Myakka

A Soil and Water Science Department Publication

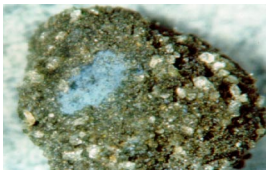
Volume 1 Number 3 | Institute of Food and Agricultural Sciences | Summer 2001

Featuring SWSD Thrust Area:

Soil Quality/ Ecological Indicators

Mycorrhizal infection of pine roots

Students in Microbial Ecology lab



Phosphate mineral 'vivianite' in Okeechobee Basin soils

Editors:
Pam Marlin
Darryl Palmer
Dr. Rao Mylavarapu - Extension
Dr. Vimala Nair - Research
Dr. John White - Teaching

Visit the SWS website:
http://soils.ifas.ufl.edu

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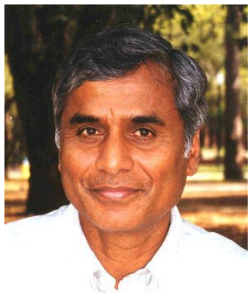

From the Chair...

Origin and History of the Department

Today the Soil and Water Science Department's (SWSD) research and education programs are well situated to address critical soil and water quality issues in a wide range of ecosystems, including agricultural lands, forested lands, range lands, urban lands, and wetlands. It is important to reflect on how we got to this stage. Let us go back in time and review the origin and history of our department, learning from past experiences as we chart our future course.

Soils-related research in Florida was first published in 1888 by the newly established Experiment Station of the State Agricultural College of Lake City, Florida. Early soil survey maps developed in 1904 included soils of Alachua, Levi, and Marion counties and showed Alachua Lake (Paynes Prairie) filled with water.

In 1907, the Experiment Station was moved from Lake City to Gainesville. The present Newell Hall, then called the Experiment Station, was built in 1908. A.W. Blair (1899-1910), chemist, probably should be considered as a pioneer in Florida soils' research. His experiments included the use of lysimeters to study nutrient leaching. This research was followed by S.E. Collison (1910-1920), who conducted detailed studies on nutrient leaching in Florida sandy soils.

Soil Science research reached new levels of sophistication in 1925, when Dr. R.M. Barnette was hired as soil chemist. By the end of the 1920s, several sub-disciplines of soil science were recognized, including physics, chemistry, mineralogy, and microbiology. Two examples of M.S. theses were: (1) An attempt at the isolation of an organic toxicant in an Everglade soil (1925, J.B. Hazard), and (2) The factors affecting the formation of the organic hardpan in the Florida Flatwood soils (1929, L.A. Richardson). Scientists in the early part of the 20th Century recognized the importance of two major soil types in Florida, organic soil (Histosols) and flatwood soils (Spodosols).

In 1933, the **Department of Chemistry and Soil** was established, with R.W. Ruprecht (1920-37) as head of the department. In 1937, the department was re-organized with Dr. R.V. Allison (1937-1944) as the new head. In 1939, the name was changed to the **Soils Department**. Faculty included C.E. Bell, H.W. Winsor, F.B. Smith, J.R. Henderson, L.K. Rogers, and R.A. Carrigan. Dr. Allison was instrumental in the establishment of the Soil Science Society of Florida and the Society's high-level publication has proven to be of inestimable value for state-wide distribution of technical information. A major publication that year was Bulletin 334, The Soils of Florida by J.R. Henderson.

Newell Hall, Experiment Station 1909

The Department expanded with several post-war appointments in 1946. F.B. Smith became head (1945-65) with new faculty added: G.M. Volk (1939-75), Soil Chemist; J.R. Neller (1944-62), Soil Chemist; G.T. Sims (1944-46), Chemist; G.D. Thorton (1944-56), Soil Microbiologist; R.E. Caldwell (1941-82), Pedologist; O.C. Olson (1941-46), Soil

See Origin and History of the Department p2

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Teaching

NEW GRADUATE STUDENTS
Summer 2001
Gina Kertulis, Ph.D., Advisor, L.Q. Ma

Carla Sperry, M.S., Advisor, D.A. Graetz

GRADUATES Summer 2001
Melina Farve, M.S., Advisor, W.G. Harris

Debbie Irons, M.S., Advisor, W.F. DeBusk

Jason Kruse, M.S., Advisor, J.B. Sartain

Carrie Miner, M.S., Advisor, W.F. DeBusk

Travis Shaddox, M.S., Advisor, J.B. Sartain

NEW UNDERGRADUATE STUDENTS
Summer 2001
Martin Anderson, Advisor, D.A. Graetz

Robert McMillan, Advisor, D. A. Comer

GRADUATES Summer 2001
James Cromer, EMA-LWM, Advisor, D.A. Graetz

Survey of a Land System
SOS 6932 - 3 credits

This new course was offered during Summer B by **John White** and Extension agent **Stan Bronson** (Palm Beach County). The curriculum was based on five modules: Survey of South Florida, Natural Systems, Role of Agriculture in South Florida, Water, and Restoration. The course began in Gainesville with one week of lectures given from 9am – 5pm by a number of managers, scientists, and faculty. This lecture series was also open to the public. The final day of lectures was highlighted by a lunchtime meeting with the State of Florida's Commissioner of Agriculture **Charlie Bronson**, Vice President of IFAS **Mike Martin**, and Deans **Luzar, Cheek, Brown, and Waddill**. The class next convened in West Palm Beach for a tour of South Florida. Over the next five days, they visited the South Florida Water Management District, the Everglades Nutrient Removal Project, Loxahatchee Wildlife Refuge, an airboat tour of Water Conservation Area 2A, Everglades

At Loxahatchee Wildlife Refuge

National Park, Southwest Florida Research and Education Center, US Sugar operations, Lake Okee-chobee, and a boat tour of the Kissimmee River. This format used the South Florida Ecosystem as a living laboratory, allowing participants to learn about the tenuous balance between natural resource issues, politics, ecosystem restoration and fresh water supply. The course met with such interest and success that it will be offered annually and has been assigned a course number and a permanent home in the Soil and Water Science Department.

Origin and History of the department *Con't from p1*

Surveyor, and L.E. Ensinger (1942-44) Soil Chemist. The passing of legislation for the State Soil Survey in 1941 opened a new era of land classification and evaluation. During the 1950s a series of studies showed the significance of various soil physico-chemical properties on soil fertility and plant nutrition. Some significant contributions included: rhizobium usage in Florida's agriculture, boron nutrition, and nitrogen and phosphorus requirements of several crops. Nutrient losses through leaching were measured in many cropping systems. Emphasis on research was slowly shifting from traditional soil fertility to environmentally sound practices. The first Ph.D. degree in soils was awarded in 1955 (since then, over 130 doctorate degrees have been awarded).

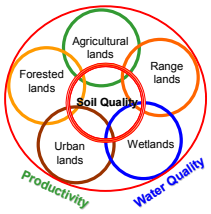
During the 1960s some of the active research programs included: phosphorus chemistry, biological nitrogen fixation, and forest soil fertility. Dr. F.B. Smith retired in 1965, followed by the appointment of Dr. C.F. Eno as department head in 1966. The expansion of citrus to the interior flatwoods created several new problems in soils management. The SWAP (Soil Water Atmosphere Plant) project established in 1968 at the Ft. Pierce Agricultural Research and Education Center, gained high scientific visibility as a comprehensive, multi-disciplinary approach to the problem of water control and citrus growth.

The name of the department was changed to **Soil Science** in 1971. During the 1970s the department's research emphasis focused on the fate and transport of nutrients, pesticides, and waste constituents. Much of the work during this period laid a strong foundation for environmental research in the later part of the century. Dr. Eno retired in 1983 and Dr. Brian McNeal became the new department chairman. Dr. McNeal remained in this position until 1989, followed by Dr. Jerry Kidder as interim chair (1989-90). He in turn was followed by Dr. George O'Connor (1990-94) and Dr. Randy Brown (1994-2000) as department chairs. Each of these modern-era chairs contributed significantly to the development of this department. To reflect its many new programs, in 1992 the department was renamed **Soil and Water Science**; under this new name the departmental programs were organized into six thrust areas. In almost 100 years, numbers of SWS faculty, staff and students have made significant contributions to improving the productivity of Florida's agriculture and contributed to soil and water science at national and international levels. In the past three decades, the research and educational focus of the department has been on environmental issues related to soil and water quality. As we move into the 21st century, we need to reflect on many of our past experiences and accomplishments, and build upon them to address the challenges of the soil and water quality issues of the future.

"We can chart our future clearly and wisely only when we know the path which has led to the present" Adlai E. Stevenson

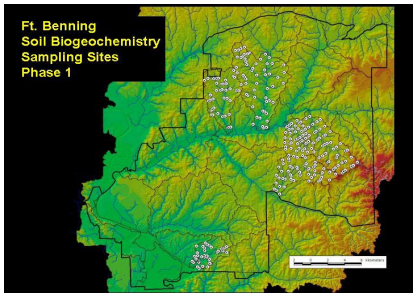
Research

Soil Quality/Ecological Indicators



Management practices in Agricultural lands, forested lands, range lands, and wetlands play an integral part in influencing soil and water quality within a watershed. Non-point source pollution of our streams, rivers, groundwater, lakes, wetlands, and estuaries is now linked to the practices used in these ecosystems. Understanding the nature of **soil quality** (which we define as *the ability of the soil resource to produce and maintain ecosystem production of plant, animal, and microbial biomass and to buffer or improve water quality*) is fundamental to meeting future demands on agriculture and natural resources. An holistic, integrated approach to research and education is needed to develop alternate practices that will maintain environmentally sound management of these ecosystems. Since *soil* is the primary driver regulating ecosystem processes and functions, its quality has a direct influence on water quality and ecosystem productivity. The task of defining soil quality and its link to sustainable biological productivity and water quality is complex . Nevertheless, it is a task that lies at the core of the mission of several state and federal agencies. The most comprehensive way to address this task is through intensive, long-term research that describes the detailed structure and function of ecosystems within a watershed. Unfortunately, there is often insufficient time and/or resources to accomplish such an effort, particularly given the rapid rate of anthropogenically-driven changes occurring in many watersheds. In these articles we describe two examples of SWSD efforts in the development of **soil quality/ ecological indicators** in forested lands and wetlands.

Soil Quality Indicators for Forested Lands at Ft. Benning, GA



Sampling sites at Ft. Benning

A multidisciplinary research team at the University of Florida and Purdue University is conducting research to develop ecological indicators to be used as resource management tools for military lands. The 5-year, $2 million study, conducted at the Ft. Benning (GA) military reservation, is funded by the Department of Defense SERDP program as part of their recently initiated Ecosystem Management Project (SEMP). **Bill DeBusk** is the lead investigator for the team which includes **Ramesh Reddy, Andy Ogram** and **Joe Prenger** from the SWS faculty. Other UF faculty involved in the project include **Debbie Miller** and **George Tanner**, Wildlife Ecology and Conservation Department; **Wendy Graham**, Biological and Agricultural Engineering Department; and **Jennifer Jacobs**, Civil Engineering Department. The Purdue research group is led by **Suresh Rao**, who is also Professor Emeritus at UF. The project team is evaluating a group of parameters related to soil biogeochemistry, hydrology, understory vegetation, and watershed hydrology as potentially sensitive indicators of ecosystem integrity and ecological response to natural and anthropogenic factors. In general, the soil quality indicators to be examined relate to changes in soil

See Ft. Benning p4

Erosion impacts upland and wetland water quality

Microbial Community Composition as Soil Quality Indicators

Hector Castro sampling in the Everglades

The use of bacteria as indicators of human impacts on ecosystems is currently being investigated by **Andy Ogram's** group. Bacteria respond much more rapidly to changes in their environment than do more complex organisms such as plants. By studying changes in the composition and activities of bacteria in soils impacted by anthropogenic activities, students **Weiwei Chen** and **Hector Castro** and post-doctoral research associate **Milind Chavan** hope to identify aspects of microbial community composition that will provide sensitive early warning indicators of impending ecosystem change.

Weiwei Chen is working with a team of scientists seeking to identify indicators of ecosystem integrity at the Ft. Benning training facility. Weiwei's approach has been to characterize soil microbial communities at Ft. Benning by a DNA fingerprinting technique, T-RFLP. This technique allows rapid comparison of the composition of different groups of bacterial genes in different samples. Weiwei has chosen to focus on the diversity of a gene important in nitrification (ammonia monooxygenase) and a gene characteristic of methanotrophic bacteria.

Hector Castro and **Milind Chavan** are using similar approaches to study the distribution and activities of bacterial strains involved in carbon cycling along nutrient gradients in eutrophic marshes such as the Everglades. Hector is particularly interested in the distribution and activities of sulfate reducing bacteria, and Milind is currently developing methods for studying the activities of several bacterial groups in these marshes. It may be that the activities and not merely presence of some bacterial strains may provide the most sensitive indicators of ecosystem change.

Extension

ANNOUNCING
First Annual Soil and Water Science Institute:
PRINCIPLES OF ARSENIC BEHAVIOR IN FLORIDA'S SOILS
March 4 - 5, 2002, Gainesville, Florida
University of Florida – Double Tree Hotel and Conference Center

Arsenic has found its way into the news and into land-use decision-making in the last several years. Decision-makers, be they individual citizens, public policy makers, or land managers, need to be provided with in-depth, scientific information about the nature and behavior of arsenic in the soil environment. This Institute is intended to provide decision-makers and their advisors/consultants with up-to-date, factual, scientific information that they can use – in appropriate combination with individual and societal values – to make *informed choices* with respect to the occurrence and behavior of arsenic in the soil environment.

This conference will impart a fundamental understanding of the forms in which arsenic occurs in soils; analysis of soils for levels and forms of arsenic; processes involved in transformations and movement of arsenic in soils; occurrence of arsenic in and across the soils and landscapes of Florida; soil-to-human exposure to arsenic; appropriate statistical techniques for understanding arsenic occurrence and behavior in soils/landscapes; interaction between CCA-treated wood and the soil; risks to humans from soil-borne arsenic; and remediation of arsenic-contaminated soils.

For Details contact: Dr. Randy Brown -- Institute Organizer, SWSD, University of Florida, Box 110510, Gainesville, FL 32611, Ph: 352-392-1803 x344; Fax 352-392-3399; SUNCOM 622-1803 x344 Email: rbb@mail.ifas.ufl.edu http://soils.ifas.ufl.edu/institute

Ft. Benning *Cont'd from p3*

physical and chemical characteristics, and the response of soil microbial and plant communities. The concept of ecosystem integrity or "health" in the context of the military installation encompasses not only the sustainability of the natural biota in the system, but also the sustainability of human activities at the installation - namely the military mission. Thus, changes in ecological condition are of great concern to both resource managers and military trainers. Relationships among ecological indicators and land condition are being evaluated following low-intensity soil and vegetation sampling at 300 sites over a broad area encompassing a range of military and non-military land use and anthropogenic disturbance. From this analysis, a short list of promising indicators will be selected for further evaluation. Concurrently, a watershed scale evaluation of hydrologic response to intensive military land use has been ongoing in paired 2nd-order watersheds. Preliminary results have revealed a strong relationship between type and intensity of anthropogenic disturbance and soil organic matter and plant-available nutrients.

Results of this study will enhance the ability to minimize, mitigate or reverse major negative environmental impacts on the DOD's ability to conduct the military mission. Early indications of change, and an understanding of the likely causes, will improve installation managers' ability to manage activities that are shown to be damaging, and prevent long-term, negative effects.

FACULTY, STAFF, and STUDENTS

Jim Jawitz joined the SWSD in September as Assistant Professor of Soil Physics/Hydrology. Jim comes from the University of Illinois at Chicago. He obtained his Ph.D. in 1999 from the University of Florida, under the guidance of Drs. P.S. Rao and M. Annable.

Sabine Grunwald joined the SWSD in August as Assistant Professor of Land Resources. Sabine comes from the Water Quality Laboratory at Heidelberg College in Tiffin, Ohio. She conducted her post- doctoral work at the University of Wisconsin, Madison. Sabine obtained her Ph.D. in 1996 from Giessen University, Germany.

At the **Florida Turfgrass Association Conference**, SWS student **Travis Shaddox** received the **Max McQuade Scholarship** in the amount of $1000. Other SWS students, **Raymond Snyder** and **Eric Brown**, won first and third place, respectively, in the graduate student paper presentation contest. **Jerry Sartain**, Professor of Soil Fertility, is the graduate advisor of these students.

Nick Comerford, Professor of Forest Soils, was elected as a **2001 Fellow of the Soil Science Society of America**.

David Sylvia, Professor of Soil Microbiology, was elected as a **2001 Fellow of the American Society of Agronomy**.

P.K. Nair, Distinguished Professor of Agroforestry, was elected as a **2001 Fellow of the Soil Science Society of America**. He is also the recipient of the **2001 International Soil Science Award**, presented by the Soil Science Society of America. Nair is an Affiliate Professor of the SWSD.

Ramesh Reddy, Graduate Research Professor of Wetland Biogeochemistry, is the recipient of the **2001 Soil Science Applied Research Award**, presented by the Soil Science of Society of America.

ALUMNI & FRIENDS

Donor gifts from alumni and friends are a boost to our teaching, research, and extension programs and without their support we would not be able to maintain a high level of academic excellence. We sincerely thank our alumni and friends for their generous support of SWSD programs. Gifts can be mailed to SWSD or to the UF Foundation Inc., SHARE, University of Florida, PO Box 110170, Gainesville, Florida 32611-0170.