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Conservation Effects Assessment Project

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CEAP-NIFA Watershed Studies: A Synthesis

As part of the CEAP Watershed Assessments, USDA's National Institute of Food and Agriculture (NIFA) and NRCS jointly funded 13 projects to evaluate the effects of cropland and pastureland conservation practices on spatial and temporal trends in water quality at the watershed scale. In some projects, participants also investigated social and economic factors that influence implementation and maintenance of practices. The NIFA-CEAP projects were conducted from 2004 to 2011. They were mainly retrospective, in that they focused on conservation practices and water quality monitoring efforts that had been implemented before the NIFA-CEAP projects began.

Six of the 13 projects were able to demonstrate water quality changes but none met their water quality targets. Three of the six (Paradise Creek, ID; High Plains Aquifer, NE; and Rock Creek, OH) employed long-term monitoring, and three (Walnut and Squaw Creeks, IA; Cannonsville Reservoir, NY; and Spring Creek, PA) used paired watershed designs. Two (Walnut and Squaw Creeks, IA, and Spring Creek, PA) were part of the USEPA 319 National NPS Monitoring Program.

By synthesizing the results of all these NIFA-CEAP projects, we explore lessons learned about ***implementing conservation practices to protect water quality*** (Osmond et al. 2012). The 15 most important lessons were as follows:

1. Programs have been funded since 1978 with the goal of understanding conservation practice effects at the watershed scale. Some of the lessons learned in the NIFA-CEAP projects were observed in these earlier programs and projects; some are new due to more holistic NIFA-CEAP study objectives. The previous lessons were *rarely* integrated into most State and Federal programming that funds conservation practices. With dwindling resources and mounting environmental degradation, it is essential that many of the lessons from NIFA-CEAP be integrated into policy and agency protocol if water resources are to be protected or improved.

2. Conservation planning must be done at the watershed scale with sufficient water quality and, if available, modeling information.

3. Before implementing conservation practices, identify the pollutants of concern and the sources of the pollutants.

4. Identify the critical source areas of the watershed—those that generate the most pollution—and prioritize conservation practices in those areas to ensure the most effective use of resources.

5. Identify watershed farmers' attitudes toward agriculture and conservation practices to promote adoption.

6. After conservation practices have been adopted, continue to work with farmers on their maintenance and sustained use.

7. Economic incentives were often required for adoption of conservation practices not obviously profitable or compatible with current farming systems.

8. Technical assistance to farmers is most effective when delivered by a trusted local contact; however, it is very people intensive. Reduced funding is eroding the ability of NRCS, Extension, and Soil and Water Conservation Districts to deliver effective programming.

9. Conservation practice adoption is a multivariate choice. Although economics are exceptionally important, many other factors are part of the decision-making process.

10. Most conservation implementation projects should *not* conduct water quality monitoring. Monitoring is technically very challenging and expensive.

11. For projects that do conduct water quality monitoring, monitoring systems should be designed to specifically evaluate response to conservation practice implementation and must include necessary resources and expertise.

12. To link water quality response to land treatment changes, conservation practices must be tracked as intensively as water quality monitoring, and at the same temporal and spatial scales.

13. Knowledge of land use, management, and conservation practices is essential to understanding the effectiveness of conservation programs. Data on conservation practices or land management are often unavailable due to confidentiality agreements or are incomplete.

14. Watershed models are complex. Select appropriate model(s) and modify if necessary. Ensure sufficiently trained personnel, well-calibrated and validated models, and adequate water quality and land treatment data, including spatial and temporal changes of these data.

15. The scientific basis of modeling is still evolving so model results must be used with care. New knowledge and tools are needed to improve the representation of both critical natural processes and management actions at the watershed scale.

Notes on the State of Conservation Practices and the Protection of Water Resources

- Erosion control has increased substantially due to technological advances, price and labor pressures, and conservation program delivery. Much of the sediment currently in streams originates from streambanks and streambeds and not from uplands (Tomer and Locke 2011).
- Controlling nutrients, especially nitrogen, will continue to be a significant challenge because nutrient management practices are harder to implement and maintain; nutrient loss reductions are not visually apparent; application of some conservation practices (such as terraces) can have unintended consequences (such as increased nitrogen leaching) in some biophysical settings; and hydrologic modifications such as tile drainage are being installed faster than conservation practices are being adopted to address the modified flow of water and nutrients.

References

Osmond, D., D. Meals, D. Hoag, and M. Arabi, eds. 2012 How to Build Better Agricultural Conservation Programs to Protect Water Quality: The NIFA-CEAP Experience. Ankeny, IA: Soil and Water Conservation Society. 387 pgs.

Tomer, M.D., and M.A. Locke. 2011. The challenge of documenting water quality benefits of conservation practices: A review of USDA-ARS's conservation effects assessment project watershed studies. Water Science & Technology 64(1) 300–310. Doi:10.2166/wst.2011.555.

A series of fact sheets developed by the synthesis team contains additional details on study findings. Visit http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/technical/nra/ceap/na/?cid=stelprdb1047821 for links to a book, the fact sheets and a map showing the locations of the 13 NIFA-CEAP watersheds covered by the synthesis study.