



NRCS **Technology News**



April 2005

“NRCS *Technology News*,” provided by Science and Technology, delivers pertinent information to our customers about new technology, products, and services available from the Soil Survey and Resource Assessment and the Science and Technology deputy areas.

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MESSAGE FROM DEPUTY CHIEF BILL PUCKETT

New Priorities for Soil Survey and Resource Assessment

I am excited by this opportunity to lead the Soil Survey and Resource Assessment Deputy Area team, which is devoted to providing data and information that are absolutely essential to helping people make good decisions on the land. What I bring to this job is a passion not only for the science but also for the information that flows out of that science.

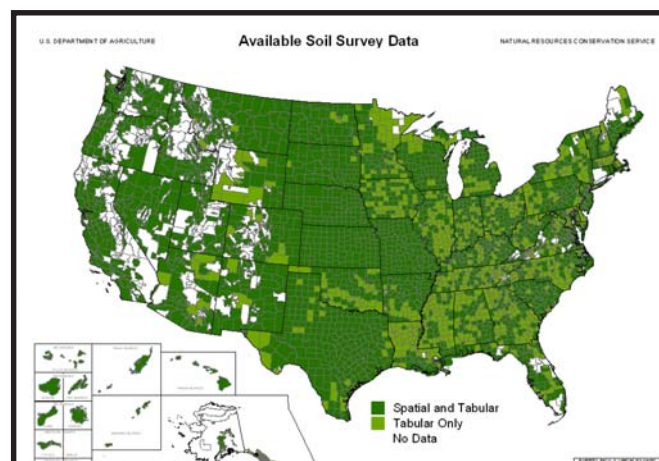
Let me share with you my immediate priorities — four activities vital to our mission of providing high-quality data and information to people on the land.

Web Soil Survey (soils.usda.gov/survey)

In June of this year, we will give the public its first look at a new web-based interface for easy access to soil survey information. This Web Soil Survey will utilize the Soil Data Mart and offer tables, text, and printer-friendly maps and legends, as well as digital products for geographic information system (GIS) users. As part of the initial functionality, the capability to view soil maps, interpretive maps, and tables and the option to download tabular and spatial data will be available for the 2,100 existing digital soil surveys, with approximately 800 additional digital soil surveys to be added over the next 3 years.

By 2006, the interface should have enhanced capabilities, allowing users to query data and print out tailored reports from a limited number of surveys that have the traditional manuscript (complete with narrative) online. Narratives eventually will be added for all soil surveys. By 2007, we expect to make all soil survey information available online as mapping is completed and approved.

Although we are probably several years away from our ultimate goal of having all 3,300 soil survey areas available as a seamless digital web-based product, what we have to offer today is revolutionary. Web Soil Survey will provide the public with current official soil survey data that is consistent with data used in the field office customer toolkit and field office technical guides.



Remote Sensing Laboratories (www.nrcs.usda.gov/technical/NRI/labs.html)

Completing all the logistics required to get our regional Remote Sensing Laboratories (RSLs) fully staffed and operational is critical to the National Resources Inventory (NRI), which is at the heart of our information mission.

The RSLs are essential to the Annual NRI. They will—

- Ensure the credibility of the NRI through strict adherence to rigorous data collection and quality assurance protocols based on scientific principles,
- Keep abreast of, and invest in, state-of-the-art digital technology that would be cost prohibitive in a distributed environment, and
- Meet the timetable of the new Annual NRI by quickly and efficiently processing and interpreting aerial imagery as it is delivered (from early spring through the fall).



RSL experience with the very latest in high-end computer and file management technology could have exciting spin-off applications in other areas of our technology program. But most important is the contribution that the RSLs will make in providing high-quality NRI information. The NRI has an increasingly central role in farm policy development, strategic planning, and the establishment of national, state, and local conservation priorities.

I cannot overstate the importance of the NRI to our mission and as a scientific foundation for the third priority I wish to share with you – the assessment of conservation effects.

Conservation Effects Assessment (www.nrcs.usda.gov/technical/NRI/ceap/)

The Conservation Effects Assessment Project (CEAP) is a mission-critical interagency effort, led by NRCS and the Agricultural Research Service (ARS), to respond to an outcomes-driven business environment. The focus of CEAP is to provide scientifically credible estimates of the environmental benefits of conservation practices. The scope of CEAP includes practices implemented as part of the Environmental Quality Incentives Program (EQIP), Conservation Reserve Program (CRP), Wetlands Reserve Program (WRP), Wildlife Habitat Incentives Program (WHIP), Conservation Technical Assistance (CTA), Conservation Security Program (CSP), and Grassland Reserve Program (GRP).

The information that flows out of CEAP will be used to report progress to Congress on the environmental effects of implementation of conservation programs in the 2002 Farm Bill, inform discussions on conservation policy development, guide program implementation, and ultimately influence conservation choices made by farmers and ranchers.

Our partnership with ARS and other agencies puts the very best science behind this project. There are two main components – the National Assessment component and the Watershed Assessment Studies component. The National Assessment will provide estimates of conservation benefits at a national and regional scale utilizing the NRI sampling frame, existing environmental models, and farm-level information gathered through a National Agricultural Statistics Service (NASS) survey. The Watershed Assessment Studies – the research component

of CEAP — will provide detailed assessments of conservation practices and their observed effects in selected watersheds.

Currently, CEAP is defined to be a five-year project. We do not expect, however, to have scientifically credible estimates for all conservation practices, all land use categories, and all resource concerns by the end of the five years. During these five years, as much progress will be made as possible within budgetary constraints. Our intention is to build a solid foundation and a sound process for continuing the effort as an on-going and integral part of conservation program implementation.

International Conservation Activities

The fourth priority I wish to share with you — outreach through International Conservation Programs — has long been a part of our technology transfer mission. You need only look at the work we have been doing in Afghanistan to see the importance of that mission. Of the 16 to 18 USDA employees sent since 2003 to help this war-ravaged country with agricultural reconstruction, 6 have come from NRCS. These NRCS specialists have tackled a variety of projects, including water management and irrigation systems, farm-to-market roads, animal health issues, farm planning (including a specification for land mine removal), crop variety trials, and addressing alternative livelihoods to poppy production.

Our international work is challenging and rewarding, providing us opportunities to be true ambassadors for conservation and our Nation. The rewards, however, come not just from helping others; they also come from ideas and technologies that we bring home from our work with other cultures and landscapes. I encourage all of you to look for opportunities to serve and to learn through our international programs.



Exciting opportunities to serve conservation surround us. Along with those opportunities, however, comes the responsibility to translate into useful information the data we gather and the experience we gain on the American countryside and across the global landscape.

TECHNOLOGICAL ADVANCES

#1 Enhancing Estimates of Error at the Soil Survey Laboratory, National Soil Survey Center

Soil standards (certified reference materials or control samples collected and repeatedly analyzed) are employed for quality control at the Soil Survey Laboratory (SSL). The rule used is if the measured analyte for a soil standard is out of an accepted range, the other data collected with it are invalid.

The principle source of precision error estimates for most analyses run at the SSL has been the data on soil standards. Error (+ or -) estimates at a specific confidence level, typically 95%, are readily calculated. It is understood that the unique properties of a soil standard make the error estimates applicable only to that soil standard and not to the range of results obtained from unknown soils; however, the error estimates have also served as ballpark error estimates for unknown soils.

To enhance our precision error estimates for unknown soils, a decision was made in FY2004 to periodically run randomly chosen unknown samples in duplicate to develop more representative estimates of precision error than can be afforded by data from a soil standard. Soil standards will continue to be used to monitor accuracy; however, running duplicates of samples will provide information on the variance of analytical results.



Analyzing duplicates of samples is not a new concept at the SSL. Our research soil scientists routinely request duplicate analyses on unknown samples when investigating developmental analyses. This practice is being introduced for established production analyses as well. The enhanced precision error estimates will add value to the precision error products available to our customers.

The work to schedule duplicates and recall/organize data is not insignificant, and our Laboratory Information Management System (LIMS) team is including automated, random duplicate sample scheduling in version 2 of LIMS to be rolled out presently. This will be an internally very useful, timesaving feature for increased efficiency at the SSL.

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#2 Wind Turbine Impacts on Birds and Bats

Wind turbine energy developments are becoming a commonplace landscape feature. Wind turbine farms are located across the nation from Maine to California and Minnesota to Texas. These structures have the potential to kill both birds and bats. The size and spacing of wind turbines and the location on the landscape of wind farms will determine the extent to which impacts will occur. Wind turbines located in forested areas appear to have a much greater impact.



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To understand the relationship of wind energy developments and avian and bat mortality, the National Wind Coordinating Committee Wildlife Workgroup was formed in 1994. The initial purpose was to provide a forum for dialogue among researchers, conservationists, wind industry representatives, and federal, state, and local officials. The workgroup has produced a Fact Sheet that summarizes what is known about bird and bat-wind interaction and what questions remain. The Fact Sheet and other available information can be accessed at www.nationalwind.org.

We are in the early stages of wind turbine development in this country and around the world. Wind turbines appear to be getting much bigger and taller. Expansive farms are being placed in water areas in some parts of the world. This will likely increase the interface of individual turbines and migrating birds and bats. However, the number of turbines per wind farm will likely decrease and this could be positive. As research results become available, the opportunity to more carefully site wind farms and to achieve turbine design that will be more sensitive to bird and bat impacts may be possible. At present, the magnitude of the potential problem, in terms of overall avian and bat population dynamics, is not yet fully understood. It is clear that wind farms are going to be an ever increasing landscape feature and there will be bird and bat losses associated with such developments.

#3 Biodiversity Values of Geographically Isolated Wetlands

NatureServe is assessing the biodiversity values associated with isolated wetlands. The study is being funded through a Wetlands Program Development Grant from EPA. Based on their existing data base, 20 states have been analyzed and by September 2005 the remaining 30 states will be added to the analysis. Preliminary data from the first 20 states will be published and available at www.natureserve.org by late January.

Key findings include:

- More than half of isolated wetland types support federally listed species. Isolated wetlands within the 20-state study area harbor 72 federally listed species, of which nearly half (35) are completely dependent on isolated wetland habitats for their survival.
- Isolated wetlands support a total of 345 plant and animal species classified by NatureServe as imperiled or vulnerable.
- At a state level, an average of 14 percent of all at-risk plant species are found in isolated wetlands.
- About 10 percent of vegetation associations classified by NatureServe as imperiled or vulnerable are characteristic of isolated wetlands.



#4 Turtle Population Demography: Planning considerations for addressing human impacts and declines in long-lived organisms

Long-lived organisms tend to share a suite of life history characteristics which make them particularly susceptible to population decline and extinction in a developing landscape. The suite of life history characteristics includes: highly variable reproductive success (relative, even successful years aren't that great), low hatchling/juvenile survivorship, delayed sexual maturity, and high adult survivorship.



An evaluation of the literature on turtles consistently demonstrates the necessity of protecting breeding adults to be successful in reversing population declines. Good buffers can be just as important as wetlands for aquatic and semi-aquatic turtles. Terrestrial impacts disproportionately affect female turtles which are exposed more because of nesting forays. The presence of roads near a wetland is correlated with altered population structure (high male to female ratios) which is a part of the pattern documented in the extinction of several turtle populations. Other major problems include collection for the pet trade, consumption, fishing nets (crab pots for diamondback terrapin)/trawling (sea turtles), agriculture, and lawn maintenance. Essentially, anything that removes adults and sub-adults from the population.

TECHNOLOGY TRANSFER

#5 Biomass Research and Development Initiative Grants

Biobased products have the potential to revolutionize the way we produce and consume energy and industrial products in the United States. Biomass can be used to produce **electricity, liquid, solid, and gaseous fuels, heat and chemicals**. It is estimated that biomass has the potential to provide by 2020 five percent of total industrial and electric generator energy demand, ten percent of transportation fuel consumed and 18 percent of chemical products. Realizing this potential, however, will require significant developments in research and development in order to remove the barriers to greater use of biomass technologies.

The U.S. Department of Agriculture (USDA) and the U.S. Department of Energy (DOE) recently announced the availability of up to \$15 million fiscal year 2005 (FY05) grants for biomass, biopower biofuels and biobased chemical research and development. The purpose of the Initiative is to promote greater innovation in the development and commercialization of biomass and biobased products.

The Initiative is authorized by the Biomass Research and Development Act of 2000 (7 U.S.C. 7624 note; Public Law 106-224) as amended by Section 9908 of the Farm Security and Rural

Investment Act of 2002 (26 U.S.C 7624 note). The Initiative directly supports Federal policy calling for greater use of biomass products in meeting energy and other chemical based product needs.

NRCS, as the home of the Initiatives Grants Program for USDA, funded 13 projects in FY 2004 totaling almost \$13.2 million. Priorities emphasized in the selection of projects for funding were the development and production of biomass feedstocks and biobased products; biomass focused forest management training, in support of Title II of the Healthy Forest Restoration Act of 2003; and identifying incentives for biomass and biobased product production. Work also continued on 15 FY 2003 grants that focused on the use of anaerobic digesters, biodiesel production, improved methods of ethanol production and biobased products.

This year's solicitation is more focused and defined than in previous years, as it will place greater emphasis on projects that lead to the commercialization of biomass technologies. Topic areas being addressed in this year's solicitation are Feedstock Development and Production, Biobased Products Development and Environmental and Economic Performance, Integrated Resource Management and Biomass Use, and Incentive Analysis for Commercialization.

Feedstock Development and Production targets two important needs: development of agricultural and forest feedstocks with high commercial potential and the development of management systems and decision tools for assessing the economic potential for feedstock production.

Biobased Products Development and Environmental and Economic Performance targets the need for gaining a greater understanding of the sustainability and environmental performance of biobased products, including those that lead to rural economic development.

Integrated Resource Management and Biomass Use targets the need for greater integration of feedstock production, feedstock harvesting and recovery, product processing and economics into land management decisions in order to help communities and businesses better realize the economic opportunities available through sustainable management of crop and forest resources.

Incentive Analysis for Commercialization targets the need to identify and develop ways for firms to internalize non-market benefits of biomass and biobased goods. This includes options such as subsidies, tax and regulatory considerations, community based goals, and logos and labeling. It can also include development of markets for environmental co-products, such as trading or credit systems.

Future solicitations under the Biomass Research and Development Initiative will likely emphasize other aspects of biomass research, development, and demonstration as the USDA and DOE seek to maintain an appropriate mix of investments in their biomass research and development portfolio.

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#6 Collecting Ecological Site Information for Forestland

How does a field office employee develop recommendations for planting a riparian forest buffer under the Continuous Conservation Reserve Program? The obvious first response is to consult the Riparian Forest Buffer standard and specification in the Field Office Technical Guide for guidance. However, many standards and specifications will provide a general list of potential tree and shrub species that could be used in the riparian restoration effort. How does the field professional decide the best mix of species for the specific restoration site? If available, the field person can consult the appropriate ecological site description for the area and select suitable plant species.



With the release of the National Forestry Manual and National Range and Pasture Handbook in 1997, the NRCS made the change from range sites and woodland suitability groups to ecological sites. Since that time there has been a continuing effort to develop ecological site descriptions. Developing these descriptions requires substantial effort to collect the needed data to support the descriptions. A key source for these data is the Ecological Site Information System (ESIS) (<http://esis.sc.egov.usda.gov/>). ESIS is organized into two applications and associated databases, Ecological Site Descriptions and Ecological Site Inventory (Forestland and Rangeland). The Forestland Ecological Site Inventory (ESI) database is composed of data for thousands of inventory plots that correlate soil components to potential tree growth. The Soil Conservation Service began collecting these data in the 1940's with primary emphasis on correlating forest soils with forest productivity. Today, NRCS recognizes the need to document the relationship for forest soils and the ecology of the site. Much can be gleaned from the existing data, but there is a continuing need to collect additional information to support the development of Ecological Site Descriptions.

Field staffs responsible for collecting these inventory data are always looking for more efficient ways to accomplish this task. Recently a group in Idaho developed an ESI (Forest) Access© Database Project to assist them in the local management of their inventory data collection. Frank Gariglio, NRCS-Idaho State Staff Forester; Mark Kimsey, University of Idaho; and Nora Abbott, Computer Consultant; were the developers for this application.

The purpose of this application is to provide a local database of inventory data that can be used as a management tool during the course of a soil survey. Plots are taken during a field season and accumulated in the local Access© database. This helps the local staff track the number of plots taken on key soil components and plant communities in order to have statistical accuracy. Any changes to soil component names during the field season for the collected plots can be made before the plot data are uploaded to the national ESI database. This application also allows for uploading the entire contents of the local Access© database to the national ESI database instead of having to enter each individual plot into the online ESI form. This project is in the final stages of development and is under review for possible enhancements and applicability nationally.

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PERSONNEL

#7 Puckett Named Deputy Chief



Dr. William E. Puckett was named the Deputy Chief for Soil Survey and Resource Assessment in January 2005, replacing Maurice Mausbach. He has overall responsibility for the National Cooperative Soil Survey Program, the National Resources Inventory Program, geospatial activities, resource assessment and policy analysis, climate change activities, the agency's international programs, and homeland security.

Prior to this position, Dr. Puckett served as Director of NRCS's East National Technology Support Center in Greensboro, North Carolina.

Dr. Puckett has held numerous positions with NRCS. He began his career in 1983 as a field soil scientist in Florida. He became State Soil Scientist in Oklahoma in 1991, and two years later he was named Assistant State Conservationist for Operations in Oklahoma. In 1995, he moved into an Operations Management position in the South Central Region office in Ft. Worth, Texas. In 1997, he joined the Oversight and Evaluations staff in Atlanta, Georgia, and from 1999 to 2001 he served as a Major Land Resource Area Leader for soil survey in Auburn, Alabama. From 2001 to 2004, he served as Director of the Soil Quality Institute.

He holds a Bachelor of Science degree in agronomy and a Master of Science degree in soil physics and mineralogy from Auburn University. He received a doctorate in soil genesis and classification from the University of Florida.

Dr. Puckett has received many awards throughout his career. They include the Berg Fellowship from the Soil and Water Conservation Society as well as accolades from Phi Kappa Phi, Sigma Xi and Gamma Sigma Delta Honor Societies.

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