Partnering to achieve conservation goals
Edward B. Knipling, administrator of the USDA Agricultural Research Service

The Agricultural Research Service (ARS) is the in-house scientific research arm of USDA. We conduct research at more than 100 federal labs across the nation. Our research program scope is very broad, encompassing the entire food chain and including natural resources, crop production and protection, livestock production and protection, food safety and quality, biobased products, and human nutrition.

The natural resources component is a significant part, nearly 20%, of the total agency program. This research is carried out by about 400 scientists at 60 different laboratory locations. The research addresses technical issues related to soil, water, air, grazing lands, bioenergy, waste management, and sustainable agricultural systems. These programs provide science information and technology to the agricultural, land management, and environmental communities, including the USDA Natural Resources Conservation Service (NRCS).

ARS and NRCS have always had a close relationship. In fact, ARS's soil and water research programs were derived more than 50 years ago from the Soil Conservation Service, the predecessor organization of NRCS. Ever since, ARS has provided research support to the Soil Conservation Service and now NRCS.

The Conservation Effects Assessment Project (CEAP) program is an outstanding real-time example of ARS research support to NRCS and collaboration with other agencies. The 2002 farm bill represented a major public investment in conservation of working lands. Accompanying this increased investment, the United States Congress charged the Secretary of Agriculture to quantify the environmental benefits of conservation practices and to provide farmers, conservationists, the general public, legislators, and others an accounting of the value of public expenditures for conservation programs.

Within USDA, NRCS is the lead agency, but many other agencies are also involved. In addition to ARS, these include the Cooperative State Research, Education, and Extension Service, the Economic Research Service, the National Agricultural Statistics Service, the Farm Service Agency, the United States Forest Service, and others. A number of organizations and agencies outside USDA are also involved. These include universities, societies, conservation districts, nongovernmental organizations, the US Geological Survey, the US Fish and Wildlife Service, US Environmental Protection Agency, National Aeronautics and Space Administration, National Oceanic and Atmospheric Administration, and others.

When originally launched in 2003, CEAP consisted of two principal components. These are continuing:

1. National Assessments, which use existing natural resources data and models to estimate environmental effects and benefits of conservation practices. This component is principally being carried out by NRCS. Several land use categories are targeted such as croplands, wetlands, and grazing lands. Essential first steps in each national assessment were the compilation and review of relevant scientific literature to identify what is and is not known about field-level effects of conservation practices. More than 5,000 literature citations have been compiled and reviewed. The USDA National Agricultural Library, an organizational component of ARS, is heavily involved in these activities.

2. Watershed Assessment Studies to generate additional and more detailed scientific data and understandings to verify the estimated benefits of conservation practices on specific kinds of sites and to otherwise improve the models used in the national assessments. A number of agencies and partners are heavily involved in these studies.

In particular ARS is conducting CEAP research on 14 watersheds in various
regions of the country. These are termed benchmark watersheds. Emphasis is on cropland watersheds that are nonirrigated. The principal measures are water quality, water quantity (both availability and use), and soil quality parameters as related to best management conservation practices. Our economic research partners in the USDA Economic Research Service, NRCS, and universities are using the data generated to assess the economic and social factors and benefits that drive and result from the implementation of conservation practices.

Most of the 14 benchmark watersheds are sites where ARS has had a long-term presence and compiled considerable hydrologic and other environmental data over the years. But now, valuable new data are being generated from the accelerated and intensified watershed studies underway. More than 50 ARS scientists are participating in these studies at the different sites and are coordinating their research among themselves and other partners on a national basis.

In addition to the 14 ARS watersheds, there are also 23 other watersheds under study. These include 10 so-called “special emphasis” watersheds managed mainly by NRCS, and 13 other watersheds that were funded by the Cooperative States Research, Education, and Extension Service through a competitive grants program.

Scientists have recorded several notable accomplishments as a result of the CEAP watershed studies. These include the modification, refinement, and broader application of an earlier ARS-developed model, the Soil Water Assessment Tool (SWAT). Some of the newest attributes of the SWAT model include terracing and other erosion-control measures to hold soil in place and slow its journey into reservoirs; better nutrient management on agricultural land and on confined animal feeding operations to prevent algal blooms; and removal of juniper and mesquite brush to increase flow in drought-stricken areas in the Southwest.

Additionally, new algorithms developed for SWAT now look at both the solid and dissolved transport of phosphorus. Scientists are now better able to measure reductions in phosphorous levels that have occurred through conservation practices.

Overall, CEAP has helped promote the adoption of SWAT, now used by hundreds of scientists and engineers at universities, government agencies, and consulting firms throughout the world.

As many of you can imagine, massive volumes of new data have been collected in the CEAP efforts. To make this data readily accessible to both researchers and decision-makers, ARS scientists and information-technology staff have developed a Web-based agricultural research data system called STEWARDS. The program compiles, documents, and organizes information on climate, water, and soil as well as on management and economic practices.

Currently, STEWARDS is integrating data collected from eight ARS watersheds. Additional information from seven other ARS watersheds is to be incorporated by 2008. Eventually the system could include data from projects sponsored by other agencies contributing to CEAP and later expanded to the general public via a Web site.

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Turning to another area of research activity, we all know that agricultural lands can be a source of sediment in a watershed. However, urban and suburban development also are significant sources of sediment. Identifying and quantifying all sources of sediment in a watershed are key steps to instituting and assessing appropriate conservation practices. Until recently, there have been no readily available techniques for determining the primary sources of sediment in a watershed.

ARS scientists at the National Sedimentation Laboratory in Oxford, Mississippi, and others in Tucson, Arizona, compared the physical and chemical properties of suspended sediments and used mathematical models and developed methods using tracers that can estimate source, fate, and transport of carbon and sediment based on soil properties in agricultural watersheds.

Those are just a few of the accomplishments that ARS and partners have achieved as a result of the CEAP watershed studies.

Looking ahead to next steps, ARS is taking on a new active role in the Mid Atlantic Regional Wetlands Assessment. Additionally, ARS is working with NOAA to assess the newest special emphasis watershed, Jobos Bay, Puerto Rico. This is the first tropical watershed in CEAP.

The scope of CEAP is being broadened to include a grazinglands national assessment. It is just getting underway and will be a major new and future focus of the interagency CEAP team in the coming years. NRCS has asked ARS to lead the efforts in documenting the environmental benefits or impacts of five major areas of concern on grazing lands. These are prescribed grazing, fire, invasive species, brush management, and water quality.

As with our efforts for the cropland CEAP, the first phase of the grazing lands initiative is to document what is known and uncover our knowledge gaps. During 2006, the National Agricultural Library published the sixth CEAP bibliography—*Environmental Effects of Conservation Practices on Grazing Lands*.

The second phase will produce a landmark synthesis of findings, to be published by the Society for Range Management, on long-term effects of conservation practices upon rangelands, pastureland, and grazable woodland.

The third phase of the project will be to organize the ARS research locations to conduct coordinated research on grazing lands to document conservation impacts and to develop decision support tools for land managers.

NRCS and ARS have selected the five-state Great Basin region of California, Nevada, Oregon, Idaho, and Utah to begin this phase. Seven new ARS sites in this western rangelands region and at a few other places will join our overall CEAP research program in 2008. Ultimately, 15 or more sites will be involved, including eastern pasturelands.

As the grazinglands national assessment and supplemental research studies on the specific sites get underway, the original purposes and goals of CEAP as well as new ones will be addressed.
The original objectives of course were to determine the effects, benefits, and cost effectiveness of conservation practices on the environment. Even more important as we go forward will be to determine a rigorous science basis for how to design, implement, and manage conservation programs and practices to more effectively meet environmental goals and achieve desired benefits for agricultural and associated ecosystems.

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This is the so-called blueprint concept and change in direction for CEAP that an external Blue Ribbon Panel, earlier established by the Soil and Water Conservation Society, so strongly endorsed in their reports in 2005. Future ARS activities, as we continue ongoing watershed studies and take on the new grazinglands initiative, will be in accordance with the panel’s recommendation and blueprint.

I would like to share my views regarding the impact CEAP has had on ARS. There are four such impacts I would like to highlight, all of which are somewhat interrelated:

First, CEAP has served as an important reminder and reaffirmation to ARS, both to the agency as a whole and to individual scientists, that as the research arm of USDA we have a responsibility to serve the action agencies of USDA by developing the science information and technology they need to formulate policy and carry out their programs. In the case of CEAP, this ARS responsibility is largely to NRCS as a customer agency. We also consider other natural resource management agencies and stakeholder organizations as important customers in this regard.

Second, CEAP has helped achieve a valuable natural resources program focus within ARS. As a federal agency, ARS has a national responsibility. Yet, because our many laboratories and work sites are highly decentralized across the United States, it is a challenge to pull all the scattered research activities together in a coordinated and coherent manner to serve a clear common purpose. CEAP has allowed ARS to achieve just that and to show that all the pieces fit together in a complementary fashion and add up to a true national program. I would like to acknowledge a few ARS people that have played key leadership roles in this national coordination. They include Al Dedrick, Dale Bucks, and Clarence Richardson, all now retired but still working on behalf of CEAP. Their previous CEAP coordination work is being continued by others in ARS from headquarters and in the field, including Mark Weltz, Mark Walbridge, Ev Byington, Jean Steiner, and John Sadler.

Third, the CEAP national assessments and ARS watershed studies have brought fresh visibility to the value and utility of past ARS research. This includes the new use of natural resource models previously developed and of historical environmental databases that were recorded over many years from our long-term watershed sites. The new CEAP activities, in some cases accompanied by new financial resources from NRCS and other sources, have brought new vitality and purpose to the data collection efforts on these watersheds.

Finally, as we all have learned, principal features and outcomes of CEAP are the building and strengthening of partnerships to achieve common goals. Much has already been said about partnerships by way of example, but I will emphasize again the value ARS places on and the benefits we have received from all the associations and collaborations we have had with other federal agencies, universities, nongovernmental organizations, state agencies, landowners, and the like. CEAP has become a true model not only for cooperation but also for achievement of conservation goals.