



Myakka

A Soil and Water Science Department Publication



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Spring 2001

Featuring
SWSD Thrust Area:

Remediation of
Contaminated Soils,
Waters, and Aquifers



Arsenic hyper-accumulating 'fern'

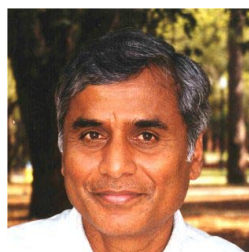


*Fixed-Film Anaerobic Digester
designed by Dr. Ann Wilkie*

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



From the Chair...

The Soil and Water Science Department (SWSD) is going through exciting and challenging times.

We all know that optimal soil and water quality is essential to

sustainable agricultural productivity as well as protection and conservation of natural resources. Nonpoint source pollution of streams, rivers, groundwater, lakes, wetlands, and estuaries is linked to the management practices used in agricultural, forest, range, and urban land ecosystems. Many current practices used in these ecosystems may not be adequate to sustain the quality of natural resources. In the context of Florida FIRST, the SWSD programs are designed to address critical issues related to soil and water quality in these ecosystems.

The SWSD faculty continue to explore new opportunities by expanding their programs and developing scientific knowledge that will help to protect the quality of soil and water resources, while sustaining the productivity of Florida's ecosystems. We are addressing the critical needs of the State of Florida through teaching courses on and off campus, timely research and extension publications, serving on state sponsored task forces, conducting in-service training and workshops, and consultations with clientele. Here are a few examples of our recent activities:

- A teaching retreat conducted by our faculty identified several critical needs in improving undergraduate and graduate education. We are taking new approaches to address this issue.
- Graduate student enrollment is steadily increasing in all thrust areas of the department.
- Discovery of a 'fern' that hyper-accumulates arsenic offers excellent opportunities to phyto remediate this important contaminant.

- With our faculty taking the lead, major research efforts are underway in addressing water quality issues in the Suwannee River Basin.

- Our faculty are in the process of developing research and extension programs to stabilize phosphorus in the Okeechobee Basin.

- We are placing increased emphasis on a watershed approach to understanding the soil and water quality issues in agricultural, forest, range, urban and wetland ecosystems.

- The SWSD hosted several international visiting scholars and hosted the 7th International Conference on Constructed Wetlands for Water Pollution held in Orlando, Florida.

- The SWSD cosponsored the 2001 York Distinguished Lecturer, Dr. M.S. Swaminathan.

- The SWSD is in the process of recruiting two new faculty members: Soil Physics/Hydrology and Land Resources.

In this newsletter we feature one of our thrust areas, 'Remediation of Contaminated Soils, Waters, and Aquifers'.

As we march forward to meet new challenges, we need support and help from our emeritus faculty, alumni, and friends. Together we can take SWSD to the next level. Any ideas and suggestions are welcome. Please take a moment and send us a letter or an e-mail. Thank you.

Teaching

NEW STUDENTS Spring 2001

Erin Bostic, M.S.
Advisor: J.R. White

Nadine Kabengi, Ph.D.
Advisor: S.H. Daroub

Konstantinos Makris, Ph.D.
Advisor: G.A. O'Connor

Lynette Malecki, M.S.
Advisor: J.R. White

Kelly Morgan, Ph.D.
Advisor: T.A. Obreza

Mike Tischler, M.S.
Advisor: M.E. Collins

Ronnie Volk, M.S.
Advisor: J.R. White

GRADUATES Spring 2001

Lingzheng Wu, Ph.D.
Advisor: L.Q. Ma

UNDERGRADUATES Spring 2001

Ahmed Khan II, B.S. - SLS

Brian Murphy, B.S. – EMA-
LWM

Todd Ondeck, B.S. - SLS

Tamara Wells, B.S. - SLS

Soils in the Environment

Dr. Mary Collins, Professor of Environmental Pedology, now teaches the department's "flagship" course, "**Introduction to Soils in the Environment**", formerly named "General Soils". Dr. Collins' commitment to teach this course will help us to increase the visibility of the role of 'Soils' in the 'Environment'.



Dr. Mary Collins on an archaeological site in Sicily

Through the leadership of Dean Jimmy Cheek's office, we are actively seeking non-traditional majors (English, History, Engineers, etc) and non-declared majors to encourage them to enroll in SOS 3022. Our aim is to open the world of soils to students who may not have thought of "what lies beneath their feet". Dr. Mary Collins is internationally recognized in Environmental Pedology. She is a Fellow of the Soil Science Society of America and serves on a National Academic Committee for Soil Science.

For details about the course contact Dr. Collins at 352-392-1951 or email at mec@gnv.ifas.ufl.edu.

SWS Teaching Retreat

The undergraduate and graduate departmental teaching retreat was held at the Reitz Union on March 5, 2001. A lively discussion was held among a variety of topics involving strategies to improve the enrollment in graduate and undergraduate programs. Key action items identified were: (1) change the focus of current undergraduate programs to reflect changing needs, (2) identify core and elective courses for graduate programs in each thrust area, (3) develop new courses to meet the needs of students in SWSD and other related interdisciplinary programs, and (4) develop strategies to increase student enrollment. Faculty sub-committees were formed to develop plans to address these critical issues, with the hope of implementing new strategies during the next fiscal year.

Upcoming Event-----

The SWSD 2nd Annual Graduate Research Forum will be held September 6, 2001 at the Reitz Union on the UF campus. The SWSD Graduate Research Forum will be held in association with 'Hydrologic Sciences Academic Cluster'. For details contact **Miss Kanika Sharma** by email at krsh@gnv.ifas.ufl.edu.

Dr. Brian McNeal, a native of central Oregon, joined UF as chair of the SWSD in 1983 and served in that capacity until 1990. Since that time he has taught introductory soils and the beginning graduate-level soil chemistry class, advised undergraduate and graduate students, and served as co-chair of the Agronomy and Soils Club. His research has dealt with nutrient losses from irrigated croplands in Central and South Florida, and with crop modeling. For several years he managed a large demonstration project in Manatee County, Florida, which was among the first to establish nitrate-N accumulation patterns beneath vegetable field and citrus groves of the state. He served during 1994-95 as interim director of the UF Center for

Dr. Brian McNeal Retires



Dr. Brian McNeal, with his wife, Dee Ann

Natural Resources, and has served since 1994 as the UF/IFAS liaison to the Florida Department of Agriculture and Consumer Services for the 1994 Legislature's Nitrate Bill, a program designed to develop research-based BMPs for croplands of the state. He is a Fellow of the American

Society of Agronomy and the Soil Science Society of America.

Dr. McNeal has also served while in Gainesville, on two separate occasions, as a bishop (lay minister) for his church, including one 3-year period of service for a congregation of young single adults aged 19-30. He has worked in church and youth programs, and in scouting, for most of his adult life. He and his wife, Dee Ann, have 4 children and 16 grandchildren. In retirement they plan to continue their enjoyment of 'grandparenting', to travel in the U.S. and abroad, to pursue their interest in genealogy, and to perform a mission for their church. The faculty, staff, and students wish Brian and Dee Ann an enjoyable retirement. They will always be part of the SWSD family.

Research

Discovery of a Fern that Hyper-accumulates Arsenic



Dr. Lena Ma examines fern plant

University of Florida scientists, led by **Dr. Lena Ma**, report discovering a fern that soaks up arsenic from contaminated soil. The first plant ever found to "hyper-accumulate" arsenic -- a carcinogenic trace element often used as an herbicide -- the fern may prove useful in cleaning up thousands of sites contaminated by arsenic from industrial, mining, agricultural or other operations around the world.

The research team, which included **Ken Komar, Cong Tu, and Beth Kennelley** of the SWSD, and **Weihua Zhang and Yong Cai** of Florida International University, Miami, found that the Brake fern, *Pteris vittata*, soaks up arsenic with staggering efficiency. They measured levels as much as 200 times higher in the fern than the concentrations in contaminated soils where it was growing. In greenhouse tests using soil artificially infused with arsenic, arsenic concentrations in the fern's fronds have reached 22,630 parts per million -- 2.3% of the plant was composed of arsenic. The findings suggest that Brake fern has the potential to remediate arsenic-contaminated soils, and could also aid in studies of arsenic uptake, translocation, speciation, distribution and detoxification in plants. The fern is an easy-to-grow perennial that prefers a sunny environment and alkaline soil. Results of this work were recently published in "Nature" (Feb. 2001).

Assessment and Remediation Alternatives for Arsenic Contamination at Cattle Dip Vat Sites in Florida

Approximately 3,500 cattle dip vats were utilized in Florida during the cattle-fever tick eradication program that ran from about 1923 to 1943. The only tickicide officially approved by the USDA during this period was arsenic (As). Vat solutions were usually pumped into a nearby pit annually and allowed to seep into the ground. This practice resulted in extensive arsenic contamination of soil and, in some cases, ground water in the immediate vicinity of these vats. A study was recently completed by **Dr. Dean Rhue** with **John Thomas, Bill Reve** and **Dr. Willie Harris**, in which the extent of arsenic contamination at several vat sites was related to soil and hydrologic properties. The extent of contamination was strongly related to soil clay content, the presence of iron oxide coatings on sand grains, and depth to the water table. Arsenic plumes varied from small, highly concentrated zones adjacent to the vat in the case of deep, well-drained soils with relatively high clay content, to contaminant plumes extending over 300m down-gradient from the vat in the case of soils with high water tables and minimal



Soil sampling adjacent to a cattle vat at Paynes Prairie, Florida.

amounts of clay and metal oxides. Evidence was also obtained that arsenic is volatilized by soil microbes at these vat sites and that the potential exists for natural attenuation of arsenic via atmospheric dispersal. Evaluation of a quick on-site test for delineating soil As plumes was conducted during the project. This test accurately delineated plumes at dipping vats located in landscapes with different soil and hydrologic properties and allows arsenic contaminant plumes to be delineated much more rapidly and cost effectively than conventional assessment techniques.

Molybdenum Standards for Biosolids Recommended



Dr. George O'Connor (far left) with colleagues from the Symposium

An interdisciplinary team of biosolids experts, led by UF scientist **Dr. George O'Connor**, has recommended long-awaited standards for molybdenum in biosolids. The original USEPA standards were withdrawn following a legal challenge in 1994, pending additional field data and reconsideration of risk. Data was generated in field studies in Florida, Illinois, and Minnesota in cooperation with UF animal scientist **Lee McDowell**, City of Chicago Water Reclamation agronomist **Tom Granato**, and ARS scientist **Bob Dowdy**. The new data was included in a reassessment of biosolids molybdenum risk by a team of experts including O'Connor and McDowell (UF), **Bob Brobst** and **Alan Rubin** (USEPA), **Rufus Chaney** (ARS), **Ron Kincaid** (Washington State Univ.), **Gary Pierzynski** (Kansas State Univ.), and **Gary Van Riper** (Montgomery Watson Consultants).

Biosolids high in molybdenum can induce a copper deficiency (termed molybdenosis) in cattle consuming forage grown on biosolids-amended land. The problem can be especially severe for cattle fed legumes grown in alkaline soils. Based on new data and an improved understanding of biosolids, pasture, and animal management, the team concluded that the risk of molybdenosis was small. Modern biosolids applied at reasonable rates, combined with reasonably expected cattle diet exposure, minimize molybdenosis risk. When cattle diets are supplemented with copper, as recommended, any molybdenosis risk can be easily controlled. The revised molybdenum standards (to be published Fall, 2001 in the Journal of Environmental Quality) will be considered by USEPA in final rule-making, expected next year.

Extension

Extension Publications on the Web. Extension specialists at the Soil and Water Science Department have made a concerted effort to have all of our department's current fact sheets and circulars updated and in the UF/IFAS electronic repository known as EDIS. Our publications may be accessed directly by going to the EDIS web site <http://edis.ifas.ufl.edu/>. The search feature is very flexible and powerful. The publications may also be accessed through the SWS web page by going to Publications then clicking on Extension Publications where access is through a menu system. Either way, the most up-to-date version of our publications is the one residing in EDIS. If you want to know if the copy of a publication you have is the latest version, go to EDIS and look at the date in the footnote associated with the title. While there, simply print out the latest version from EDIS. Publications on EDIS are in html format so they can be searchable by web search engines. They are also available in pdf format, which is the familiar print version.

New Publication. "Introduction to Preparing Nutrient Management Plans" is a new 54-page UF/IFAS circular (#1247) designed to lay the groundwork for nutrient management planning, especially on dairy and poultry farms. Authors are **G. Kidder, H.H. Van Horn, L.W. Schnell, J.P. Jacob, and R. Mylavarapu**. Currently, copies are available from Jerry Kidder, kidder@ufl.edu. It will also be available as a pdf file on EDIS in the near future.

Erosion Control on Highway Embankments. **Dr. Jerry Kidder** is working with colleagues in Environmental Horticulture on a Florida Department of Transportation project to study the effectiveness of various treatments to control erosion on steep slopes such as overpass embankments. Mulch made from ground up urban plant debris (yard wastes) is working quite well.

Upcoming Event

SOIL AND WATER SCIENCE INSTITUTE

Mark your calendars and plan to attend the First Annual Soil and Water Science Institute, to be held March 4 - 5, 2002 in Gainesville. This first Institute will deal with "Principles of Arsenic Behavior in Florida's Soils". Instructors will include members of the UF Soil and Water Science and Statistics Departments' faculties. A field trip will take you to the greenhouse to see an arsenic hyper-accumulating fern and to the field to see a cattle dipping vat site to learn field analysis and plume determination techniques. Keep your eyes peeled for additional information over the next several months.

For details contact: **Dr. Randy Brown** at 352-392-1803 x344 or email at rbb@mail.ifas.ufl.edu.

STATE LAND JUDGING CONTEST

The 42nd Annual Florida State Land Judging Contest was successfully hosted by the Orange Hill (Washington County) and Holmes Creek (Holmes County) Soil and Water Conservation Districts on March 30, 2001. Thirty 4-H and FFA teams from around the state participated. Visit the website at <http://landjudging.ifas.ufl.edu>.

FACULTY, STAFF, and STUDENTS

New Faculty Members



Arnold Schumann joined the Citrus Research and Education Center (CREC) in Lake Alfred as Assistant Professor of Citrus Nutrition in the Soil and Water Science Department.

Arnold obtained his Ph.D. degree in Soil Chemistry at the University of Georgia, under the guidance of Dr. Malcolm Sumner.



Samira Daroub joined the Everglades Research and Education Center (EREC) in Belle Glade. Samira obtained her Ph.D. in soil chemistry at Michigan State University under the guidance of Dr. Boyd Ellis.

Samira divides her time between the EREC in Belle Glade and the FREC in Ft. Lauderdale.

Congratulations to:

Dr. Andy Ogram for his promotion to Associate Professor with tenure.

Vijayalakshmi (Viji) Ramakrishnan for first prize in the Environmental Biology Poster Session of the University Graduate Student Forum.

Gerald Green, recipient of the University Scholars Program Award (2001-2002). His advisor is Dr. W.G. Harris.

Comments/Suggestions please send to SWSD Newsletter, Box 110510, University of Florida, Gainesville, Florida 32611
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