United States Department of Agriculture
Natural Resources Conservation Service
Helping People Help the Land

Conservation Effects Assessment Project
CEAP Highlights

December 2007

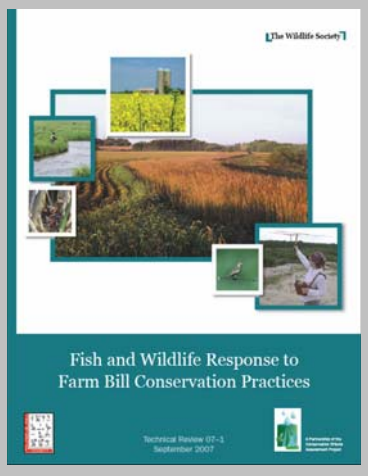
Wildlife Literature Review Addresses Conservation Practice Benefits

Below are key findings from *Fish and Wildlife Response to Farm Bill Conservation Practices (Technical Review 07-1)*, a CEAP literature synthesis published in September 2007 by The Wildlife Society in partnership with NRCS and the Farm Service Agency.

Summary Findings

- Considering wildlife in the planning of practices is key to achieving wildlife benefits.
- Wildlife response to grass establishment is significant, but variable by species, cover, management, and other factors.
- Linear practices promote high use by wildlife, but with limited reproductive success. With proper planning and management, they can result in substantial landscape biodiversity benefits.

New Release



This new publication and its companion volume -- *Fish and Wildlife Benefits of Farm Bill Conservation Programs* (TWS Technical Review 05-2) -- are available on the CEAP website.

- Wetland establishment practices substantially benefit wildlife.
- Stream restoration and other practices affecting streams benefit aquatic biota, but landscape factors must be considered.
- Overall, effects of individual practices on fish and wildlife depend on many factors.

Key Findings by Chapter

Effects of Cropland Conservation Practices on Fish and Wildlife Habitat

- Historically, agricultural intensification has negatively impacted grassland, wetland, and forestland wildlife. Soil and water conservation practices provide some habitat on cropland landscapes.
- Little has been published documenting specific effects of most soil and water conservation practices on terrestrial wildlife habitat. However, conservation practices that reduce soil erosion and sediment delivery or that otherwise improve the quality of runoff water play significant roles in improving aquatic habitat quality.
- Conservation tillage benefits some species (beneficial insects, invertebrate food sources for birds and mammals).
- No-till provides greater wildlife benefit (nesting and winter food and cover) than more intensive tillage systems.
- Grassed waterways are used for bird nesting (and re-nesting following disturbance of other habitats), but nest success is low due to predation and mowing.
- Grass-backed terraces provide some nesting cover and add to biodiversity in cropland systems.
- Filter strips and field borders increase wildlife use of crop fields.
- Woody hedgerows provide nesting and winter cover for birds, but may have negative effects on grassland obligate species due to habitat fragmentation.
- Landscape effects (species-specific, spatial, and temporal) confound generalizations on the value of individual practices.

Grassland Establishment for Wildlife Conservation

- Change from cropland to grassland use has had a positive influence on grassland wildlife. Grassland bird benefits have been documented; effects on other wildlife are largely unknown.
- Wildlife response to grassland establishment is a multi-scale phenomenon dependent upon vegetation structure and composition within the planting, practice-level factors such as size and shape of the field, and its landscape context, as well as temporal factors such as season and succession.
- Grassland succession makes management an important determinant of wildlife habitat conditions.
- Benefits of any management scenario to a particular species will depend, in part, on the management of surrounding sites. Additional species may benefit, but others may be excluded. Thus, the benefits of grassland establishment and management are location- and species-specific.

Agricultural Buffers and Wildlife Conservation: A Summary About Linear Practices

- Linear practices such as filter strips, grassed waterways, buffers, contour strips, riparian buffers, windbreaks, and shelterbelts originally were designed to reduce soil erosion and improved water quality.
- Most often grasses, or mixtures of grasses and forbs, are used in linear practices, although establishment of trees and shrubs is encouraged in some practices.
- Acreage enrolled in linear practices has increased in recent years. Most wildlife studies focus heavily on benefits to birds and do not address broader ecological communities.
- The small area and high edge-area

ratios limit the usefulness of these practices for wildlife.

- Buffer width, vegetation composition and structure, and landscape context all affect wildlife communities benefited.
- Positive effects are associated with longer and wider buffers, with buffers associated with or connecting other habitat practices such as blocks of cover or food plots, and with practices that are grouped on the landscape.
- With careful planning and management, applying linear practices widely within an agricultural landscape could be expected to have positive wildlife benefits compared with continued intensive row cropping.

Benefits of Farm Bill Grassland Conservation Practices to Wildlife

- Rangeland conservation practices (prescribed grazing, prescribed burning, range planting, and restoration of declining habitats) can provide wildlife benefits.
- Prescribed grazing produces both positive and negative responses by wildlife.
- Prescribed burning also has both positive and negative effects, but benefits generally outweigh detriments.
- Range planting and restoration of declining habitats benefit wildlife, but determining appropriate comparisons can be problematic. Undisturbed grassland ecosystems have greater heterogeneity and diversity, making comparisons between managed and "native" ecosystem conditions complex.
- Additional practices, including fencing, brush management, tree planting and shelterbelts, and pest management can all be used to improve wildlife habitat, although each can also cause problems for wildlife in certain situations.
- Bird responses to practices have received the greatest attention. Even for birds, considerable information is lacking, e.g., effects of practices on many species, effects of surrounding landscape factors on wildlife responses, and responses in reproductive rates or survival rates to various practices.
- Grassland ecosystems and wildlife are considered among the most at risk, and rangeland practices can be used to maintain, enhance, and restore needed plant communities and habitat conditions.

Fish and Wildlife Benefits Associated with Wetland Establishment Practices

- Efforts to restore or create wetlands have increased in recent decades.
- Most published studies describe bird response to wetland restoration, with most reporting bird communities in restored wetlands to be similar to those of natural reference wetlands.
- Studies indicate that invertebrates and amphibians generally respond quickly to and colonize newly established wetland habitats.
- Key factors correlated with wildlife species richness include wetland size, availability of nearby wetland habitats, diversity of water depths and vegetation, wetland age, and active maintenance and management.
- Knowledge gaps include the need for studies on biota other than birds and long-term monitoring of wetland condition and wildlife response over time.

Effects of Conservation Practices on Aquatic Habitats and Fauna

- Landscape management affects the condition of aquatic communities at the watershed scale.
- Land clearing, leveling, draining, tilling, fertilizing, and harvesting together create prolonged perturbations manifested in the ecological and physical conditions of streams and rivers.
- Physical damage due to channelization, erosion, sedimentation, and altered hydrology coupled with inputs of excess nutrients, pesticide contamination, and riparian clearing cumulatively diminish the quality of aquatic habitats.
- Primary conservation goals in agricultural watersheds have been to (a) control non-point source pollutants such as nutrients, sediments, and pesticides; (b) maintain adequate water supplies for crop and animal production; and (c) maintain stream/river channel stability.
- Little monitoring of aquatic biota response to stream restoration and other conservation practices has been done.
- Steam bank vegetation establishment improves aquatic habitat.
- Clearing and snagging to remove wood from streams has a negative impact on stream habitat quality and diversity.
- Dams and stream diversions reduce habitat quality and quantity for stream biota.
- Fish passage, stream habitat restoration, and livestock exclusion practices have been shown to improve aquatic habitat quality.
- Grassed waterways, riparian forest buffers, and other buffer practices designed to improve water quality benefit aquatic habitat condition,
- The complexities of effects of various conservation practices and systems on fish and macroinvertebrates, coupled with landscape management diversity, leave many questions unanswered.

Wetlands National Assessment

Monitoring Wetland Conservation-Benefits Across the Choptank Landscape

Scientists from the CEAP national assessment of wetlands (NRCS) and the Choptank Benchmark Watershed (Agricultural Research Service) are partnering to assess the effects of conservation practices on ecosystem services (e.g., pollutant reduction) provided by wetlands in the watershed of the Choptank River, a major tributary of the Chesapeake Bay. Findings will be used to assess and improve the effectiveness of conservation practices and Farm Bill programs affecting wetlands and associated lands on the Maryland and Delaware Coastal Plain. The project is an important step towards producing a national landscape analysis tool as part of the National Wetlands Monitoring Framework being developed through CEAP supported research.

The project brings together an interdisciplinary group of experts and resources from the NRCS, the Agricultural Research Service, the U.S. Geological Survey, and the University of Maryland to assess the ability of wetlands along a land use/hydrology alteration gradient to improve water quality. Project scientists will combine information gained from individual wetlands with landscape scale measurements from satellite images and other geospatial datasets. The ability to quantify ecosystem services "on the ground" and then link this information to remotely sensed data represents a powerful tool for future wetland applications such as monitoring.

Nine wetland/stream study sites have been established in the headwaters of the Choptank River Watershed, divided

equally between prior converted wetlands on croplands, lands where conservation practices to restore wetland hydrology have been implemented, and native wetlands. Approximately 50 shallow groundwater wells have been distributed across the study sites to best monitor groundwater depth and water quality. These wells and nearby surface waters will be monitored monthly and during rain events for parameters that best indicate: 1) the hydrologic connectivity of wetland sites to ground and surface waters, 2) the potential of these sites to reduce and transform waterborne agrochemicals (e.g., nitrogen and phosphorus) before their entry into ground and surface waters, and 3) the amount of denitrification occurring at these sites. The water quality and quantity data are complimented by additional field-collected data on soils, vegetation, and biota.

The synergistic potential of the ground data and multiple types of remotely sensed images – LIDAR (light detection and ranging), synthetic aperture radar, and multispectral imagery -- is being assessed, and initial results are extremely promising. Radar data has been used to create multi-temporal maps of wetland hydroperiod – the most important abiotic factor controlling wetland function and extent. Fine scale (1 m horizontal and 15 cm vertical resolution) digital elevation maps (DEMs), previously unavailable at this scale, have been created using airborne LIDAR imagery. A combination of the hydroperiod maps, DEMs, and ancillary data is being used to help determine the origin of waters flowing into different types of wetlands and the likelihood that agrochemicals are being removed from these waters before they enter adjacent streams. The ground data will be used to calibrate and validate these estimates of wetland water quality services and to extend the predictive function of the geospatial data to other important services (e.g., habitat).

The impact of this project is greatly enhanced by extending the analysis to adjacent streams and measuring the effect of wetland biogeochemical processes on stream health. Examination of the wetland/stream connection is especially timely given increasing attention on the health of the Chesapeake Bay, which carries high nutrient and sediment loads originating from agriculture.

[Contributed by Dr. Megan Lang, USDA-ARS Hydrology and Remote Sensing Laboratory, Beltsville, Maryland]

Native

Restored

Prior Converted

Examples of the Choptank Watershed's wetlands along an alteration gradient, from native wetlands, through lands where conservation practices to restore wetland hydrology have been implemented, to prior converted wetlands on cropland.

Cropland National Assessment

CEAP Cropland Component Goes Regional

The CEAP Cropland National Assessment has re-designed its plans for publishing summaries of the effects of conservation practices currently present on the landscape. Instead of a single report covering the entire country, a series of reports will be prepared for each water resource region with significant cropland acreage. The first report will be for the Upper Mississippi River Basin, with a draft report for interagency peer review scheduled for completion in August 2008. The report will be based on the full set of NRI-CEAP cropland sample points and will include both onsite effects of practices (field level) and offsite water quality effects. Regional resource concerns will be emphasized.

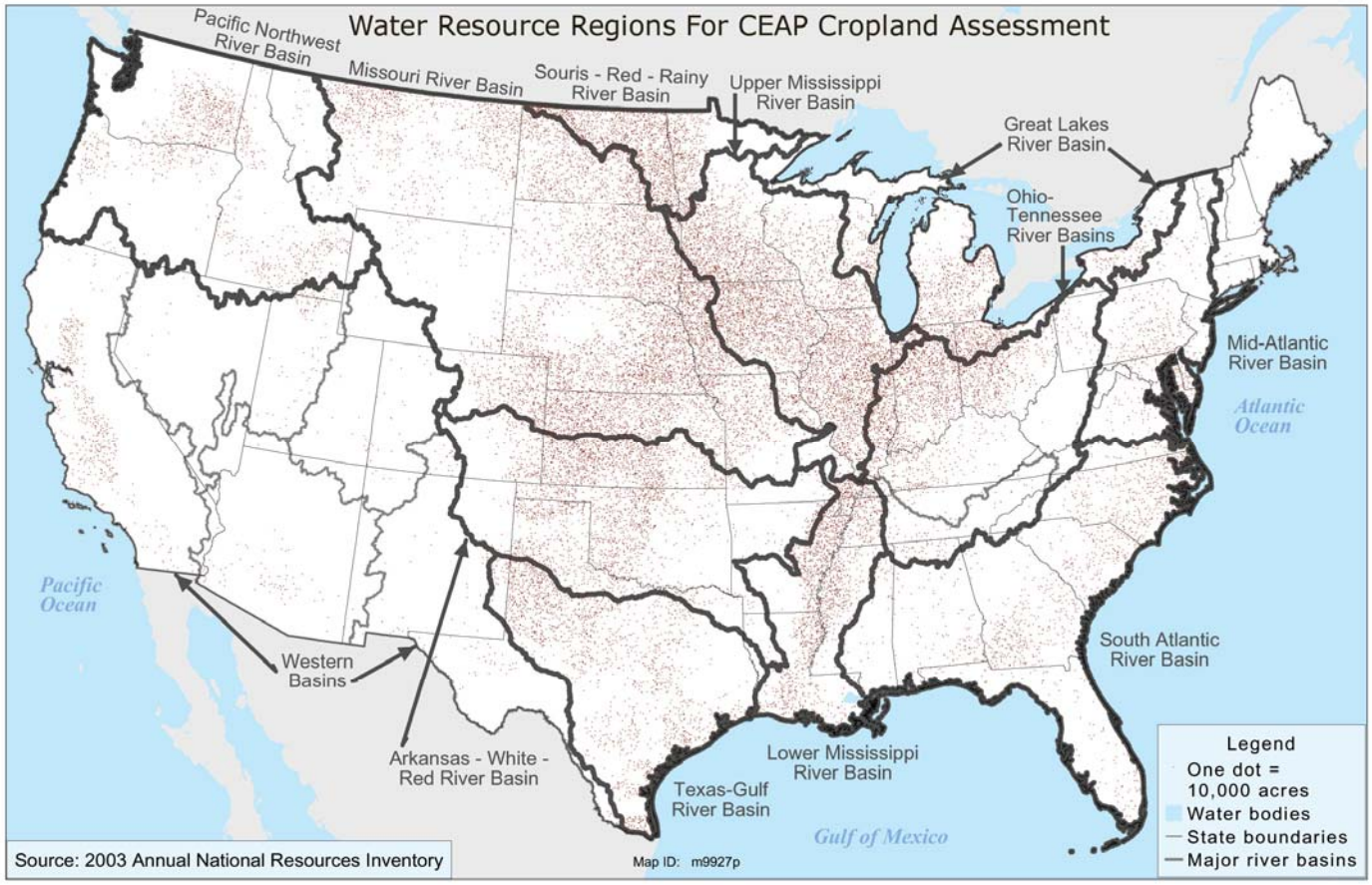
Regional reports for each of the four other basins making up the Mississippi drainage will follow—Ohio-Tennessee Basin, Missouri River Basin, Lower Mississippi River Basin, and the Arkansas-White-Red water resource region. These reports are expected to be completed by early 2009. Regional reports for remaining water resource regions—Pacific Northwest, Texas-Gulf, South Atlantic-Gulf, Mid-Atlantic, and the Great Lakes—are expected to be completed by the end of 2009.

After the regional reports are completed, a national assessment of the field-level effects of conservation practices, including a national assessment of conservation treatment needs, will be prepared.

RUSLE2 Incorporated in Cropland National Assessment Model

Researchers at the Texas Agricultural Experiment Station working with the NRCS CEAP cropland team have incorporated RUSLE2 (Revised Universal Soil Loss Equation 2) model routines into APEX (Agricultural Policy/ Environmental eXtender), the field-level model being used to assess the effects of conservation practices for the national assessment. RUSLE2 is a stand-alone model currently being used in NRCS field offices for evaluating relative effectiveness of soil erosion control practices to aid in preparation of conservation plans. The field office also uses RUSLE2 to report expected reductions in soil erosion associated with conservation plans. This model upgrade enables the CEAP estimates of soil erosion effects and benefits to correspond more closely to agency practice standards.

The addition of RUSLE2 also allows for the use of the Soil Tillage Intensity Rating (STIR) component and the Soil Conditioning Index (SCI) in CEAP analysis. This enables the CEAP team to examine relationships between conservation effects and tillage intensity, cropping systems, and soil types. Specifically, it is now possible to examine the consequences of periodic shifts in tillage intensity or "rotational tillage." We can now estimate how much is lost in terms of previous conservation gains when a producer temporarily shifts to the use of conventional tillage, and we can also determine how much conservation is gained by seasonal adoption of conservation tillage.



Watershed Assessment Studies

CSREES Watershed Projects to Report Preliminary Results

An all day session on CEAP Competitive Grant Watershed projects will be held February 6, 2008, at the CSREES National Water Conference in Sparks, Nevada. Project directors will summarize overall current project findings regarding the effects of conservation practices on water resources. Some will focus on modeling approaches and advances, decision support, data management challenges, and monitoring strategies to evaluate management practice effectiveness. Several presentations will focus on the effectiveness of outreach efforts and factors affecting adoption of conservation practices. To wrap up the day, the framework and approach to the CEAP Synthesis Project will be discussed along with future opportunities for CEAP. More information on the CSREES National Water Conference is available at http://www.soil.ncsu.edu/swetc/waterconf/2008/home08.htm.

Object Modeling System Framework Scheduled for January 2008 Delivery

Agriculture Research Service (ARS) scientists in Fort Collins, Colorado, expect to deliver version 2.1 of the prototype OMS (Object Modeling System) framework to NRCS in January 2008. OMS is designed to address processes and issues associated with regional differences in climate, soils, farming practices, etc. Its modular structure allows component process models (e.g. water balance, nutrient cycling, soil erosion, and plant growth and development) to be used interchangeably so that the model can be customized for any specific region of the United States.

OMS is the modeling platform for ARS Cropland CEAP Objective 5: Develop and verify regional watershed models that quantify environmental outcomes of conservation practices. When fully operational, OMS will enhance modeling capabilities for future assessments of conservation programs, save time and money spent on model development, and facilitate the development of models customized for specific NRCS uses.

Grants Awarded for CEAP Synthesis Project

In November, USDA's Cooperative State Research, Education and Extension Service (CSREES) announced competitive grants to conduct a synthesis of findings from the CSREES CEAP Competitive Grant Watersheds and related findings from other CEAP watershed studies.

The awards, jointly funded by the CSREES National Integrated Water Quality Program and NRCS, were made to North Carolina State University, which will lead the synthesis effort, and to the University of Idaho.

In presenting the grants, Acting Agriculture Secretary Chuck Conner noted that "These two studies culminate the first phase of USDA's work to understand the effects of conservation practices benefiting a watershed. This science and outreach will provide additional practical knowledge for planning and carrying out conservation programs across the nation."

For more information, see the press release http://www.csrees.usda.gov/newsroom/news/2007news/11261_ceap.html

Grazing Lands National Assessment

Rangeland Modeling Update

Plant Growth Component. A team of scientists from NRCS, the Agricultural Research Service, and the National Aeronautics and Space Administration (NASA) has begun modifying and adapting existing hillslope-scale rangeland models for use in estimating the impact/benefit of conservation practices for plant community associations. The models are RHEM (Rangeland Hydrology and Erosion Model) and ALAMANAC (Agricultural Land Management Alternatives with Numerical Assessment Criteria).

ALAMANAC will be used to estimate plant community response to climate, management, and deployment of conservation practices. The model is being adapted to simulate inter- and intra-species competition on rangelands. This model will focus on developing a functional plant group approach where classes such as short grass, mixed grass, tall grass, annual grass, shrubs, trees, and forbs can be simulated on a single ecological site. If possible, cryptogamic crusts will also be addressed if enough information is available in the literature to document the growth, resistance, and resilience to disturbance of this functional plant group.

The ALAMANAC modeling team will also develop the technology to simulate the temporal and spatial impact of the following conservation practices: Prescribed grazing, prescribed fire, brush management, range seeding, reduction in the impact of invasive species, riparian management and the associated affiliated practices such as fencing, water development, and placement of supplements, as defined in the NRCS field office technical guides.

The primary function of ALAMANAC is to provide the required biophysical output (i.e., canopy cover, plant height, standing biomass, root distribution and mass, ground cover, percentages of functional plant groups, etc.) to estimate soil and water quality and wildlife habitat with other component models being developed as part of CEAP.

Soil Carbon Component. The CASA (Carnegie-Ames-Stanford Approach) model developed by NASA is being evaluated for use in estimating changes in soil carbon as a function of the interaction of climate, management, and deployment of conservation practices.

CEAP

Building the Science Base for Conservation

Science based conservation is the key to managing agricultural landscapes for environmental quality. The Conservation Effects Assessment Project (CEAP) is a multi-agency effort to scientifically quantify the environmental benefits of conservation practices used by private landowners participating in U.S. Department of Agriculture (USDA) and other conservation programs. Project findings will guide USDA conservation policy and program development and help farmers and ranchers to make informed conservation choices.

The three principal components of CEAP — the national assessment, the watershed assessment studies, and the bibliographies and literature reviews — contribute to the evolving process of building the science base for conservation. That process includes research, monitoring and data collection, modeling, and assessment.

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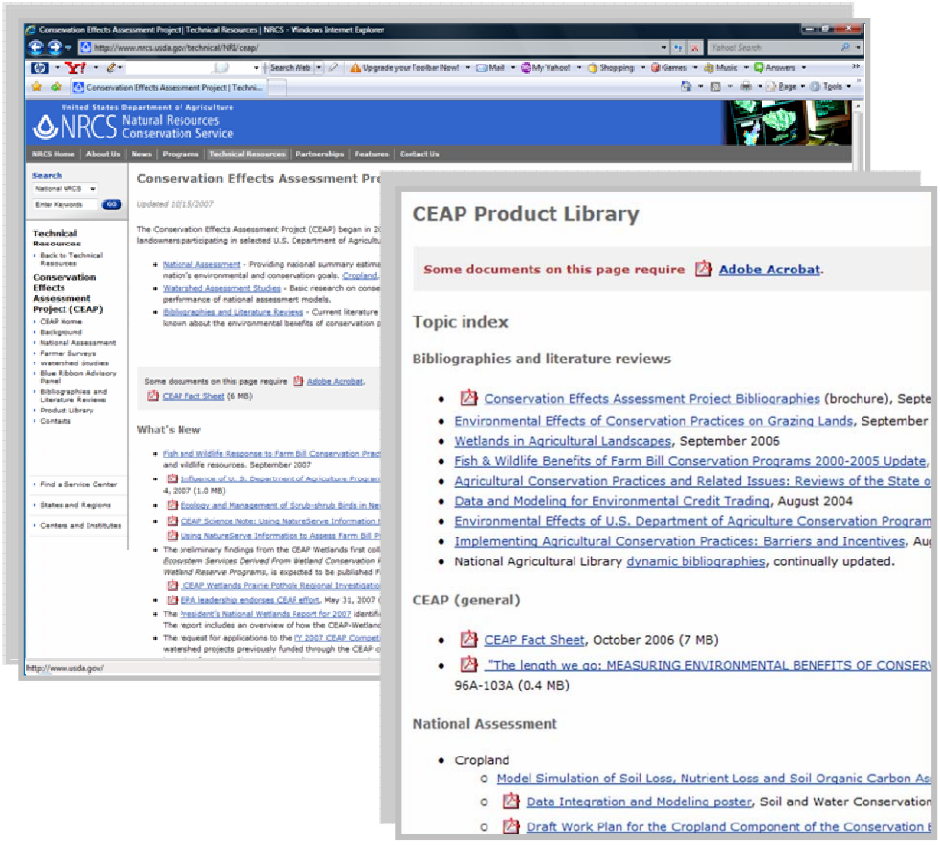
Visit the CEAP Website!



www.nrcs.usda.gov/technical/NRI/ceap

New CEAP Project Coordinator

In August 2007, Lisa Duriancik joined NRCS as full-time coordinator of the multi-agency CEAP effort. She came to NRCS after more than five years with USDA's Cooperative State Research, Education and Extension Service (CSREES).

In her new position, Duriancik has responsibility for coordinating the overall CEAP effort, leading the interagency Steering Committee, and providing management and leadership for CEAP watershed studies. She succeeds Roberta Parry, an Environmental Protection Agency employee who served as CEAP coordinator from 2005 to 2006 and Tom Drewes, NRCS, who served as CEAP watershed coordinator from 2004 to 2007.

While at CSREES, Duriancik managed national research and extension programs focusing on water resources, conservation effects, and agricultural air quality. She has been a CSREES representative on the CEAP Technical Steering Committee since 2003 and a principal coordinator of the joint CSREES/NRCS watershed assessment studies selected through the CSREES Competitive Grants Program.

Duriancik, an environmental scientist (with focus on soil ecology) holds an M.S. degree from The Ohio State University (OSU) and a B.S. degree from Allegheny College. Prior to joining USDA, she worked for OSU's Ohio Agricultural Research and Development Center and for a non-profit research and education institution in southeastern Pennsylvania. Her research focused on nitrogen and carbon cycling in corn, soybean, and pasture systems, including long-term effects of changes in management practice on soil, water resources, and production.