruiting students who are already on campus.

On-campus students may have already declared a major or designated themselves an "undecided" student. How can we grab these students' attention? One of the best recruiting tools we have is the introductory course in soils. This course normally has a high enrollment of students and usually is taught every semester.

At the University of Florida, Soils in the Environment (SOS 3022) is the introductory soils course. It is taught every fall and spring semester and every odd-year summer semester. The enrollment in this course is limited by size of classroom assigned. Spring semester enrollment is usually larger than fall semester, because a larger classroom is available. Spring semester 2008 had the largest enrollment ever for this class (158 students). The students ranged from freshman to graduate students and represented 37 majors from 10 colleges (Table 2). The 2007 Heisman Trophy winner even took the class. The first course can capture the students' interest in soils at an early stage in their college career. It may and hopefully inspires students to change majors or at least to take additional soil courses.

Other courses offered need to be addressed. The enrollments for selected soil courses at UF are presented in Fig. 1–3. It is readily evident that SOS 3022 has a large enrollment (Fig. 1), but what about the other courses. How "popular" are they? Why do some soils courses have much higher enrollments than others?

To explain one of the reasons why, we will have to go back to 1991 when my department changed its name from Soil Science Department to Soil and Water Science (SWS) Department. The faculty felt that a name change better reflected our mission, but our course offerings did not change. Up until a few years ago we did not have any "water" courses. Now we have several: World of Water (SOS 2007), Wetlands (SOS 4244), Water Resource Sustainability (SOS 4245), Hydric Soils (SOS 4942), and Ecology of Waterborne Pathogens (SOS 4307). World of Water has only been taught since 2005, but its popularity/enrollment has grown from 12 to 180 students (Fig. 4). Wetlands has always been a popular course, averaging 35 students. Hydric Soils has reached its cap enrollment every time offered. The popularity of water courses is ever-increasing. This may be the result of the public's interest in water issues including the quality and quantity of drinking water, the newness of this area, and the instructors' passion to teach.

As a result of attention in water, a "water science" specialization is being established at UF. This was a result of the USDA-CSREES (Cooperative State Research, Education, and Extension Service) review of the SWS department

Table 2. List of majors/specializations and colleges/schools of students who have taken the introductory soils course (spring semester 2008).

Major/specializations	College/school
Agriculture and Biological Engineering	Agricultural and Life Sciences
Agriculture Education and Communication	Agricultural and Life Sciences
Agriculture Operations Management	Agricultural and Life Sciences
Anthropology	Liberal Arts and Sciences
Biology	Agricultural and Life Sciences
Chemical Engineering	Engineering
Chemistry	Liberal Arts and Sciences
Criminology, Law, and Society	Liberal Arts and Sciences
Education	Education
Entomology	Agricultural and Life Sciences
Environmental Horticulture	Agricultural and Life Sciences
Environmental Engineering	Engineering
Environmental Science	Natural Resources and Environment
Family Youth and Community Sciences	Agricultural and Life Sciences
Food and Resource Economics	Agricultural and Life Sciences
Food Science and Human Nutrition	Agricultural and Life Sciences
Forestry and Resource Conservation	Forest Resource and Conservation
Geography	Liberal Arts and Sciences
Geological Sciences	Liberal Arts and Sciences
Horticultural Science	Agricultural and Life Sciences
History	Liberal Arts and Sciences
Independent Studies	Agricultural and Life Sciences
Journalism	Journalism and Mass Communication
Landscape and Nursery Horticulture	Agricultural and Life Sciences
Management	Business Administration
Microbiology and Cell Science	Agricultural and Life Sciences
Music	Fine Arts
Natural Resource Conservation	Forest Resource and Conservation
Plant Science	Agricultural and Life Sciences
Political Science	Liberal Arts and Sciences
Psychology	Liberal Arts and Sciences
Public Relations	Journalism and Mass Communication
Sociology	Liberal Arts and Sciences
Soil and Water Science	Agricultural and Life Sciences
Sports Management	Health and Human Performance
Undergraduate Studies	Liberal Arts and Sciences
Wildlife Ecology and Conservation	Agricultural and Life Sciences

in April 2007 (O'Connor and Reddy, unpublished report, 2007). The water science specialization will emphasize water management, policies, and resources. If this specialization is successful, we may increase the number of students. But not the number of soil science majors.

A colleague of mine asked me if I still teach cation exchange capacity in SOS 3022. My reply was "yes," and his response was "the problem with soils courses is that they are still being taught the way they were 50 years ago!" How true. Maybe that is why the number of students in the other courses such as Soil and Water Chemistry (SOS 4451), Soil Physics (SOS 4606), Environmental Pedology (SOS 4715), and Soil Microbial Ecology (SOS 4303) have been historically low (Fig. 2 and 3). As shown in Fig. 2, Environmental Quality has higher enrollment than Environmental Pedology. Environmental Pedology is taken primarily by undergraduate students in SWS whereas Environmental Quality includes mostly non-SWS students. Thus, have we remained too static, too "traditional" in what we offer? How do we increase curiosity?

With the world and technology changing rapidly, we need to evaluate every 5 years the courses we offer to determine if the objectives taught are still essential. How can we transform today's courses to make them more appealing for today's students? For example, the soil physics course could be changed to Water Movement in the Environment, pedology could be renamed Distribution, Identification, and Assessment of Soils, and soil microbiology to The Living Soil. But changing the title is only part of the answer. Course content needs to be modernized. Also, new courses dealing with today's needs should also be created. How about teaching courses such as Soil Biology (not just microbiology), Soil Ecology, Soil Sustainability, Soils and Public Health, or Soils of the World to name a few? But as Smiles et al. (2000) stated while discussing the situation, "…in Australia, no school of soil science is big enough to offer a reasonable spectrum of skills required…" As the number of soil science faculties shrink in the United States, how can we offer new soils courses?

One approach in which new courses could be offered is through distance education. A new undergraduate soils course, Forest and Soil Ecosystem Services, is being taught for the first time in the fall of 2008. This web-based, nontraditional soils course is being taught at seven universities (four in the United States and three in Brazil). It includes subjects such as "Spiritualism and Aesthetics as Forest and Soil Ecosystems" in which scenic landscapes, recreation, ecotourism, and religious connections to the forest (e.g., Native Americans) will be covered.

Other tools that can be used to recruit students on and off campus include a combined (B.S./M.S.) degree program, preprofessional tracks/specializations, and a minor in education. Outstanding undergraduates can apply for the combined degree in which they can receive both undergraduate and graduate credits for specific classes. They can transfer up to 12 credit hours to their M.S. programs. In theory, these students should earn their M.S. degrees in 1 year.

At recruiting opportunities, I tell students that they can major in soils and prepare for professional schools (e.g., law school or medical school). At this time, we have a two

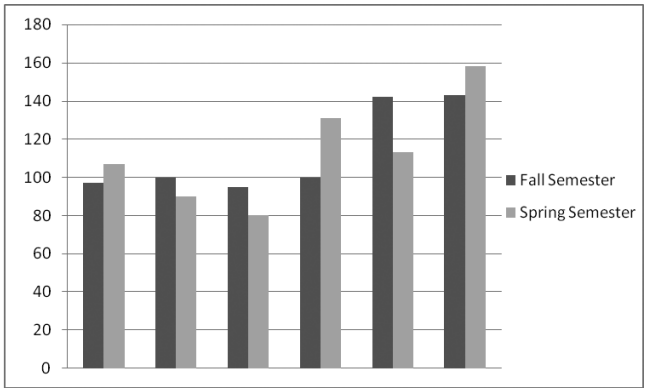

Fig. 1. Enrollment for Soils in the Environment (SOS 3022) course from 2003 to 2008. This is the introductory soils course taught on campus at the University of Florida. Enrollment is limited by the size of the classroom assigned.

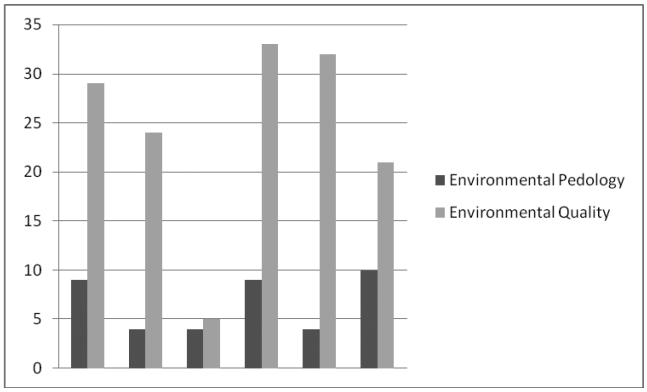

Fig. 2. Number of students enrolled in the Environmental Pedology and Environmental Quality undergraduate soils courses taught spring semesters (2003–2008) at the University of Florida.

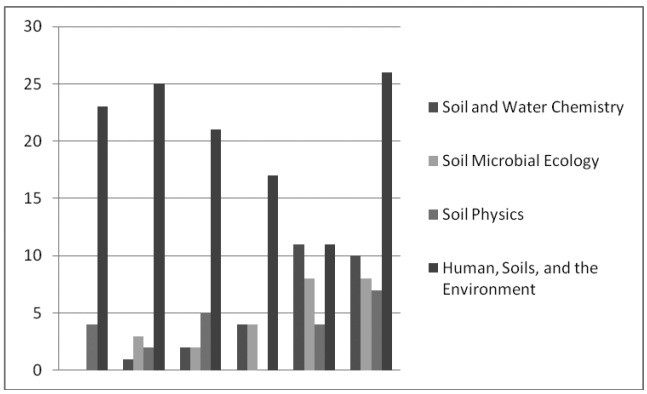

Fig. 3. Number of students enrolled in undergraduate soils courses taught fall semesters (2003–2008) at the University of Florida. In fall 2003, no undergraduate students enrolled in Soil and Water Chemistry and Soil Microbial Ecology. In fall 2006, no undergraduate students were registered in Soil Physics.

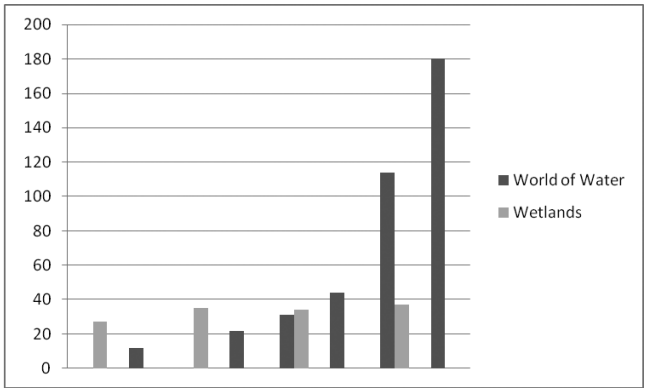

Fig. 4. Number of students in World of Water and Wetlands courses (2005–2008) at the University of Florida. World of Water is taught fall and spring semesters whereas Wetlands is taught spring semester. Enrollment is limited by the size of the classroom.

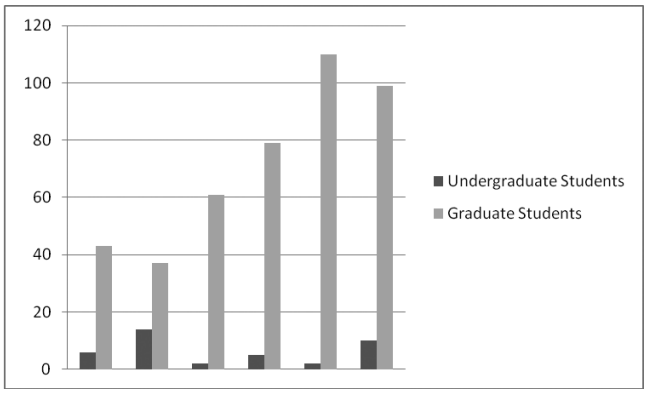

Fig. 5. Number of undergraduate and graduate students from 1998 to 2008 in the Soil and Water Science Department, University of Florida. Reference http://cals.ifas.ufl.edu/cir/.

soils students who have expressed interest in pre-med. This recruiting tool is critical, because many students believe that the only way to get accepted to a professional school is to major in biology, microbiology, chemistry, animal science, and so forth. It is difficult to convince students (and parents) that they can major in any discipline and still be accepted to a professional school (with the proper electives). Another recruiting tool is the new minor in education through the UF College of Education. Upon graduating with this 18-credit hour minor, the student would be eligible for a temporary Florida teaching certificate and qualified to become an instructor of high school science.

One concern students (and their parents) have is the opportunity to be employed. As mentioned above, when asked how the decision was made to select a major, the UF College of Agricultural and Life Sciences (CALS) survey indicated "career opportunities available." Even though the student numbers are down, employment prospects both in the private and public sectors are extensive. Recently, the St.

Table 3. Undergraduate enrollment for spring 2008 in the College of Agriculture and Life Sciences at the University of Florida.

Major	Number of students	Percentage of total
Agriculture education and communication	76	2.1
Agriculture operations management	115	3.2
Animal sciences†	509	14.1
Biology	200	5.5
Botany	23	0.6
Entomology and nematology	31	0.9
Environmental management in agriculture and natural resources	6	0.2
Family, youth and community sciences†	499	13.8
Food and resource economics†	374	10.4
Food science and human nutrition†	843	23.2
Forest resources and conservation	39	1.1
Geomatics	74	2.0
Golf and sports turf management	20	0.6
Horticulture science	32	0.9
Landscape and nursery horticulture	52	1.4
Microbiology and cell science†	278	7.7
Natural resource conservation	37	1.0
Non-degree	168	4.6
Packaging science	34	1.0
Plant science	21	0.6
Soil and water science	10	0.3
Statistics	11	0.3
Wildlife ecology and conservation	163	4.5

† The top five majors account for 70% of the enrollment. Reference: http://cals.ifas.ufl.edu/cir/.

Johns River Water Management District in northeast Florida advertised a soil scientist's position. The position called for a B.S. degree with 5 years of professional experience directly related to soil mapping, interpretation, and classification. It had a salary range of $55,993.60 to $93,329.60. The high salary range is a result of high demand and low supply of soil scientists in Florida. Another situation we face is that when our students are employed, they generally are not given the title of "soil scientist" but given some other designation (e.g., environmental scientists, natural resource manager). Thus, students and the public don't "see" soil scientists in the work force.

What are Some of Our Constraints to Increase Our Numbers?

There are many reasons for the low numbers of students. Some are the result of specific university/administrative decisions while others are more general. Here are some of the reasons why UF has such low numbers majoring in SWS.

- Students at UF do not know about our program until it is too late to switch majors. For example, they take the introductory soils course late (junior or first semester senior) in their program. They enjoy the subject matter in the course and want to change their major. But it is too late in their program; they would be "off-track" to graduate. So, some of them declare a minor in SWS. Others who may be seniors decide to join us as graduate students. During 1998 to 2008 the number of graduate students in the UF SWS Department increased from 43 in 1998 to 110 in 2006 (Fig. 5). Since 2004 we have been ranked number one or two in the number of graduate students in the college.
- Our science is not taught in high schools.
- We only have one county soil extension agent who majored in soils (25 years ago!).
- Their parents have never heard of our major, so their son/daughter is not encouraged to search out the opportunities in soil.
- Many majors in the CALS are in very high demand because students and parents believe these majors are required to be accepted into a professional school.

How Do We Overcome These Constraints?

- Advertise the introductory soils course across campus to incoming freshmen, transfer students, and undeclared majors. Identify the best instructor in the department and have him/her teach the introductory soils course. Above all, are soil science faculties committed to an undergraduate program?
- The teaching of soils in high schools may be changing. Many students majoring in agricultural education, who are required at UF to take the introductory soils course, will be teaching science or FFA (Future Farmers of America) in high schools. Several students have expressed to me that they will be using their notes from my class to teach. But can we wait until high school to get students interested in the dynamic field of soils? In 2006 SSSA created the S591 K–12 Committee to reach out to individuals in elementary and middle schools. The objective of the committee is to "increase interest and awareness of soil science and related sciences as a scientific pursuit and career choice" (https://www.soils.org/committee/S591/; verified 26 Sept. 2008).
- Parents have never heard of the major because they have never interacted with a soil scientist or at least not realized it. It is going to be difficult to change the attitude of the parents. One way is to advertise the employment opportunities for soils scientists, and the fact that their son/daughter may be able to attend professional school.
- Administrators need to support the major. University of

Florida is the largest university in Florida with a student population of 51,725. As a result of its excellent opportunities and programs, thousands of students apply, but few are chosen. One reason that admission is denied to a well-qualified student is that the student has applied to a degree program that is in demand, thus overpopulated. Examples of this are shown in Table 3 where in spring semester 2008 five of the top majors (22 majors in the college) accounted for approximately 70% of the students. These five majors have one thing in common—many of these students have a desire to attend a professional school upon graduation. Administrators could screen the students' applications and determine if the students have the background and an interest in soil science. Because SWS is an "under-enrolled" major, the chances of a student being accepted to UF would probably increase greatly.

Future of the Major

Does the soil science undergraduate program have a future? To answer that question let's look at the demographics of what we presently have. Recently, the Soil Science Society of America (SSSA) conducted a survey of its members (Collins, 2006). Of the responses received, it was observed that the "average" SSSA member was a male with a Ph.D. working at a U.S. university. The median age is 48 years with 26% of the members over the age of 55 and 17% under the age of 35. Hartemink et al. (2008) reported that the average age of members in the Dutch Society of Soil Science was 52 and in Denmark, 50% of the members in their society are over 50. Thus, soil scientists are "mature" nationally and internationally.

I concur with the statement by Hartemink et al. (2008) which states "The increasing age of soil science society members may be due to (1) lack of influx from a younger generation, which would include a lack of soil science graduates and/or (2) younger soil scientists are not joining learned societies in the same proportions as the previous generations." These concerns have been addressed by SSSA through the American Society of Agronomy (ASA) Early Careers Members Committee (ACS 530). Also, graduate students are given a reduced membership fee and that fee is carried to their first year of employment. Another way to increase the number of "younger" members is allowing undergraduate students to join SSSA as an individual. Previously, undergraduates students could only join ASA, and this was through their student Agronomy Clubs.

The age factor can also be seen at the universities. Many faculty members have or will be reaching retirement age. Will retiring faculty members be replaced, and if so will they be replaced with individuals who have an interest in students? It is a shame that the new, bright, and young faculty members, who can relate to high school and college-age students, are being steered toward research and graduate students in order to obtain promotion and tenure. Also, some of these new faculty members received their degrees in discipline other than soils.

These changes are becoming especially obvious in departments that have become a smorgasbord of disciplines. Lal (2007) expressed this viewpoint when he commented, "The downward spiral started…but (was) exacerbated during the 1990s when the already-battered soil science community was merged as a conglomeration with unrelated disciplines such as fisheries, wildlife, parks and recreation, policy, communication, etc." He goes on to say, "…soil science is slated for slow but sure extinction." We can see the outcome of these decisions by observing the names of departments, majors, and/or concentrations/specializations/tracks related to soil science (Table 1).

Will we in the United States follow our colleagues in the United Kingdom and Ireland where only a very few soil science departments still exist? Many university administrators believe that if a department does not have a strong undergraduate program, the department is nonessential. Taskey discussed this statement in 1994 and it is more significant today. We have seen many soil science departments that were combined with other disciplines to create mega-departments. In departments that have remained, discussions have centered on combining the undergraduate programs.

Taskey (1994) stated, "If the soil science profession is to remain viable and dynamic into the coming millennium, opportunities and expertise must not be forfeited or relinquished to other professions, either willingly or by default." We are now 8 years in the "next millennium." Most likely to continue the soil science curriculum, the program needs to be in a department in which the faculty is dedicated to the students and reaches out to associated disciplines such as agronomy, hydrological sciences, environmental sciences, engineering, wetlands, and geological and geographic sciences.

Conclusions

Concern about the declining enrollment of undergraduate students majoring in soil science has existed for many years. This declining trend has caught the attention of the NAS-NCSS. A subcommittee of the NCSS was formed to address the situation and concluded that the decline of soil science interest by undergraduates is for the most part occurring nationwide. Our international colleagues tell us that the trend is also occurring in their countries.

There could be many causes for this decline, including: (1) not changing the public's perception—why are we off the radar screen for parents and potential students?; (2) offering a "traditional" soil science curriculum with dull courses; (3) combining departments, thus losing identity; (4) renaming the major or only offering soil science as a concentration/specialization/track; (5) maintaining the current administrative decisions, such as limited classroom space; and (6) competing for students with "high demand/enrolled" majors. These issues were raised and possible solutions were presented.

As a result of this decrease in majors, graduate students are coming from other disciplines without the basic undergraduate courses in soil science, soil science departments are being eliminated or combined, and national and international soil societies' statistics show that soil scientists are not getting any younger. We don't have a fresh generation of soil scientists.

Courses in the soil science curricula must be changed

and modernized so that the content is more appealing to today's students. New courses should also be added to curricula to meet the rapidly changing technology. Changing the name of a course or department is not likely enough. Course content should be regularly evaluated to determine if the material is relevant and "appealing" to attract students.

Soil science departments and faculty should make more of an effort to publicize the employment opportunities available to undergraduates in soil science. As more soil science graduates are employed, prospective employers will become aware of the qualifications and availability of soil science graduates. Thus, more opportunities for future graduates will likely become available.

One final note: It is expected that the soils exhibit titled "Dig It: The Secrets of Soil" at the Smithsonian Institute in Washington, DC, will be seen by millions of people during the 18 months it will be open (http://forces.si.edu/soils/; verified 26 Sept. 2008). It will be interesting to see if this exhibit will have any influence on the number of students who choose soils as a major.

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