

“USDA NRCS Technology News” ~ December 2001

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Science and Technology

“USDA NRCS *Technology News*” is a monthly electronic information piece provided by Science and Technology. It is designed to deliver 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. “USDA NRCS *Technology News*” is in a format that is available to all NRCS field staff.

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MESSAGE FROM THE DEPUTY CHIEFS

Lawrence E. Clark and Maurice J. Mausbach

A fragile insect has become a metaphor in recent debates over the potential impacts of bioengineered crops on the environment. Ever since scientists at Cornell University and Iowa State University released research indicating that monarch butterflies died after ingesting the pollen of genetically engineered corn, there has been a flurry of activity to either replicate or disprove the studies' results. In an August 2001 technical briefing, the Environmental Protection Agency (EPA) concluded that "Bt corn, genetically engineered to make its own pesticide, poses little risk to monarch butterflies, and while there is a small chance that 1 in 100,000 monarch caterpillars could be affected by toxic pollen, research suggests that even these larvae will mature into healthy butterflies. (1) EPA reiterated its message in October, when it announced, "...engineered corn...is not a threat to human health or the environment." (2)

In September, the New York Times also reported that a large number of new scientific studies say the corn is having "virtually no effect." Still, scientists debate whether it is the pollen, other plant parts, both pollen and plant parts, or none of these, that might impact the monarch caterpillars. A professor of entomology at the University of Illinois who edited several of the new studies, commented, "I don't think there's a near and present danger." So, as the Times article points out, the "debate is far from ended." (3)

Meanwhile, the monarch butterfly goes on with its life. It embodies an interesting and complex life cycle that has fascinated and puzzled entomologists, environmentalists, and others for many years. Every autumn monarch butterflies make amazing migrations. Those born on the East Coast fly thousands of miles south to Mexico. As one author writes, the still unanswered question is: How do monarch butterflies, "millions of them, end up every year in the same unlikely spot, a remote and largely inhospitable 50 acres of oyamel pine forest 10,000 feet up the southwestern flank of Mexico's Transverse Neovolcanic Mountains?" (4) The migration cannot be explained by memory or patterning, because no single butterfly ever makes the round trip.

While the debate on the impact of bioengineered corn on monarchs continues, they are encountering other threats that may be even more important to their survival. For one, monarchs are unable to migrate at night, as many songbirds do, to evade predators. If the temperature goes below 55 degrees they become sluggish and unable to fly. For another, of the 106 known species of milkweed, only about 16 are suitable for monarchs to lay their eggs. These are the species that provide the cardiac glycosides that render monarch butterflies poisonous to most birds. Finally, despite the efforts of the Mexican government and environmental organizations, many of the oyamel fir trees in Mexico where monarchs spend their winters are being lost to Mexican logging interests.

It is apparent that the monarch butterfly is not only a metaphor in the bioengineering debate, but also a metaphor for the intricate balance of humans and nature, constantly challenged by the introduction of new technologies. Milkweed plants, oyamel pines, predators, weather—all are part of a sensitive network that sustains the monarch, just as

there are other important networks that sustain other species. Those of us who devote our lives to natural resource conservation, and who use and develop new technologies, would do well to look to the example of the monarch. This is the essence of resource management planning, where we look not at a single conservation practice but at the total environment and all of the natural interactions within it.

1. "EPA Claims Monarch 'Not At Risk' From Bt Plants," News Release, Environmental Protection Agency, August 2001.
2. "EPA Calls Biotech Corn No Threat," The Washington Post, October 17, 2001.
3. Pollack, Andrew, "New Research Fuels the Debate Over Genetic Food Altering," The New York Times, September 9, 2001.
4. Halpern, Sue, Four Wings and a Prayer: Caught in the Mystery of the Monarch Butterfly, Pantheon Books, New York, 2001.

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CONSERVATIONIST'S CORNER

Shirley Gammon, State Conservationist, Montana

Tools developed by the NRCS Grazing Lands Technology Institute (GLTI) and the Soil Quality Institute (SQI) are helping Montana conservationists reach our goal of providing private landowners with high quality natural resource information and conservation planning excellence on grazing lands and cropland.

Following guidance from the "National Range and Pasture Handbook," rangeland management specialists in Montana began the process of updating 700 site descriptions across 14 major land resource units in 1999. Ecological site descriptions are one of the foundation pieces of applied science used by NRCS staff to inventory and assess rangeland condition and potential. The increased information and knowledge regarding native plant communities will be very beneficial to NRCS staff and our Agency partners to better describe the existing condition of rangeland resources and to understand management options available to improve these resources.

The GLTI has been instrumental in assisting the Northern Plains States with this task. They have provided us with a sound, consistent scientific framework for new site descriptions that has the approval of all western rangeland universities in the country. They have provided high quality examples of the new site description format and are available to discuss concerns and issues related to this task.

NRCS Montana has also strengthened its resource conservation work by implementing several soils quality tools. Through association with and work of the SQI, Montana collaborated with North Dakota to develop the "Mon-Dak Soil Quality Score Card," which allows producers to evaluate and track soil quality on their farms in an effort to improve sustainability. Through the work and cooperation of the National Soil Survey Center, the "Soil Conditioning Index" was adopted. It predicts the effects of management on soil organic matter, a primary indicator of soil condition.

Historically, cropland management systems in Montana have had adverse effects on soil health. In an effort to assess and identify cropland condition, Montana has worked closely with the Watershed Science Institute in the adoption of the “Cropland Health Worksheet.” This is a guide and training tool for assessing resources and identifying resource conditions or problems in cropland.

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NEW PRODUCTS AND SERVICES

#1 Historical Ecology Handbook Distributed

“The historical ecology handbook: A restorationist’s guide to historical ecosystems,” published by the Society for Ecological Restoration, was recently distributed by the National Plant Data Center to State Conservationists. The book explains tools and processes, along with the importance of learning about the history of the land when undertaking ecological restoration. The book is of particular interest to persons involved in ecosystem restoration and “in the long and laborious job of building a permanent and mutually beneficial relationship between civilized men and a civilized landscape” (Aldo Leopold 1934).

Chapter 2, “The contribution of ethnobiology to the reconstruction and restoration of historic ecosystems,” was written by a National Plant Data Center ethnoecologist, Kat Anderson.

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#2 Planting Guide Available for Northern Plains Wildflowers

A concise, 1-page planting guide is available for five native wildflowers recently released for the Northern Plains by the Plant Material Centers (PMC) in Montana and North Dakota. The front side of the guide displays full color images of the seed and bloom of Antelope Germplasm slender white prairieclover (*Dalea candida*), Bismarck Germplasm purple prairieclover (*Dalea purpurea*), Bismarck Germplasm stiff sunflower (*Helianthus pauciflorus*), Medicine Creek Germplasm Maximilian sunflower (*Helianthus maximiliani*), and Bismarck Germplasm narrow-leafed purple coneflower (*Echinacea*

angustifolia). On the other side, the guide provides plant characteristics, seeding dates and rates, and adaptation information.

The guide may be obtained from the PMC in North Dakota or downloaded online at <http://plant-materials.nrcs.usda.gov/pubs/ndpmcpg2000rel.pdf>.

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TECHNOLOGICAL ADVANCES

#3 Lake Stage Indicators Developed Using Subaqueous Soil Morphology

In an effort to protect its water resources from significant harm, Florida has passed legislation mandating minimum flows and levels on its lakes, rivers, springs, and aquifers. To describe the fluctuating hydrology of lakes, Florida has defined the frequent high (FH), average (AVE), and frequent low (FL) levels as the lakeshore elevations that are flooded 20, 50, and 80 percent of the time, respectively. Lake stage indicators (LSIs) are used to determine the historic FH, AVE, and FL of lakes that have few or no stage records. In the past the state has relied on vegetation-based LSIs. However, due to the seasonal and annual changes that occur in vegetation, soil morphology-based LSIs have become more desirable because they persist through wet and dry cycles and offer permanent lake stage markers.

Technology that uses soil morphology for the identification and delineation of jurisdictional wetlands has been in use for a decade or more. A National Soil Survey Center soil scientist working with a University of Florida graduate student has successfully extended the technology to much wetter ecosystems that have subaqueous soil. By correlating lake stage data with subaqueous soil morphology, reliable LSIs for FH, AVE, and FL levels have been developed for north central Florida's Lake Lowry and Lake Magnolia, two recharge sandhill lakes of the central Florida sand ridge. These indicators can be applied to hydrologically similar lakes on similar landscapes that have little or no stage data. Soil morphology-based LSIs are being identified for other types of recharge sandhill lakes. When this work is completed, identification of LSIs will begin for discharge lakes, rivers, and springs.

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TECHNOLOGY TRANSFER

#4 Lime Application Demonstration Study Initiated

The Watershed Science Institute and National Water Management Center have joined with the University of Arkansas, Pine Bluff, in a five-year demonstration study on the benefits of lime application to acidic soils. The study, conducted at the University Research and Demonstration Farm at Lonoke, Arkansas, will demonstrate the effect of different liming rates on soybean and sorghum production. The study's objective is to determine the impact of raising the soil pH on crop yield and net income of limited resource farmers in the area. The cost of adding lime to an acid field will be weighed against the expected increase in yield and subsequent gross income. A net increase or decrease in farm income will be calculated. As the net income will depend on the price of the crop, a "break even" price will also be determined.

The anticipated benefits of applying lime to acidic soils where soybeans are grown include increased growth and yield, decreased weed and, possibly, pest pressures, decreased erosion, and improved nutrient uptake efficiency. When combined with other conservation practices, such as nutrient management, pest management, and conservation tillage, the addition of lime can eventually lead to improved soil quality and increased income for Arkansas limited resource farmers. The study will help Arkansas farmers visualize the benefits of lime and determine whether applying lime to their acid soils will be economically beneficial.

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#5 Plant Materials Center Assists Montana Conservation District

In 2001, Plant Materials Center (PMC) staff in Montana assisted the McCone County Conservation District with establishment of a 17-acre conservation plant demonstration area on a site that is 2,500 feet in elevation and receives 12 to 13 inches mean annual precipitation. The seed was purchased by the district through a Grazing Lands Conservation Initiative grant and planted with a PMC seed drill. A total of 66 plots was established, consisting of individual cool-season and warm-season grasses, legumes, wildflowers, shrubs, and grass and grass plus shrub mixtures. Tree and shrub seedlings—for windbreaks, buffers, and wildlife applications—were also planted to display the various woody species adapted to McCone County.

The conservation district will maintain the planting and organize tours for local landowners to learn about new plant cultivars available for conservation practices.

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#6 Tour Demonstrates Effective Long-term No-till Systems

Compaction and declining yields may plague some long-term no-till systems, but this is not inevitable. At the recent Soil Quality in Action Tour, farmers and local conservationists in the North Carolina Piedmont Region demonstrated several effective cropping systems under long-term no-till that allow intensive production while generating enough residue to protect soil quality. The tour highlighted the efforts of local farmers to improve the quality of their soils through innovative crop rotations and tillage systems. Researchers from the area and the local farmers presented their perspectives on the benefits and economics of enhancing soil quality.

Approximately 70 scientists from throughout the world attended the tour that was sponsored by the Soil Quality Institute and the Soil Science Society of America and organized and guided by local NRCS and conservation district employees. The tour was held in conjunction with the annual meetings of the American Society of Agronomy, Crop Science Society of America, and Soil Science Society of America.

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WEB-BASED TECHNOLOGY

#7 New SCAN Site Installed

A new SCAN site to enhance soil-climate monitoring was recently installed at the Agriculture Research Service (ARS) research farm in Maryland. The site provides hourly soil and climate information via meteor burst communication technology. Precipitation, air temperature, relative humidity, windspeed, wind direction, solar radiation, and soil moisture and temperature are measured. Data are available in near real-time on the National Water and Climate Center's Web site at <http://www.wcc.nrcs.usda.gov>.

Funding for the SCAN site was partially provided by ARS. Some of the equipment came from one of the original Soil Moisture/Soil Temperature pilot project sites that has been decommissioned. A briefing on why interest is growing in the SCAN technology and a tour of the site were attended by NRCS and ARS headquarters personnel.

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#8 Plant Information Search Made Easier

The PLANTS "Advanced Query" is online. You can now query for all of the information contained in PLANTS. Do you want a list of the U.S. native conservation plants that are fire resistant and known to occur in California? How about the conservation grasses or grass-likes that grow at a pH of less than 4, are known to occur in Texas, and are native to the U.S.? You can bring this information into your browser or download it. Click on the "Advanced Query" on the PLANTS home page <<http://plants.usda.gov>>. The query form allows you to check off the core attributes for 41,000 plants and/or the additional 100 attributes for the 2,000+ conservation plants (the plants for which extended plant characteristics are available).

If you are processing a large or complex query, please download the data. The data set could be so large that it will not load into your browser. Note that at the top of the query

form, you can elect to “query the PLANTS database and download the results without display.”

For more information, contact:

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#9 Social Sciences Institute Web Address Changed

The new web address for the Social Sciences Institute is <http://www.ssi.nrcs.usda.gov/ssi/>. Please update any links you may have to older addresses (i.e. people.nrcs.wisc.edu).

For more information, contact:

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#10 “The Leader in You” Web Page Updated

Updated information on “The Leader in You,” a self-paced training program designed to enhance the skills of all levels of The Conservation Partnership, is now available on the Social Sciences Institute (SSI) Web site. The updated format includes a program summary, descriptions of the available videotapes, and a link to request a tape for viewing. “The Leader in You” Web page is at the SSI Web site <<http://www.ssi.nrcs.usda.gov>> under “Training.”

“The Leader in You” tape series provides training from nationally known authors and experts at no cost to employees and directors of the sponsors. Training topics are divided into the following categories: Tools for Collaborations and Community Building, Leadership Development, Manager Skills, Managing Change, and Marketing. Each tape may be borrowed for 2 weeks and copies can be made for viewing within The Conservation Partnership. Handouts are included with each training tape. The most recent satellite seminar, “Change and Leadership” featuring Tom Peters, is available.

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USDA NRCS TECHNOLOGY NEWS

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