Preface

From 2004 to 2006, the USDA National Institute of Food and Agriculture (NIFA) (formerly the Cooperative State Research, Education, and Extension Service) and the USDA Natural Resources Conservation Service jointly funded 13 watershed projects across the nation. These NIFA projects were established to evaluate the effects of agricultural conservation practices on water quality at the watershed scale. The overall goal of these watershed studies was to determine the measurable effects of agricultural conservation practices on spatial patterns and trends in water quality at the watershed scale. Conducted under the name Conservation Effects Assessment Project (CEAP), the projects were intended to increase understanding of the following:

- How the timing, location, and suite of implemented agricultural conservation practices affect water quality at the watershed scale
- How conservation practices implemented in a watershed interact with respect to their effects on water quality
- What social and economic factors facilitate or impede implementation of conservation practices
- The optimal set of conservation practices and their optimal placement within the watershed needed to achieve water quality goals

As these 13 NIFA–CEAP watershed studies were nearing completion, the USDA NIFA funded another project to synthesize the information gained from the projects in order to build an aggregate knowledge base that both evaluated impacts of conservation practices and programs on water resources in order to improve the management of agricultural landscapes and achieve environmental goals that could inform future policy decisions. This book describes the outcome of the synthesis effort.

The synthesis clearly demonstrates a need for watershed conservation projects to actively assess when and where agricultural conservation efforts are effective and, where applicable, how those efforts could be improved. The authors found that the most successful projects consisted of a network of stakeholders and information providers who worked together to develop and follow clear goals, included farmer input, applied sound science, and provided information effectively to change behavior. Sound science involved a well-designed monitoring and assessment program, coupled with modeling that could link outcomes to conservation practices. Clear goals involved proper identification of the pollutant(s) of concern and means for control, and cooperating with others in the network to consistently identify the pollutant(s) and the conservation practices needed for control. Providing information effectively involved participatory education approaches that measured success by outcomes rather than effort.

Regardless of the specific approach, conservation practice activities must be intentional; practices must be carefully planned and targeted with objectives and techniques functionally aligned with project goals. Intent includes identifying the pollutant(s) of concern and the source(s) of pollution, selecting conservation practices that control the pollutant(s), and installing them in identified critical areas in sufficient numbers to improve and protect water quality.

Farmer acceptability must be considered, as it affects how much of the "best" technical solution will be adopted. Once implemented, effective farmer operation and maintenance of practices must be ensured over the long term. Installed practices should be carefully documented in time and space, and their statuses tracked beyond final installation. Without these implementation and operation steps, conservation programs likely will have minimal effects on water quality.

Implementation of conservation practices to address agricultural water quality issues is far more than a technical or financial exercise in design, construction, and cost-share, as shown by the NIFA–CEAP and the synthesis effort. Researchers can estimate costs and returns of conservation practices but have difficulty extrapolating results to other regions or larger populations of farmers and also in accounting for interactions among driving factors, such as yields, income, profit, and farm labor. Cost-share and other incentives are usually necessary but are seldom sufficient to drive implementation. Sociological factors that enhance or inhibit adoption of conservation practices have been identified but are rarely objectively factored into planning efforts. Perhaps most important to note is that educational and technical support provided by a local, trusted, and dedicated person is often more effective than other formats, although this kind of assistance is in decline due to budget constraints. Farmer-to-farmer information exchange also is crucial to the adoption process. Watershed programs must recognize that adoption of any new agricultural practice takes place in a complex milieu of economics, technical knowledge, community and individual values, and social relationships.

If conservation is to be linked to demonstrating water quality change, then water quality monitoring must be designed to meet individual project objectives and accurately measure critical indicators with sufficient precision and spatial resolution to evaluate response to land treatment. Models must be selected and applied with technical expertise, used for both knowledge development and collaborative learning purposes, and continually improved. Both monitoring and modeling have important roles to play in watershed project evaluation, and their collaborative use should be encouraged.

Finally, we must build upon the knowledge gained from the NIFA–CEAP and past watershed water quality programs. We cannot afford to continue to repeat the shortcomings of programs of past decades. Many of the lessons learned in this synthesis are essentially those observed in the Rural Clean Water Program, the Hydrologic Unit Area Program, and others in the past. The demands of decreasing budgets and increasing needs for accountability require that we not only learn from the NIFA–CEAP watershed studies but that we apply this knowledge to move forward to more effectively achieve water quality goals.

The book is divided into two sections. The first section (Chapters 1 through 8) defines the synthesis methodology and presents results, lessons learned, and recommendations with respect to key informant interviews, land treatment, water quality monitoring, watershed modeling, socioeconomic analysis, and education outreach and then presents overarching lessons learned from the NIFA–CEAP watershed studies. The second section (Chapters 9 through 21) presents detailed information about each of the NIFA–CEAP studies, including watershed setting, water quality problem(s), land treatment, water quality results, modeling, socioeconomics, and outreach education.

The lessons learned from the watershed-scale NIFA–CEAP watershed studies and the synthesized information presented in this book can and should be applied to the next generation of watershed conservation projects, so that our best technical and financial resources can be effectively applied to protecting and improving water quality, while maintaining a healthy, sustainable, and productive agriculture.