# Working Group On Water Quality



U.S. Department of Agriculture

## - FOREWORD -

The **USDA Water Quality Program** was initiated in 1989. Selected materials have been assembled to provide some background on this highly successful **"Team - USDA"** approach to protecting the Nation's water resources from contamination by agricultural chemicals.

The **USDA Water Quality Program** is based on a **Program Plan** (item 1) and is in concert with the announced **USDA Policy for Water Quality Protection** (item 2). The Program is coordinated by a Working Group on Water Quality (chaired by Science and Education) that includes twelve USDA agencies and a number of other Federal agencies organized into six committees. These committee structures and memberships are identified in the **Directory** (item 3).

The program committees have prepared various specific **plans** for **Research** (item 4), and for **Education, Technical and Financial Assistance** (item 5), supported by **Agency water quality budgets** (item 6), and based on **"Building a Better America"** (item 7). The current **Work Plan** is included (item 8) along with selected **Updates and Waterfax** (items 9 and 10).

You will receive replacement materials as they are updated.

The functions of the Working Group on Water Quality are facilitated by a Secretariat. Dr. Fred Swader serves as the Executive Secretary, assisted by Mr. Larry Adams and Mr. James Meek. They can be reached at (202) 205-5853 for further information.

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# TO SUPPORT THE

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**U.S. Department of Agriculture**
**and**
**Cooperating State Agencies**

**July 1989**

# PREFACE

The USDA Water Quality Program Plan to support the President's Water Quality Initiative was prepared by an agency work group appointed by USDA Agency Heads and coordinated by the Office of the Deputy Assistant Secretary for Science and Education.

Its purpose is to identify the objectives and procedures for the implementation of the USDA Water Quality Program Plan and to assure both internal and external coordination of the Department's water quality activities. The Report describes a schedule of 10 planned output-oriented and program support activities for the 5-year implementation period 1990-1994. This planned schedule is based on the expected extended availability of the President's 1990 funding proposal for the 5-year implementation period. It is a complex and challenging program whose success is dependent on sustained support.

Deputy Secretary
U.S. Department of Agriculture
July 1989

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## EXECUTIVE SUMMARY

### Background

USDA's response to the President's Water Quality Initiative brings a new focus and coordinated commitment to the goal of protecting the Nation's waters from contamination by agricultural chemicals and waste products applied on agricultural lands. The management of agricultural chemicals and wastes to meet environmental and public safety objectives is in many ways a new functional activity for USDA, particularly with its emphasis on groundwater contamination. It involves the capabilities and activities of more USDA Agencies, working in closer concert with a wider variety of Federal and State Agencies than any previously established Departmental function.

### Objectives

USDA's overriding aim for the President's Water Quality Initiative is to provide farmers, ranchers and foresters the knowledge and technical means to respond independently and voluntarily in addressing on-farm environmental concerns and related State water quality requirements. The Department plans to achieve this objective in a way that reduces the need for restrictive regulation and in a manner that maintains agricultural productivity, avoids economic hardship and sustains an economic and safe supply of food and fiber. The Plan strives to: (1) determine the precise nature of the relationship between agricultural activities and groundwater quality; and (2) develop and induce the adoption of technically and economically effective agrichemical management and agricultural production strategies that protect the beneficial uses of ground and surface water quality.

### USDA Water Quality Program Strategy

The USDA Water Quality Program will be carried out through three major, integrated and interdependent functional components: (1) Education and Technical Assistance; (2) Research and Development; and (3) Database Development and Evaluation.

(1) Education and technical assistance efforts will assist farmers, ranchers and foresters in applying new and improved agrichemical and waste management and agricultural production practices based on already available research results and new techniques, practices and systems developed through the research and development program component. The adoption of practices to reduce or prevent contamination will be encouraged and accelerated where existing or potential contamination of ground or surface waters from agricultural nonpoint sources has been identified as a public concern. Demonstration projects will be established in some of these areas and enhanced education, technical and some financial assistance will be provided in others beginning in the first year of the Program. Practice adoption will begin in the first year and accelerate in the subsequent years. Education and technical assistance will be provided for agricultural chemical management and production practices that are needed to meet State water quality requirements under Section 319 State water quality plans based on State-identified priorities, and for the specific water quality goals of multi-State regional water quality projects. Where appropriate, particular emphasis will be placed on agrichemical nonpoint sources of groundwater pollution.

(2) Research and development efforts will provide new and improved agricultural and forestry management practices and systems that will increase farmer, rancher and forester effectiveness in reducing the chances of water quality degradation for a wide range of conditions. Research is essential to expand and improve our understanding of the mechanisms that govern the movement of agrichemicals through soil and geologic materials and that govern how such chemicals become

available in forms that readily move through these media into groundwater. This new knowledge about the fate and transport processes of agrichemicals will provide the bases for developing new and improved practices and systems to control agricultural nonpoint sources of actual or potential water contamination. Analyses of socio-economic effects and impacts of current and new management methods on farm, community and regional bases will provide measures of the relative cost-effectiveness of alternative practices and systems.

(3) Development of comprehensive, consistent, periodic national data on agricultural chemical use, related farm practices, and links with the physical environment will provide the necessary basis for Federal agencies and State governments to assess the implications of current agricultural practices and to evaluate the consequences of alternative policies for reducing any adverse effects of agricultural production on water quality. Centralized systems for linking data and statistical information on agricultural productivity, land use, agricultural chemical use, physical attributes of the land and surrounding watersheds, climate, and water quality will support a variety of program decisions by a range of Federal and State agencies, including those requiring improved pesticide benefit assessment.

Planned Output and Program Support Activities. The foregoing functional components will be implemented through 10 major output-oriented and program support activities:

- Building National and State databases on agrichemical use and related farm practices
- Providing digitized geographic information systems for State and Federal evaluation of alternative policies and program strategies
- Developing methods for sampling, measuring, and evaluating groundwater contamination
- Conducting fundamental research to provide the basis for improved management of chemicals used in agriculture
- Improving agrichemical management and agricultural production systems
- Expanding USDA and CES staff capacity to deliver educational and technical assistance to producers for effective agrichemical and waste product management and environmental stewardship
- Demonstrating and delivering technologies and management systems for voluntary farmer, rancher and forester adoption and implementation
- Meeting State water quality requirements through education and technical assistance
- Evaluating economic, social and technical effects and impacts of new and improved management practices and systems
- Informing the public of program activities and achievements

These building blocks constitute a fully integrated system within which each set of outputs relies upon successful achievement of related program components to assure the Nation's producers are provided with profitable options for effective agricultural chemical management.

**Interagency Coordination and Relation to Ongoing Programs**

The planned activities of 8 principal USDA Agencies and the State Agricultural Experiment Stations and Cooperative Extension Services are closely coordinated with each other and with related activities of EPA and Agencies of the Departments of Interior and Commerce under the President's Water Quality Initiative. The USDA Water Quality Program will benefit from related, past and ongoing Departmental efforts in soil and water conservation, public information, research, and extension, and will complement the aims of other targeted programs such as Integrated Pest Management (IPM), Low Input Sustainable Agriculture (LISA) and the National Agricultural Pesticide Impact Assessment Program (NAPIAP).

**The President's Water Quality Initiative**

USDA's contribution to the President's Water Quality Initiative brings a new focus and coordinated commitment to the goal of protecting the Nation's water from contamination by agricultural chemicals and waste products applied on agricultural lands.

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President Bush recommended a new initiative for enhancing water quality in his 1990 budget proposal to the Congress, presented on February 9, 1989. The President's initiative defines a vigorous effort to protect ground and surface water from potential contamination by agricultural chemicals and wastes, especially pesticides and nutrients. The initiative integrates the combined expertise of Agencies from four Federal departments to promote the use of environmentally and economically sound farm production practices, and to develop improved chemical and biological pest controls.

The initiative, in its first principle emphasizes groundwater protection. Other principles and policies speak to agricultural nonpoint sources of water pollution in general. To support the initiative, the President proposed a $41.2 million permanent increase to the current USDA $140 million base funds which are now devoted to ongoing water quality programs and activities. The Department and cooperating State institutions understand that the main emphasis for the budget increase is on reducing ground water contamination by agricultural chemicals. Current programs addressing degradation of water quality as a result of agricultural practices are to continue.

In his statement of principles and policies, the President makes it clear that farmers are ultimately responsible for avoiding contamination of water resulting from management practices they apply to the landscape. He also stated that the role of USDA is to conduct research and provide education and technical assistance that helps producers fulfill their responsibilities by developing and demonstrating "...farming practices that avoid water quality degradation...," and that are economically viable.

The USDA, the cooperating State Agricultural Experiment Stations (SAES) and State Cooperative Extension Services (CES) are prepared to accept the responsibilities for their part in the President's initiative. A multi-Agency, multidisciplinary plan has been developed to meet the challenge head on. The planned program will clearly demonstrate that agriculture is concerned about the environment and that the agricultural sector can and will make the necessary changes to protect ground water quality. The plan also provides for input from and cooperation with other Federal and State departments.

## PRIMARY GOALS AND OBJECTIVES OF THE USDA'S AND STATES' CONTRIBUTION TO THE PRESIDENT'S WATER QUALITY INITIATIVE

The primary goal of USDA's Water Quality Program is to:

*Provide farmers, ranchers, and foresters the knowledge and technical means to respond independently and voluntarily in addressing on-farm environmental concerns and related State water quality requirements. The Department plans to achieve this goal in a way that reduces the need for restrictive regulation, and in a manner that maintains agricultural productivity, avoids economic hardship, and sustains an economical and safe supply of food and fiber.*

The primary objectives of the multi-Agency, multidisciplinary plan for this program are to:

- *Determine the precise nature of the relationship between agricultural activities and ground water quality.*
- *Develop and induce the adoption of technically and economically effective agrichemical management and agricultural production strategies to protect water quality.*

**Program Plan Involves Substantively New and Different Directions for USDA**

The management of agricultural chemicals and wastes to meet environmental and public safety objectives is in many ways a new functional activity for USDA, particularly as it relates to groundwater contamination. It involves the capabilities and activities of more USDA Agencies, working in closer concert with a wider variety of Federal and State Agencies than any previously established Departmental function. It is a unique approach to solving a very complex issue.

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The USDA water quality program is supplemental to existing programs. Its distinction arises from (1) its particular focus on agricultural chemicals and groundwater contamination, and (2) the extensive degree of interagency coordination, collaboration and program integration required to successfully achieve its goals. It builds upon a proud USDA history of accomplishment, expertise, and experience in basic and applied agricultural research, soil and water conservation, and a variety of farmer education and extension programs for the development and use of best management practices to protect soil and water sources in rural areas. Activities carried out under the President's Water Quality Initiative are expected to benefit from, as well as contribute to, ongoing programs.

The integrated development of basic data, the underlying science and technology, and the operational information and practices for implementation of effective agricultural chemical management systems will be accomplished through cooperative and collaborative Agency activities following the objectives and guidance of the Departmental Plan No overall lead Agency will be designated.

USDA technical assistance programs relating to water quality have historically focused on reducing sediment and sediment-borne contaminants in surface waters as well as animal waste management and salinity control. The Department, SAES and CES biological pest control, integrated pest management, and nutrient management research and programs need to be linked with compatible efforts to understand and address groundwater contamination. Although the USDA, SAES and CES have the basic capabilities to address agricultural chemical and groundwater issues, the required data and information bases, and the coordinated delivery systems have not been developed and implemented for effective agricultural chemical management systems. The USDA response to the President's Water Quality Initiative rectifies these problems.

A total of 8 principal USDA Agencies and their cooperating State institutions and Agencies are collaborating with the Environmental Protection Agency (EPA), the United States Geological Survey (USGS), and the National Oceanic and Atmospheric Administration (NOAA) to produce a wide range of new and interrelated water quality program outputs.

The USDA's Water Quality Program plan is described in the following pages. The plan is built upon the foundation of successful, historical programs. It is designed to complement established targeted programs, such as Integrated Pest Management (IPM), and the National Agricultural Pesticide Impact Program (NAPIAP), and newer programs such as Low Input Sustainable Agriculture (LISA). Its successful implementation is expected to increase significantly the contributions of the established USDA base program to water quality and contribute importantly to a growing compatibility between agricultural production and environmental quality.

**Principal USDA and Cooperating State Program Agencies Contributing to The Initiative**

- Agricultural Research Service (ARS)
- Agricultural Stabilization and Conservation Service (ASCS)
- Cooperative State Research Service (CSRS) in conjunction with the system of State Agricultural Experiment Stations (SAES)
- Economic Research Service (ERS)
- Federal Extension Service (ES), in conjunction with State and County Cooperative Extension Services (CES)
- Forest Service (FS)
- National Agricultural Statistics Service (NASS)
- Soil Conservation Service (SCS)

**Each lead Agency has a number of new, multi-Agency, multidisciplinary program activities, many of which are also coordinated with ongoing or refocused programs of other USDA Agencies, including the: Animal and Plant Health Inspection Service (APHIS); Farmers Home Administration (FmHA); and National Agricultural Library (NAL).**

**Integrated Water Quality Program Plan is Output-Oriented**

The USDA Water Quality Program will produce a closely-linked array of outputs and support activities: National and State data on agrichemical use; related information on soils and farm practices; new research knowledge on the fate and transport of agrichemicals; new and improved agrichemical management and agricultural production practices and systems; educational and technical assistance to farmers, ranchers and foresters as well as States and communities; evaluations of impacts and effects of new and improved practices and systems, and public information materials on the activities and accomplishments of the program. The successful integration and achievement of these interdependent program components will provide a new basis for the nationwide expression of the Department's commitment for mutual retention of National agricultural productivity and environmental quality. The Nation's producers will be provided means for cost-effective agricultural chemical and waste management and environmental stewardship, particularly for water quality.

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The USDA Water Quality Program plan recognizes that some appropriate technology is currently available to improve agricultural chemical management. But, much remains unknown about the magnitude and extent of agriculture's effects on water quality, the specific nature of agricultural chemical fate and transport in water systems, and the economic and environmental tradeoffs among alternative production and agricultural chemical management systems. Thus, educational and technical assistance, research, and database development and evaluation, the three major functional components of the USDA Water Quality Program, will get underway concurrently. They will address ten output-oriented and program support building blocks which constitute the implementation strategy for the USDA Program. The program building blocks define "what needs to be done" to help producers use agricultural chemical and waste management technology, practices and systems that will contribute to the maintenance of agricultural productivity while protecting ground and surface water quality.

New and expanded **National and State databases on agricultural chemical use and related practices**, and the development of coordinated, digitized **geographical information systems** will provide the basis for producing improved pesticide assessments, evaluating agriculture's impact on the environment, selecting critical areas for targeting research, education, technical and financial assistance, monitoring change over time, and documenting improvements in productivity and environmental quality.

New fundamental and applied research activities will improve **methods for sampling, measuring, evaluating groundwater contamination problems**, and expand our knowledge and understanding of water contaminant sources, degradation processes and products, and chemical movement through soils. Critical longer-term research will be planned and conducted to better understand the persistence of contaminants where it occurs, or its absence. This research will produce **new technologies** and **improved agricultural and forestry management systems** that reduce the chances of water degradation.

A series of **on-farm demonstration projects** and other targeted **farmer education and technical assistance** efforts will speed the delivery of technologies and management systems to farmers. These efforts will initially focus on improving the transfer of available information and technology and to incorporate new findings, advanced technologies, and improved management systems as they emerge from the program's research efforts. **Economic and social evaluations** will assure that the management systems developed and extended are both practicable and profitable. Widely disseminated **public information** will facilitate community-wide understanding and acceptance of the need for increased compatibility between agriculture and the environment.

A schematic design of the linkages among the 10 output-oriented and program support building block components of the USDA water quality strategy is presented in Figure 1. Their objectives, procedures, intended beneficiaries, leadership roles, coordination and integration mechanisms, and delivery schedules are described on the following pages.

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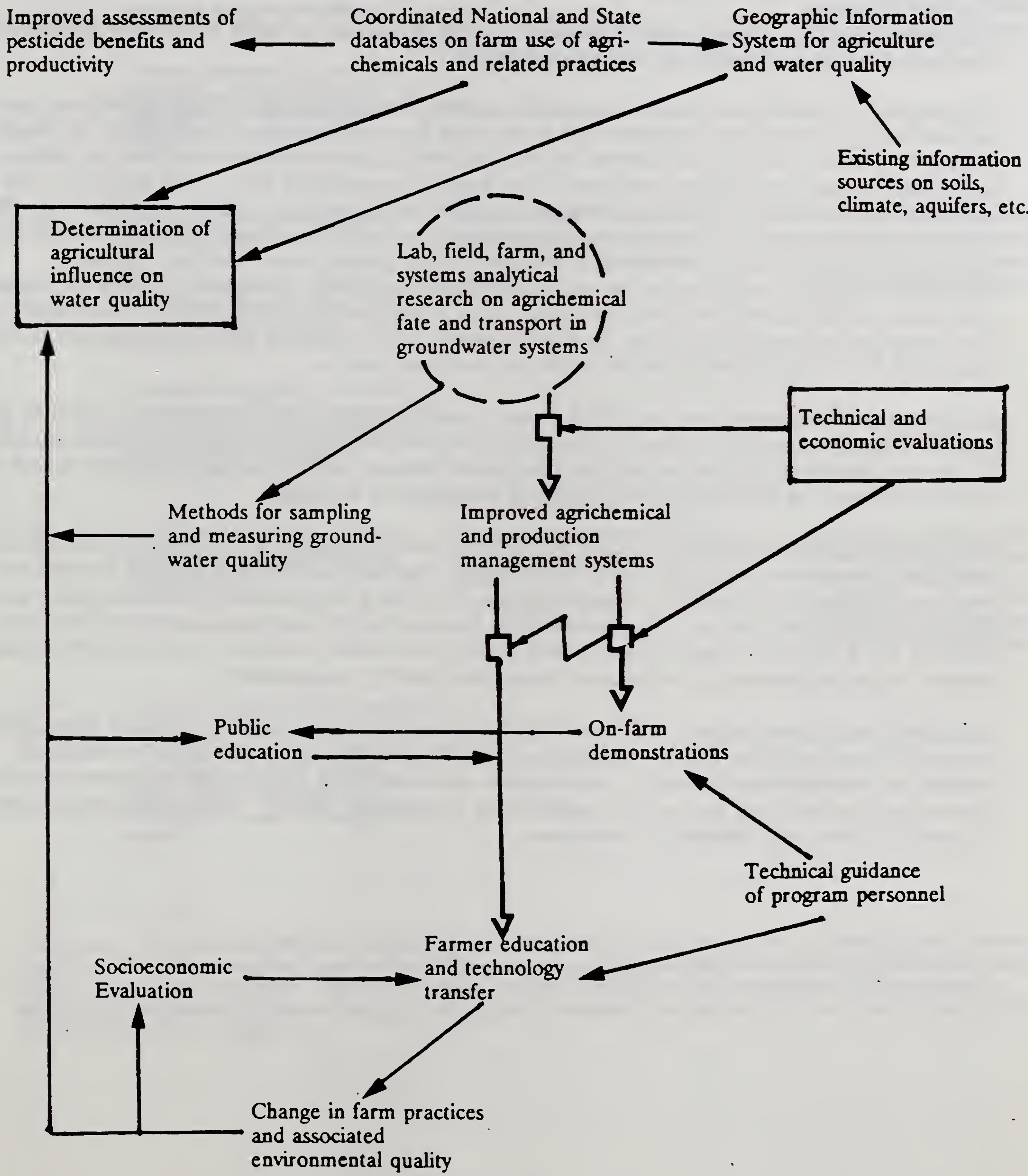
**Figure 1. Schematic design of linkages among the output-oriented and program support components of the USDA Water Quality Strategy.**



**Building Nationally Coordinated Databases on Agricultural Chemical Use and Related Farm Practices**

The development of comprehensive, consistent, periodic National data on agricultural chemical use, related farm practices, and links with the physical environment will provide the necessary basis for Federal Agencies and State Governments to assess the benefits, costs and other effects of current agricultural practices and to evaluate the consequences of alternative policies and practices for reducing any adverse effects of agricultural production on water quality.

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**Objectives:** Develop, analyze, and disseminate timely, statistically reliable and detailed data on farm use of pesticides, fertilizers, and related inputs.

**Procedures:** A continuous cycle of commodity-specific, National surveys will be established and implemented to create cross-sectional and time-series data on farm use of agricultural chemicals and waste products. Survey instruments will be designed to concurrently collect data on related farm practices and the physical attributes of the land, in cooperation with SAES and CES, and in sufficient detail to satisfy local requirements consistent with available funding. Farm survey efforts will be initiated through a pilot test on a single crop in early 1990, and will proceed to cover all major and a range of minor commodities over a 3-4 year period before the cycle repeats. Resultant data will, at a minimum, be statistically significant at the State level. States and other Government Agencies will be given the opportunity to supplement survey funds for additional sub-State sampling to provide more site- and field-specific, locally relevant data. Summarized survey results will be widely disseminated via print and electronic media.

**Beneficiaries:** With regard to the USDA Water Quality Program, the data will: (1) provide one basis for identifying priority areas for research, education, technical and financial assistance efforts; (2) form a component of the geographic information system; and (3) support efforts to assess the benefits and costs of new agricultural chemical management strategies.

Improved agricultural chemical use data will: (1) substantially enhance EPA and USDA pesticide benefit-risk assessment activities under the National Agricultural Pesticide Impact Assessment Program (NAPIAP); (2) assist in targeting programs of the Food and Drug Administration and other food safety services; and (3) provide State Agencies which undertake additional sub-State sampling more intensive locally relevant data and a cost-effective means to assess the relationship between actual agricultural practices and State water quality requirements.

**Leadership and Coordination:** ERS and NASS will design the National surveys with input solicited informally from the other USDA Agencies and SAES, and from EPA and USGS. NASS will conduct the enumeration through a reimbursable agreement with ERS. ERS will summarize and disseminate the data and any related analytical or interpretive reports. SAES will develop more site-specific farm- and soil-specific databases.

## Planned Schedule for Building a Nationally Coordinated Database on Agricultural Chemical Use and Related Farm Practices

| | | | NAPIAP Applications and Benefits |
|---|---|---|---|
| 1990 | Plan survey cycle for collection of use data by major and minor crops, and livestock categories. Select on crop for pilot test of survey.<br><br>Develop preliminary survey questionnaire and solicit input and participation in questionnaire design from other Agencies. Conduct the pilot test. | Invite, solicit, and assess opportunities to enhance sampling activities at sub-State level. | Determine baseline for the independent, historical contribution of pesticides and of nitrogen fertilizers to growth in agricultural productivity. |
| 1991 | Summarize, interpret and disseminate findings from 1990 survey.<br><br>Develop and pretest questionnaires for remaining major field crops, livestock, fruit and vegetable crops.<br><br>Determine feasibility of expanding sample size in Midwest States that prove unable to supplement survey efforts to achieve sub-State reliability. . | Initiate planned survey cycle by holding enumerator training and conducting 3 crop-specific surveys. | Estimate the cumulative effect of past pesticide regulation on the agricultural sector and rural communities through 1990. |
| 1992 | Summarize, interpret and disseminate findings from 1991 surveys. 1991 surveys. | Conduct 3-5 commodity-specific surveys as per planned survey cycle. | Continue to increase and enhance USDA capabilities to perform pesticide benefit assessments at the rate and of the form required for EPA benefit-risk determinations.[**] |
| 1993 and beyond | Continue to develop and implement surveys and summarize, interpret, and disseminate survey findings according to originally planned survey cycle, as expanded over time to accommodate emerging needs. | | |

[**] In all years, through ongoing NAPIAP programs, generate data through expert opinion to fill survey gaps on the use of agricultural pesticides undergoing special review by EPA, and conduct pesticide benefit assessments by selected commodity and for large classes of pesticides. Utilize accumulating, National pesticide use data (collected via USDA surveys) to regularly update estimates of pesticide regulatory effects on the magnitude and distribution of farm input industries, rural communities, and water quality.

**Developing a U.S. Geographic Information System (GIS) for Agriculture and Water Quality**

The development of a digitized geographic information system for agriculture and water quality will link nationwide data and statistical information on agricultural productivity, land use, agrichemical use, physical attributes of the land and surrounding watersheds, climate, and water quality, to support a variety of policy and program decisions by a range of Federal and State Agencies.

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**Objectives:** Determine on a national basis, the locations and relative intensities of potential water quality problems which are independently indicated by concomitant geographic occurrence of specific geomophologic systems, soil types, geologic sequences, vulnerable water systems, land uses, agricultural practices, farm types, and weather systems.

Many Federal Agencies have planned or ongoing activities to compile and distribute descriptive national data sets. A few relevant examples include: the collection of data on soil properties through the SCS and national Cooperative Soil Survey program; NOAA's extensive records of weather and climate data; EPA's national well water survey; USGS compilation of the characteristics of the nation's hydrologic systems; ASCS farm and program participation records; APHIS collects data through its cooperative plant and animal health monitoring system; and ERS and NASS national surveys on agricultural land use, agricultural practices, and farm costs and returns. The value of these independently detailed databases could be enormously enhanced by merging them to discover the interrelationships among various physical, agronomic, and economic characteristics and by improved accessibility to these data and information by all interests.

**Procedures:** Because the various data sets originate from different sampling procedures, are stored in different forms, and are statistically reliable at different levels of geographic specificity, simple mapped overlays of current information are neither possible nor valid without extensive data reconciliation. Thus, initial steps for the development of a comprehensive GIS involve putting the various component data in compatible format and conducting statistical procedures to determine the nature of statistically reliable geographic overlaps among the disparate databases. Data not already georeferenced in digital format will be digitized and a computer-aided stratification for survey sampling will be developed to reconcile data sources. As the various data become available in newly consistent and compatible forms, they will be merged to create a GIS which combines data on agricultural activities with data on climatic, hydrologic, and other physical attributes.

**Beneficiaries:** The nationwide GIS on agriculture and water quality will be accessible to any Agency with research or program goals that can be enhanced by this comprehensive digitized data system. The availability of the GIS will form a tangible basis for increasing interagency cooperation and increased consistency among Government programs.

Knowledge of the geographic relationships between potentially problematic conditions and practices will directly contribute to the selection of sites and future focus of ground water research, education, demonstration, and technical assistance efforts under the USDA Water Quality Program. Benefits should accrue to a wide range of other, unrelated programs of all participating Federal Agencies and to State and local program Agencies as well as the private sector.

**Leadership and Coordination:** NASS, in close cooperation with SCS and CSRS-SAES, and with input from a wide range of Federal and State Agencies, will lead the effort to build, make operational, and maintain the GIS. The agricultural chemical use data to be collected under USDA's Water Quality Program will be an important component of the GIS. Within the Department, activities will be coordinated through the existing USDA Geographic Information Systems Subcommittee of the Natural Resources and Environment Committee. Especially heavy collaboration between USDA and USGS is anticipated.

## SEQUENCE OF ACTIVITIES REQUIRED TO DESIGN AND CONSTRUCT A COMPREHENSIVE U.S. GEOGRAPHIC WATER QUALITY INFORMATION SYSTEM FOR AGRICULTURE

**1990:** Conduct research on geographic information system (GIS) methodology (NASS; SAES)

Digitize soils interpretation and NRI data (SCS).

Incorporate USGS digital data into USDA sampling procedures (NASS).

**1991 to 1992:** Develop statistical procedures to use high resolution satellite imagery in locating cultivated land in geographic proximity to surface water (NASS; NOAA).

Construct cartographic overlays of currently available digitized geographic data on soil and water systems (SCS; USGS).

Determine how to optimally integrate imagery, digital topographic, ground and farm-level, field-level, and other survey data to maintain statistical integrity (above and beyond cartographic integration) -- (NASS).

Develop procedures to automatically classify and identify physical and biological barriers to ground and surface water contamination, for use in GIS database (SCS; ARS; USGS; EPA, NASS, CSRS/SAES).

**1993 to 1994:** Develop data structures and computer processes for GIS construction (NASS, SCS).

Provide data, in appropriate form for GIS integration on: soils and National Resources Inventory (NRI) (SCS); farm and conservation program participation (ASCS, SCS); cropping patterns (NASS); agricultural input use (ERS); weather patterns (NOAA); hydrology, geology, and topography (USGS); and water quality monitoring and test results (EPA).

Merge reconciled data to form a U.S. Geographic Water Information System for Agriculture (NASS and SCS, with input from Agencies indicated above).

Apply GIS databases to describe coincidence of agronomic, physical and economic phenomena to water quality problems.

**Developing Improved Methods for Sampling, Measuring and Evaluating Groundwater Contamination Problems**

General and site-specific research on agricultural chemicals in groundwater requires early development of new, rapid and lower cost field and lab techniques for sampling and measuring contaminants and identifying their sources and flow paths. Development and application of such tools are thus among the initial priorities of research efforts.

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**Objectives:** Assess the extent to which agricultural practices contribute to contamination of ground water. Develop improved procedures to measure and evaluate the physical, chemical, and microbial processes involved in the movement of chemicals through the soil and into ground water.

**Procedures:** Research will be conducted to develop and improve laboratory and field methods for rapidly, reliably, and cost-effectively sampling and analyzing pesticide residues and other contaminants and for determining the rates at which water and chemicals move through soil to groundwater, and for interpretation of analytical results. Initially, research will give priority to developing improved sampling and analytical methodologies. Improved sampling methodologies will provide the means to obtain accurate and representative data at a reduced cost, including in situ pesticide analytical methods, leachate and groundwater recharge measurement and sampling methods, and sampling strategies and protocols that accurately determine spatial and temporal variabilities. Also, it will be necessary to develop improved methods for agricultural chemical handling and disposal so that subsequent research on agricultural chemicals in groundwater can isolate the effects of point from nonpoint sources of potential contamination.

**Beneficiaries:** Virtually any Federal, State, or local Agency involved with environmental monitoring will benefit financially and scientifically from the availability of accurate, reliable, and lower cost sampling, measurement, and evaluation tools. Furthermore, the application of these methods within the President's Water Quality Initiative will serve the general public and administrative needs to gauge the nature and extent of agriculture's independent contribution to observed groundwater quality problems.

Improved protocols will lead to greater efficiency in the collection of groundwater quality measurements in conjunction with national, State, and local site-specific surveys on farm use and effects of agricultural chemicals and related practices. Their widespread application will contribute to the value of data represented in geographic information systems. Evaluation of findings from their use will provide the fundamental basis for determining and communicating the current situation and future outlook for agriculture's relationship to water quality.

**Leadership and Coordination:** USDA research on and development of soil and groundwater sampling, measurement, evaluation, and agricultural chemical disposal and isolation tools will involve the joint efforts of ARS, CSRS and SAES, and FS. Research will be coordinated with USGS and EPA efforts, and will be designed to develop sampling, analytical, and statistical methodologies for surface and groundwater quality. NASS, ARS, and SAES will determine the feasibility of conjunctive collection of groundwater quality and farm practice data from farmers. ARS and SAES will reconcile groundwater quality data with statistical information on management practices and the physical attributes of the land.

**PLANNED ACTIVITIES AND OUTPUTS FOR SAMPLING, MEASURING AND EVALUATING GROUNDWATER CONTAMINATION PROBLEMS**

| | | |
|---|---|---|
| **1990** | On-farm techniques for inexpensive, rapid cleaning/disposal of pesticide containers made available. | |
| **1991** | Improved field and lab techniques for evaluation of water quality (e.g., rapid, lower cost detection and vadose zone sampling) released. | Improved sampling and measurement methods installed on system research sites. |
| **1992** | Release improved on-farm pesticide cleanup techniques. | Incorporate water quality sampling into agrichemical use survey efforts. |
| **1993 and later years** | Release new and modified methods for data acquisition. | |

**Conducting Fundamental Research to Provide New Technology and Knowledge for Improved Management of Chemicals Used in Agriculture**

Development of improved management of agricultural production systems that prevent contamination of groundwater is highly dependent upon understanding mechanisms that govern the persistence and movement of agricultural chemicals through soil and geologic materials, and that govern how such chemicals become available in forms that readily move.

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**Objectives:** Identify and understand the biological-physical-chemical processes that determine how agricultural chemicals change or persist in the soil and how they and their breakdown products move downward to enter groundwater. This research is the core of understanding the principles involved in chemical degradation, reactions, and persistence in soils and water.

**Procedures:** Basic studies will be made to document the sources and amounts of potentially hazardous contaminants in groundwater attributable to agricultural and forestry practices, and to identify and determine the significance of the basic processes involved in their movement through soil into groundwater. Results of these individual studies will be assembled into integrated subsystems and process models.

Laboratory and field studies will be conducted at sites throughout the Nation to fill the knowledge gap that currently exists in understanding the fate of chemicals from pesticides, fertilizers, and wastes, and the linkages between agricultural chemical application to land and the occurrence of residues in groundwater. Knowledge of individual processes and integrated subsystems is absolutely essential so teams of scientists can develop new agricultural management systems that reduce or prevent leaching of chemicals from farm fields to underlying groundwater.

**Beneficiaries:** Ultimately, this work is critical to understanding processes in soils and the maintenance of an environmentally acceptable groundwater quality. All segments of society will benefit. Scientists, extension, education and technical advisors will receive more accurate information for use in developing new materials to assist the Nation's producers in improving their effectiveness in both agrichemical management and environmental stewardship. Agricultural producers will receive immediate benefits in the form of well-founded management systems with which to carry out their responsibilities to themselves, their families and to society.

**Leadership and Coordination:** USDA research will be led through the joint efforts of ARS, CSRS, SAES, and FS and coordinated with USGS groundwater quality research and with the needs of SCS, FS, and EPA.

**Planned Schedule for Fundamental Research Activities to Determine and Understand Mechanisms that Govern the Persistence and Movement of Agrichemicals through Soils and Geologic Materials**

| | |
|---|---|
| **1990** | Initiate fundamental research on priority water quality problems through the grant process<br><br>Water quality measurement and sampling instrument installation started on field and farm sites<br><br>Models to evaluate management systems for their effects on groundwater quality |
| **1991** | Continue fundamental investigations and initiate additional components of research on prioritized objectives<br><br>Monitor water quality in relation to agronomic practices and physical attributes of land |
| **1992** | Begin release of individual systems component studies (e.g., sorption of pesticides on soil complex; occurrence and importance of preferential flow paths). Continue basic studies, as needed and initiate new studies on basic problems and identified gaps in models |
| **1993 to 1994** | Release refined models for assessing agricultural effects on groundwater quality<br><br>Continue basic studies as needed |

**Improved Agricultural Chemical and Production Management Systems**

The ultimate goal of systems analytical and site-specific research activities is the knowledge-based development of new, practical and profitable management systems that reduce environmental loading of contaminants from agrichemicals and waste products while maintaining agricultural productivity and water quality.

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**Objectives:** Improve existing and develop new, cost-effective agricultural systems to address water quality problems.

**Procedures:** A major effort will be devoted to applying the systems approach to develop specific options to address effects of agriculture on water quality. These systems will include alternatives for managing soils, crops, chemicals, and water to maintain farm profitability and enhance soil and water quality. Systems will also be adopted for field use and tested for safe and environmentally sound storage and handling of pesticides.

Systems developed will be approached on a crop and regional basis. One such program is the Midwest Initiative which will focus on the development of cost-effective and environmentally safe corn and soybean production systems. Other managements systems are being evaluated concurrently in several other areas of the country, both in on-going programs and through grants.

Research sites in the Midwest will be chosen in representative production areas overlying significant aquifers. Researchers will measure key inputs and outputs of water and chemicals on each site to determine rates and amounts of chemical loss to water and will collect data on economic costs and returns.

Development of system simulation models is well underway at several State and USDA locations across the country. Completion of this on-going research and the use of the resulting models will allow tentative or trial release of practice recommendations and selection of promising management systems for field testing and verification in a relatively short time in the Midwest Initiative. In addition, development of expert systems or other decision aids that incorporate current best knowledge regarding agricultural chemicals management should be released for use during the second year of the Initiative. Related research in on-going programs, new grants from the new Water Quality Initiative and the Midwest Initiative will be coordinated into an integrated overall water quality program.

Evaluation of new management systems for corn and soybean production at targeted sites in the Midwest will require a start-up period of up to 2 years. Preliminary evaluation of some systems may be possible after 3 years in the absence of drought or other weather-related problems. However, depending on the length of crop rotations, time for chemical treatments to be expressed in groundwater, and considering weather vagaries, 12 to 15 years may be required to fully evaluate the effectiveness of the systems in preventing groundwater contamination. After field installations, sample analysis and initial model development are completed at Midwest sites, it should be possible to shift funds to further increase research on serious fundamental knowledge gaps, to broaden coverage of Midwest problems, and/or extend research to other areas of the country.

**Beneficiaries:** The products of research on agricultural chemical and production management systems will feed directly into the USDA Water Quality Program's education and technical assistance efforts, whose principal beneficiaries are the farmers, ranchers, and foresters to whom cost-effective management systems for ground water protection are extended. As with most research efforts of this magnitude, useful technological spin-offs will likely arise.

**Leadership and Coordination:** ARS, CSRS, and State cooperators at the Land Grant universities have the lead roles in USDA's water quality research plan. They will ensure that new water quality research projects are coordinated with existing and related projects and that new research is sharply focused on filling the gaps in information and technology for assessing and managing ground water quality. ERS and NASS will coordinate with ARS, CSRS, and State cooperators to assure uniform parameters, definitions and measures of farm costs, returns, and productivity are used in the analysis of economic and social consequences of alternative management practices and systems and agricultural policies.

The Midwest Initiative will be conducted in cooperation with the Midcontinent Initiative of the U.S. Geological Survey. USDA and USGS have appointed representatives to each other's planning committees.

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## PLANNED OUTPUTS AND PROGRAM SUPPORT ACTIVITIES FOR IMPROVED AGRICULTURAL CHEMICAL AND PRODUCTION MANAGEMENT SYSTEMS

| | | | |
|---|---|---|---|
| 1990 | Field sites for determining impact of alternative management practices upon agricultural chemical losses to ground water selected and characterized. | | |
| 1991 | Measurement and sampling instrument installation on field sites<br><br>Demographic, economic information collected in study areas; baseline studies completed. | New alternative management systems for alleviating groundwater problems such as use of new tillage or pest management practices based on off-shelf knowledge and on-going research. | |
| 1992 | Production management research evaluation site installation completed. | Costs and benefits of alternative management systems for "whole farms," and estimated impacts on farm costs, returns and productivity. | Release preliminary assessment of accumulative effects of management activities in time and space for mixed use (timber and cropland) areas.* |
| 1993 | Improved models and management systems, and producer decision aids for their implementation. | Second year soil, chemical and crop management site effects allow drawing first tentative conclusions on water quality impacts from modified management systems that are single-cropped (no rotation). | First tentative conclusions based on 3-year results of studies on mixed land-use study. |
| 1994 | Redirect part of USDA support from Midwest Initiative to other areas. | Analysis of socioeconomic consequences of second round of modified management practices and agricultural policies directed toward protecting groundwater. | |

*Dependent on funds being made available to the Forest Service for this purpose in FY 1991.

**Expanding USDA and CES Staff Capacity to Deliver Educational and Technical Assistance to Producers for Effective Agrichemical and Waste Product Management and Environmental Stewardship**

USDA and CES staff capacity for the planning, delivery, and analysis of water quality protection procedures and improved agricultural chemical and production management systems will be expanded and enhanced through updating the Soil Conservation Service Field Office Technical Guides, other references, and through organized professional training.

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**Objective:** Provide USDA and CES field office personnel the detailed technical knowledge and ability to accomplish the farmer education and technology transfer goals of the water quality program in every agricultural county in America.

USDA and CES educational, technical, and program personnel are located in each U.S. State and every agricultural county in America to assist farmers, educate the public, and carry out other program priorities which, at present, involve limited focus on ground water quality related to agricultural chemical use. Much of the achievement of the USDA Water Quality Program's farmer education and technology delivery goals will depend squarely upon these field-based representatives. Detailed field guides and organized professional training on new concepts and technologies pertaining to agricultural chemical and waste product management and related environmental stewardship are essential to develop that delivery capacity.

**Procedures:** A significant component of the technical support capabilities activity will be the education and training of field office personnel to deliver expanded programs, develop or refine water quality practice standards and specifications, implement Geographic Information Systems (GIS) technologies, and conduct monitoring and evaluation, including the analysis of results and the refinement of technical procedures. SCS and ES will publish information material to provide technical guidance on the environmentally responsible management of pesticides, nutrients and waste products for use by farmers, foresters, farm advisors, agribusinesses, and local, county, and State Agencies.

Workshops and special training sessions will be held for USDA and State Agency personnel. A prerequisite to this training will be the selective expansion of ES and SCS technical staffs to ensure that an adequate level of professional support is available.

**Beneficiaries:** Farmers, ranchers and foresters will directly benefit from access to an expanded cadre of thoroughly and well trained Federal and State Agency personnel who possess state-of-the-art knowledge on agricultural chemical and production management strategies to meet environmental stewardship objectives for protecting water quality.

**Leadership and Coordination:** Technical Guide preparation and professional training will largely be conducted by and for ES, CES, SCS and FS personnel, who will call upon the expertise of other lead USDA Agencies, EPA, and USGS as technical resources, trainers, and reviewers of draft technical materials. State Agency personnel and field representatives of other Federal Agencies, such as ASCS, will be invited to participate both as trainers and trainees, as appropriate.

## PLANNED ACCOMPLISHMENTS TO IMPROVE USDA AND CES TECHNICAL SUPPORT CAPABILITIES

| | Technical training | Water quality field staff expansion | Technical materials |
|---|---|---|---|
| **1990** | Totals of 4,000 Federal [1/] and 2,500 State Agency [2/] personnel trained. | A total of 40 new technical specialists hired. | Technical materials representing current state of knowledge on agrichemical management and the effects of conservation practices on groundwater and surface water will be developed for an estimated 2,600 field offices. |
| **1991** | A total of 8,000 Federal and 5,500-6,000 State Agency personnel trained. | Between 20-30 new technical specialists hired. | Technical materials prepared for an additional 600 field offices. Former materials updated to incorporate new findings from research efforts. |
| **1992** | A total of 3,000 Federal and 1,000-2,000 State Agency personnel trained. | Between 15-25 new technical specialists hired. | Outdated training and technical materials replaced with new guidelines on advanced management strategies arising from research and development efforts. |
| **1993 and beyond** | Technical guides continuously revised and updated to rapidly reflect new knowledge, understanding, and management of agricultural chemicals, waste products, and water resources. | | |

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[1/] Federal includes ASCS, SCS, and CES (State level)

[2/] State agency includes county extension agents, conservation district staff, State and local agency personnel and others.

**Demonstration Projects**

Large scale demonstrations and application of currently available and new technology involving many commercial farming operations in large, contiguous land areas will demonstrate to producers, the public and environmental interests that State requirements for ground and surface water quality can be met effectively and voluntarily. Site-specific on-farm demonstrations of improved practices to reduce the transport of agrichemicals through soils and potentially to groundwater will be established to accelerate producer adoption and implementation.

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**Objective:** Encourage accelerated adoption of appropriate technology by producers, as a means of achieving voluntary, cost-effective, and substantial reduction in the loadings of agricultural chemicals to the environment where there is evidence of a water quality problem relating to agriculture. Demonstrate for the soils, climate, cropping and farming practices in each project area how quickly and effectively producers can modify their pesticide and nutrient inputs, conservation systems, tillage and management practices to reduce the movement of agrichemicals and waste products through soils and potentially to groundwater and surface water.

**Procedures:** Projects will be located in multi-county areas to address nonpoint source water quality impairment under specific agricultural, soils, and geologic conditions; and where the water resource has high economic and environmental value. For these projects, critical nonpoint sources of contamination will be identified and specific treatment goals established. Utilizing the best available research data, cost effective resource management systems that integrate efficient production practices with agricultural chemical management will be designed for each demonstration area. Projects will demonstrate to commercial farmers, ranchers and foresters, on their own and their neighbors' lands, pesticide and nutrient management systems that minimize ground and surface water loadings of agricultural chemicals and wastes. Economic, social, and environmental barriers to adoption of these systems will be identified and cost effective solutions to overcome these barriers will be demonstrated. Some financial assistance will be available under the Department's Agricultural Conservation Program. Projects will be evaluated on the extent that improved practices are adopted by producers in each area, the costs of implementation, and the environmental improvements obtained as modified production systems are implemented. Results will be adapted for regional use after 3 years.

**Beneficiaries:** Farmers and private foresters are the direct beneficiaries of extended knowledge and technology that will allow them to reduce voluntarily the adverse impact of their activities on water quality without incurring economic hardship. Producers, the public and environmental interests will be informed about the agricultural and environmental effectiveness of the projects and the voluntary producer implementation of improved practices. Successful producer adoption of environmentally beneficial practices will also reduce pressure on State and Federal budgets by reducing the need for costly regulatory and enforcement programs.

**Leadership and Coordination:** The Extension Service and the Soil Conservation Service will provide joint leadership for the implementation of on-farm demonstration projects. The Agricultural Stabilization and Conservation Service will provide financial assistance. The Forest Service has plans to initiate similar projects for forestry management beginning in 1991. APHIS will like results from the projects to its existing and new regional biocontrol and IPM projects. Demonstration project implementation will require coordination among USDA Agencies, and with the Environmental Protection Agency, and Agencies of the Departments of Interior and Commerce. Cooperating State Agencies, conservation districts and other local entities will be involved in planning and implementing projects.

Collaborating Agencies will provide advice on the selection of demonstration sites that will complement technology and management system research and development activities and that will extend the research results to other geographic regions with specific, identified groundwater quality problems.

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**Planned Sequencing and Practice Adoption for On-Farm Demonstration Projects**

| | | | |
|---|---|---|---|
| **1990** | Initiate first 8 projects<br>--recruit farmer participants<br>--select initial set of management to be demonstrated<br>--establish specific evaluation criteria<br>--farmer adoption and implementation of practices begins | Select sites for subsequent demonstration projects | |
| **1991** | Implement first 8 projects<br>--assist participants in adoption of extended management practices<br>--collect farm level and area-wide data for evaluation purposes<br>--farmer adoption of practices accelerates | Initiate second set of 8 projects | Select sites for subsequent demonstration projects |
| **1992** | Evaluate mid-term success of first 8 projects. Adapt and update management plans to incorporate newly developed technologies and management systems.<br>Farmer adoption of practices culminates | Implement second set of 8 projects | Initiate third set of 8 projects |
| **1993** | Agencies continue to use on-farm demonstration projects for accelerating improved practice adoption while producers maintain installed practices on the demonstration project farms | Adapt, update, and improve management strategies demonstrated in ongoing projects | |
| **1994** | Evaluate the performance and effects resulting from first 8 projects | | Continue adapting current projects to take advantage of water quality research findings |

**Meeting Water Quality Requirements through Education and Technical Assistance**

Education and technology transfer efforts will be targeted to farmers, ranchers, foresters, and rural Agencies who need or seek assistance in implementing management practices that will meet specific State water quality requirements such as those developed for Section 319 water quality plans or specific goals of State, multi-State, regional water quality programs. Where appropriate, specific emphasis will be placed on agricultural nonpoint sources affecting groundwater.

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**Objective:** Provide the background, technology, and consultation support that will allow farmers, ranchers, and foresters to meet formalized State and regional water quality objectives without experiencing economic hardship.

In response to the provisions of Section 319 of the Clean Water Act as amended in 1987, each State is required to submit to EPA a State Nonpoint Source Management Program which indicates the degree to which agriculture is believed to contribute to identified ground and surface water quality problems in the State, and a management plan to reduce identified sources of nonpoint source pollution to the maximum extent possible. Likewise, a number of interstate, interagency efforts, such as the Chesapeake Bay Program and Great Lakes Program, have ongoing initiatives to reduce nonpoint agricultural source contamination of regional watersheds. Agricultural producers who are expected to contribute to State and regional program goals, must be given the knowledge and technology to do so.

**Procedures:** A major emphasis of this activity is to provide education and technical assistance in hydrologic units identified as significant agricultural contributors to water quality problems by the State Section 319 Assessment Reports. Hydrologic units will be ranked at the State level and selected on the basis of: (1) significance of the agricultural sources of pollution; (2) priority for addressing groundwater problems; (3) relative priority of pollutants (pesticides, animal wastes, nutrients); and (4) integration with other water quality efforts. For each hydrologic unit selected, the nonpoint sources of pollution will be identified and specific treatment alternatives developed. Appropriate existing practices, and improved or new practices as they become available, will be applied to meet the specific water quality improvement needs in the hydrologic unit. Education and technical support will be provided to land owners and local Agencies to assist the implementation of new practices. Experience gained through previous and ongoing water quality programs will serve as one basis for hydrologic unit treatment.

Ongoing educational and technical assistance will be continued for multi-State regional projects which have already established that their most immediate problems are degradation of surface water by nutrients and/or animal wastes. Similar assistance will be extended to new regional projects which qualify. Additional assistance to regional projects will be provided to implement agricultural chemical management plans and the application of water quality education and technology capabilities to support objectives established by the regional management Agencies.

**Beneficiaries:** By assisting agricultural producers in meeting established State and regional water quality goals and requirements, the beneficial uses of water and its quality will be protected and the need for onerous or costly regulation will be avoided. Thus, benefits accrue directly to farmers, ranchers and foresters in the form of cost-effective alternatives, and to local, State, and Federal Government Agencies in terms of reduced costs, and to the public in terms of agriculture's independent contribution to water quality protection. As a result of USDA assistance and recommendations to the States, it is anticipated that more State and local Governments will adopt SCS standards and guidelines as a basis for their own initiatives to address the use of agricultural chemicals. This should be a factor in promoting consistency among State programs for agrichemical management.

**Leadership and Coordination:** SCS and ES will jointly lead educational and technical assistance efforts under an existing Memorandum of Understanding Relating to the Implementation of Water Quality Activities. The Forest Service plans to initiate projects relating specifically to ground water quality related to forestry. An interim Memorandum of Agreement establishes the framework for USDA cooperative efforts with EPA. Greater involvement with EPA will include providing technical assistance to support the development of State plans under Section 319 of the Clean Water Act, as amended in 1987 and administered by EPA.

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## SCHEDULE OF PROJECT DEVELOPMENT AND TARGETED ACCOMPLISHMENTS OF EDUCATION AND TECHNICAL ASSISTANCE TO MEET STATE WATER QUALITY REQUIREMENTS AND GOALS

**Project Development Schedule:**

| | 1990 | 1991 | 1992 | 1993 | 1994 |
|---|---|---|---|---|---|
| Number of plans and strategies developed and target adoption goals identified for nonpoint source hydrologic units | 110 | 65 | 55 | 45 | — |
| Number of nonpoint source hydrologic unit projects initiated | 37 | 73 | 65 | 55 | 45 |
| Number of water quality plans, strategies, and target adoption goals identified for regional water quality programs | 95 | 50 | 45 | 40 | — |
| Number of new project areas initiated within existing regional projects | 45 | 50 | 50 | 45 | 40 |

**Targets for Accomplishment of Goals:**

| | Number of years after a project's initiation | | | | |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 |
| Percent of management plans and practices adopted by producers within hydrologic unit or region | 5 | 20 | 50 | 75 | 100 |
| Data from nonpoint source hydrologic unit projects analyzed | → | → | → | → | Year 5 |
| Data from expansion of regional projects analyzed | → | → | → | Year 4 | |

**Economic, Social, and Technical Evaluations**

Evaluations will be conducted at each stage of management system development, extension, and implementation to assure that new and demonstrated technologies and systems are practical and profitable and maintain productivity, and to design incentive and education programs to assure widespread adoption of effective management systems.

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**Objectives:** Determine the economic and technical feasibility and expected consequences of producer adoption of new technologies and management systems before they are recommended, and follow up to document, refine, and assess actual performance of programs in achieving adoption and water quality goals.

**Procedures:** USDA will conduct evaluations of the effectiveness of its water quality activities at all levels from individual projects and individual components of projects to the national level.

The overall USDA evaluation will be summarized in an annual report which evaluates the progress of each building block component and the initiative as a whole.

An evaluation requirement will be built into each research plan. Proposals and final research reports will be evaluated to ensure that research results are both technically correct and responsive to practical problems. Cost effectiveness of recommended solutions will be a major consideration.

Evaluation of demonstration, education, technical and financial assistance components will assess whether agricultural chemical and production management systems extended to producers incorporate the best management practices called for in local, State, and regional, and local planning; whether and to what extent these systems are adopted by landowners; whether water quality models and monitoring data indicate that practices are achieving planned water quality goals; and the extent to which management system implementation complements or conflicts with other agricultural, environmental and social goals.

The program's database components will be evaluated through assessment of the timeliness, level of detail, and statistical reliability of the data collected and the usefulness of the data to policy makers, researchers, and action program Agencies.

**Beneficiaries:** Farmers, ranchers, and foresters, the primary target beneficiaries of the USDA Water Quality Program, will benefit from assurances that their needs and constraints are given attention through economic, social, and technical evaluations. Evaluation reports will guide USDA program administration and inform Federal and State legislators and related program administrators about expected and documented effects of the USDA effort.

**Leadership and Coordination:** The 8 principal USDA Agencies will participate in coordinated evaluation efforts. ARS and CSRS-SAES will lead technical evaluation efforts. ERS will lead economic and social evaluation activities but rely heavily on collaboration with agricultural economics and social science personnel in SCS, ES, ASCS, FS, and the State Land Grant universities. Annual report preparation will be coordinated by the USDA Water Quality Task Force.

Examples of planned evaluation reports are shown on the facing page.

## PLANNED USDA WATER QUALITY PROGRAM EVALUATION REPORTS

| Subject of report(s) | Target release date(s) (FY) |
|---|---|
| Success of 1990 agrichemical use and related practices survey pilot test in meeting USDA, EPA, and USGS data needs | 1991 |
| Technical and economic evaluations of newly developed techniques for on-farm pesticide clean-up and disposal (ARS, CSRS-SAES, ERS) | Annually 1991-1995 |
| Use rates and user satisfaction with Water Quality Information Center (NAL) | Annually 1991-1995 |
| Technical evaluations of newly developed field and lab water quality measurement, sampling and analysis techniques (ARS, CSRS-SAES, and user groups) | Annually 1992-1995 |
| Technical evaluation by scientists and users of new management systems models and newly developed alternative management systems (ARS, CSRS-SAES, and user groups) | 1992 |
| Economic analysis of input substitution possibilities and economic consequences of alternative management systems designed through initial research efforts (ERS and State Cooperators) | 1992 |
| Economic tradeoffs among agricultural productivity, low input agricultural options, environmental regulatory alternatives, the best management approach, and water quality (ERS and State Cooperators) | 1992 |
| Interim technical and economic evaluations of additional management options and refinements resulting from 1992 evaluations (ARS, CSRS-SAES, ERS) | 1993 |
| Number of extended agrichemical and production management systems adopted, and acres covered by each (SCS, ES) | Annually 1991-1995 |
| Environmental loadings reduced and water quality changes induced by demonstration, education, and technical assistance projects (SCS, ES) | Annually 1991-1995 |
| Evaluation of success of initial demonstration, hydrologic unit, (Section 319) and regional education and technical assistance projects in generating changes in agricultural practices and water quality (SCS, ES, ASCS, ERS) | 1993 for 45 regional projects<br>1994 for 8 demonstration and 37 hydrologic unit projects |
| Socioeconomic impacts of new and improved management options for improving ground water quality (ERS and State Cooperators) | 1994 |
| Overall program evaluation and progress reports (all lead USDA Agencies) | Annually 1991-1995 |

**Public Information**

Databases, scientific findings, educational materials, progress reports, and general information will be widely disseminated to appropriate audiences to assure that farmers, environmental groups, Federal and State legislators and program administrators, scientists and the general public are aware of agricultural chemical management and water quality program objectives, activities, findings, and accomplishments.

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**Objectives:** Educate the general public on issues of agriculture's relation to environmental quality, share scientific data, and gain community-wide understanding and support of USDA Water Quality Program goals.

**Procedures:** Frequent press releases will announce and explain the initiation of the program's component projects. Popular publications, written in lay-language, will be prepared and widely disseminated to accelerate public understanding of nonpoint source pollution problems and solutions, including pesticide management, nutrient management, cost-effectiveness of improved management, and testing and treatment of rural water supplies. Annual reports will also be summarized in shortened and easily comprehended format for broad distribution.

A water quality information center will be established at the National Agricultural Library. The center will pilot test a water quality "hotline," expand its Water Information Network, and provide assistance to action Agencies in accessing and analyzing the literature on past research to provide information for technical assistance and educational activities. Databases and survey results summaries will be made widely available via electronic and print media. Workshops and conferences will be held periodically to share scientific findings and present program evaluation results.

**Beneficiaries:** Overall, the effectiveness of the President's Water Quality Initiative in gaining high standards of water quality protection will be enhanced by public awareness of its various programs, accurate public knowledge concerning the issues, and public support of its goals. Public concerns over groundwater quality will be reduced.

The scientific community, both here and abroad, will benefit from improved access to data and research findings. This easy access should accelerate external research on agricultural and water quality issues by reducing research redundancy and providing a foundation for expanded research on related agroenvironmental issues.

**Leadership and Coordination:** Popular news items and publications to inform and educate the general public will be prepared by ES, SCS, ASCS and other principal USDA Agencies, with the assistance of the USDA Office of Information. The National Agricultural Library will contribute substantially to internal and external coordination through its establishment and operation of water quality information networks.

## NEW AND SPECIAL GROUNDWATER QUALITY INFORMATION ACTIVITIES

### A Water Quality Information Center

The Water Quality Information Center (WQIC) at the National Agricultural Library (NAL) will support USDA's research, education, and information dissemination activities. Center staff will provide an information and referral service; strengthen the AGRICOLA database with water quality research and educational/training materials; enhance communication and information dissemination by maintaining an electronic bulletin board conference on water quality and establishing information networks; and develop information products directed toward researchers, educators, farmers, and consumers. NAL will work closely with key Government Agencies, the land-grant community, and other agricultural constituencies.

### Major Workshops and Conferences

Annual Research and Development Conference: A conference to be held during February of each year, the audience to include research scientists and administrators, education and technical assistance professionals, producers, agribusinesses, consumers, and other interested groups. Research and developmental results will be presented with specific effort made at the workshop to integrate results and identify those that are ready for timely transfer and users.

**New Directions from Existing Paths**

USDA Water Quality Program activities are closely coordinated among USDA Agencies and with the related activities of EPA and Agencies of the Departments of Interior and Commerce under the President's Water Quality Initiative. The USDA Water Quality Program will benefit from related, past and ongoing Departmental efforts in soil and water conservation, public information, research, and extension, and will complement the aims of established programs such as those addressing integrated pest management and low input, sustainable and alternative agricultural systems.

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It is clear from the preceding sections that no single planned output from the USDA Water Quality Program is to be produced through the exclusive efforts of a single Agency; all are multi-Agency activities. Also, many of the program's major activities contribute to more than one set of planned outputs. This close integration of program components is predicated upon a network of interagency coordination mechanisms, many of which are in place and others of which are currently under development.

**Interagency Coordination:** At the Departmental level, the Secretary provides overall direction for the Water Quality Program. Implementation of program plans will be the responsibility of the Department's line Agencies. The Agency heads or their designees will form a special Working Group on Water Quality to oversee and integrate the development, implementation and evaluation of program plans. In addition to the USDA Agencies, the Environmental Protection Agency, the Department of the Interior's U.S. Geological Survey, and the Department of Commerce's National Oceanographic and Atmospheric Administration will be asked to appoint representatives to the work group.

A range of existing, formal and informal interagency agreements can easily accommodate coordination of various new program activities. Where no appropriate mechanism exists, one will be established. For example, committees and working groups have been formed to plan specific aspects of both research and data collection activities, and EPA and USGS representatives have been included in planning meetings.

**Relation to Ongoing Programs:** New activities to be conducted under the USDA Water Quality Program will take maximum advantage of the structures and outputs of ongoing programs. For example, research on agricultural chemical management systems will capitalize on the products of current research on biological pest control and agricultural engineering. Current research and extension programs on integrated pest management (IMP) and low input, sustainable agriculture (LISA) will both contribute to and benefit by water quality program activities. APHIS will integrate applicable results from the USDA Water Quality Program with its biocontrol and IPM programs and its plant and health monitoring programs. The National Program for Soil and Water Conservation: 1988-97 Update (NCP) provides an integration mechanism for other education and technical assistance elements of USDA's Water Quality Program with current conservation programs. Financial assistance under ASCS's Agricultural Conservation Program will facilitate producers' ability to adopt some water quality protection strategies.

It is expected that by 1994, USDA's approach to interagency implementation and management of its contribution to the President's Initiative on Water Quality will be recognized as an innovative and effective way of addressing Nationally important agricultural problems. Adaptation of this management method to other, ongoing problems will represent a new base for future expansion of the Department's commitment to mutual retention of National agricultural productivity and environmental quality.

NEWS

United States
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YEUTTER LAUNCHES FARM CONSERVATION PROGRAM, WATER QUALITY POLICY

AMANA, Iowa, Sept. 26 -- Taking advantage of an event in which he launched a three-year "Take Pride in America" Farm Conservation Program, Secretary of Agriculture Clayton Yeutter today also announced a comprehensive new USDA Water Quality policy designed to reduce the pollution of ground and surface water by agricultural chemicals.

Appearing at the Farm Progress Show here with executives from Goodyear and two national farm conservation groups, Yeutter praised the conservation efforts of America's farmers, and their contributions to protecting the environment.

"American farmers have long been conscientious stewards of America's natural resources," Yeutter said. "Now, through this Farm Conservation Program, we have an opportunity to recognize those farmers who practice exceptional conservation techniques."

The Farm Conservation Program, a cooperative effort between USDA, the National Association of Conservation Districts (NACD) and the National Association of State Conservation Agencies (NASCA), will honor an outstanding farmer in each of the nearly 3,000 soil and water conservation districts across the United States during a three-year period.

Continuing the theme of farmers as conservationists, Yeutter went on to announce a new USDA Water Quality policy, which will improve coordination among USDA's vast array of water quality programs, and encourage farmers to adopt agricultural practices and systems that reduce pesticide and agricultural chemical-induced ground and surface water contamination, while still preserving farmers' profitability.

As part of the new clean water strategy, USDA is putting Soil Conservation Service and Extension personnel in all of the 3,000 agricultural counties of the country through an intensive training course in methods of preserving water quality, and, in many cases, is rewriting field guides to help farmers keep agricultural chemicals out of the water.

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# Remarks

News Division, Office of Public Affairs, Room 404-A, U.S. Department of Agriculture, Washington, D.C. 20250

REMARKS PREPARED FOR DELIVERY TO
FARM PROGRESS SHOW
BY
SECRETARY OF AGRICULTURE
CLAYTON YEUTTER

September 26, 1990
Amana, Iowa

I appreciate this opportunity to participate in an "open dialogue" with you on "Challenges and Opportunities Facing American Agriculture." Dialogue means we both get to talk, which will give me a chance to listen to your questions and concerns, as well as share with you a few ideas and concerns of my own.

Before we open this dialogue, though, allow me to take a few minutes to "set the stage" with some initial thoughts on what I consider the most topical items on America's agricultural agenda.

The farm bill now being discussed in Congress would head my list, for reasons of immediacy in terms of timing as well as immediacy of potential farmer impact.

Next, I would consider a successful resolution in December to this current round of trade talks -- the so-called "Uruguay Round" of talks -- to be of great significance because of its tremendous long-term implications for American farmers.

Third, in keeping with the Take Pride in America theme, of which conservation of our natural resources is so important, I will briefly talk about our comprehensive new USDA policy on water quality.

First, the farm bill. This being Take Pride in America Week, wouldn't it be nice if we could list the pending 1990 Farm Bill as one of the things about which to take pride. But it would be premature to do that. The long and short of it is, this pending legislation still needs a lot of work.

As currently drafted, this legislation would undo many of the hard-fought gains of the 1985 Farm Bill. Why? Because while farmers had their plows in the fields this Spring, non-farmers in Congress had their heads in the clouds, making competitiveness-killing decisions based on political expediency; decisions farmers didn't want, and wouldn't have made for themselves.

In 1981, Congress argued that it could safely raise support levels without damaging our competitiveness, without causing higher budget outlays, without leading to increased supply controls, and without hurting American agriculture. As we all know, Congress was wrong. One doesn't have to be an agriculture historian to recall the near-catastrophic fallout from that farm bill: Competitors climbed under our price umbrella, increased production and undersold us in the marketplace. Here at home, exports plummeted, farm incomes shrank while farm program costs skyrocketed and land prices fell into the pits. Worse, we lost a lot of dedicated, productive farmers.

Thankfully, the 1985 Farm Bill pulled us out of those economic doldrums. Gone from the 1985 Farm Bill was the foggy "have our cake and eat it too" thinking that made the 1981 Farm Bill so destructive. Farm policies finally became more market-oriented again, and the results are now in. Farm exports grew from $26 billion to $40 billion, carryover stocks were reduced, and farmers' debt loads shrank while net farm income hit new record highs.

Now, Congress is preparing a new farm bill for 1990, and from the looks of things, one would think that Yogi Berra, that master of the malapropism, is one of the farm bill conferees: "It's deja vu all over again." Once again Congress thinks it knows more about farming, and farm markets and exports, than farmers do. Congress has passed legislation that incorporates some of the same pre-1985 policies that got us into so much trouble only a few years ago. Why are our memories so short, or so faulty?

Could it be because it's an election year, and Congress is eager to pass a "popular" farm bill, even if it may be detrimental to farmers in the long-term?

Though Congress is trying to label this new legislation as being farmer-friendly, it looks to us, and to America's farmers, more like "Nightmare on Elm Street, Part II," where the heart of America's farm economy could once again be handed to our competitors on a silver platter. The Administration has gone to great lengths to point out that these pre-'85 policies are not in anyone's best interests.

In February, we printed a book chock-full of ideas and recommendations on how the 1990 Farm Bill could build on the successes of the 1985 Farm Bill. We called it our "Green Book," our "go book," because it contains policies and recommendations that the Administration, as well as farmers, would like to see included before we go forward with any new farm legislation.

Just so there wouldn't be any confusion, we've also published -- and sent to Members of Congress -- the specific policy items to be avoided in any new legislation. This is our "Red Book," our "stop, these-policies-won't-fly" book, which lists policies that would cause great consternation to American farmers.

If Congress won't listen to the Administration, I would plead at <u>least</u> listen to America's farmers: "Please, don't do us any favors! Don't tie our hands, and don't force us into

another agricultural and international disaster. We've gone down this uncompetitive road before, and a lot of us didn't survive to tell about it."

Let's give farmers what they really want, not what some here in Washington, D.C. want them to have. Let's give American farmers a bill that lets them compete. A bill like 1985's. A bill that let the Europeans know we are serious about selling in international markets. A bill that let the United States enter the Uruguay Round negotiations in a strong position to battle against barriers to agricultural trade.

The most important trade negotiations in history are going to conclude ten weeks from now in Brussels, Belgium. That event is an ocean and a continent away, but what happens there will have a huge impact on Iowa farmers and the entire American agricultural community.

I am talking about the GATT negotiations which have been underway for four years. The GATT -- the General Agreement on Tariffs and Trade -- has helped build world prosperity in the post-World War II years. If new multilateral agreements are not achieved it will be because some nations, particularly the developed nations of Europe, have failed to show the necessary political will to build a level playing field for farmers everywhere.

President Bush is determined to build that level playing field. At July's Economic Summit meeting in Houston, he told the gathered leaders of the world's wealthiest nations -- Japan, Britain, France, Italy, Canada, and Germany -- that the United States will not sign a new GATT trade agreement unless American farmers, and farmers all over the world, get a fair break. The President said that no agreement is preferable to a bad agreement.

American farmers do not have a level playing field today. It is hardly level when European governments spend 20 times more than the United States on export subsidies. Our farmers do not get a fair deal when they have to compete against the treasuries of Europe instead of against European farmers. Our farmers do not get a fair break when European governments misuse health and sanitary regulations to keep out American agricultural products -- beef being the most recent example. Nor do they get a fair break when variable levies take away the benefits of their production efficiencies and impede their exports.

The opportunities for America's farmers will be much brighter if we have a significant, new GATT agreement which includes farm products. Only about five out of every 100 people in the world are Americans. We need open markets to sell to the other 95 percent. You can see why President Bush, our trade representative Carla Hills, and I will not compromise on trade reform principles in the GATT negotiations. Gaining a level playing field is vital to the future of American farming.

American farmers are outstanding managers who are prepared to compete against anybody. More market access will give them the chance to prove that. Here is what we are working for in a new GATT agreement: More market access -- import barriers must come down; export competition -- permit more competition by phasing out export subsidies; internal

supports -- reduce them over a 10-year period and let the market determine who can produce most efficiently and sell most effectively; sanitary and phytosanitary regulations -- use them for legitimate food safety purposes, not to build trade barriers.

You can help in the critical weeks which remain. You can help by making sure your Congressmen and Senators support the U.S. negotiating position, for that position is sound. There are voices outside the U.S. conducting a scare campaign about a new GATT agreement, and there even are some in this country who believe the falsehoods they are spreading. They are saying that a new agreement will mean that nations will no longer be able to help their farmers. That is not true. Governments will continue to have the right to support their farmers, just as long as they do so fairly, without gaining an unfair advantage in the marketplace.

By distorting market signals, many nations have not only precluded development of a level playing field in agriculture, they have also failed to establish sensible policies to conserve the environment. Some nations have encouraged their farmers to grow far beyond market demand, without sufficient attention to water quality and the environment. American agriculture will not take that road. It is the commitment of this Administration to develop sensible ways to sustain our environment and maintain the high productivity of American farms.

In keeping with that goal and commitment, we in the Bush Administration, as part of the President's Water Quality Initiative, have begun a major effort to reduce the risk of agricultural chemical pollution of ground and surface water. This comprehensive new USDA policy was drafted by the Working Group on Water Quality, and is designed to improve coordination among USDA's broad array of water quality programs, and encourage voluntary adoption of agricultural practices that will protect and enhance the nation's ground and surface water.

This goes hand-in-hand with an effort to help farmers directly by assisting them with practices and farming systems that will reduce the use of chemicals while still preserving farmers' profitability.

As part of our new clean water strategy, the USDA is putting Soil Conservation Service and Extension personnel from all of the 3,000 agricultural counties of the country through an intensive training course in methods of preserving water quality. Our field guides, in many cases, are also being rewritten to help farmers keep agricultural chemicals out of the water.

Our 1990 funding includes 85 state-level projects in which USDA experts are working with state officials to actually solve water problems. This is a practical exercise in which we go in with our sleeves rolled up and help local farmers solve problems.

So all these things -- putting our people through crash courses, rewriting our field guides,

and working with farmers on the local level -- are being done to protect and enhance water quality.

Nitrogen and phosphorus compounds from pesticides, herbicides, and fertilizers have been getting into our ground and surface water. The question is: What can we do about it? The answer is: Quite a bit. We can turn good scientific research to the benefit of the American farmer, and help sustain a high level of productivity while also preserving the environment. And we can do this on a voluntary basis, rather than under compulsion.

These are the main challenges now facing American agriculture. They are all important: Passing a new farm bill which will take American agriculture forward, negotiating new trade agreements to open markets abroad, and improving water quality and conserving the environment.

#

# USDA POLICY FOR WATER QUALITY PROTECTION

## 1. Preamble

This policy addresses the impacts of agricultural activities and practices on water quality. It is predicated upon the need to minimize impacts on ground and surface water, and to effectively manage the complex interactions of land use activities with the quality of ground and surface water.

## 2. Purpose

This statement sets for the policy of the United States Department of Agriculture (USDA) to foster agricultural and forestry practices that protect and enhance the Nation's ground and surface water resources. The purpose of this statement is to provide policy guidance for implementing USDA programs related to water quality. The policy is designed to improve coordination among USDA's broad array of water quality programs and encourage voluntary adoption of agricultural practices or systems to minimize impacts on water quality.

## 3. Background

The Clean Water Act directed EPA and the States to develop water quality management plans that include a process to "identify, if appropriate, agriculturally and silviculturally related nonpoint sources of pollution... and set forth procedures and methods to control, to the extent feasible, such sources." In response to the requirements of Section 319, States have developed, and are implementing, nonpoint source management programs. The objective of the Clean Water Act is to restore and maintain the chemical, physical, and biological integrity of the Nation's surface waters. Other environmental statutes, including the Safe Drinking Water Act and the Federal Insecticide, Fungicide and Rodenticide Act, are used by the States and EPA in programs designed to protect ground water.

Currently, two-thirds of the assessed surface waters meet designated use standards. Where water quality is not adequate for the designated uses, EPA has reported that pollution from nonpoint sources, including agriculture, is a major cause of impairment. Potential contaminants from agricultural sources include sediment, nutrients, animal wastes, pesticides, and salts. These materials can move into surface water either attached to sediments or dissolved in runoff.

Groundwater vulnerability to agricultural nonpoint source contamination depends on a range of factors, including soils, climate and geology. When dissolved, agricultural chemicals can contaminate ground water supplies through natural recharge processes. Contaminated surface water may enter the groundwater through influent (recharge) streams. However, there are no comprehensive data on the scope and extent of ground water contamination, and much uncertainty as to both the likely extent, and the specific causes. Ground water also provides the base flow for many surface streams.

USDA programs, practices and assistance have been offered to producers under management authorities dating back to 1897. The early focus was on erosion and sediment control. More recently, USDA programs have also included animal wastes and salinity as agricultural sources of pollution.

The USDA response to public concern about nonpoint source contamination of both ground and surface water was set forth initially in "USDA Nonpoint Source Water Quality Policy," Department Regulation 9500-7, issued in December 1986. A separate USDA "Policy for Ground Water Quality," Department Regulation 9500-8, was issued in November 1987. This was followed in 1988 with concrete action to evaluate USDA performance in this area and to design and implement programs focusing primarily on the protection of ground water. In January 1989, The USDA;s National Program for Soil and Water Conservation established the protection of surface and ground water from nonpoint sources of contamination as a high priority objective. In July 1989, the USDA Water Quality Program Plan presented a five-year, output oriented schedule for implementing the President's 1990 Water Quality Initiative. It is now being implemented by USDA agencies, in cooperation with the States, the Environmental Protection Agency, the U.S. Geological Survey, and the National Oceanic and Atmospheric Administration.

In February 1990, an interagency (USDA) task group was appointed to review and update, as appropriate, previous USDA water quality protection policies. This policy statement reflects those efforts, includes suggestions from other Federal agencies, and supersedes Department Regulations 9500-7 and 9500-8.

## 4. Policy

It is the policy of the USDA to foster agricultural and forestry practices that protect and enhance the Nation's ground and surface water resources. The USDA will provide the best knowledge and technical means available for voluntary responses to avoid or reduce unwanted water quality impacts from agricultural practices. The USDA will continue to develop, implement, and coordinate programs to foster the protection and

enhancement of surface and ground water quality while maintaining agricultural productivity, avoiding economic hardship, sustaining an economical and safe supply of food and fiber, and meeting state and Federal water quality goals and standards. USDA will continue to cooperate with State and Federal agencies to reduce reliance on regulatory approaches to meet water quality goals.

**ACCORDINGLY, USDA WILL:**

a) Develop and implement programs that provide information, procedures and assistance to enhance the voluntary adoption of management practices that reduce the potential for contamination of surface and ground waters from agriculture, forestry, and other sources.

b) Ensure understanding of the role of agricultural chemicals in production, support the prudent use and careful management of agricultural chemicals to reduce the potential for water contamination and, as needed, foster modifications in the use of agricultural chemical and the adoption of alternative crop management systems.

c) Focus, whenever possible, programs, training, personnel, and materials to address water quality concerns in geographically targeted, environmentally sensitive areas.

d) Coordinate USDA water quality programs with other Federal, State and local water quality programs, and work to achieve Federal and State water quality and drinking water standards.

e) Continue improvement of data collection and research efforts to better define and assess the link between agricultural management practices and impacts on quality and beneficial uses of water.

f) Conduct evaluations of practices, technologies, and programs to assess progress and performance in achieving asides goal; and evaluate social costs and benefits associated with water quality programs.

g) Determine the effectiveness of USDA policies and programs in addressing public concerns about the impact of American agriculture on surface and ground water quality, and solicit recommendations from public and private representatives for strengthening programs to meet the USDA goal.

## 5. Implementation

USDA Policy for Water Quality Protection and Enhancement is established under the Secretary's Policy Coordinating Council and issued as a Departmental regulation. A Working Group on Water Quality has been established to assure: (1) effective implementation of this Policy, and (2) effective coordination of USDA agency programs that address or impact water quality. The USDA will implement this policy to protect or enhance water quality goals, and to assure that producers can competitively provide food and fiber for growing world population, while also meeting the needs of an expanding domestic economy.

3/20/91

# DEPARTMENTAL REGULATION

| | |
|---|---|
| **NUMBER:** 9600 | |
| **SUBJECT:** USDA POLICY FOR WATER QUALITY PROTECTION | **DATE:** |
| | **OPI:** ASSISTANT SECRETARY SCIENCE AND EDUCATION |

## 1 PURPOSE

This regulation sets forth the policy of the United States Department of Agriculture (USDA) to foster agricultural and forestry practices that protect and enhance the Nation's ground and surface water resources. The purpose of this regulation is to provide policy guidance for implementing USDA programs related to water quality. The policy is designed to improve coordination among USDA's broad array of water quality programs and encourage voluntary adoption of agricultural practices or systems to minimize impacts on water quality.

This policy addresses the impacts of agricultural activities and practices on water quality. It is predicated upon the need to minimize impacts on ground and surface water, and to effectively manage the complex interactions of land use activities with the quality of ground and surface water.

## 2 CANCELLATIONS

The following directives are superseded by this regulation and are hereby rescinded.

a. Departmental Regulation 9500-7, USDA Nonpoint Source Water Quality Policy, December 5, 1986.

b. Departmental Regulation 9500-8, USDA Policy for Ground Water Quality, November 9, 1987.

## 3 POLICY

It is the policy of the USDA to foster agricultural and forestry practices that protect and enhance the Nation's ground and surface water resources. The USDA will provide the best knowledge and technical means available for voluntary responses to avoid or reduce unwanted water quality impacts from agricultural practices. The USDA will continue to develop, implement, and coordinate programs to foster the protection and enhancement of surface and ground water quality while maintaining agricultural productivity, avoiding economic hardship, sustaining an economical and safe supply of food and fiber, and meeting State and Federal water quality goals and standards. USDA will continue to cooperate with State and Federal agencies to reduce reliance on regulatory approaches to meet water quality goals.

**DISTRIBUTION:** 96

## 4 BACKGROUND

The Clean Water Act directed the Environmental Protection Agency (EPA) and the States to develop water quality management plans that include a process to "identify, if appropriate, agriculturally and silviculturally related nonpoint sources of pollution. . . and set forth procedures and methods to control, to the extent feasible, such sources." In response to the requirements of Section 319 of the Clean Water Act, States have developed, and are implementing, nonpoint source management programs. The objective of the Clean Water Act is to restore and maintain the chemical, physical, and biological integrity of the Nation's surface waters. The EPA and the States have established programs to protect ground water, in accordance with the Safe Drinking Water Act and the Federal Insecticide, Fungicide and Rodenticide Act.

Currently, two-thirds of the assessed surface waters meet designated use standards. Where water quality is not adequate for the designated uses, EPA has reported that pollution from nonpoint sources, including agriculture, is a major cause of impairment. Potential contaminants from agricultural sources include sediment, nutrients, animal wastes, pesticides, and salts. These materials can move into surface water either attached to sediments or dissolved in runoff.

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design and implement programs focusing primarily on the protection of ground water. In January 1989, the USDA's National Program for Soil and Water Conservation established the protection of surface and ground water from nonpoint sources of contamination as a high priority objective. In July 1989, the USDA Water Quality Program Plan presented a 5-year, output-oriented schedule for implementing the President's 1990 Water Quality Initiative. It is now being implemented by USDA agencies, in cooperation with the States, the Environmental Protection Agency, the U.S. Geological Survey, the Tennessee Valley Authority, the U.S. Army Corps of Engineers, and the National Oceanic and Atmospheric Administration.

On November 1, 1989, the Deputy Secretary established the Working Group on Water Quality under the Secretary's Policy and Coordination Council for the purpose of coordination of intradepartmental programs and activities related to all aspects of water quality including the President's Water Quality Initiative. The Working Group on Water Quality consists of the Assistant Secretaries for Marketing and Inspection Services, Natural Resources and the Environment, Economics, and Science and Education, or their designees, and representatives designated by the Administrators of those agencies involved in water quality research, educational, regulatory, budgetary or technical assistance activities.

In February 1990, an interagency (USDA) task group was appointed to review and update, as appropriate, previous USDA water quality protection policies. This regulation reflects those efforts and includes suggestions from other Federal agencies.

5 RESPONSIBILITIES

a The Office of the Secretary will:

(1) Coordinate USDA efforts with other Federal departments and agencies that implement policies and procedures that relate to this policy.

(2) Resolve issues and act on recommendations raised by the Secretary's Policy Coordination Council and Departmental Committees.

b The Working Group on Water Quality will provide Departmental leadership for the implementation of this policy. The Working Group on Water Quality will:

(1) Coordinate the work of USDA agencies in carrying out provisions of this policy.

(2) Monitor the implementation of this policy and inform the Secretary regarding progress and problems encountered.

c USDA Agencies and offices will:

(1) Develop and implement programs that provide information, procedures and assistance to enhance the voluntary adoption of management practices that reduce the potential for contamination of surface and ground waters from agriculture, forestry, and other sources.

(2) Ensure understanding of the role of agricultural chemicals in production, support the prudent use and careful management of agricultural chemicals to reduce the potential for water contamination and, as needed, foster modifications in the use of agricultural chemicals and the adoption of alternative crop management sytems.

(3 Focus, whenever possible, programs, training, personnel, and materials to address water quality concerns in geographically targeted, environmentally sensitive areas.

(4) Coordinate USDA water quality programs with other Federal, State and local water quality programs, and work to achieve Federal and State water quality and drinking water standards.

(5) Continue improvement of data collection and research efforts to better define and assess the link between agricultural management practices and impacts on quality and beneficial uses of water.

(6) Conduct evaluations of practices, technologies, and programs to assess progress and performance in achieving USDA's goals; and evaluate social costs and benefits associated with water quality programs.

(7) Determine the effectiveness of USDA policies and programs in addressing public concerns about the impact of American agriculture on surface and ground water quality, and solicit recommendations from public and private representatives for strengthening programs to meet the USDA goals.

-END-

United States
Department of
Agriculture

# United States Department of Agriculture Working Group on Water Quality

Directory

January 1992

# Directory

## United States Department of Agriculture Working Group on Water Quality

## January 1992

### From the President's Initiative on Water Quality:

"The protection of the environment and the conservation and wise management of our natural resources must have a high priority on our national agenda. But given sound research, innovative technology, hard work, sufficient public and private funds, and—most important of all—the necessary political will, we can achieve and maintain the environment that protects the public health and enhances the quality of life for us all."

### Principles

- The President is committed to protecting the Nation's groundwater resources from contamination by fertilizers and pesticides without jeopardizing the economic vitality of U.S. agriculture.
- Water quality programs must accommodate both the immediate need to halt contamination and the future need to alter fundamental farm production practices.
- Ultimately, farmers must be responsible for changing production practices to avoid contaminating ground and surface waters. Federal and state resources can provide valuable information and technical assistance to producers so that environmentally sensitive techniques can be implemented at minimum cost.

In response to this Initiative, USDA established a Working Group on Water Quality to coordinate the programs of the various agencies within the Department and to coordinate USDA programs with those of other agencies.

### Agricultural Council on Environmental Quality

The Food, Agriculture, Conservation, and Trade Act of 1990 (FACT) established as Congressional policy "... that water quality protection, including source reduction of agricultural pollutants, henceforth shall be an important goal of the programs and policies of the Department of Agriculture." The FACT Act also provided for establishment of the Agricultural Council on Environmental Quality. The Council was established early in 1991 with a charge to coordinate and direct environmental policies and programs of the Department. The Working Group on Water Quality now reports to the Agricultural Council on Environmental Quality. Under the direction of the Council, the Working Group undertakes assignments dealing with water quality programs and has specific responsibility for coordinating USDA's programs that contribute to the President's Initiative on Water Quality.

# Agency and Organization Acronyms Used in This Directory

United States Department of Agriculture (USDA) Agencies:

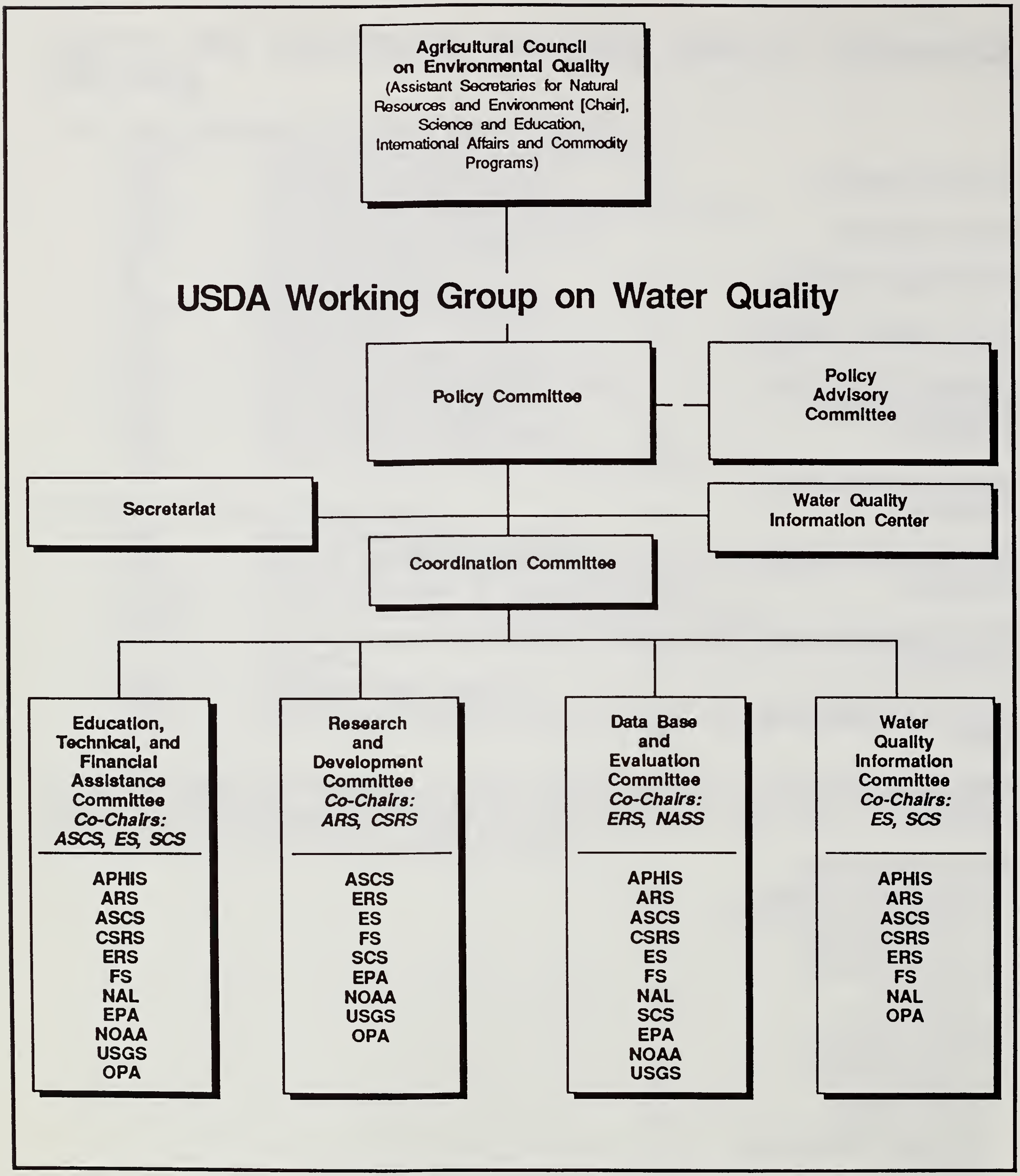
| | |
|---|---|
| APHIS | Animal and Plant Health Inspection Service |
| ARS | Agricultural Research Service |
| ASCS | Agricultural Stabilization and Conservation Service |
| CSRS | Cooperative State Research Service |
| ERS | Economic Research Service |
| ES | Extension Service |
| FmHA | Farmers Home Administration |
| FS | Forest Service |
| NAL | National Agricultural Library |
| NASS | National Agricultural Statistics Service |
| SCS | Soil Conservation Service |
| OPA | Office of Public Affairs, USDA |
| OBPA | Office of Budget and Policy Analysis, USDA |

Non-USDA Agencies and Organizations:

| | |
|---|---|
| EPA | Environmental Protection Agency |
| FWS | Fish and Wildlife Service, U.S. Department of the Interior |
| NACD | National Association of Conservation Districts |
| NASCA | National Association of State Conservation Agencies |
| NOAA | National Oceanic and Atmospheric Administration, U.S. Department of Commerce |
| TVA | Tennessee Valley Authority |
| USGS | United States Geological Survey, U.S. Department of the Interior |

Use zip code 20250 to mail materials to any USDA office in Washington, DC. Please note that this directory was developed primarily for internal use within USDA. To verify mailing address, please contact the person to whom you are sending materials.

# Contents


Agricultural Council on Environmental Quality
(Assistant Secretaries for Natural Resources and Environment [Chair], Science and Education, International Affairs and Commodity Programs)
USDA Working Group on Water Quality
Policy Committee
Policy Advisory Committee
Secretariat
Water Quality Information Center
Coordination Committee
Education, Technical, and Financial Assistance Committee
Co-Chairs: ASCS, ES, SCS
APHIS ARS ASCS CSRS ERS FS NAL EPA NOAA USGS OPA
Research and Development Committee
Co-Chairs: ARS, CSRS
ASCS ERS ES FS SCS EPA NOAA USGS OPA
Data Base and Evaluation Committee
Co-Chairs: ERS, NASS
APHIS ARS ASCS CSRS ES FS NAL SCS EPA NOAA USGS
Water Quality Information Committee
Co-Chairs: ES, SCS
APHIS ARS ASCS CSRS ERS FS NAL OPA

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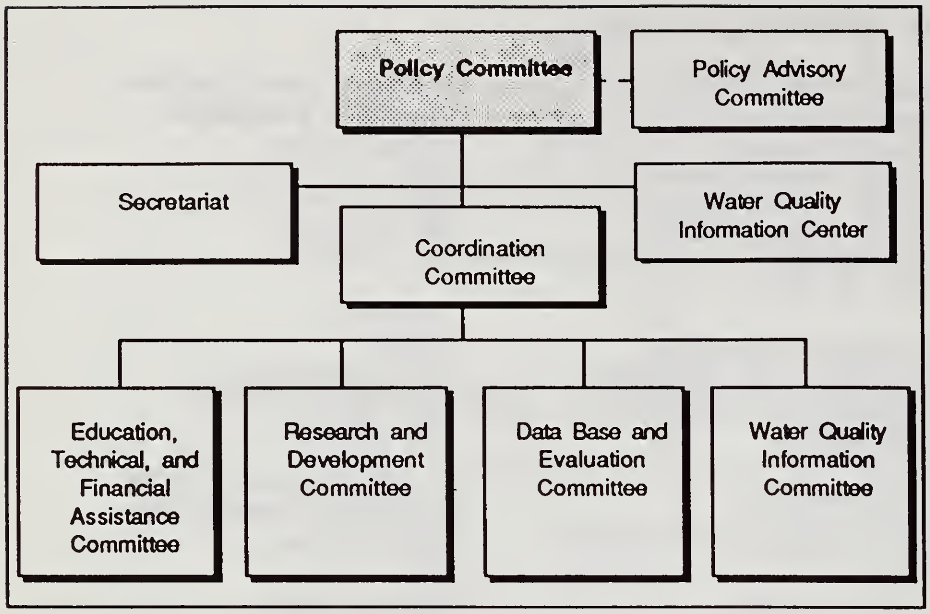


**Provides overall policy review and coordination of water quality activities, particularly those mandated by the President's Initiative, and provides recommendations to the Agricultural Council on Environmental Quality.**

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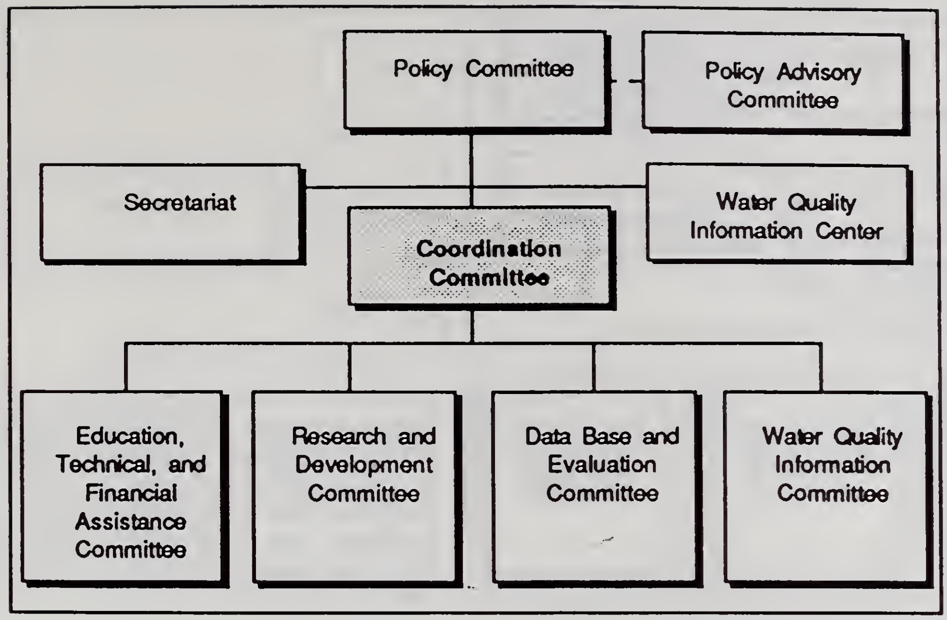


**Provides overall coordination of Working Group on Water Quality activities.**

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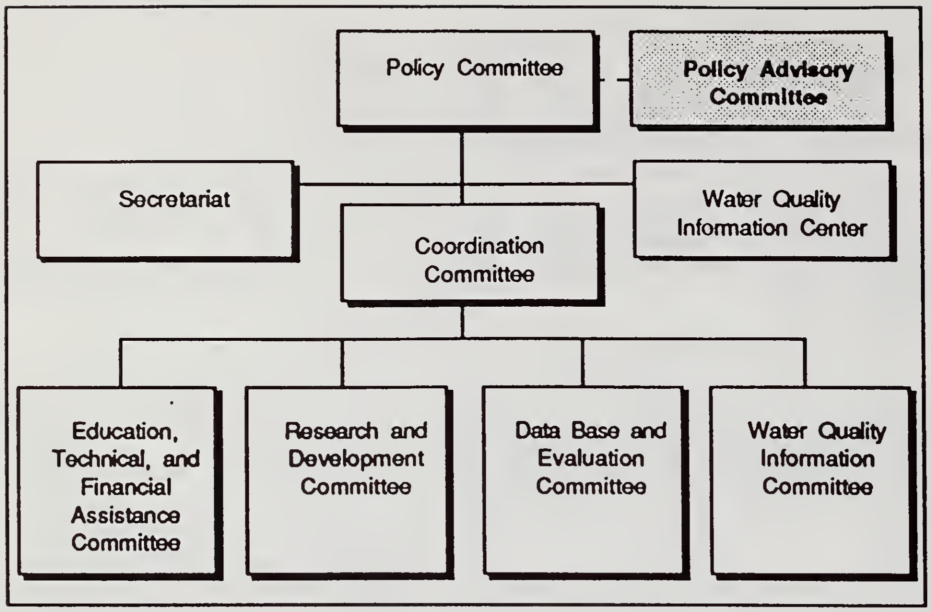


**Provides advice and counsel to the Policy Committee on policy, program direction, legislative activities, and coordination activities with other federal, state, and local agencies; interest groups; and the public.**

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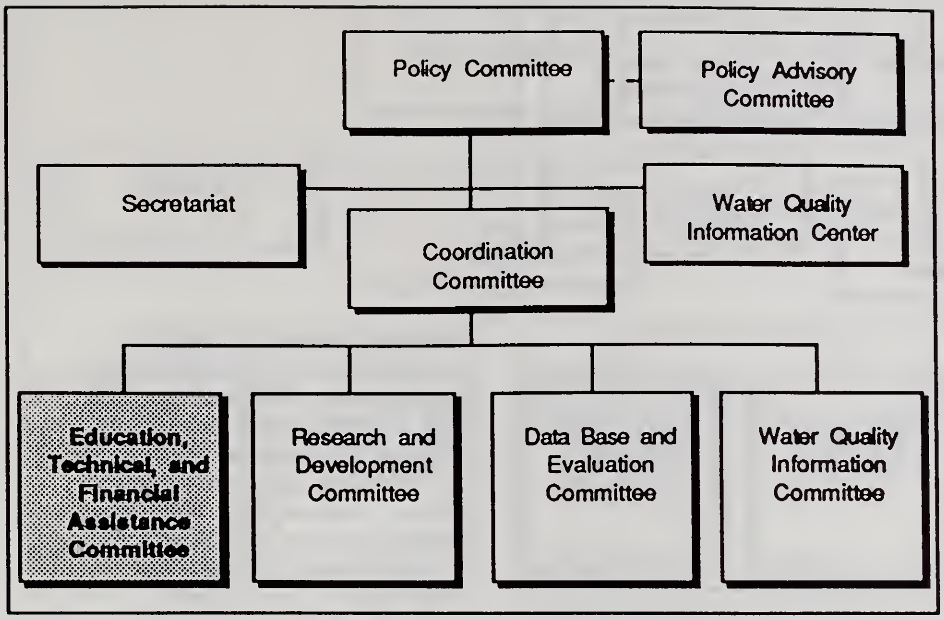


**Provides leadership and coordination for education, technical, and financial assistance efforts. These efforts help farmers, ranchers, and foresters apply new and improved agrichemical and waste management and agricultural production practices based on available research results and new techniques, practices, and systems derived from research and development.**

## Education, Technical, and Financial Assistance Committee

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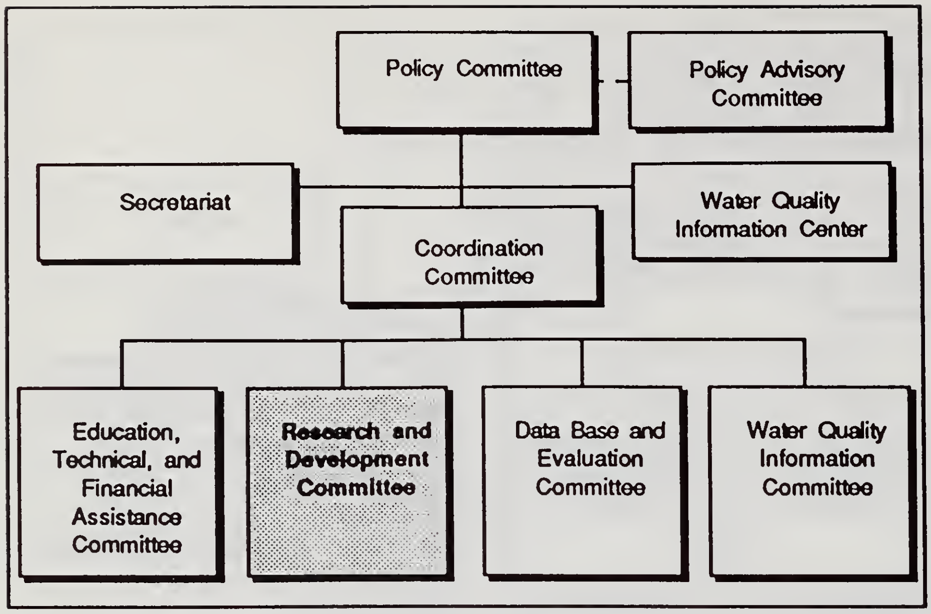


**Provides leadership and coordination for research and development efforts to provide new and improved agricultural and forestry management practices and systems that will increase farmer, rancher, and forester effectiveness in reducing the risks of water quality degradation for a wide range of conditions.**

# Research and Development Committee

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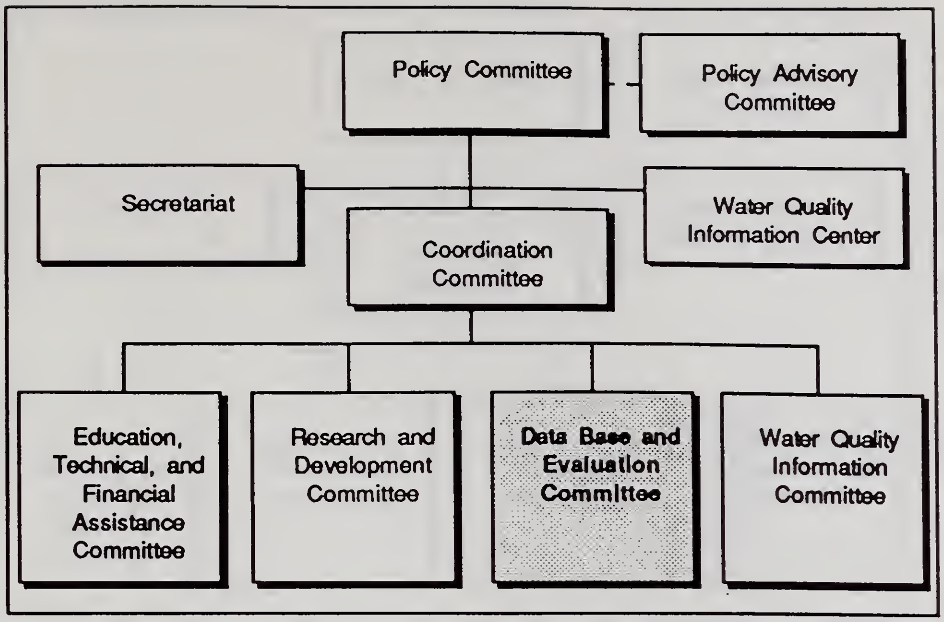
**Technical Integration Group—Subcommittee to the Research and Development Committee**
The purpose of the Technical Information Group (TIG) is to advise the Working Group on development and implementation of a coordinated, integrated, and comprehensive interagency research program to address questions regarding agricultural chemicals and water resources. A framework of federal, state, and local public and private institutions exists to address water resources, agricultural, and environmental issues. The TIG seeks to use existing organizational and program networks that link federal activities to those of state and local institutions. Membership of the TIG varies as to what the identified problem is and what coordination is necessary.




**Provides leadership and coordination to:**

- **Develop, analyze, and report timely, statistically reliable data on the aggregate levels of use and composition of pesticides, fertilizers, and related inputs.**
- **Analyze the expected environmental improvements and economic effects of a comprehensive program of research, education, and technical and financial assistance for reducing water quality problems in agriculture.**

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**Continued on next page**

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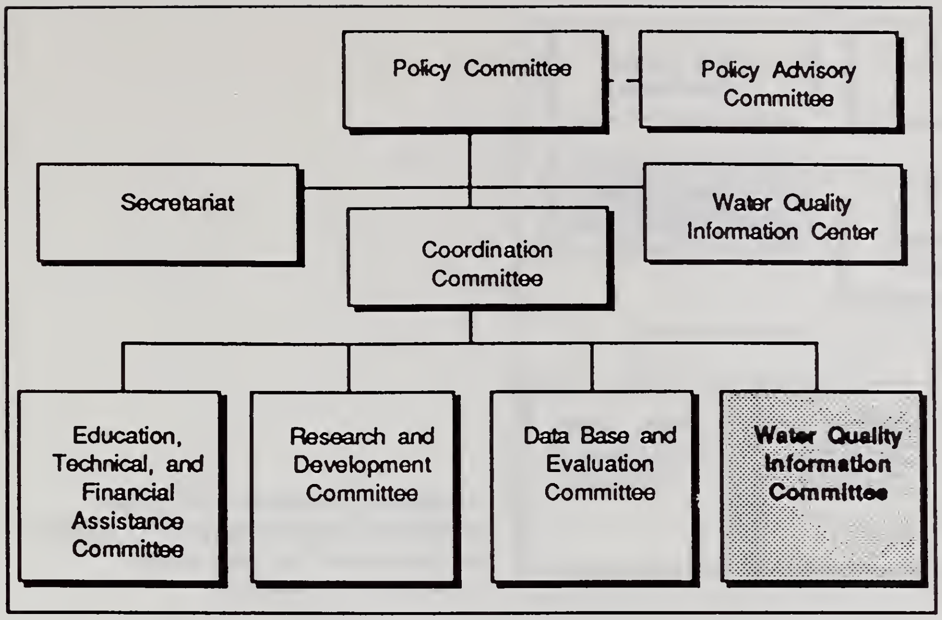


The Water Quality Information Committee is composed of top information officers from each USDA agency involved in water quality at the Working Group level. The Committee:

- Provides USDA-wide coordination and interagency cooperation in water quality information.
- Develops informational materials to interpret USDA policy on water quality.
- Addresses the need for wide dissemination of information about the issue of water quality as it pertains to the food and agriculture industry.

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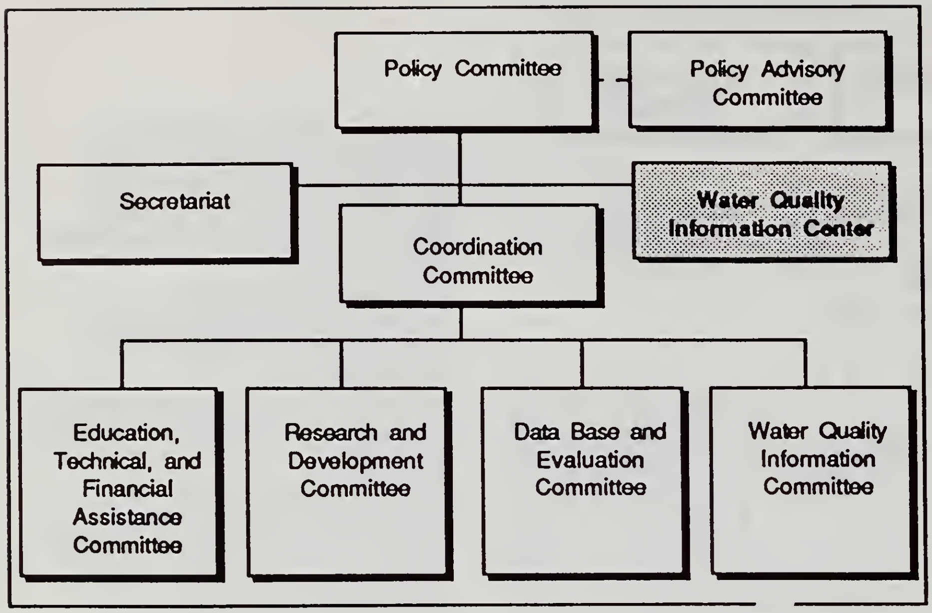


**Provides information services relating to water quality as it affects or is affected by agricultural production practices.**

## Water Quality Information Center

The water quality Information Center is part of the National Agricultural Library located in Beltsville, Maryland. The Center, established as part of the President's Initiative on Water Quality, provides a variety of information services to scientists, technical experts, other state and federal agencies, farmers and ranchers, and the general public. The primary focus of the Center is on the quality and quantity of water resources as they affect or are affected by agricultural production practices. Staff in the Center can:

- Help you to find information on a specific topic related to water quality. This may include performing brief, complimentary searches of computerized databases or more exhaustive searches on a cost recovery basis.
- Refer you to additional information resources on water quality available through the private sector.
- Identify current research and applied projects conducted by USDA and other agencies.
- Determine the status of legislation and regulations related to water quality.
- Connect you to others interested in water quality through the Water Information Network, a conference on NAL's electronic bulletin board.

The Center can be contacted by mail, telephone, fax, NAL's electronic bulletin board, and through electronic networks (Internet and Telemail).

**Mailing address:**
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National Agricultural Library,
Room 1402
10301 Baltimore Blvd
Beltsville, MD 20705-2351
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FTS: 964-6077
Fax: 301-504-7098
FTS Fax: 964-7098

**Electronic mail addresses:**
TELEMAIL: JKEMP
INTERNET:
JKEMP.ASRR.ARSUSDA.GOV

NAL's electronic bulletin board (Agricultural Library Forum) 301-504-6510 or 504-5111, FTS 964-6510 (access requires a computer terminal or computer, modem, and communications software. Software parameters should be set to 300, 1200, or 2400 BAUD; 8 data bits; 1 stop bit; parity—none; duplex—full. Access the Water Information Network by joining the WIN conference.)

## Interagency Coordinating Committee

**Provides a forum for review and coordination of policy concerns at the level of Cabinet officers and agency heads. The chair rotates among agencies.**

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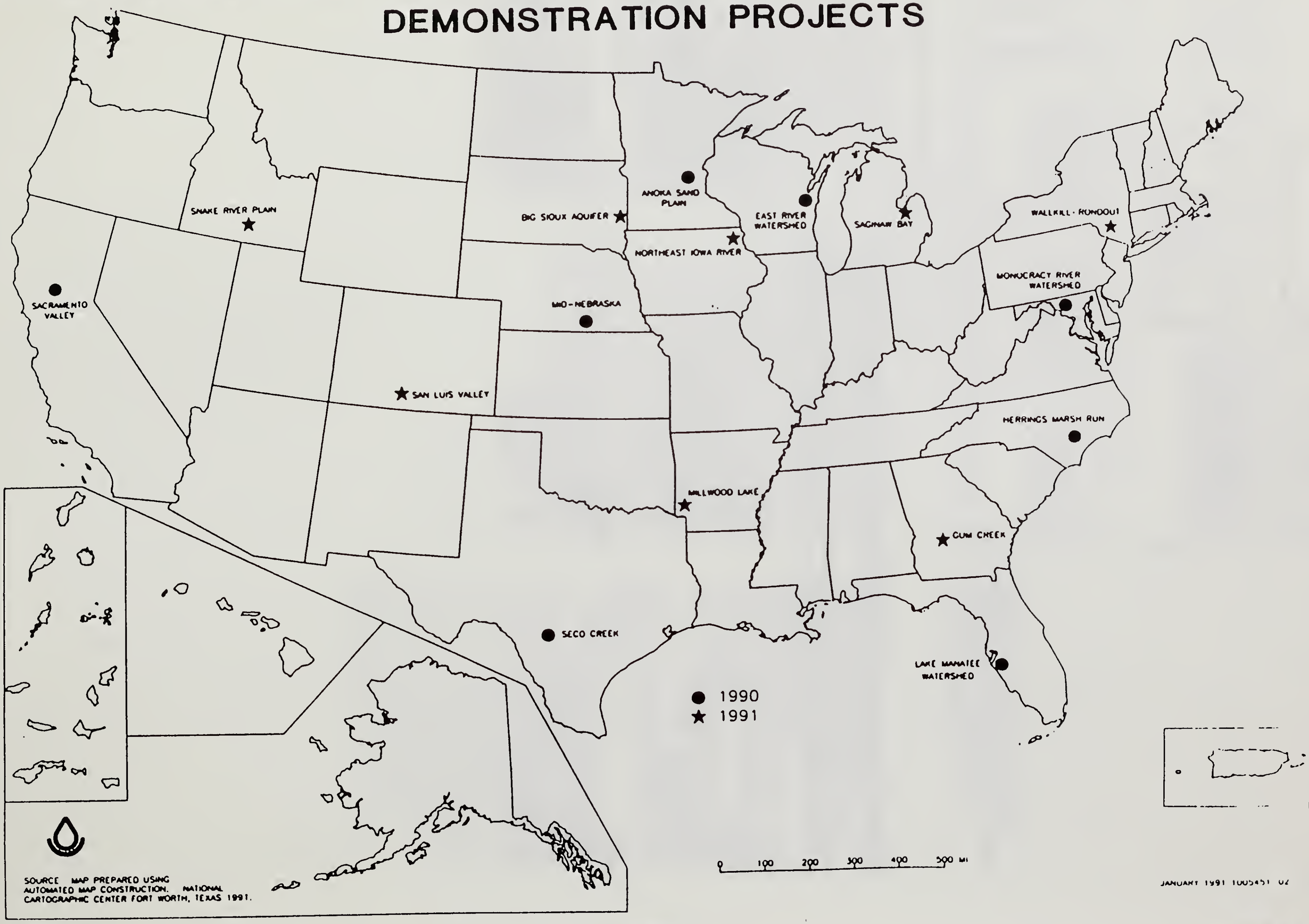
During 1990 and 1991, 16 projects representing different sets of agricultural, soil, and geologic conditions were selected to address agricultural nonpoint sources of pollution. The objective of these projects is to demonstrate the effectiveness of selected conservation practices in treating specific nonpoint source pollution problems and to promote the use of these practices in other areas. Demonstration projects are using the best available technology and management concepts to implement systems of conservation practices that combine efficient production with the producer's water quality goals.

## DEMONSTRATION PROJECTS



## 1990 DEMONSTRATION PROJECTS

| STATE | PROJECT NAME | COUNTY |
|---|---|---|
| CALIFORNIA | SACRAMENTO VALLEY | BUTTE, COLUSA, SUTTER, YUBA, TEHAMA, PLACER, YOLO |
| FLORIDA | LAKE MANATEE WATERSHED | MANATEE |
| MARYLAND | MONOCACY RIVER WATERSHED | CARROLL, FREDERICK, MONTGOMERY |
| MINNESOTA | ANOKA SAND PLAIN | ANOKA, BENTON, CHISAGO, HENNEPIN, ISANTI, MILLE, LACS, RAMSEY, SHERBURNE, STEARNS, WASHINGTON, WRIGHT |
| NEBRASKA | MID-NEBRASKA | ADAMS, BUTLER, CLAY, FILLMORE, HAMILTON, KEARNEY, POLK, SEWARD, YORK, WEBSTER |
| NORTH CAROLINA | HERRINGS MARSH RUN | DUPLIN (NORTHWESTERN PART) |
| TEXAS | SECO CREEK | BANDERA, MEDINA, UVALDE |
| WISCONSIN | EAST RIVER WATERSHED | BROWN |

## 1991 DEMONSTRATION PROJECTS

| STATE | PROJECT NAME | COUNTY |
|---|---|---|
| ARKANSAS | MILLWOOD LAKE | HEMPSTEAD, HOWARD, LITTLE RIVER, POLK, SEVIER |
| COLORADO | SAN LUIS VALLEY | ALAMOSA, CONEJOS, COSTILLA, RIO GRANDE, SAGUACHE |
| GEORGIA | GUM CREEK | CRISP, DOOLY |
| IDAHO | SNAKE RIVER PLAIN | BLAINE, CASSIA, JEROME, LINCOLN, MINIDOKA, ONEIDA, POWER, TWIN FALLS |
| IOWA | NORTHEAST IOWA RIVER | ALLAMAKEE, CLAYTON, FAYETTE, WINNESHIEK |
| MICHIGAN | SAGINAW BAY | BAY, HURON, SAGINAW, TUSCOLA |
| NEW YORK | WALLKILL-RONDOUT | ORANGE, SULLIVAN, ULSTER |
| SOUTH DAKOTA | BIG SIOUX AQUIFER | BROOKINGS, MOODY, MINNEHAHA |

# Water Resource Treatment Objectives for Demonstration Projects

| State | Principal Water Resource Concern | | Polluting Agents | | | | |
|---|---|---|---|---|---|---|---|
| | Ground Water | Surface Water | Pesticides | Nutrients | Animal Waste | Mineral Salts & Elements | Sediment |
| Demonstration Projects 1990 | | | | | | | |
| California | | X | X | | | | |
| Florida | X | X | X | X | | | |
| Maryland | X | X | X | X | X | | X |
| Minnesota | X | | X | X | | | |
| Nebraska | X | | X | X | | | |
| North Carolina | X | X | X | X | X | | X |
| Texas | X | X | X | X | X | | X |
| Wisconsin | X | X | X | X | X | | |
| Demonstration Projects 1991 | | | | | | | |
| Arkansas | X | X | | X | X | | |
| Colorado | X | | X | X | | | |
| Georgia | X | X | X | X | | | X |
| Idaho | X | X | X | X | | | X |
| Iowa | X | X | X | X | | | X |
| Michigan | X | X | X | X | | | X |
| New York | X | X | X | X | X | | X |
| South Dakota | X | | X | X | X | | |

## USDA Water Quality Demonstration Projects Initiated in FY 1990

| State | County/Parish | Project Name | Project Purpose | SCS Coordinator | ES Coordinator |
|---|---|---|---|---|---|
| California | Butte, Colusa, Sutter, Yuba, Tehama, Placer, Yolo | Sacramento Valley Demonstration Project | Demonstrate economic and environmental feasibility of pesticide management practices that reduce pesticide residue levels in irrigation return flow water. | Gary Bullard (916) 449-2855 | Jim Hill (916) 752-3458 |
| Florida | Manatee | Lake Manatee Watershed Demonstration Project | Demonstrate use of profitable irrigation and crop management systems, based on computer decision models, for the reduction of nutrient and pesticide loadings to surface and ground water. | Jerry Joiner (904) 377-7127 | Brian McNeal (904) 392-1804 |
| Maryland | Carroll, Frederick, Montgomery | Monocacy River Watershed Demonstration Project | Focus on economically feasible and environmentally effective methods for farmers to reduce the application of fertilizers and properly manage animal wastes, thus reducing the potential to pollute surface and ground water. | Jeff Loser (301) 757-7145 | Dick Weismiller (301) 405-1312 |

## USDA Water Quality Demonstration Projects Initiated in FY 1990—Continued

| State | County/Parish | Project Name | Project Purpose | SCS Coordinator | ES Coordinator |
|---|---|---|---|---|---|
| Minnesota | Anoka, Benton, Chisago, Hennepin, Isanti, Mille Lacs, Ramsey, Sherburne, Stearns, Washington, Wright | Anoka Sand Plain Demonstration Project | Demonstrate cost-effective nutrient and crop management systems that reduce loadings of nitrates and pesticides in a groundwater recharge area. | Jon DeGroot (612) 290-3677 | Fred Bergsrud (612) 625-9733 |
| Nebraska | Adams, Butler, Clay, Fillmore, Hamilton, Kearney, Polk, Seward, York, Webster | Mid-Nebraska Water Quality Demonstration Project | Demonstrate on irrigated cropland the integrated use of cost-effective nitrogen, irrigation, and pest management to reduce chemical inputs, production costs, and groundwater contamination. | Tom Hamer (402) 437-5313 | Richard Ferguson (402) 762-4431 |
| North Carolina | Duplin (northwestern part) | Herrings Marsh Run Demonstration Project | Demonstrate crop and nutrient management systems that maintain farm profitability and reduce pesticide and nutrient loadings to both ground and surface waters in areas with shallow groundwater tables. | John Garrett (919) 790-2909 | Frank Humenick (919) 737-2675 |
| Texas | Bandera, Medina, Uvalde | Seco Creek Demonstration Project | Demonstrate cost-effective vegetative management systems to increase water yield and reduce pesticide and nitrogen leaching in a groundwater recharge area. | Gary Westmorland (817) 774-1255 | Billy Harris (409) 845-2425 |

## USDA Water Quality Demonstration Projects Initiated in FY 1990—Continued

| State | County/Parish | Project Name | Project Purpose | SCS Coordinator | ES Coordinator |
|---|---|---|---|---|---|
| Wisconsin | Brown | East River Watershed Demonstration Project | Demonstrate crop management systems that reduce the level of nitrogen, phosphorus, and pesticides required to produce competitive crops, thus enhancing farmers' net income and reducing the loading of nutrients and pesticides to surface and ground water. | Jim Kapp (608) 264-5578 | Gary Jackson (608) 262-1916 |

# USDA Water Quality Demonstration Projects Initiated FY 1991

| State | Counties | Project Name | Project Purpose | SCS Coordinator | ES Coordinator |
|---|---|---|---|---|---|
| Arkansas | Hempstead, Howard, Little River, Polk, Sevier | Millwood Lake | Demonstrate BMP's for proper utilization and disposal of animal manures. | Albert E. Sullivan (501) 378-5964 | Stanley Chapman (501) 671-2168 |
| Colorado | Alamosa, Conejos, Costilla, Rio Grande, Saguache | San Luis Valley | Reduce pollution of groundwater by agricultural chemicals through the promotion and application of BMP's, including improved IWM. | Steve Chick (303) 491-6172 | Lloyd Walker (303) 491-6172 |
| Georgia | Crisp, Dooly | Gum Creek | Increase the voluntary adoption of innovative BMP's to protect ground and surface water from excessive loading of nutrients and pesticides. | Hiram Boone (404) 546-2272 | Bill Segars (404) 542-9072 |
| Idaho | Blaine, Cassia, Jerome, Lincoln, Minidoka, Oneida, Power, Twin Falls | Snake River Plain | Encourage adoption of BMP's, including IWM to reduce need for deep well injection, to reduce surface and ground water impacts of agriculture. | Rod Alt (208) 334-9643 | Robert Mahler (208) 885-7025 |
| Iowa | Allamakee, Clayton, Fayette, Winneshiek | Northeast Iowa River | Accelerate the adoption of economically sound onfarm management systems, including the Farmstead Assessment System, that protect ground and surface water quality. | Lyle Asell (515) 284-4523 | Gerald Miller (515) 294-1923 |

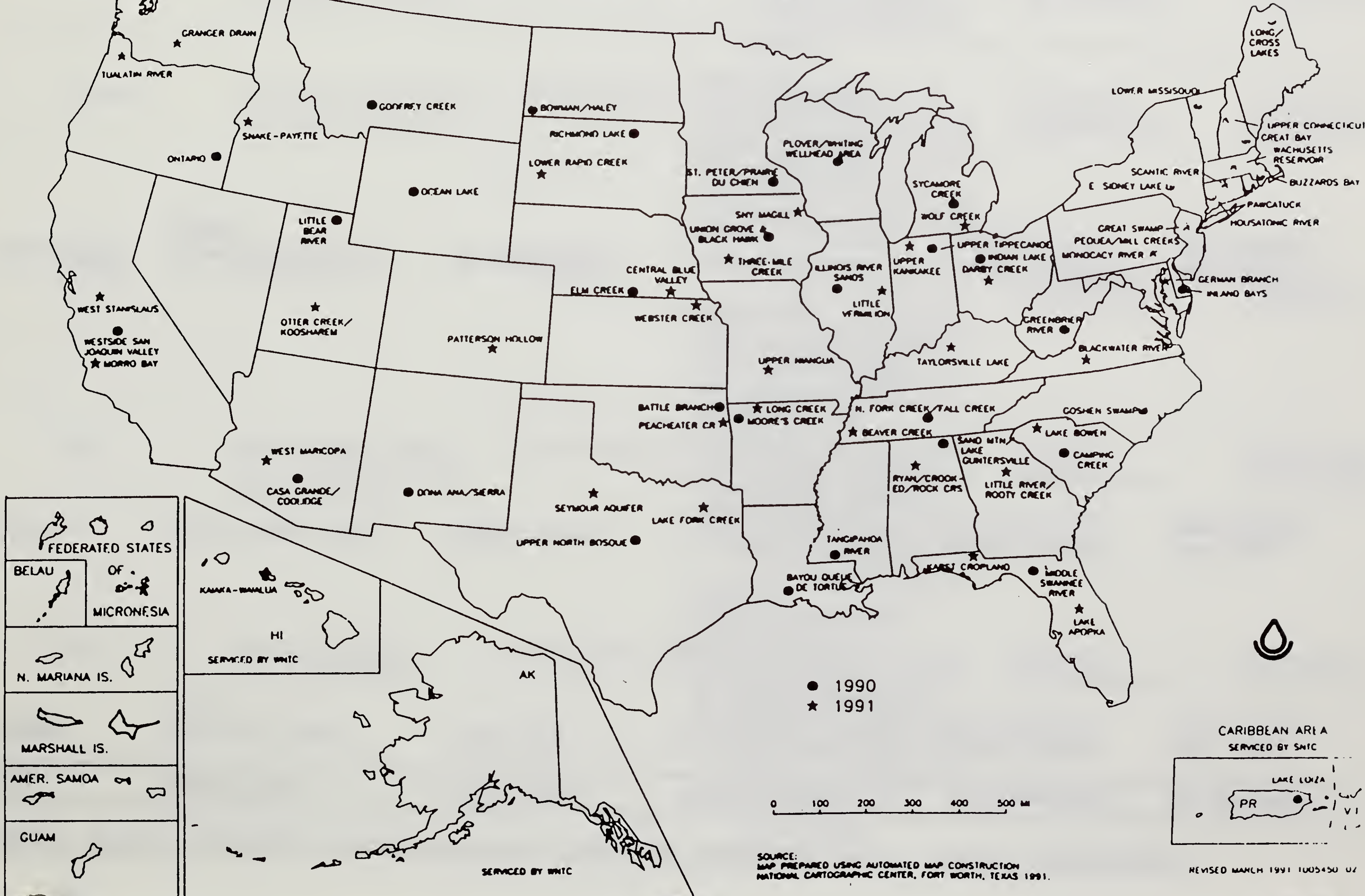
## USDA Water Quality Demonstration Projects Initiated in FY 1991—Continued

| State | County/Parish | Project Name | Project Purpose | SCS Coordinator | ES Coordinator |
|---|---|---|---|---|---|
| Michigan | Bay, Huron, Saginaw, Tuscola | Saginaw Bay | Provide new and innovative technology to agricultural producers in order that traditional farming practices be modified to protect water quality. | William Hartman (517) 337-6904 | Mark Hansen (517) 355-0117 |
| New York | Orange, Sullivan, Ulster | Wallkill-Rondout | Demonstrate coincident benefits to crop and animal management and water resource protection by integrating and coupling options for water and soil management, nutrient management, and integrated pest management. | Malcolm Henning (914) 343-1873 | Keith Porter (607) 255-5941 |
| South Dakota | Brookings, Moody, Minnehaha | Bg Sioux Aquifer | Implement BMPs on agricultural lands and develop other measures at the local level to protect public water supplies in shallow ground water aquifers from contamination. | LeRoy Holtzsclaw (605) 353-1783 | Alan Bender (605) 688-4910 |

In selected agricultural watersheds or aquifer-recharge areas called "hydrologic unit areas," SCS, ES, ASCS, and cooperating agencies provide educational, technical, and financial assistance to help farmers and ranchers meet state water quality goals. The purpose of an HUA is to address an identified nonpoint source water quality problem.

During 1990 and 1991, 74 HUAs were selected on the basis of (1) significance of the agricultural sources of pollution; (2) relative predominance of such pollutants as pesticides, nutrients, animal waste, sediments, and salts; and (3) conformance with other water quality efforts. In each area, cost-sharing is provided to farmers to install conservation practices for water quality improvement. Cost-share funds may come from several sources, including ASCS and state cost-share programs. HUA water quality plans are now being implemented. Each project will be evaluated to determine the effect that selected conservation practices have on the water quality problem.

## HYDROLOGIC UNIT AREA PROJECTS



## 1991 HYDROLOGIC UNIT AREAS

| STATE | PROJECT NAME | COUNTY(S) |
|---|---|---|
| ALABAMA | RYAN/CROOKED/ROCK CREEKS | CULLMAN, WINSTON |
| ARIZONA | WEST MARICOPA | MARICOPA |
| ARKANSAS | LONG CREEK | CARROLL, BOONE |
| CALIFORNIA | MORRO BAY | SAN LUIS OBISPO |
| CALIFORNIA | WEST STANISLAUS | STANISLAUS |
| COLORADO | PATTERSON HOLLOW | OTERO, PUEBLO |
| CONNECTICUT | SCANTIC RIVER | HARTFORD, TOLLAND |
| FLORIDA | KARST CROPLAND | JACKSON |
| FLORIDA | LAKE APOPKA | LAKE, ORANGE |
| GEORGIA | LITTLE RIVER/ROOTY CREEK | JASPER, MORGAN, NEWTON, PUTNAM, WALTON |
| HAWAII | KAIAKA-WAIALUA | HONOLULU |
| IDAHO | SNAKE-PAYETTE | ADAMS, CANYON, GEM, PAYETTE, WASHINGTON |
| ILLINOIS | LITTLE VERMILION | CHAMPAIGN, EDGAR, VERMILION |
| INDIANA | UPPER KANKAKEE | LA PORTE, MARSHALL, ST. JOSEPH |
| IOWA | SNY MAGILL | CLAYTON |
| IOWA | THREE MILE CREEK | ADAIR, UNION |
| KANSAS | WEBSTER CREEK | BROWN, NEMAHA |
| KENTUCKY | TAYLORSVILLE LAKE | ANDERSON, BOYLE, MERCER, NELSON, SHELBY, SPENCER |
| MARYLAND | GERMAN BRANCH | QUEEN ANNE'S |
| MASSACHUSETTS | WACHUSETTS RESERVOIR | WORCESTER |
| MICHIGAN | WOLF CREEK | LENAWEE |
| MISSOURI | UPPER NIANGUA | DALLAS, LACLEDE, WEBSTER |
| NEBRASKA | CENTRAL BLUE VALLEY | GAGE, JEFFERSON, SALINE |
| NEW HAMPSHIRE | UPPER CONNECTICUT | GRAFTON |
| NEW JERSEY | GREAT SWAMP | MORRIS, SOMERSET |
| OHIO | DARBY CREEK | CHAMPAIGN, FRANKLIN, LOGAN, MADISON, PICKAWAY, UNION |
| OKLAHOMA | PEACHEATER CREEK | ADAIR |
| OREGON | TUALATIN RIVER | WASHINGTON |
| PENNSYLVANIA | PEQUEA/MILL CREEKS | LANCASTER |
| SOUTH CAROLINA | LAKE BOWEN | GREENVILLE, SPARTANBURG |
| SOUTH DAKOTA | LOWER RAPID CREEK | PENNINGTON |
| TENNESSEE | BEAVER CREEK | FAYETTE, HAYWOOD, SHELBY, TIPTON |
| TEXAS | SEYMOUR AQUIFER | HASKELL, KNOX |
| TEXAS | LAKE FORK CREEK | HOPKINS, RAINS, WOOD |
| UTAH | OTTER CREEK/KOOSHAREM | PIUTE, SEVIER |
| VIRGINIA | BLACKWATER RIVER | FRANKLIN |
| WASHINGTON | GRANGER DRAIN | YAKIMA |

## 1990 HYDROLOGIC UNIT AREAS

| STATE | PROJECT NAME | |
|---|---|---|
| ALABAMA | SAND MTN/LAKE GUNTERSVILLE | MARSHALL, DE KALB, JACKSON |
| ARIZONA | CASA GRANDE/COOLIDGE | PINAL |
| ARKANSAS | MOORE'S CREEK | WASHINGTON |
| CALIFORNIA | WESTSIDE SAN JOAQUIN VALLEY | FRESNO, MERCED, KINGS |
| CONNECTICUT | HOUSATONIC RIVER | LITCHFIELD, FAIRFIELD, NEW HAVEN, HARTFORD (PLUS DUTCHESS & COLUMBIA COS., N.Y. & BERKSHIRE CO. MASS.) |
| DELAWARE | INLAND BAYS | SUSSEX |
| FLORIDA | MIDDLE SWANNEE RIVER | LAFAYETTE, SUWANNEE |
| ILLINOIS | ILLINOIS RIVER SANDS | MASON |
| INDIANA | UPPER TIPPECANOE | KOSCIUSKO |
| IOWA | UNION GROVE AND BLACK HAWK | TAMA, MARSHALL |
| LOUISIANA | BAYOU QUEUE DE TORTUE | ACADIA, VERMILION, LAFAYETTE |
| MAINE | LONG/CROSS LAKES | AROOSTOOK |
| MASSACHUSETTS | BUZZARDS BAY | PLYMOUTH, BRISTOL, BARNSTABLE |
| MICHIGAN | SYCAMORE CREEK | INGHAM |
| MINNESOTA | ST. PETER/PRAIRIE DU CHIEN | OLMSTED |
| MISSISSIPPI | TANGIPAHOA RIVER | PIKE, AMITE, LINCOLN |
| MONTANA | GODFREY CREEK | GALLATIN |
| NEBRASKA | ELM CREEK | WEBSTER |
| NEW HAMPSHIRE | GREAT BAY | ROCKINGHAM, STRAFFORD |
| NEW MEXICO | DONA ANA/SIERRA | DONA ANA, SIERRA |
| NEW YORK | EAST SIDNEY LAKE | DELAWARE |
| NORTH CAROLINA | GOSHEN SWAMP | DUPLIN |
| NORTH DAKOTA | BOWMAN/HALEY | BOWMAN |
| OHIO | INDIAN LAKE | LOGAN, HARDIN |
| OKLAHOMA | BATTLE BRANCH | DELAWARE |
| OREGON | ONTARIO | MALHEUR |
| PUERTO RICO | LAKE LOIZA | LAKE LOIZA in the RIO GRANDE DE LOIZA WATERSHED |
| RHODE ISLAND | PAWCATUCK | WASHINGTON |
| SOUTH CAROLINA | CAMPING CREEK | LEXINGTON, NEWBERRY |
| SOUTH DAKOTA | RICHMOND LAKE | BROWN, EDMUNDS, MC PHERSON |
| TENNESSEE | N. FORK CREEK/FALL CREEK | BEDFORD |
| TEXAS | UPPER NORTH BOSQUE | ERATH, HAMILTON |
| UTAH | LITTLE BEAR RIVER | CACHE |
| VERMONT | LOWER MISSISQUOI | FRANKLIN, LAMOILLE |
| WEST VIRGINIA | GREENBRIER RIVER | GREENBRIER |
| WISCONSIN | PLOVER/WHITING WELLHEAD AREA | PORTAGE |
| WYOMING | OCEAN LAKE | FREMONT |

# Water Resource Treatment Objectives for Hydrologic Unit Areas

| State | Principal Water Resource Concern | | Polluting Agents | | | | |
|---|---|---|---|---|---|---|---|
| | Ground Water | Surface Water | Pesticides | Nutrients | Animal Waste | Mineral Salts & Elements | Sediment |
| **Nonpoint Source Hydrologic Unit Areas 1990** | | | | | | | |
| Alabama | X | X | X | | X | | X |
| Arizona | X | | | X | | | |
| Arkansas | X | X | | X | X | | |
| California | X | | X | X | | X | |
| Connecticut | X | X | X | X | X | | X |
| Delaware | X | X | X | X | X | | X |
| Florida | X | X | | X | | | |
| Illinois | X | | X | X | | | |
| Indiana | X | X | X | X | | | X |
| Iowa | X | X | X | X | | | X |
| Louisiana | | X | | | X | | X |
| Maine | | X | | X | | | X |
| Massachusetts | | X | X | X | X | | |
| Michigan | X | X | X | | | | X |
| Minnesota | X | | X | X | | | |
| Mississippi | | | X | X | X | | X |
| Montana | | | | X | X | | X |
| Nebraska | | X | | | | | X |
| New Hampshire | X | X | X | X | X | | X |
| New Mexico | X | X | X | | X | X | X |
| New York | X | | | X | | | X |
| North Carolina | X | X | | X | | | X |
| North Dakota | | X | | X | | | X |
| Ohio | | X | | | | | X |
| Oklahoma | | X | | X | | | |
| Oregon | X | X | X | X | | | |
| Puerto Rico | | X | X | | | | |
| Rhode Island | X | X | X | X | | | |
| South Carolina | | X | X | X | | | |

## Water Resource Treatment Objectives for Hydrologic Unit Areas—Continued

| State | Principal Water Resource Concern | | Polluting Agents | | | | |
|---|---|---|---|---|---|---|---|
| | Ground Water | Surface Water | Pesticides | Nutrients | Animal Waste | Mineral Salts & Elements | Sediment |
| South Dakota | | X | | X | | | X |
| Tennessee | X | X | X | X | X | | X |
| Texas | | X | X | X | X | | |
| Utah | | X | | X | | | X |
| Vermont | X | X | X | X | | | X |
| West Virginia | X | X | X | X | | | X |
| Wisconsin | X | | X | X | | | |
| Wyoming | | X | X | X | | | X |
| **Nonpoint Source Hydrologic Unit Areas 1991** | | | | | | | |
| AL - Ryan/Crooked/RockCreeks | X | X | | X | X | | X |
| AZ - West Maricopa | X | X | X | X | | | |
| AR - Long Creek | X | X | | X | X | | |
| CA - Morro Bay | X | X | X | X | | | X |
| CA - West Stanislaus | | X | X | X | | | X |
| CO - Patterson Hollow | X | X | X | X | | X | X |
| CT - Scantic River | X | X | X | X | | | X |
| FL - Karst Cropland | X | | X | X | | | X |
| FL - Lake Apopka | | X | X | X | | | X |
| GA - Little River/Rooty Creek | X | X | X | X | X | | X |
| HI - Kaiaka-Waialua | X | X | X | X | | | X |
| ID - Snake-Payette | X | X | X | X | | | X |
| IL - Little Vermilion | | X | X | X | | | X |
| IN - Upper Kankakee | X | | X | X | | | |
| IA - Three Mile Creek | X | X | X | X | X | | X |
| IA - Sny Magill Creek | | X | X | X | X | | X |
| KS - Webster Creek | | X | X | X | X | | X |
| KY - Taylorsville Lake | X | X | | X | | | X |

## Water Resource Treatment Objectives for Hydrologic Unit Areas—Continued

| State | Principal Water Resource Concern | | Polluting Agents | | | | |
|---|---|---|---|---|---|---|---|
| | Ground Water | Surface Water | Pesticides | Nutrients | Animal Waste | Mineral Salts & Elements | Sediment |
| MD - German Branch | X | X | X | X | | | X |
| MA - Wachusetts Reservoir | X | X | | X | X | | |
| MI - Wolf Creek | X | X | X | X | | | X |
| MO - Upper Niangua | X | X | X | X | X | | |
| NE - Central Blue Valley | X | | X | X | | | |
| NH - Upper Connecticut | | X | X | X | X | | X |
| NJ - Great Swamp | | X | | X | | | X |
| OH - Darby Creek | | X | X | X | | | X |
| OK - Peacheater Creek | X | X | | X | X | | |
| OR - Tualatin River | | X | X | X | X | | X |
| PA - Pequea/Mill Creeks | X | X | X | X | X | | X |
| SC - Lake Bowen | X | X | X | X | | | X |
| SD - Lower Rapid Creek | X | X | X | X | X | | X |
| TN - Beaver Creek | X | X | X | X | | | X |
| TX - Seymour Aquifer | X | | X | X | | | |
| TX - Lake Fork Creek | X | X | X | X | X | | |
| UT - Otter Creek/Koosharem | | X | | X | X | | X |
| VA - Blackwater River | | X | X | X | | | X |
| WA - Granger Drain | X | X | X | X | X | | X |

## Nonpoint Source Hydrologic Unit Areas Initiated FY 1990

| State | County/Parish | Project Name | Project Concern | SCS Coordinator | ES Coordinator |
|---|---|---|---|---|---|
| Alabama | Marshall, De Kalb, Jackson | Sand Mountain/Lake Guntersville | Focus on problems of intensive agriculture (row crops, swine, poultry, dairy, beef) on shallow soils and the effects of pesticides, sediment, and bacteria in Lake Guntersville. | William R. Thompson, Jr. (205) 821-8070 | James E. Hairston (205) 844-4985 |
| Arizona | Pinal | Casa Grande/Coolidge | Reduce the amount of nitrates from irrigated cropland and confined animal feedlots entering ground water. | Barton E. Ambrose (602) 640-2248 | Roger Huber (602) 621-7207 |
| Arkansas | Washington | Moore's Creek | Reduce nitrogen and phosphorus loadings from confined animal feedlots and poultry and dairy operations to Lincoln Lake and the Illinois River. | Danny P. Goodwin (501) 378-5445 | Stan Chapman (501) 373-2620 |
| California | Fresno, Merced, Kings | Westside San Joaquin Valley | Improve irrigation management and scheduling techniques to reduce subsurface drainage volume and the amount of pesticide and nutrient residues entering ground water. | Gary L. Bullard (916) 449-2848 | Ken Tanji (916) 752-0683 |

## Nonpoint Source Hydrologic Unit Areas Initiated FY 1990–Continued

| State | County/Parish | Project Name | Project Concern | SCS Coordinator | ES Coordinator |
|---|---|---|---|---|---|
| Connecticut | Litchfield, Fairfield, New Haven, Hartford (plus Dutchess and Columbia Counties in N.Y. and Berkshire County in Mass.) | Housatonic River | Reduce the amount of nutrients, pesticides, fertilizers, and sediment entering the Housatonic River and adjacent wetlands from agricultural enterprises. | Joseph A. Neafsey (203) 487-4017 | Roy Jeffery (203) 887-1608 |
| Delaware | Sussex | Inland Bays | Improve nutrient and animal waste management techniques to reduce sediment and nutrient movement into water courses and the Inland Bays estuary. | Lester Stillson (302) 678-4162 | Dave Woodward (302) 451-2505 |
| Florida | Lafayette, Suwannee | Middle Suwannee River | Reduce the amount of nutrients entering the Suwannee River and the Floridan Aquifer from agricultural operations on karst topography through the accelerated use of nutrient and animal waste management techniques. | Jerry R. Joiner (904) 377-7127 | Arthur G. Hornsby (904) 392-1951 |
| Illinois | Mason | Illinois River Sands | Focus on the reduction of agricultural nutrient and pesticide loadings entering the aquifer through improved irrigation water management. | Gary Parker (217) 398-5271 | Donald Kuhlman (217) 333-9649 |

## Nonpoint Source Hydrologic Unit Areas Initiated FY 1990–Continued

| State | County/Parish | Project Name | Project Concern | SCS Coordinator | ES Coordinator |
|---|---|---|---|---|---|
| Indiana | Kosciusko | Upper Tippecanoe | Reduce the potential for agricultural nitrates, phosphates, pesticides, and sediment to contaminate lakes and ground water through the use of crop, agrichemical, and livestock management techniques. | Charles Gossett (317) 290-3219 | David Petritz (317) 494-8494 |
| Iowa | Tama, Marshall | Union Grove and Black Hawk | Reduce the amount of agricultural nutrients, pesticides and sediment entering lakes and tributaries by improving crop and animal waste management methods. | Lyle Asell (515) 284-4260 | Jerry Miller (515) 294-1923 |
| Louisiana | Acadia, Vermilion, Lafayette | Bayou Queue De Tortue | Focus on the reduction of sediment-laden discharges from rice fields entering streams through improved irrigation management. | Kent Milton (318) 473-7808 | Bill Branch (504) 388-2229 |
| Maine | Aroostook | Long/Cross Lakes | Reduce the amount of nutrients, pesticides, and sediment entering streams and lakes through improved crop and nutrient management methods. | Robert Wengrzynek (207) 581-3436 | Rick Kersbergen (207) 581-3312 |

## Nonpoint Source Hydrologic Unit Areas Initiated FY 1990–Continued

| State | County/Parish | Project Name | Project Concern | SCS Coordinator | ES Coordinator |
|---|---|---|---|---|---|
| Massachusetts | Plymouth, Bristol, Barnstable | Buzzards Bay | Reduce the amount of agricultural nutrients and pesticides entering streams and the estuary through improved crop and nutrient management techniques. | Fred Suffian (413) 256-0441 | Bob Schrader (413) 545-2665 |
| Michigan | Ingham | Sycamore Creek | Use fertilizer, pesticide, and crop management techniques to reduce agricultural pesticides and sediment entering surface waters. | William J. Hartman (517) 337-6904 | Frank Brewer (517) 355-0117 |
| Minnesota | Olmsted | St. Peter/Prairie Du Chien | Reduce the amount of agricultural nutrients and pesticides entering drinking water and ground water aquifers in karst topography through improved nutrient and pesticide management methods. | Jon DeGroot (612) 290-3677 | Fred Bergsrud (612) 625-9733 |
| Mississippi | Pike, Amite, Lincoln | Tangipahoa River | Focus on reduction of agricultural pesticides, fertilizers, animal waste, and sediment entering the river system. | Robert N. Jones (601) 965-4330 | John Wilson (601) 325-8737 |
| Montana | Gallatin | Godfrey Creek | Reduce the amount of sediment, animal waste, and nitrates entering the watershed from agricultural sources through improved irrigation water and animal waste management methods. | Scott Hoag, Jr. (406) 587-6816 | Richard E. Phillips (406) 994-3681 |

## Nonpoint Source Hydrologic Unit Areas Initiated FY 1990–Continued

| State | County/Parish | Project Name | Project Concern | SCS Coordinator | ES Coordinator |
|---|---|---|---|---|---|
| Nebraska | Webster | Elm Creek | Focus on reduction of soil erosion and sediments entering the watershed through improved crop management methods. | Tom Hamer (402) 437-5313 | James Bushnell (402) 472-2966 |
| New Hampshire | Rockingham, Strafford | Great Bay | Reduce the amount of agricultural nutrients, pesticides, sediment, and animal waste entering tributaries and the estuary through improved nutrient, pesticide and crop management methods. | John D. Minnick (603) 868-7581 | Frank Mitchell (603) 862-1067 |
| New Mexico | Dona Ana, Sierra | Dona Ana/Sierra | Minimize the impacts of agricultural chemicals, nutrients, and animal wastes on surface and ground water through improved nutrient, pesticide, livestock and irrigation water management techniques. | Ernest Gonzales (505) 766-2173 | Elston Grubaugh (505) 646-2021 |
| New York | Delaware | East Sidney Lake | Reduce the amount of agricultural nutrients, pesticides, and sediment entering lakes and tributaries through improved crop, nutrient and pesticide management methods. | Joseph R. DelVecchio (315) 423-5544 | David W. Gross (607) 255-2825 |

# Nonpoint Source Hydrologic Unit Areas Initiated FY 1990—Continued

| State | County/Parish | Project Name | Project Concern | SCS Coordinator | ES Coordinator |
|---|---|---|---|---|---|
| North Carolina | Duplin | Goshen Swamp | Improve chemical and biological values of surface and ground water by reducing the amount of nutrients, pesticides, sediment and animal wastes entering the system through improved crop, animal waste and agrichemical management practices | John Garrett (919) 790-2909 | Frank Humenik (919) 737-2675 |
| North Dakota | Bowman | Bowman/Haley | Reduce the amount of agricultural nutrients and sediment entering tributaries and the lake through improved crop and nutrient management methods. | Herb T. Mittelstedt (701) 250-4421 | Darnell Lundstrom (701) 237-7239 |
| Ohio | Logan, Hardin | Indian Lake | Reduce agricultural sedimentation of Indian Lake through improved crop and soil management techniques. | Robert L. Burris (614) 469-6932 | Don Pritchard (614) 292-4077 |
| Oklahoma | Delaware | Battle Branch | Reduce the amount of agricultural nutrients entering the river system through improved nutrient and animal waste management practices. | Donald R. Vandersypen (405) 624-4404 | James H. Stiegler (405) 744-6421 |

## Nonpoint Source Hydrologic Unit Areas Initiated FY 1990—Continued

| State | County/Parish | Project Name | Project Concern | SCS Coordinator | ES Coordinator |
|---|---|---|---|---|---|
| Oregon | Malheur | Ontario | Reduce loadings of sediment, nutrients and pesticides entering the river systems from agricultural operations through accelerated implementation of crop, nutrient and pesticide management practices. | Kenneth D. Kaul (503) 326-2751 | James A. Vomocil (503) 737-2441 |
| Puerto Rico | Lake Loiza in the Rio Grande de Loiza watershed | Lake Loiza | Reduce the amount of agricultural nutrients, pesticides, sediment, and animal wastes entering Lake Loiza through improved nutrient, pesticide, crop, and animal waste management methods. | Manuel Roman-Sanchez (809) 878-5120 | Rafael Davila-Lopez (809) 765-8000 |
| Rhode Island | Washington | Pawcatuck | Reduce loadings of agricultural nutrients, pesticides, sediment and animal wastes entering the river system by improving crop, nutrient, pesticide and animal waste management methods. | Kristine A. Stuart (401) 828-1300 | William R. Wright (401) 792-2495 |

## Nonpoint Source Hydrologic Unit Areas Initiated FY 1990–Continued

| State | County/Parish | Project Name | Project Concern | SCS Coordinator | ES Coordinator |
|---|---|---|---|---|---|
| South Carolina | Lexington, Newberry | Camping Creek | Reduce the amount of agricultural nutrients, pesticides, sediment, and bacteria entering Lake Murray and its tributaries through improved crop, nutrient, pesticide, and animal waste management techniques. | Brian Schmidt (803) 253-3977 | Mack Horton (803) 656-3113 |
| South Dakota | Brown, Edmunds, McPherson | Richmond Lake | Reduce the amount of agricultural nutrients, sediment, and bacteria entering Richmond Lake and its tributaries by improving crop, nutrient and animal waste management practices. | Leroy Holtsclaw (605) 353-1783 | Chuck Ullrey (605) 688-5669 |
| Tennessee | Bedford | N. Fork Creek and Fall Creek | Reduce agricultural nutrients, pesticides, sediment, and animal waste entering surface and ground water in karst topography by improving crop, nutrient, and pesticide management methods. | Tim Powers (615) 736-5471 | George Smith (615) 974-7306 |
| Texas | Erath, Hamilton | Upper North Bosque | Focus on reducing the amounts of agricultural nutrients pesticides, and animal wastes entering the river system through improved animal waste and crop management techniques. | Gary Westmoreland (817) 774-1360 | Bill Harris (409) 845-2425 |

## Nonpoint Source Hydrologic Unit Areas Initiated FY 1990–Continued

| State | County/Parish | Project Name | Project Concern | SCS Coordinator | ES Coordinator |
|---|---|---|---|---|---|
| Utah | Cache | Little Bear River | Reduce the amount of agricultural nutrient and sediment loadings to the river system by improving crop, pasture, and rangeland management and irrigation water management methods. | R. Deane Harrison (801) 524-5054 | Richard C. Peralta (801) 750-2786 |
| Vermont | Franklin, Lamoille | Lower Missisquoi | Minimize impacts of agriculture on surface and ground water quality by improving management of crops, soils, nutrients, pesticides, and animal wastes. | Richard J. Croft (802) 951-6795 | Don McFeeters (802) 656-2990 |
| West Virginia | Greenbrier | | Reduce agricultural nutrients, pesticides, and sediment entering surface and ground water in limestone bedrock by improving crop, nutrient, and pesticide management techniques. | Paul Dunn (304) 291-4151 | Edmond B. Collins (304) 293-6131 |

# Nonpoint Source Hydrologic Unit Areas Initiated Fiscal Year 1991

| State | County/Parish | Project Name | Project Concern | SCS Coordinator | ES Coordinator |
|---|---|---|---|---|---|
| Alabama | Cullman, Winston | Ryan/Crooked/Rock Creeks | Reduce animal waste pollutants in streams and lakes, agricultural nitrates and bacteria in groundwater, and sediment delivered to reservoirs. | Ernest V. Todd (205) 821-8070 | Anne E. Thompson (205) 844-5700 |
| Arizona | Maricopa | West Maricopa | Demonstrate use of biofilters to prevent salt and agricultural chemicals from being released into surface waters through return flow from agricultural lands. | Mike Sullivan (602) 640-2829 | Jack Watson (602) 568-2273 |
| Arkansas | Carroll, Boone | Long Creek | Reduce bacteria and phosphorus levels in streams and lakes through changes in nutrient management and waste utilization. | Gene Sullivan (501) 378-5445 | Ted Jones (501) 671-2000 |
| California | San Luis Obispo | Morro Bay | Reduce the loading of sediments to the Morro Bay estuary through soil erosion control pactices. | Gary Bullard (916) 449-2855 | Kenneth Tanji (916) 752-0683 |
| California | Stanislaus | West Stanislaus | Reduce soil erosion and tailwater runoff from surface irrigated agricultural fields to the San Joaquin River. | Gary Bullard (916) 449-2855 | Kenneth Tanji (916) 752-0683 |
| Colorado | Otero, Pueblo | Patterson Hollow | Reduce amount of salt to the river, reduce overapplication of nutrients and pesticides, improve irrigation water management. | Stephen K. Chick (303) 236-2886 | Jim C. Loftis (303) 491-5252 |

## Nonpoint Source Hydrologic Unit Areas Initiated Fiscal Year 1991–Continued

| State | County/Parish | Project Name | Project Concern | SCS Coordinator | ES Coordinator |
|---|---|---|---|---|---|
| Connecticut | Hartford, Tolland | Scantic River | Reduce amount of sediment from agricultural lands to the river, reduce amount of organic waste and nutrients to the river, improve nutrient and pest management. | Joseph A. Neafsey (203) 487-4017 | Roy F. Jeffrey (203) 887-1608 |
| Florida | Jackson | Karst Cropland | Reduce amount of agricultural pesticides and nutrients in use, reduce amount of agricultural runoff entering the aquifer, replace pesticides of high leaching potential with those of low leaching potential. | Jerry Joiner (904) 377-7127 | Roy Carriker (904) 392-2394 |
| Florida | Lake, Orange | Lake Apopka | Reduce nutrient loading to surface waters. | Jerry Joiner (904) 377-7127 | Roy Carriker (904) 392-2394 |
| Georgia | Jasper, Morgan, Newton, Putnam, Walton | Little River/Rooty Creek | Reduce amount of agricultural chemicals, nutrients, and bacteria entering streams and lakes. | Hiram Boone (404) 546-2272 | Bill Segars (404) 542-9072 |
| Hawaii | Honolulu | Kaiaka-Waialua | Reduce agricultural chemical pollution of the Waialua Aquifer and control soil erosion and sedimentation. | Warren M. Lee (808) 541-2601 | Roy K. Nishimoto (808) 948-8157 |
| Idaho | Adams, Canyon, Gem, Payette, Washington | Snake-Payette | Improve nutrient and pest management to reduce nonpoint source pollution of groundwater. | Rod Alt (208) 334-9643 | Robert Mahler (208) 885-7025 |

## Nonpoint Source Hydrologic Unit Areas Initiated Fiscal Year 1991–Continued

| State | County/Parish | Project Name | Project Concern | SCS Coordinator | ES Coordinator |
|---|---|---|---|---|---|
| Illinois | Champaign, Edgar, Vermillion | Little Vermilion | Reduce sediment delivery, suspended solids, and nitrate concentrations to reservoirs and the river. | Wiley Scott (217) 398-5301 | Rick Farnsworth (217) 333-4565 |
| Indiana | La Porte, Marshall, St. Joseph | Upper Kankakee | Reduce the amount of agricultural nitrates, phosphorus, pesticides, and sediment entering surface and ground waters. | William Weber (317) 290-3202 | David Petritz (317) 494-8494 |
| Iowa | Clayton | Sny Magill | Reduce sediment delivery, animal waste runoff, and pesticide contamination to the river. | Lyle W. Asell (515) 284-4260 | Gerald A. Miller (515) 294-1923 |
| Iowa | Adair, Union | Three Mile Creek | Reduce sediment delivery, animal waste and nutrient runoff, and pesticides to the lake and groundwater. | Lyle W. Asell (515) 284-4260 | Gerald A. Miller (515) 294-1923 |
| Kansas | Brown, Nemaha | Webster Creek | Reduce suspended solids, phosphorus, fecal bacteria, and nitrates delivered to the stream. | Larry Miles (913) 823-4578 | John Hickman (913) 532-5776 |
| Kentucky | Anderson, Boyle, Mercer, Nelson, Shelby, Spencer | Taylorsville Lake | Reduce sediment and nutrient loads and pesticide runoff delivered to the lake. | Kilby Lanier (606) 233-2747 | Curtis W. Absher (606) 257-1846 |

## Nonpoint Source Hydrologic Unit Areas Initiated Fiscal Year 1991–Continued

| State | County/Parish | Project Name | Project Concern | SCS Coordinator | ES Coordinator |
|---|---|---|---|---|---|
| Maryland | Queen Annes | German Branch | Reduce amounts of nutrients and pesticides applied and protect and improve riparian zone vegetation in surface waters. | Melissa Westerlund (301) 757-0861 | Richard Weismiller (301) 454-4787 |
| Massachusetts | Worcester | Wachusetts Reservoir | Reduce amounts of nutrients, bacteria, and sediment delivered to the reservoir. | Carl Gustafson (413) 256-0441 | Robert Schrader (413) 545-2665 |
| Michigan | Lenawee | Wolf Creek | Reduce amounts of agricultural chemicals, phosphorus, and sediment entering Lake Adrian. | William Hartman (517) 337-6904 | Mark Hansen (517) 355-0117 |
| Missouri | Dallas, Laclede, Webster | Upper Niangua | Improve animal waste handling methods and close abandoned farm wells to protect surface and groundwater systems. | Tulley Nelson (314) 875-5213 | Jerry Carpenter (314) 882-2731 |
| Nebraska | Gage, Jefferson, Saline | Central Blue Valley | Reduce pesticide and nitrogen applied and improve irrigation efficiency and animal waste handling methods to protect groundwater. | Tom H. Hamer (402) 437-5313 | Dale Vanderhelm (402) 472-3305 |
| New Hampshire | Grafton | Upper Connecticut | Reduce amounts of sediment, nutrients, animal waste, and pesticides entering surface and groundwaters. | Carter Christenson (603) 868-7581 | Frank Mitchell (603) 862-1067 |

## Nonpoint Source Hydrologic Unit Areas Initiated Fiscal Year 1991–Continued

| State | County/Parish | Project Name | Project Concern | SCS Coordinator | ES Coordinator |
|---|---|---|---|---|---|
| New Jersey | Morris, Somerset | Great Swamp | Reduce amounts of sediment and nutrients entering surface waters. | Thomas Drewes (201) 246-1662 | Theodore Shelton (201) 932-9631 |
| Ohio | Champaign, Franklin, Logan, Madison, Pickaway, Union | Barby Creek | Reduce sedimentation in Darby Creek and protect the riparian corridor. | Robert L. Burris (614) 469-6932 | Don Pritchard (614) 292-4077 |
| Oklahoma | Adair | Peacheater Creek | Reduce nitrate, phosphorus, and animal waste loads to surface waters. | Don Vandersypen (405) 624-4404 | Jim Stiegler (405) 744-6421 |
| Oregon | Washington | Tualatin River | Reduce sediment and nutrient loads to surface waters and improve pesticide and nutrient management. | Ken Kaul (503) 326-2751 | John Buckhouse (503) 737-3341 |
| Pennsylvania | Lancaster | Pequea/Mill Creeks | Reduce nutrient, pesticide, and animal waste loads to surface waters. | Robert Heidecker (717) 782-4403 | Les Lanyon (814) 863-1614 |
| South Carolina | Greenville, Spartanburg | Lake Bowen | Reduce soil erosion and sediment, pesticide, and nutrient loads to Lake Bowen. | Burton Wells (803) 765-5683 | Paul M. Horton (803) 656-5056 |
| South Dakota | Pennington | Lower Rapid Creek | Reduce sediment, animal waste, nutrient, and pesticide loads to Rapid Creek and improve irrigation efficiencies and water management techniques. | Leroy Holtsclaw (605) 353-1783 | Alan Bender (605) 688-4910 |

## Nonpoint Source Hydrologic Unit Areas Initiated Fiscal Year 1991–Continued

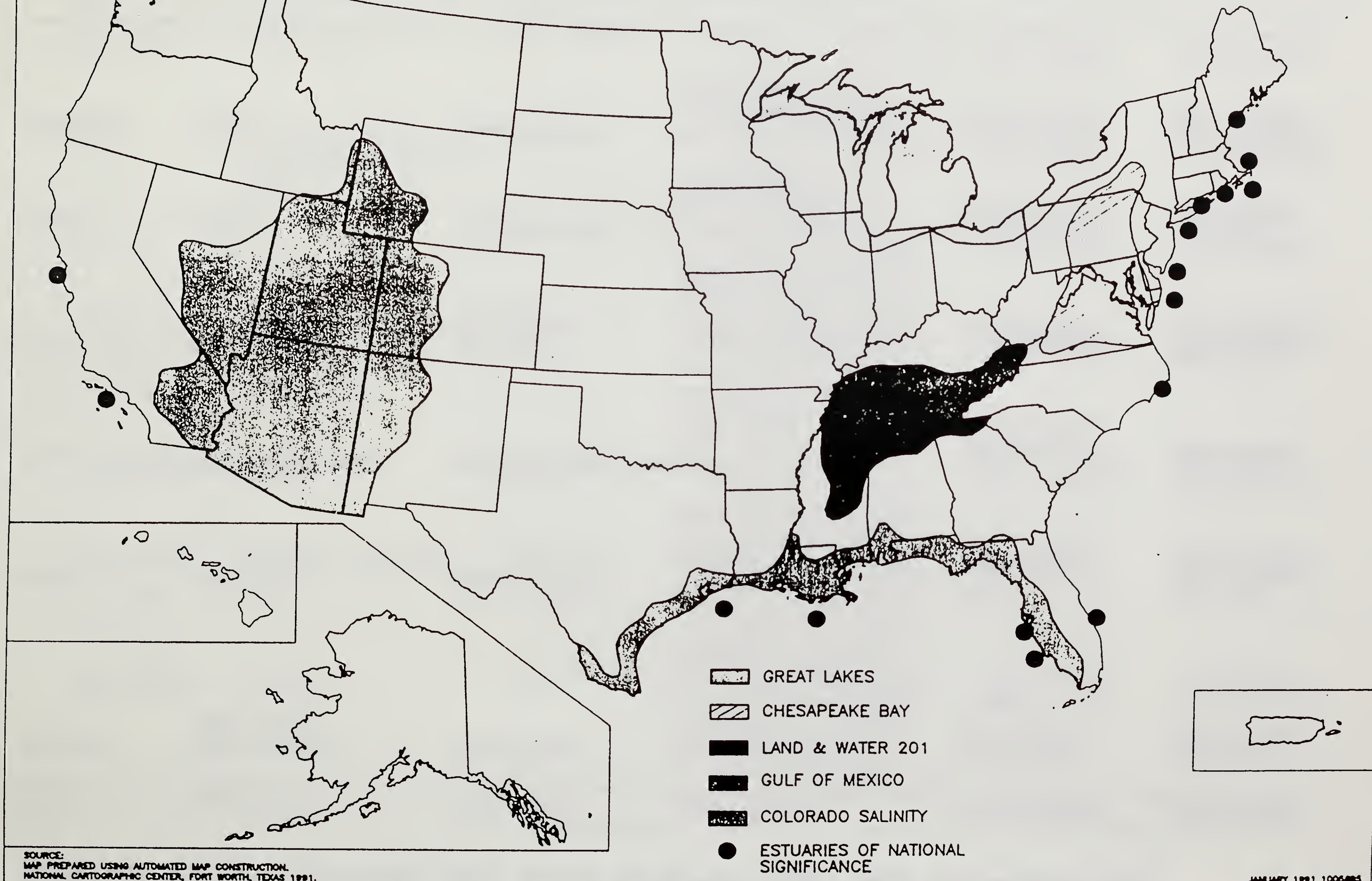
| State | County/Parish | Project Name | Project Concern | SCS Coordinator | ES Coordinator |
|---|---|---|---|---|---|
| Tennessee | Fayette, Haywood, Shelby, Tipton | Beaver Creek | Reduce the delivery of sediment, pesticides, and nutrients to surface waters, and reduce the potential for leaching of pesticides and nutrients into groundwater. | Louis Godbey (615) 736-5473 | George Smith (615) 974-7306 |
| Texas | Haskell, Knox | Seymour Aquifer | Reduce the amounts of pesticides, nutrients, animal wastes and salts reaching the groundwater aquifer. | Gary Westmoreland (817) 774-1255 | Bill L. Harris (409) 845-2425 |
| Texas | Hopkins, Rains, Wood | Lake Four Creek | Reduce the amounts of animal wastes and nutrients reaching surface and ground waters. | Gary Westmoreland (817) 774-1255 | Bill L. Harris (409) 845-2425 |
| Utah | Piute, Sevier | Otter Creek/ Koosharem | Reduce the amounts of sediment, fertilizers, pesticides, and bacteria reaching streams and reservoirs. | R. Deane Harrison (801) 524-5054 | David Rogers (801) 750-1255 |
| Virginia | Franklin | Blackwater River | Reduce sediment and nutrient deliveries to the Blackwater River. | George Norris (804) 771-2457 | Jim Johnson (703) 231-6705 |
| Washington | Yakima | Granger Drain | Reduce sediment, nutrient and biological loads to the Yakima River. | David P. Myra (509) 865-4012 | Robert G. Stevens (509) 786-2226 |

U.S. DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

FIGURE 3

# WATER QUALITY INITIATIVE REGIONAL TECHNICAL ASSISTANCE



# ESTUARIES OF NATIONAL SIGNIFICANCE

| | | |
|---|---|---|
| 1. | PUGET SOUND | WA |
| 2. | SAN FRANCISCO BAY | CA |
| 3. | SANTA MONICA BAY | CA |
| 4. | GALVESTON BAY | TX |
| 5. | BARATARIA—TERREBONNE ESTUARY | LA |
| 6. | TAMPA BAY | FL |
| 7. | SARASOTA BAY | FL |
| 8. | INDIAN RIVER LAGOON | FL |
| 9. | ALBEMARLE—PAMLICO SOUND | NC |
| 10. | DELAWARE INLAND BAYS | DE |
| 11. | DELAWARE BAY | DE—NJ |
| 12. | NEW YORK—NEW JERSEY HARBORS | NY—NJ |
| 13. | LONG ISLAND SOUND | NY—CT |
| 14. | NARRAGANSETT BAY | RI |
| 15. | BUZZARDS BAY | MA |
| 16. | MASSACHUSETTS BAY | MA |
| 17. | CASCO BAY | ME |

# Regional Multi-State Water Quality Projects
# National Estuary Program

The National Estuary Program promotes comprehensive planning and management in nationally significant estuaries threatened by pollution, development, or overuse. The goals of the program are protection and improvement of water quality and enhancement of living resources. The National Estuary Program (NEP) was established under Section 320 of the Clean Water Act of 1987.

## Soil Conservation Service National Estuary Program Contacts

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Gainesville, FL 32601
Tel: 904-338-0235

**Delaware Inland Bays, Delaware**
Paul Petrichenko
Soil Conservation Service
Treadway Towers
9 East Loockerman Street, Suite 207
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**Long Island Sound, Connecticut, New York**
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**Narragansett Bay, Rhode Island**
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Somerset, New Jersey 08873
Telephone: (908) 246-1662

# Regional Technical Assistance Projects

**Great Lakes Program**
**Jerome (Romy) Myszka, Conservation Liaison**
**Great Lakes National Program Office**

The Great Lakes Water Quality Agreement (GLWQA) obligates both the United States and Canada to take vigorous measures to restore and maintain the chemical, physical, and biological integrity of the water of the Great Lakes Basin Ecosystem. Section 118 of the Clean Water Act, as amended in 1978, requires that the Chief of the Soil Conservation Service (SCS) submit an annual report to the Administrator of the U.S. Environmental Protection Agency (EPA) with respect to the activities of the SCS relating to the Great Lakes.

SCS is providing accelerated technical assistance with emphasis on nonpoint source pollution control especially as it relates to erosion control and phosphorus management. Wetland identification and mapping, tillage surveys and other environmental assessments were accelerated within the Basin during 1989. SCS is represented and currently serves in an advisory capacity on several Great Lakes Program committees including those overseeing the development and implementation of Remedial Action Plans, Phosphorus Reduction Plans, and Lakewide Management Plans.

**Chesapeake Bay Program**
**Mike Permenter**
**Chesapeake Bay Program Coordinator**
**Chesapeake Bay Liaison Office**
**410 Severn Avenue**
**Annapolis, Maryland**

The Soil Conservation Service (SCS) is providing accelerated technical assistance in the Chesapeake Bay drainage area for the restoration and protection of the Bay's water quality and living resources. SCS work is being carried out as set forth in the Memorandum of Understanding (MOU) signed November 21, 1984, between the Environmental Protection Agency (EPA) and SCS and is in cooperation with the U.S. Fish and Wildlife Service, U.S. Geological Survey, National Oceanic and Atmospheric Administration, and the Department of Defense. SCS is working closely with other USDA agencies such as the Agricultural Stabilization and Conservation Service, Extension Service, and Forest Service to provide a complete cross section of USDA support for Bay activities. Memorandums of Understanding have been developed between SCS and Extension Service, Agricultural Research Service, Environmental Protection Agency, and U.S. Geological Survey to strengthen interagency cooperation in the Bay program.

**Colorado River Salinity Control Program (CRSCP)**
**Mark Waggoner, Program Manager**
**Soil Conservation Service**
**Washington, D.C.**

The objectives of the Colorado River Salinity Control Program are to reduce salt loadings in order to enhance and protect the quality of water available in the Colorado River for use in the United States and Mexico (Public Law 93-320, Colorado River Basin Salinity Control Act). Key provisions of the program are the non-Federal cost-share reimbursement from the hydroelectric power revenues of the Upper and Lower Colorado River Basin development funds and authority to cost-share with irrigation districts and canal companies. Major SCS activities include development of project plans, preparation of onfarm conservation plans, and provision of technical assistance to help landusers apply conservation practices and to help ensure that adequate irrigation water management is practiced.

**Land and Water 201**
**Keven Brown, Program Manager**
**Muscle Shoals, Alabama**

In 1984, a memorandum of agreement was signed creating Land and Water 201 to serve as a national demonstration of multiagency cooperation in reducing soil erosion and improving water quality while maintaining farm income. Participating organizations are the soil and water conservation and water quality agencies of the seven Tennessee Valley states (Alabama, Georgia, Kentucky, Mississippi, North Carolina, Tennessee and Virginia), the Food and Agriculture Council in each state representing USDA agencies, U.S. Environmental Protection Agency, and the Tennessee Valley Authority.

The primary function of the Land and Water 201 program is to provide remedial measures to 201 counties in the project area to reduce sheet and till erosion in an area that has the highest estimated cropland erosion in the nation.

**Gulf of Mexico Program**
**Kenneth Blan, Program Manager**
**Soil Conservation Service**
**Stennis Space Center, Mississippi**

The Gulf of Mexico Program was established to develop and implement a comprehensive strategy for managing and protecting the resources of the Gulf. Issues of particular importance to the Gulf of Mexico have been identified for detailed study since they are of regional significance, cross jurisdictional boundaries, constitute significant threats to the resources of the Gulf, and are amenable to solution.

Nutrient enrichment was identified as an important issue because of its impact on the overall environmental quality of the Gulf area, especially the capability of the marine ecosystem to continue to support diverse and balanced populations of fish, shellfish, and other organisms which effect the economic, aesthetic, and recreational value of the Gulf.

## Water Quality Special Projects (WQSPs)

Water quality special projects are projects with special emphasis on improving the quality of ground water and surface water that has been impaired by agricultural nonpoint sources. Various conservation measures authorized by the Agricultural Conservation Program (ACP) are available to solve problems identified in the project plans. The projects are administered by ASCS with educational and technical assistance provided by ES and SCS.

The primary mechanism for controlling nonpoint source pollution shall be the voluntary application of best management practices. USDA will assume vigorous leadership in the effort to prevent and reduce contamination of surface and ground water by agricultural nonpoint sources. This will be accomplished by working with other federal agencies, state agencies, and local communities in helping producers conserve natural resources.

A preventive approach will be more successful than a regulatory approach because it identifies and minimizes potential problems before contamination reaches a critical level that would call for regulatory action.

WQSPs are selected with special emphasis given to projects providing multiple benefits such as:

- Ground water, particularly where public benefits could accrue, through domestic consumption;
- Surface waters, such as inland lakes, the Great Lakes, Chesapeake Bay, and surface waters next to the oceans or the Gulf of Mexico. Consider bodies of water where an improvement in water quality would offer public recreation, consumption, and economic dependency.
- Streams, waterways, or their tributaries that have an impact on public navigation because of sediment, flooding, or both.

Forty 1990 WQSPs in 29 states were selected at the national level for fiscal year 1990. Program funds were reserved by ASCS to fund WQSPs developed by county ASC committees.

For 1991, 35 projects were funded in 31 states to improve water quality in agricultural areas. Program funds allocated to WQSPs are $9.1 million. Unlike previous years, there will be no national reserve. All of the $9.1 million was initially provided to the 35 projects.

Flexibility is built into the ACP water quality special projects concept. Projects may be used to solve locally identified water quality problems to provide significant public benefits to non-agricultural interests as well as projects that are designed to support state 319 nonpoint source objectives.

U.S. DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

FIGURE 4

# WATER QUALITY SPECIAL PROJECTS


SOURCE:
MAP PREPARED USING AUTOMATED MAP CONSTRUCTION.
NATIONAL CARTOGRAPHIC CENTER, FORT WORTH, TEXAS 1991.

REVISED MARCH 1991 1005722

USDA-SCS-NATIONAL CARTOGRAPHIC CENTER, FT. WORTH, TX.-1991

# APPROVED 1990 AND 1991 PROJECTS
## (ACP-WQSP)

### 1990 PROJECTS

| STATE | PROJECT NAME | COUNTIES |
|---|---|---|
| ALABAMA | BIG PRAIRIE CREEK | HALE |
| ARKANSAS | BEAVER LAKE | BENTON, CARROLL, MADISON & WASHINGTON |
| DELAWARE | NANTICOKE RIVER | SUSSEX & KENT |
| GEORGIA | PIEDMONT | BALDWIN, GREENE, TALIAFERRO, MORGAN & PUTNAM |
| INDIANA | LAGRANGE CO LAKES | LAGRANGE |
| ILLINOIS | CEDAR LAKE | JACKSON |
| IOWA | CORYDON LAKE | WAYNE |
| KANSAS | MIOLA LAKE | MIAMI |
| KENTUCKY | MAMMOTH CAVE AREA | EDMONSON |
| LOUISIANA | TANGIPAHOA RIVER BASIN | TANGIPAHOA, ST. HELENA & WASHINGTON |
| MAINE | KENDUSKEAG STREAM | PENOBSCOT |
| MAINE | 25 MILE RIVER | WALDO, KENNEBEC, PENOBSCOT & SOMERSET |
| MARYLAND | CHINCOTEAGUE & SINEPUXENT BAY | WORCESTER |
| MARYLAND | BOHEMIA & SASSAFRAS RIVERS | CECIL |
| MASSACHUSETTS | LOWER DEERFIELD R. | FRANKLIN |
| MICHIGAN | CLAM RIVER | MISSAUKEE, OSCEOLA, CLARE & WEXFORD |
| MISSISSIPPI | TENN-TOM | ITAWAMBA |
| NEBRASKA | QUAD COUNTY | BUFFALO, HALL, MERRICK & NANCE |
| NEBRASKA | SOUTHERN NUCKOLLS | NUCKOLLS |
| NEW YORK | CHESAPEAKE BAY & SUSQUEHANNA | ALLEGANY, BROOME, CHEMUNG, CHENANGO, CORTLAND & DELAWARE |
| NEW YORK | CATTARAUGUS CREEK/LAKE ERIE | ALLEGANY, ERIE, CATTARAUGUS, WYOMING & CHAUTAUQUA |
| NORTH DAKOTA | RENWICK WATERSHED LAND TREATMENT | PEMBINA & CAVALIER |
| OHIO | UPPER VERMILLION R. | ASHLAND, HURON & RICHLAND |
| OHIO | UPPER DARBY CREEK | MADISON & CHAMPAIGN |
| OHIO | CLARK LAKE | CLARK |
| OREGON | NESTUCCA RIVER | TILLAMOOK |
| OREGON | COQUILLE RIVER | COOS |
| PENNSYLVANIA | POTOMAC-JUNIATA | FULTON, FRANKLIN, HUNTINGDON, JUNIATA, PERRY & BRADFORD |
| RHODE ISLAND | NARRAGANSETT BAY | BRISTOL, KENT, NEWPORT & WASHINGTON |
| SOUTH CAROLINA | CLARENDON/SUMTER | CLARENDON & SUMTER |
| SOUTH CAROLINA | GREENWOOD & MCCORMICK | GREENWOOD & MCCORMICK |
| TENNESSEE | LICK CR WASTE MGT & LIMESTONE CREEK | GREENE & WASHINGTON |
| TENNESSEE | UPPER DUCK RIVER | BEDFORD & COFFEE |
| VERMONT | LOWER LAKE CHAMPLAIN | CHITTENDEN, ADDISON & RUTLAND |
| VIRGINIA | LOWER NOTTOWAY & BLACKWATER RIVER | SOUTHHAMPTON |
| VIRGINIA | ROCKINGHAM COUNTY | ROCKINGHAM |
| WASHINGTON | S. FK. PALOUSE R. | WHITMAN |
| WASHINGTON | KAMM CREEK | WHATCOM |
| WISCONSIN | LAKE NESHONOC & LITTLE LACROSSEE R. | LA CROSSE |

### 1991 PROJECTS

| STATE | PROJECT NAME | COUNTIES |
|---|---|---|
| ARIZONA | SILVER CREEK | NAVAJO |
| ARKANSAS | ILLINOIS RIVER (1990) | BENTON & WASHINGTON |
| CALIFORNIA | LIVESTOCK WASTE CONTROL | SONOMA & MARIN |
| COLORADO | HOLBROOK | OTERO |
| DELAWARE | CHESAPEAKE BAY | NEW CASTLE |
| DELAWARE | NANTICOKE | KENT & SUSSEX |
| GEORGIA | UPPER CHATTAHOOCHEE RIVER BASIN | DAWSON, FORSYTH, HAVERSHAM, HALL, LUMPKIN & WHITE |
| HAWAII | MAUNAWILI-WAIMANALO | HONOLULU |
| IDAHO | LAKE LOWELL & INDIAN CR | CANYON & ADA |
| IOWA | FRENCH CREEK | ALLAMAKEE |
| KANSAS | SQUAW CREEK | BROWN |
| KANSAS | ROCK CREEK | JEFFERSON |
| LOUISIANA | SABINE RIVER-SAN MIGUEL | DESOTA & SABINE PARISHES |
| MAINE | ST. GEORGE RIVER | KNOX |
| MASSACHUSETTS | BILLINGTON SEA | PLYMOUTH |
| MICHIGAN | NORTH LAKE LEELANAU | LEELANAU |
| MICHIGAN | SAUK RIVER & CHAIN-OF-LAKES | STEARNS |
| NEBRASKA | QUAD COUNTY (1990) | BUFFALO, HALL, MERRICK & NANCE |
| NEBRASKA | BAZILE TRIANGLE | ANTELOPE, KNOX & PIERCE |
| NEW YORK | LAKE CHAMPLAIN & EMPIRE BASIN | CLINTON, WASHINGTON, FRANKLIN & ESSEX |
| NEW YORK | SUSQUEHANNA RIVER BASIN (1990) | ALLEGANY, BROOME, CHEMUNG, CHANANGO, CORTLAND, DELAWARE, HERKIMER, MADISON, OSTEGO, STEUBEN & TIOGA |
| NORTH CAROLINA | UPPER HIAWASSEE | CHEROKEE & CLAY |
| OHIO | OLD WOMAN CREEK | ERIE |
| OREGON | COQUILLE RIVER BASIN (1990) | COOS |
| OREGON | CRABTREE-THOMAS CREEK | LINN |
| PENNSYLVANIA | LAKE WALLENPAUPACK | LACKAWANNA, WAYNE & PIKE |
| RHODE ISLAND | NARRAGANSETT BAY (1990) | PROVIDENCE |
| SOUTH CAROLINA | LITTLE SALUDA/CLOUDS CR | SALUDA |
| SOUTH DAKOTA | BAD RIVER | STANLEY |
| TENNESSEE | SWEETWATER CREEK | LOUDON, MCMINN & MONROE |
| UTAH | RABBIT VALLEY | WAYNE |
| VERMONT | LOWER LAKE CHAMPLAIN DIRECT (1990) | ADDISON, CHITTENDEN & RUTLAND |
| VIRGINIA | ACCOMACK COUNTY | ACCOMACK |
| WASHINGTON | KAMM CREEK (1990) | WHATCOM |
| WEST VIRGINIA | UPPER MILL CREEK | JACKSON |

## ACP Water Quality Special Projects Initiated FY 1990

| State | County/Parish | Project Name | Project Concern | ASCS Coordinator |
|---|---|---|---|---|
| Alabama | Hale | Big Prairie | Agricultural waste and agricultural chemicals/nutrients affecting ground water | Joan Grider (205) 223-7230 |
| Arkansas | Benton, Carroll, Madison, and Washington | Beaver Lake | Animal waste, fertilizers, and pesticides | Wiley Bailey |
| Delaware | Sussex & Kent | Nanticoke | Poultry waste, fertilizers affecting ground water | Ben Titus (302) 285-8483 |
| Georgia | Baldwin, Greene, Morgan, Putnam, Taliaferro | Piedmont | Piedmont | David Perkins (404) 546-2266 |
| Illinois | Jackson | Cedar Lake | Sediments and nutrients | Lisa Manning (217) 492-4180 |
| Indiana | LaGrange | LaGrange County | Lake enrichment | Ron Birt (317) 290-3030 |
| Iowa | Wayne | Corydon Lake | Sediment, animal waste, chemicals, and fertilizers | Bill Hawks (515) 284-4210 |
| Kansas | Miami | Miola Lake | Sediment and nutrients. | Roger Lemmons (913) 539-3531 |
| Kentucky | Barren, Edmonson, Hart, Metcalfe, and Warren | Mammoth Cave | Sediment, pesticides, herbicides, fertilizers, animal waste affecting ground water | Thomas Howard (606) 233-2726 |
| Louisiana | Tangipahoa, St. Helena, and Washington | Tangipahoa River Basin | Animal waste affecting river | J. B. LeRay (318) 473-7721 |
| Maine | Waldo, Kennebec, Penobscot, and Somerset | 25 Mile River | Sediment, animal waste, and fertilizers | Melvin Perkins (207) 942-0342 |
| Maryland | Cecil | Bohemia/Sassafras River | Animal waste, nutrients, & sediments | Marilyn Warner (301) 381-4550 |

# APPROVED 1990 AND 1991 PROJECTS
## (ACP-WQSP)

### 1990 PROJECTS

| STATE | PROJECT NAME | COUNTIES |
|---|---|---|
| ALABAMA | BIG PRAIRIE CREEK | HALE |
| ARKANSAS | BEAVER LAKE | BENTON, CARROLL, MADISON & WASHINGTON |
| DELAWARE | NANTICOKE RIVER | SUSSEX & KENT |
| GEORGIA | PIEDMONT | BALDWIN, GREENE, TALIAFERRO, MORGAN & PUTNAM |
| INDIANA | LAGRANGE CO LAKES | LAGRANGE |
| ILLINOIS | CEDAR LAKE | JACKSON |
| IOWA | CORYDON LAKE | WAYNE |
| KANSAS | MIOLA LAKE | MIAMI |
| KENTUCKY | MAMMOTH CAVE AREA | EDMONSON |
| LOUISIANA | TANGIPAHOA RIVER BASIN | TANGIPAHOA, ST. HELENA & WASHINGTON |
| MAINE | KENDUSKEAG STREAM | PENOBSCOT |
| MAINE | 25 MILE RIVER | WALDO, KENNEBEC, PENOBSCOT & SOMERSET |
| MARYLAND | CHINCOTEAGUE & SINEPUXENT BAY | WORCESTER |
| MARYLAND | BOHEMIA & SASSAFRAS RIVERS | CECIL |
| MASSACHUSETTS | LOWER DEERFIELD R. | FRANKLIN |
| MICHIGAN | CLAM RIVER | MISSAUKEE, OSCEOLA, CLARE & WEXFORD |
| MISSISSIPPI | TENN-TOM | ITAWAMBA |
| NEBRASKA | QUAD COUNTY | BUFFALO, HALL, MERRICK & NANCE |
| NEBRASKA | SOUTHERN NUCKOLLS | NUCKOLLS |
| NEW YORK | CHESAPEAKE BAY & SUSQUEHANNA | ALLEGANY, BROOME, CHEMUNG, CHENANGO, CORTLAND & DELAWARE |
| NEW YORK | CATTARAUGUS CREEK/LAKE ERIE | ALLEGANY, ERIE, CATTARAUGUS, WYOMING & CHAUTAUQUA |
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| OHIO | UPPER VERMILLION R. | ASHLAND, HURON & RICHLAND |
| OHIO | UPPER DARBY CREEK | MADISON & CHAMPAIGN |
| OHIO | CLARK LAKE | CLARK |
| OREGON | NESTUCCA RIVER | TILLAMOOK |
| OREGON | COQUILLE RIVER | COOS |
| PENNSYLVANIA | POTOMAC-JUNIATA | FULTON, FRANKLIN, HUNTINGDON, JUNIATA, PERRY & BRADFORD |
| RHODE ISLAND | NARRAGANSETT BAY | BRISTOL, KENT, NEWPORT & WASHINGTON |
| SOUTH CAROLINA | CLARENDON/SUMTER | CLARENDON & SUMTER |
| SOUTH CAROLINA | GREENWOOD & MCCORMICK | GREENWOOD & MCCORMICK |
| TENNESSEE | LICK CR WASTE MGT & LIMESTONE CREEK | GREENE & WASHINGTON |
| TENNESSEE | UPPER DUCK RIVER | BEDFORD & COFFEE |
| VERMONT | LOWER LAKE CHAMPLAIN | CHITTENDEN, ADDISON & RUTLAND |
| VIRGINIA | LOWER NOTTOWAY & BLACKWATER RIVER | SOUTHHAMPTON |
| VIRGINIA | ROCKINGHAM COUNTY | ROCKINGHAM |
| WASHINGTON | S. FK. PALOUSE R. | WHITMAN |
| WASHINGTON | KAMM CREEK | WHATCOM |
| WISCONSIN | LAKE NESHONOC & LITTLE LACROSSEE R. | LA CROSSE |

### 1991 PROJECTS

| STATE | PROJECT NAME | COUNTIES |
|---|---|---|
| ARIZONA | SILVER CREEK | NAVAJO |
| ARKANSAS | ILLINOIS RIVER (1990) | BENTON & WASHINGTON |
| CALIFORNIA | LIVESTOCK WASTE CONTROL | SONOMA & MARIN |
| COLORADO | HOLBROOK | OTERO |
| DELAWARE | CHESAPEAKE BAY | NEW CASTLE |
| DELAWARE | NANTICOKE | KENT & SUSSEX |
| GEORGIA | UPPER CHATTAHOOCHEE RIVER BASIN | DAWSON, FORSYTH, HAVERSHAM, HALL, LUMPKIN & WHITE |
| HAWAII | MAUNAWILI-WAIMANALO | HONOLULU |
| IDAHO | LAKE LOWELL & INDIAN CR | CANYON & ADA |
| IOWA | FRENCH CREEK | ALLAMAKEE |
| KANSAS | SQUAW CREEK | BROWN |
| KANSAS | ROCK CREEK | JEFFERSON |
| LOUISIANA | SABINE RIVER-SAN MIGUEL | DESOTA & SABINE PARISHES |
| MAINE | ST. GEORGE RIVER | KNOX |
| MASSACHUSETTS | BILLINGTON SEA | PLYMOUTH |
| MICHIGAN | NORTH LAKE LEELANAU | LEELANAU |
| MICHIGAN | SAUK RIVER & CHAIN-OF-LAKES | STEARNS |
| NEBRASKA | QUAD COUNTY (1990) | BUFFALO, HALL, MERRICK & NANCE |
| NEBRASKA | BAZILE TRIANGLE | ANTELOPE, KNOX & PIERCE |
| NEW YORK | LAKE CHAMPLAIN & EMPIRE BASIN | CLINTON, WASHINGTON, FRANKLIN & ESSEX |
| NEW YORK | SUSQUEHANNA RIVER BASIN (1990) | ALLEGANY, BROOME, CHEMUNG, CHANANGO, CORTLAND, DELAWARE, HERKIMER, MADISON, OSTEGO, STEUBEN & TIOGA |
| NORTH CAROLINA | UPPER HIAWASSEE | CHEROKEE & CLAY |
| OHIO | OLD WOMAN CREEK | ERIE |
| OREGON | COQUILLE RIVER BASIN (1990) | COOS |
| OREGON | CRABTREE-THOMAS CREEK | LINN |
| PENNSYLVANIA | LAKE WALLENPAUPACK | LACKAWANNA, WAYNE & PIKE |
| RHODE ISLAND | NARRAGANSETT BAY (1990) | PROVIDENCE |
| SOUTH CAROLINA | LITTLE SALUDA/CLOUDS CR | SALUDA |
| SOUTH DAKOTA | BAD RIVER | STANLEY |
| TENNESSEE | SWEETWATER CREEK | LOUDON, MCMINN & MONROE |
| UTAH | RABBIT VALLEY | WAYNE |
| VERMONT | LOWER LAKE CHAMPLAIN DIRECT (1990) | ADDISON, CHITTENDEN & RUTLAND |
| VIRGINIA | ACCOMACK COUNTY | ACCOMACK |
| WASHINGTON | KAMM CREEK (1990) | WHATCOM |
| WEST VIRGINIA | UPPER MILL CREEK | JACKSON |

## ACP Water Quality Special Projects Initiated FY 1990

| State | County/Parish | Project Name | Project Concern | ASCS Coordinator |
|---|---|---|---|---|
| Alabama | Hale | Big Prairie | Agricultural waste and agricultural chemicals/nutrients affecting ground water | Joan Grider (205) 223-7230 |
| Arkansas | Benton, Carroll, Madison, and Washington | Beaver Lake | Animal waste, fertilizers, and pesticides | Wiley Bailey |
| Delaware | Sussex & Kent | Nanticoke | Poultry waste, fertilizers affecting ground water | Ben Titus (302) 285-8483 |
| Georgia | Baldwin, Greene, Morgan, Putnam, Taliaferro | Piedmont | Piedmont | David Perkins (404) 546-2266 |
| Illinois | Jackson | Cedar Lake | Sediments and nutrients | Lisa Manning (217) 492-4180 |
| Indiana | LaGrange | LaGrange County | Lake enrichment | Ron Birt (317) 290-3030 |
| Iowa | Wayne | Corydon Lake | Sediment, animal waste, chemicals, and fertilizers | Bill Hawks (515) 284-4210 |
| Kansas | Miami | Miola Lake | Sediment and nutrients. | Roger Lemmons (913) 539-3531 |
| Kentucky | Barren, Edmonson, Hart, Metcalfe, and Warren | Mammoth Cave | Sediment, pesticides, herbicides, fertilizers, animal waste affecting ground water | Thomas Howard (606) 233-2726 |
| Louisiana | Tangipahoa, St. Helena, and Washington | Tangipahoa River Basin | Animal waste affecting river | J. B. LeRay (318) 473-7721 |
| Maine | Waldo, Kennebec, Penobscot, and Somerset | 25 Mile River | Sediment, animal waste, and fertilizers | Melvin Perkins (207) 942-0342 |
| Maryland | Cecil | Bohemia/Sassafras River | Animal waste, nutrients, & sediments | Marilyn Warner (301) 381-4550 |

## ACP Water Quality Special Projects Initiated FY 1990—Continued

| State | County/Parish | Project Name | Project Concern | ASCS Coordinator |
|---|---|---|---|---|
| Massachussetts | Franklin | Lower Deerfield River | Animal waste, bacteia, chemicals affecting ground water | Dick McIntire (413) 256-0232 |
| Michigan | Clare, Missaukee, Osceola, & Wexford | Clam River | Sediments and animal waste | Robert Payne (517) 337-6659 |
| Mississippi | Itawamba | Tenn-Tom | Sediments, herbicides, pesticides, and fertilizers | Tom Breland (601) 965-4300 |
| Nebraska | Nuckolls | Southern Nuckolls | Nitrates in the ground water aquifer | Roger Hessman (402) 437-5581 |
| Nebraska | Buffalo, Hall, Merrick, and Nance | Quad Counties | Nitrates in the ground water aquifer | Roger Hessman (402) 437-5581 |
| New York | Allegany, Broome, Chemung, Chenengo, Cortland, Delaware, Herkimer, Madison, Otsego, Schuyler, Steuben, and Tioga | Multi-County Chesapeake Bay/ Susquehanna River Basin | Sediment, fertilizers, animal waste, toxic substances | Olen Sharron (315) 423-5176 |
| New York | Allegany, Erie, Cattaraugus, Chataugua, and Wyoming | Cattaraugus Creek/Lake Erie | Phosphorus, nitrogen, pesticides, sediments | Olen Sharron (315) 423-5176 |
| North Dakota | Cavalier and Pembina | Renwick Watershed | Nutrients, silt, organic enrichment, and suspended solids | Robert Mullenback (701) 239-5224 |
| Ohio | Madison and Champaign | Upper Darby Creek | Animal waste and sediment. | Mark Giles (614) 469-6735 |
| Ohio | Clark | Clark Lake | Sediment, pesticides, herbicides, and fertilizers | Mark Giles (614) 469-6735 |
| Ohio | Ashland, Huron, and Richland | Upper Vermillion | Nutrients, sediments, and bacteria. | Mark Giles (614) 469-6735 |

## ACP Water Quality Special Projects Initiated FY 1990—Continued

| State | County/Parish | Project Name | Project Concern | ASCS Coordinator |
|---|---|---|---|---|
| Oklahoma | Adair | Peacheater | Animal waste, mainly poultry and phosphorus and nitrogen | Garl Mardis (405) 624-4110 |
| Oregon | Coquille River | Coquille River | Animal waste including coliform bacteria | Betty Lissman (503) 326-2741 |
| Oregon | Tillamook | Nestucca River | Animal waste | Betty Lissman (503) 326-2741 |
| Pennsylvania | Bedford, Fulton, Franklin, Huntingdon, Juniata, and Perry | Potomac/Juniata | Sediments, pest., phosphorus, and nitrogen | Rex Wright (717) 782-4547 |
| Rhode Island | Bristol, Kent, Newport, Washington, and Rutland | Narragansett Bay | Animal waste, nutrients, pest., and sediments. | Mark Ruwet (401) 828-8232 |
| South Carolina | Clarendon and Sumter | Clarendon/Sumter | Sediments, nutrients, pest., and bacteria | Bernard Radcliff (803) 765-5186 |
| Tennessee | Greene and Washington | Limestone and Lick Creeks | Animal waste, sediment, and low dissolved oxygen levels. | William Hancock (615) 736-5555 |
| Tennessee | Bedford and Coffee | Upper Duck River | Sediment, pest., animal waste, and nutrients | William Hancock (615) 736-5555 |
| Vermont | Franklin | Lower Mississquoi | Sediment and animal waste. | Alan Rogers (802) 951-6715 |
| Virginia | Rockingham, Rockingham | Rockingham | Animal waste, sediment, nutrients, and chemicals | Wilson T. Leggett, Jr. (804) 771-2581 |
| Virginia | Southampton | Lower Nottaway and Blackwater Rivers | Animal waste and agricultural chemicals | Wilson T. Leggett, Jr. (804) 771-2581 |
| Washington | Whitman and Latah (Idaho) | South Fork of the Palouse River | Sediment | Stan Liebing (509) 353-2307 |

## USDA Water Quality Special Projects Initiated FY 1990—Continued

| State | County/Parish | Project Name | Project Concern | ASCS Coordinator |
|---|---|---|---|---|
| Wisconsin | LaCrosse and Monroe | Lake Neshonoc/Little LaCrosse River | Sediment, phosphorus and nitrogen, and bacteria. | Don Wachter (608) 264-5301- |

## ACP Water Quality Special Projects Initiated FY 1991

| State | County/Parish | Project Name | Project Concern | ASCS Coordinator |
|---|---|---|---|---|
| Arizona | Navajo | Silver Creek | Ground water, surface water, animal waste | Alan Nulliner (602) 241-5200 |
| Arkansas | Benton and Washington | Illinois River (1990) | Ground water, surface water, nutrients, animal waste, sediments | Wiley Bailey (501) 378-5220 |
| California | Sonoma and Marin | Livestock waste control | Surface water, nutrients, animal waste | Larry Plumb (FTS) 460-1801 |
| Colorado | Otero | Holbrook | Surface water, pesticide, nutrients, mineral salts & elements, sediments | Garth Bond (FTS) 776-2877 |
| Delaware | New Castle | Chesapeake Bay | Ground water, surface water, nutrients, animal waste, sediments | Ben Titus (302) 285-8483 |
| Delaware | Kent and Sussex | Nanticoke | Ground water, nutrients, animal waste | Ben Titus (302) 285-8483 |
| Georgia | Dawson, Forsyth, Habersham, Hall, Lumpkin, and White | Upper Chattachoochee River Basin | Ground water, surface water, pesticide, nutrients, animal waste, sediments | David Perkins (404) 546-2266 |
| Hawaii | Honolulu | Maunawili-Waimanalo | Ground water, surface water, pesticide, nutrients, sediments | Pat Sniffen (808) 541-2646 |
| Idaho | Canyon and Ada | Lake Lowell and Indian Creek | Surface water, pesticide, nutrients, animal waste, sediments | Jean Greear (FTS) 554-1762 |
| Iowa | Allamakee | French Creek | Surface water, nutrients, animal waste, sediments | Bill Hawks (515) 284-4210 |
| Kansas | Brown | Squaw Creek | Surface water, pesticide, nutrients, animal waste, sediments | Roger Lemmons (913) 539-3531 |
| Kansas | Jefferson | Rock Creek | Ground water, surface water, pesticide, nutrients, animal waste, sediments | Roger Lemmons (913) 539-3531 |

## ACP Water Quality Special Projects Initiated FY 1991—Continued

| State | County/Parish | Project Name | Project Concern | ASCS Coordinator |
|---|---|---|---|---|
| Louisiana | DeSoto and Sabine | Sabine River-San Miguel | Surface water, nutrients, animal waste | J. B. LeRay (318) 473-7721 |
| Maine | Knox | Saint George River | Surface water, nutrients, animal waste | Melvin Perkins (207) 942-0342 |
| Massachusetts | Plymouth | Billington Sea | Surface water, nutrients | Dick McIntire (413) 256-0232 |
| Michigan | Leelanau | North Lake Leelanau | Ground water, pesticide, nutrients, sediments | Robert Payne (517) 337-6659 |
| Minnesota | Stearns | Sauk River and Chain-of-Lakes | Surface water, nutrients, animal waste, sediments | Gregg Anderson (FTS) 777-3650 |
| Nebraska | Buffalo, Hall, Merrick, and Nance | Quad County (1990) | Ground water, pesticide, nutrients | Roger Hessman (402) 437-5581 |
| Nebraska | Antelope, Knox, and Pierce | Bazile Triangle | Ground water, pesticide, nutrients | Roger Hessman (402) 437-5581 |
| New York | Clinton, Washington, Franklin, and Essex | Lake Champlain and Empire Basin | Surface water, pesticide, nutrients, animal waste, sediments | Olen Sharron (315) 423-5176 |
| New York | Allegany, Broome, Chemung, Chenango, Cortland, Delaware, Herkimer, Madison, Ostego, Steuben, and Tioga | Susquehanna River Basin (1990) | Ground water, surface water, pesti-cide, nutrients, animal waste, sediment | Olen Sharron (315) 423-5176 |
| North Carolina | Cherokee and Clay | Upper Hiawassee | Surface water, pesticide, nutrients, animal waste, sediments | Harold Mangum (FTS) 672-2966 |
| Ohio | Erie | Old Woman Creek | Surface water, pesticide, nutrients, animal waste, sediments | Mark Giles (614) 469-6735 |

## ACP Water Quality Special Projects Initiated FY 1991—Continued

| State | County/Parish | Project Name | Project Concern | ASCS Coordinator |
|---|---|---|---|---|
| Oregon | Coos | Coquille River Basin | Surface water, nutrients, animal waste | Betty Lissman (503) 326-2741 |
| Oregon | Linn | Crabtree-Thomas Creek | Surface water, nutrients, animal waste | Betty Lissman (503) 326-2741 |
| Pennsylvania | Lackawanna, Wayne, and Pike | Lake Wallenpaupack | Surface water, nutrients, animal waste, sediments | Rex Wright (717) 782-4547 |
| Rhode Island | Providence | Narragansett Bay (1990) | Surface water, sediments | Mark Ruwet (401) 828-8232 |
| South Carolina | Saluda | Little Saluda/Clouds Creek | Surface water, nutrients, animal waste, sediments | Bernard Radcliff (803) 765-5186 |
| South Dakota | Stanley | Bad River | Surface water, pesticide, nutrients, sediments | Ronald Larson (605) 353-1840 |
| Tennessee | Loudon, McMinn, and Monroe | Sweetwater Creek | Ground water, surface water, pesticide, nutrients, animal waste, sediments | William Hancock (615) 736-5555 |
| Utah | Wayne | Rabbit Valley | Surface water, nutrients, mineral salts & elements, sediments | Dennis Tuttle (FTS) 588-3262 |
| Vermont | Addison, Chittenden, and Rutland | Lower Lake Champlain (1990) | Ground water, surface water, pesticide, nutrients, animal waste, sediments | Alan Rogers (FTS) 832-6715 |
| Virginia | Accomack | Accomack County | Ground water, nutrients, animal waste | Wilson Leggett (804) 771-2581 |
| Washington | Whatcom | Kamm Creek | Ground water, surface water, pesticide, nutrients, animal waste, sediments | Stan Liebing (509) 353-2307 |
| West Virginia | Jackson | Upper Mill Creek | Surface water, pesticide, nutrients, animal waste, sediments | Clifford Sypolt (FTS) 923-4351 |

# Management System Evaluation Areas

**The President's Initiative**
Contamination of the nation's ground and surface water supplies from the normal use of pesticides and nitrogen has caused concern about the impact of agricultural practices on the quality of our drinking water. Ground water is the primary source of drinking water for nearly 90 percent of our rural population and more than 40 percent of the total population. While field application of chemicals is not the only source of contamination, the presence of agricultural chemicals in surface and ground water has focused concern on current agricultural practices. To assess the effects of management practices and improve them where necessary, the President's Initiative on Enhancing Water Quality began in 1989, bringing together several different programs among various federal and state agencies.

**The Initiative's Goals**
The overall goal of the Presidnet's Initiative is to safeguard and enhance the quality of the nation's surface waters and ground waters in the presence of sustained agricultural activities. Activity to achieve this goal will be carried out at each of the five key Management System Evaluation Area (MSEA) sites, where the impact of current and emerging farming systems and practices will be evaluated.

**The Midwest Initiative**
The initial study is focused in the Midwest on five MSEAs. These areas are located in Iowa with two satellite locations, Minnesota with three satellite locations, Missouri, Nebraska, and Ohio and are delineated to study the complex interactions of soils, weather, water, chemicals, economics, and farm management systems.

Cooperating agencies involved in the MSEA project are:
- United States Department of Agriculture:
  - Agricultural Research Service
  - Cooperative State Research Service
  - Economic Research Service
  - Extension Service
  - Soil Conservation Service
- Unites States Geological Survey
- United States Environmental Protection Agency
- State Agricultural Experiment Stations
- Cooperative Extension System
- State Departments of Agriculture
- State Resource and Pollution Control Agencies
- Private Organizations and Industries

## Research and Development MSEA Management Team

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Fax: 515-294-8125

Management System Evaluation Areas*

* Includes satellite locations in Iowa and Minnesota.

# Agency Roles and Contacts at Each MSEA

| Agency | Iowa | Minnesota | Missouri | Nebraska | Ohio |
|---|---|---|---|---|---|
| Agricultural Research Service | Develop and evaluate farming systems to protect water quality and maintain databases. *Contact: Jerry Hatfield 515-294-5723* | Develop and evaluate farming systems to protect water quality practices and determine N management effects on ground water quality. *Contact: Robert Dowdy 612-625-7058* | Develop and evaluate farming systems to protect water quality. *Contact: E.E. Alberts 314-882-1112* | Develop nitrogen management practices for various irrigation regimes and tissue testing methods for nitrogen management. *Contact: Jim Schepers 402-472-1513* | Coordinate model development activities involving chemical transport *Contact: Norm Fausey 614-292-9806* |
| Cooperative State Research Service | Evaluate pesticide and nitrate transformations for alternative systems. *Contact: James Baker 515-294-4025* | Develop and evaluate farming systems to protect water quality practices and to determine N management effects on ground water quality. *Contact: James Anderson 612-625-8209* | Evaluate the profitability and social acceptability of alternative farming systems. *Contact: Tony Prato 314-882-3545* | Operate a network of ground water monitoring wells; evaluate improved irrigation systems to protect water quality. *Contact: Darrell Watts 402-472-1413* | Develop and evaluate farming systems to protect water quality including socioeconomic impacts. *Contact: Andy Ward 614-292-9345* |
| Enivronmental Protection Agency | Determine environmental benefits; devise measures to prevent ecological degradation; provide diagnostic, predictive tools for ecologically based water quality management systems. | — | — | — | — |
| Economic Research Service | Coordinate assessments of profitability and social acceptability of various farming systems. | — | — | — | — |
| Extension Service | Develop educational and technical assistance programs on the use of alternative farming systems. | — | — | — | — |
| Soil Conservation Service | Assist in site characterization for each MSEA, including detailed soil mapping, soil chemical, physical parameters. | — | — | — | — |
| U.S. Geological Survey | Determine hydrologic processes; assess water sampling procedures; evaluate watershed models to predict water quality impacts. | Evaluate transport and storage of agricultural chemicals; determine relation between ground water recharge rates and agricultural chemical loading rates. | Determine fate and transport of fertilizers and other dissolved chemicals through soil macropores and within unsaturated zone. | Develop detailed information on ground water flow, recharge, and aquifer system dynamics. | Assess bacterial degradation of agricultural chemicals in the aquifer system. |

## U.S. Geological Survey: President's Water Quality Initiative Projects

| Project type | Cooperating agencies | Project name and location | Project objectives | USGS coordinator |
|---|---|---|---|---|
| HUA | Florida Department of Environmental Regulation | Middle Suwanee River, Florida | Measure the effectiveness of Best Management Practices to reduce dairy wastes on ground and surface water | Bill Andrews (904-681-7649 |
| HUA | Florida Department of Environmental Regulation | Middle Suwanee River, Florida | Measure the effectiveness of Best Management Practices to reduce poultry wastes on ground and surface water | Hilda Hatzell (904) 681-7485 |
| HUA | Tennessee Department of Agriculture | Beaver Creek Basin, Tennessee | Measure effects of Best Management Practices on the surface water quality of six agricultural sub basins | Angel Roman (615) 736-5424 |
| DEMO | Texas State Soil Conservation Board | Seco Creek, Texas | Assess improvements of water quality from range best management practices | Greg Nalley (512) 229-4390 |
| MSEA | CSRS, ARS | Toxic substances hydrology, Nationwide | Research fate and transport of agrichemicals through environmental systems | Gail Mallard (703) 648-6872 |
| MSEA | Ohio State University, Ohio Department of Natural Resources | Buried Valley Aquifer, Ohio | Characterize hydrogeologic, geochemical, and geomicrobial environments | Martha Jaquicki (614) 469-5553 |
| MSEA | Iowa State University, University of Iowa Hygienic Laboratory | Walnut Creek Watershed, Iowa | Define ground water flow path and evaluate models of surface water and sediment movement | Philip Soenksen (319) 337-4191 |
| MSEA | University of Minnesota, Minnesota Pollution Control Agency | Sand Plains, Minnesota | Quantify the movement of agricultural chemicals in ground water and investigate effects of focused recharge | Geoffrey Delin (612) 229-2622 |
| MSEA | University of Minnesota, North Dakota State University | Sand Plains, Minnesota and North Dakota | Investigate the effects of evapotranspiration on pesticide distribution and transport in the unsaturated zone | Stephen Komor (612) 229-2641 |
| MSEA | University of Missouri | Goodwater Creek Watershed, Missouri | Conduct research on macropore flow and investigate processes affecting nitrogen cycling | Dale Blevins (816) 254-5824 |
| MSEA | University of Nebraska, Nebraska Department of Environmental Control | Platte River Valley, Nebraska | Define hydrologic properties of aquifers and rates of ground water flow in study area | Douglas Druliner (402) 437-5124 |

# Projects and Programs of the Tennessee Valley Authority to Minimize Agrichemical Point Source and Nonpoint Source Contamination of Waters

The Tennessee Valley Authority is a Federal agency with responsibility for regional development in the Tennessee Valley. TVA also has a national responsibility to develop and introduce new fertilizer technology to help keep U.S. agriculture productive and competitive. TVA has shifted a major portion of its resources into developing and introducing new generation fertilizers and practices, remediation technologies, and converstion of industrial waste by-products into beneficial uses. Thrust is on helping the nation keep agriculture competitive, sustainable, and environmentally acceptable. This work is conducted by TVA's National Fertilizer and Environmental Research Center at Muscle Shoals, Alabama. Contact John Shields, 205-386-2598; John Culp, 205-386-2585; Eugene Sample, 205-386-2545; and Ron Kirkland, 205-386-2354.

| Location | Project/Program Description | Cooperating Organizations | Contact |
|---|---|---|---|
| Alabama, Georgia, Kentucky, Mississippi, North Carolina, Tennessee, Virginia | Land and Water 201; program activities coordinated among state and federal agencies | Seven Valley states, TVA, USDA, EPA | Cliff Bice 205-386-2887 |
| Alabama, California (3), Florida, Georgia, Illinois, Louisiana, Maryland, Michigan, Missouri, Nebraska, New York, Oregon, South Dakota, Virginia | Model demonstrations at fertilizer dealer sites; point source containment | Dealers, state, industry, others | Horace Mann 205-386-2351 |
| Delaware, Maryland, Minnesota, Pennsylvania, Vermont, Wisconsin | Soil nitrate test development and evaluation | Land-grant universities | Bert R. Bock 205-386-3095 |
| Alabama, Georgia, North Carolina, Nebraska, Tennessee, Virginia | Winter cover crop evaluation for nitrate interception | Land-grant universities | Kenneth R. Kelley 205-386-3492 |
| 41 states and Puerto Rico | More than 250 test and demonstration projects | Land-grant universities | Ronald J. Williams 205-386-3552 |

## Agricultural Chemical Use Surveys (Comprehensive Accounting of Applications of Pesticides and Fertilizers)

As a result of the water quality and food safety initiatives, NASS and ERS were delegated the responsibility for developing an agricultural chemical use database. To develop this database, NASS and ERS have begun a series of statistical surveys. The following is an outline of those surveys.

**Contact:**

Michael LeBlanc, ERS 202-219-0438
Sam Rives, NASS 202-475-5744

**1989**

- Cotton Survey
  - — 14 major cotton states
  - — Publication, December 1990

**1990**

- Field Crops
  - — Includes corn, cotton, potatoes, rice, soybeans, and wheat in major producing states
  - — Publication, March 1991
- Vegetables
  - — Includes all vegetables, melons, and strawberries
  - — States included are Arizona, California, Florida, Michigan, and Texas
  - — Publication, June 1991

**1991**

- Field Crops
  - — Includes corn, cotton, peanuts, sorghum, rice, soybeans, and wheat in major producing states
  - — Publication, March 1992
- Fruits and Nuts
  - — All major fruit and nut commodities
  - — 15 major producing states
  - — Covers approximately 85 percent of U.S. fruit and nut acreage
  - — Publication, June 1992

# Water Quality Research Projects

## Agricultural Research Service, Cooperative State Research Service, and State Agricultural Experiment Stations

The President's Initiative on Water Quality provided funding to both the Agricultural Research Service (ARS) and the Cooperative State Research Service (CSRS) for research programs on water quality in both FY 1990 and FY 1991. A joint research program between ARS, CSRS, and the State Agricultural Experiment Stations ( SAES) was established to gain a better understanding of the impacts of agricultural production systems on water quality, and to develop agricultural systems that are both economically and environmentally beneficial. The research program consists of a National Priority Components Research Program of competitively awarded grants administered by CSRS, with the cooperation of SAES; and the Midwest Initiative on Water Quality conducted through five Management Systems Evaluation Areas (MSEA) by ARS, CSRS, and SAES, in cooperation with the U.S. Geological Survey and the U.S. Environmental Protection Agency.

Under the Priority Components Research Program, CSRS awarded 23 Special Research Grants in water quality in FY 1989. With increased funding under the President's Initiative, 46 grants were awarded in FY 1990 and 44 in FY 1991 by CSRS.

The focus of the ARS and CSRS water quality research projects funded in FY 1990 and 1991 were in five areas having a potential impact from agricultural systems on water quality: fundamental processes, diagnostic methodology, production systems, decision aids and information systems, and socio-economic implications. A list of the ARS and CSRS/SAES projects funded in FY 1990 and FY 1991 under the President's Initiative on Water Quality are shown below. For telephone numbers or addresses of the Principal Investigator of CSRS Grants, contact Dr. Berlie L. Schmidt or Dr. Maurice Horton at 202-401-4504.

## Agricultural Research Service: President's Water Quality Initiative Projects Initiated FY 1990

| State | Project Title | Research Unit | Research Leader |
|---|---|---|---|
| Arizona | Development of prototype knowledge-based systems for water quality modeling | Aridland Watershed Management Research Unit, Tucson | L. J. Lane (602) 670-6381 |
| California | Water quality management in San Joaquin Valley | Water Management Research Unit, Fresno | H. I. Nightingale (209) 453-3100 |
| California | Water quality models for irrigated salt-affected soils | U.S. Salinity Lab., Riverside | R. van Genuchten (714) 369-4847 |
| Colorado | Nitrogen management to protect ground water quality | Soil-Plant Nutrient Research, Ft. Collins | R. F. Follett (303) 482-5733 |
| Georgia | Develop decision aids & other model-based systems for enhancing water quality & farm profitability | Southeast Watershed Research, Tifton | R. A. Leonard (912) 386-3462 |
| Illinois | Weed management & application techniques for ground water quality protection | Crop Production Research Unit, Urbana | L. M. Wax (217) 333-9653 |
| Indiana | Controlled-release formulations—efficacy & role in reducing ground water contamination | Insect/Weed Control Research, West Lafayette | M. M. Schreiber (317) 494-4604 |
| Iowa | Analytical detection of chemicals in soil & ground water | National Soil Tilth Lab., Ames | J. L. Hatfield (515) 394-5723 |
| Iowa | Development of farming management systems to improve water quality | National Soil Tilth Lab., Ames | J. L. Hatfield (515) 394-5723 |
| Iowa | Decision-aid systems for farm management & water quality | National Soil Tilth Lab., Ames | J. L. Hatfield (515) 394-5723 |
| Iowa | Impact of preferential flow on chemical & water movement in agricultural systems | National Soil Tilth Lab., Ames | J. L. Hatfield (515) 394-5723 |
| Iowa | Transport & chemical transformation of pesticides in agricultural systems | National Soil Tilth Lab., Ames | J. L. Hatfield (515) 294-5723 |

## Agricultural Research Service: President's Water Quality Initiative Projects Initiated FY 1990—Continued

| State | Project Title | Research Unit | Research Leader |
|---|---|---|---|
| Iowa | Evaluation of farming management systems on ground water quality (MSEA project) | National Soil Tilth Lab., Ames | J. L. Hatfield (515) 294-5723 |
| Maryland | Degradation of pesticide waste by ozone & degradation | Pesticide Degradation Lab., Beltsville | C. J. Hapeman-Somich (301) 344-3233 |
| Maryland | ARS pesticide properties database | Systems Research Lab., Beltsville | S. R. Heller (301) 344-1709 |
| Minnesota | Effects of soil freezing on the fate of soil-applied nitrogen & pesticides | North Central Conservation Research Lab., Morris | G. R. Benoit (612) 589-3411 |
| Minnesota | Isopotential available ion-extraction of pesticides | North Central Conservation Research Lab., Morris | A. E. Olness (612) 589-3411 |
| Minnesota | Weed-emergence modeling for a weed/crop bioeconomic expert | North Central Conservation Research Lab., Morris | F. Forcella (612) 589-3411 |
| Minnesota | Sorption-desorption process affecting pesticide mobility in tilled soils | Soil/Water Management Research Unit, St. Paul | C. E. Clapp (612) 625-2767 |
| Minnesota | Midwest initiative on water quality (Northern Cornbelt Sand Plains MSEA project) | Soil/Water Management Research Unit, St. Paul | R. H. Dowdy (612) 625-7058 |
| Missouri | Alternative management systems for enhancing water quality of an aquifer underlying claypan soils (MSEA project) | Cropping Systems/Water Quality Research Unit, Columbia | E. E. Alberts (314) 882-1144 |
| Nebraska | Management of irrigated corn & soybeans to minimize ground water contamination (MSEA project) | Soil/Water Conservation Research Unit, Lincoln | J. S. Schepers (402) 472-1513 |
| Nebraska | Management of soil water & nitrogen to protect ground water quality | Soil/Water Conservation Research Unit, Lincoln | J. F. Power (402) 472-1484 |

## Agricultural Research Service: President's Water Quality Initiative Projects Initiated FY 1990—Continued

| State | Project Title | Research Unit | Research Leader |
|---|---|---|---|
| Ohio | Water-table management for crop protection & ground water quality | Soil Drainage Research Unit, Columbus | N. R. Fausey (614) 292-9806 |
| Ohio | Ohio Buried Valley Aquifer Management Systems Evaluation Area (MSEA project) | Soil Drainage Research Unit, Columbus | N. R. Fausey (614) 292-9806 |
| Ohio | Surface-subsurface & chemical movement & interactions on agricultural watersheds | North Appalachian Experimental Watershed, Coshocton | J. V. Bonta (614) 545-6349 |
| Pennsylvania | Environmental tracing of chemicals & water flow pathways in cropland watersheds | Northeast Watershed Research Center, University Park | H. B. Pionke (814) 865-2048 |
| South Carolina | Water quality evaluation for Duplin County | Soil/Water Conservation Research Unit, Florence | P. G. Hunt (803) 669-5203 |
| South Dakota | Develop technologies to manage corn rootworm populations with reduced insecticide inputs | Northern Grain Insects Research Lab., Brookings | D. R. Lance (609) 693-5211 |
| West Virginia | Water quality impacts of agriculture in southeast West Virginia | Appalachian Soil/Water Research Lab., Beckley | G. C. Pasquarell (304) 252-6426 |

## Agricultural Research Service: President's Water Quality Initiative Projects Initiated FY 1991

| State | Project Title | Research Unit | Research Leader |
|---|---|---|---|
| Arizona | Nitrogen fertilizer transport under 100% irrigation efficiency | U.S. Water Conservation Lab., Phoenix | H. Bouwer (602) 379-4356 |
| Arizona | Quasi-point sources of agricultural ground water contamination | U.S. Water Conservation Lab., Phoenix | H. Bouwer (602) 379-4356 |
| Arizona | Water quality model support systems | Aridland Watershed Management Research, Tucson | L. J. Lane (602) 670-6381 |
| California | Improved agrichemical management & agricultural production systems | Water Management Research Lab., Fresno | (C. J. Phene (209) 453-3100 |
| California | Development of an integrated salt-loading assessment methodology for managing soil salinity | U.S. Salinity Lab., Riverside | J. D. Rhoades (714) 369-4815 |
| California | Development of practical solute models for the management of irrigated salt-affected soils | U.S. Salinity Lab., Riverside | R. van Genuchten (714) 369-4847 |
| Colorado | Water & nitrogen management to protect ground water | Irrigation/Drainage Research, Ft. Collins | D. F. Heermann (303) 491-8229 |
| Colorado | Root zone water quality model | Great Plains Systems Research, Ft. Collins | L. R. Ahuja (303) 221-0578 |
| Georgia | Use of re-established riparian forest to control water pollution from a manure application site | Southeast Watershed Research Unit, Tifton | R. R. Lowrance (912) 386-3514 |
| Georgia | Agrichemical transport & controlling processes in Claiborne Aquifer recharge area of southwest Georgia | Southeast Watershed Research Unit, Tifton | R. A. Leonard (912) 386-3462 |
| Louisiana | Integrated water table & tillage/fertilizer/pesticide management to improve water quality | Soil/Water Research Unit, Baton Rouge | G. H. Willis (504) 387-2783 |
| Maryland | Minimizing effects of macropore flow on pesticide leaching | Pesticide Degradation Lab., Beltsville | A. R. Isensee (301) 344-3297 |

## Agricultural Research Service: President's Water Quality Initiative Projects Initiated FY 1991—Continued

| State | Project Title | Research Unit | Research Leader |
|---|---|---|---|
| Maryland | Nutrient management expert system | Systems Research Lab., Beltsville | H. E. Lemmon (415) 559-5965 |
| Maryland | Volatilization, transport & deposition of agricultural chemicals | Environmental Chemistry Lab., Beltsville | R. J. Wright (301) 344-3511 |
| Minnesota | Develop alfalfa to increase N fixation & reduce N losses to environment | Plant Science Research, St. Paul | M. P. Russelle (612) 625-8145 |
| Mississippi | Improve water quality by development of more efficient methods of applying herbicides | Field Crops Mechanization, Stoneville | J. E. Hanks (601) 686-2311 |
| Missouri | Tripsacum as a potential for reducing soil pesticide applications on corn | Plant Genetics Research, Columbia | E. H. Coe, Jr. (314) 882-2768 |
| Oklahoma | Water quality implications of playa lake containment of feedlot wastes | Water Quality/Water Watershed Research Lab., Durant | S. J. Smith (405) 924-5066 |
| Oklahoma | Prevention of ground water contamination by new agricultural production systems | Water Quality/Water Watershed Research Lab., Durant | S. J. Smith (405) 924-5066 |
| South Carolina | Reduction of shallow ground water contamination in southeastern coastal plains | Soil/Water Conservation Research Center, Florence | P. G. Hunt (803) 669-5203 |
| Texas | Develop comprehensive water quality management models | Grassland Soil/Water Research Lab., Temple | J. R. Williams (817) 770-6508 |

## Agricultural Research Service: President's Water Quality Initiative Projects Initiated FY 1992

| State | Project Title | Research Unit | Research Leader |
|---|---|---|---|
| California | Chemistry of potentially toxic trace elements in irrigated soils & drainage waters | Soil/Water Chemistry Research, Riverside | D. L. Suarez (714) 369-4814 |
| California | Water & pesticide management combinations for reducing pesticide movement to ground water | Pesticide/Water Quality Research, Riverside | W. F. Spencer (714) 787-5145 |
| Georgia | Upland agricultural nonpoint source contributions to riparian forests & other buffer systems | Southeast Watershed Research, Tifton | D. D. Bosch (912) 386-3462 |
| Georgia | Use of re-established riparian forest to control water pollution from a manure application site | Southeast Watershed Research, Tifton | R. R. Lowrance (912) 386-3514 |
| Idaho | Integrated agronomic & irrigation management systems to reduce nitrate leaching | | D. L. Carter (208) 423-6565 |
| Iowa | Effects of conservation tillage on pesticide fate & water quality | National Soil Tilth Lab., Ames | T. B. Moorman (515) 294-5723 |
| Maryland | Develop improved nitrogen management practices to reduce nitrate contamination of ground water | Environmental Chemistry Lab., Beltsville | J. J. Meisinger (301) 504-6511 |
| Maryland | Sources of mutagenic substances in ground & surface water | Environmental Chemistry Lab., Beltsville | R. J. Wright (301) 504-6511 |

## Cooperative State Research Service: President's Water Quality Initiative Projects Initiated FY 1990

| State | Project Title | Research Unit | Research Leader |
|---|---|---|---|
| Arizona | Molecular Methods for Evaluation of Microbial Quality of Groundwater | Univ. of Arizona | I. L. Pepper 602-621-7234 |
| Arkansas | Modeling Water Quality Impacts of Surface-Applied Broiler Litter to Identify BMPs's | Univ. of Arizona | T. C. Daniel 501-575-5720 |
| California | Dissolved Organic Matter in Water and its Role in Tracing Pesticide Degradation | Univ. of California | A. C. Chang 714-784-5325 |
| California | A Water Deselenification Process Using Accelerated Microbial Production | Univ. of California | W. T. Frankenberger 714-787-3405 |
| California | Field Test of a Stochastic Organic Solute Transport Model | Univ. of California | D. E. Rolston 916-752-2113 |
| California | Economic Incentives to Reduce Agricultural Pollution of Water Resources | Univ. of California | J. E. Wilen 916-752-6093 |
| Colorado | Crop Management Expert System for Reducing Ground Water Contamination | Colorado State Univ. | J. C. Loftis 303-491-5252 |
| Colorado | Predicting Pesticide Leaching from Spatial Variability of Transport Properties | Colorado State Univ. | J. C. Loftis 303-491-5252 |
| Connecticut | Degradation of Pesticide Wastes and Contaminated Media | Univ. of Connecticut | J. J. Pignatello 203-789-7237 |
| Delaware | Nitrate Leaching from Soybeans and Subsequent Contamination of Ground Water | Univ. of Delaware | J. J. Fuhrman 302-451-1392 |
| Florida | Degradation of Telone II and Fenamiphos in Subsoils and Groundwater, and by Microorganisms | Univ. of Florida | Li-Tse Ou 904-392-1978 |
| Georgia | Role of Winter Cover Crops in Reduction of NO3 Leaching | Univ. of Georgia | J. W. Johnson 404-228-7321 |

## Cooperative State Research Service: President's Water Quality Initiative Projects Initiated FY 1990—Continued

| State | Project Title | Research Unit | Research Leader |
|---|---|---|---|
| Hawaii | Liquid Chromatographic Methods for Pesticides in Water | Univ. of Hawaii | C. J. Miles<br>808-948-7306 |
| Hawaii | Application of Fractal Geometry for Estimating Soil Hydraulic Properties | Univ. of Hawaii | G. Uehara<br>808-948-6593 |
| Idaho | Microbial Detoxification of Pesticide Containers and Rinseates | Univ. of Idaho | R. L. Crawford<br>208-885-7966 |
| Illinois | Water Flow and Herbicide Transport Through Soil Macropores | Univ. of Illinois | F. W. Simmons<br>217-333-9649 |
| Indiana | Decision Support Systems for Evaluating Groundwater Quality Programs | Purdue Univ. | B. A. Engel<br>317-494-1198 |
| Iowa | Groundwater Recharge and Chemical Transport in Two Glacial Till Confining Units in Iowa | Iowa State Univ. | R. S. Kanwar<br>515-294-4913 |
| Kentucky | Effects of Riparian Vegetation on Water Quality: Modeling and Experimental Studies | Univ. of Kentucky | B. J. Barfield<br>606-257-5658 |
| Louisiana | Perceptions of Water Quality Problems Among Rural Residents of Southwest Louisiana | Louisiana State Univ. | E. J. Luzar<br>504-388-3282 |
| Louisiana | Atrazine and Metabolite Transport in the Soil Root Zone and Quality of Ground Water of Shallow Water | Louisiana State Univ. | H. M. Selim<br>504-388-2110 |
| Maryland | Prediction of Groundwater Contamination from Genetically Engineered Microbes | Univ. of Maryland | J. S. Angle<br>301-454-3722 |
| Massachusetts | Dairy Manure on Alfalfa to Reduce Overapplication and N Loss from Corn Fields | Univ. of Massachusetts | S. J. Herbert<br>413-545-2250 |
| Michigan | Assessment and Modeling of Nitrate Leaching Under Conventional and Organically Managed Corn | Michigan State Univ. | E. A. Paul<br>517-355-0271 |

## Cooperative State Research Service: President's Water Quality Initiative Projects Initiated FY 1990—Continued

| State | Project Title | Research Unit | Research Leader |
|---|---|---|---|
| Michigan | Stratification and Fate of N Within Soil Profiles: Management-Induced Changes | Michigan State Univ. | F. J. Pierce<br>517-355-6892 |
| Mississippi | Cotton Irrigation and the Effects on Herbicide Movement, Persistence, and Carryover | Mississippi State Univ. | C. E. Snipes<br>601-686-9311 |
| Missouri | Role of Plant Rhizosphere and Associated Microflora in Pesticides Degradation | Univ. of Missouri | G. A. Buyanovsky<br>314-882-6216 |
| New York | Electrochemical Treatment of Pesticide Wastewater | Cornell Univ. | A. T. Lemley<br>607-255-1944 |
| New York | Reducing Groundwater Pollution: A Systems Analysis Including Transport and IPM | Cornell Univ. | C. A. Shoemaker<br>607-255-9233 |
| New York | Interaction of Preferential Flow and Biodegradation in Heterogeneous Soils | Cornell Univ. | T. S. Steenhuis<br>607-255-2489 |
| New York | Protecting Groundwater from Nitrate on Dairy Farms in the Northeast | Cornell Univ. | R. J. Wagenet<br>607-255-5459 |
| North Carolina | Groundwater Contamination Potential Using Models, GIS, and Remote Sensing | N.C. State Univ. | S. Khorram<br>919-515-3430 |
| North Carolina | Effects of Water Table Management on Groundwater Quality | N.C. State Univ. | R. W. Skaggs<br>919-515-3121 |
| Ohio | Assessing and Modeling Water Quality Benefits of Water Table Management Systems | Ohio State Univ. | A. D. Ward<br>614-292-9354 |
| Oregon | Fate and Cycling of 15N-Labelled Dairy Manure | Oregon State Univ. | D. D. Myrold<br>503-737-2441 |
| Pennsylvania | Soil Management of Residual Manure Nitrogen Affecting Nitrates in Ground Water Within Limestone Terrain in Lancaster County, PA | Penn State Univ. | D. E. Baker<br>814-865-1221 |

## Cooperative State Research Service: President's Water Quality Initiative Projects Initiated FY 1990—Continued

| State | Project Title | Research Unit | Research Leader |
|---|---|---|---|
| Pennsylvania | Microencapsulation and Adjuvant Effects on Herbicide Leaching and Persistence | Penn State Univ. | J. K. Hall<br>814-865-1159 |
| Tennessee | Effects of Tillage and Cropping Systems on Transport of Nitrate Through Heterogeneous Soils | Univ. of Tennessee | G. V. Wilson<br>615-974-8823 |
| Texas | Hydraulic Conductivity and Macropore Flow in Relation to Soil Structure | Texas A&M Univ. | K. J. McInnes<br>409-845-5986 |
| Utah | Economic Incentives for Managing Non-Point Pesticide Pollution of Groundwater: A Prototype Application | Utah State Univ. | T. F. Glover<br>801-750-2297 |
| Virginia | Soil Nitrogen as a Predictor of Nitrogen Fertilizer Needs of Winter Wheat | VPI & State Univ. | M. M. Alley<br>703-231-9777 |
| Virginia | Composting as a Means to Dispose of Pesticide Waste | VPI & State Univ. | D. F. Berry<br>703-231-9792 |
| Washington | Managing Nitrate Groundwater Pollution from Agriculture in the Pacific Northwest | Washington State Univ. | N. K. Whittlesey<br>509-335-1809 |
| West Virginia | Nematicide Mobility and Biodegradation: Effects of Orchard Soil Management | West Virginia Univ. | J. B. Kotcon<br>304-293-3911 |
| Wisconsin | Safe, On-Farm Disposal of Dilute Pesticide Wastes | Univ. of Wisconsin | G. Chesters<br>608-262-3838 |
| Wisconsin | Using Ground Penetrating Radar to Predict and Monitor Preferential Flow in Sandy Soils | Univ. of Wisconsin | K-J S. Kung<br>608-262-6530 |

## Cooperative State Research Service: President's Water Quality Initiative Projects Initiated FY 1991

| State | Project Title | Research Unit | Research Leader |
|---|---|---|---|
| Arizona | Non-Ideal Transport of Pesticides in Soils | Univ. of Arizona | M. L. Brusseau 602-621-3244 |
| Arizona | The Persistence of Preferential Flow During an Infiltration Event | Univ. of Arizona | A. W. Warrick 602-621-1516 |
| California | Comparison of Transfer Function and Mechanistic Flow and Transport Models | Univ. of California | W. A. Jury 714-787-5116 |
| Colorado | Effect of Best Management Practices on Ground Water Quality | Colorado State Univ. | D. S. Durnford 303-491-5252 |
| Connecticut | Preferential Flow of Atrazine in Banded and Broadcast Treatments in Corn | Univ. of Connecticut | K. Guillard 203-486-6309 |
| Georgia | Chemigation Impacts on Water, Soil, and Crop Quality | Univ. of Georgia | J. E. Hook 912-386-3182 |
| Idaho | Application of Gems in Remediation of Chloroaromatics | Univ. of Idaho | C. S. Orser 208-885-7167 |
| Indiana | Field Scale Preferential Flow on Structured and Non-Structured Silt Loam Soils | Purdue Univ. | E. J. Kladivko 317-494-6372 |
| Kentucky | Role of Sediment in Nutrient Transport in a Karst Groundwater Catchment | Univ. of Kentucky | G. K. Felton 606-257-3000 |
| Maine | Impacts of Precommercial Thinning and Fertilization on Water Quality | Univ. of Maine | R. D. Briggs 207-581-2899 |
| Maryland | Effect of N Placement and Ridge Tillage on Nitrate Leaching as Traced by Bromide | Univ. of Maryland | R. R. Weil 301-405-1314 |
| Massachusetts | Regulations and Economic Incentives for Achieving Groundwater Quality | Univ. of Massachusetts | C. R. Harper 413-545-5717 |

## Cooperative State Research Service: President's Water Quality Initiative Projects Initiated FY 1991—Continued

| State | Project Title | Research Unit | Research Leader |
|---|---|---|---|
| Minnesota | A Field Tracer Test Method for Large Soil Samples | Univ. of Minnesota | E. Calvin Alexander 612-624-3517 |
| Minnesota | Role of Earthworm Macropores in Preferential Flow of Water and Contaminants | Univ. of Minnesota | S. C. Gupta 612-625-1241 |
| Minnesota | A Regional Assessment of Soil Nitrogen Tests in Iowa, Minnesota, and Wisconsin | Univ. of Minnesota | G. W. Randall 507-835-3620 |
| Missouri | CT-Measured Fractal Dimension, Lacunarity and Crack Porosity Related to Transport | Univ. of Missouri | R. Lee Peyton 314-882-3678 |
| Montana | Validation of Solute Transport Models Under Varying Moisture Regimes | Montana State Univ. | W. P. Inskeep 406-994-5077 |
| Montana | Cropping Systems and Non-Point Source Groundwater Pollution | Montana State Univ. | [illegible]. Johnson 406-994-2580 |
| Montana | A Land and Microclimate On-Farm Information System for Groundwater Protection | Montana State Univ. | G. A. Nielsen 406-994-5075 |
| Nebraska | Movement of Agricultural Chemicals Beneath Conservation Tilled-Furrow Irrigated Land | Univ. of Nebraska | D. E. Eisenhauer 402-472-1637 |
| Nebraska | Quantifying Nitrate Leaching Under Continuous Corn Versus a Corn-Soybean Rotation | Univ. of Nebraska | G. W. Hergert 308-532-3611 |
| Nebraska | Measurements of Injected Herbicide Mobility and Persistence in Groundwater | Univ. of Nebraska | R. F. Spalding 402-472-7558 |
| New Mexico | Chemical Transport and Persistence in a Furrow Irrigated No-Till Management System | New Mexico State Univ. | N. B. Christensen 505-985-2292 |
| New York | Locating Soil Layers in the Vadose Zone with Non-Destructive Methods | Cornell Univ. | T. S. Steenhuis 607-255-2489 |

## Cooperative State Research Service: President's Water Quality Initiative Projects Initiated FY 1991—Continued

| State | Project Title | Research Unit | Research Leader |
|---|---|---|---|
| New York | Parameterization of Tillage Effects on Soil Hydraulic Properties and Agricultural Losses | Cornell Univ. | H. M. van Es<br>607-255-5629 |
| North Carolina | Preferential Movement of Water and Solutes Through Soil/Saprolite Sequences | NC State Univ. | A. Amoozegar<br>919-515-3967 |
| North Carolina | Planted and Natural Vegetated Buffers for Nonpoint Source Pollution Control | NC State Univ. | J. W. Gilliam<br>919-515-2040 |
| Ohio | Role of Water Table Position and History on Fate of Subsurface Contaminants | Ohio State Univ. | L. C. Brown<br>614-292-3826 |
| Ohio | Weed Management Systems to Reduce Ground Water Contamination in No-Till Corn | Ohio State Univ. | J. Cardina<br>216-263-3644 |
| Oklahoma | Economics of Managing Pesticides to Reduce Water Quality Degradation | Oklahoma State Univ. | D. L. Nofziger<br>405-744-6417 |
| Oklahoma | Economic Impacts of Ground Water Quality Management | Oklahoma State Univ. | P. E. Norris<br>405-744-9818 |
| Oregon | Dynamic Modeling of Alternating Furrow Irrigation to Minimize Nitrate Leaching to Groundwater | Oregon State Univ. | A. R. Mitchell<br>503-475-3305 |
| Oregon | Development and Testing of Wick Lysimeters for Observation of Solute Transport | Oregon State Univ. | J. S. Selker<br>503-737-2041 |
| Pennsylvania | Nitrate Leaching in Continuous Corn and Manured Corn-Alfalfa Rotations | Penn. State Univ. | R. H. Fox<br>814-865-1169 |
| Pennsylvania | Karst Aquifer Pollution Assay by Vulnerability Index Determinations | Penn. State Univ. | D. A. Kurtz<br>814-863-4436 |
| Rhode Island | Attenuation of Groundwater Nitrate in Riparian Buffer Zones | Univ. of Rhode Island | A. J. Gold<br>401-792-2903 |

## Cooperative State Research Service President's Water Quality Initiative Projects Initiated FY 1991—Continued

| State | Project Title | Research Unit | Research Leader |
|---|---|---|---|
| South Carolina | Soil Classification System to Southern Region Based on [illegible] and Chemical Flow | Clemson Univ. | V. L. Quisenberry 803-656-352[illegible] |
| South Dakota | Tillage Induced Microrelief Impacts on NO3 and Atrazine Movement in Soils | SD State Univ. | D. E. Clay 605-688-4586 |
| Tennessee | The Effects of Tillage on Fate and Transport of Pesticides Through Unsaturated Soil Profiles | Univ. of Tennessee | M. E. Essington 615-974-8819 |
| Texas | Pesticide Degradation by a Genetically Engineered Fungus | Texas A&M Univ. | C. M. Kenerley 409-845-826[illegible] |
| Texas | Management of Dairy Waste to Minimize Potential Groundwater Contamination | Texas A&M Univ. | M. [illegible] Wolfe 409-845-367[illegible] |
| Vermont | Nitrogen Management Systems for Corn to Reduce Nitrate Leaching | Univ. of Vermont | F. R. Magdoff 802-656-2630 |
| Washington | On-Farm Management of Groundwater Nitrate Pollution in Pacific Northwest Irrigated Agriculture | Wash. State Univ. | [illegible] K. Whittlesey 509 335-1809 |
| Wisconsin | Preferential Movement of Water and Agchemicals [illegible] Sandy Soil with Animal Burrows | [illegible] | [illegible] M. Norman 608-[illegible]62-4576 |

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United States
Department of
Agriculture

Agricultural
Research
Service

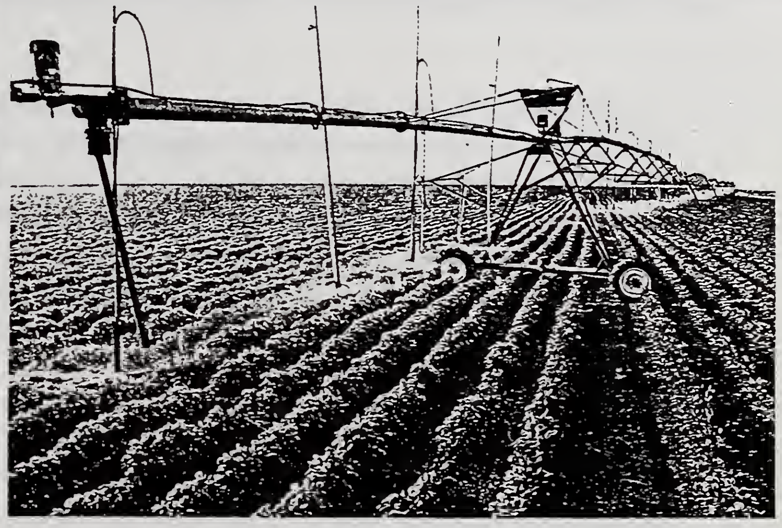
*and*

Cooperative State
Research Service

*In cooperation with*

State Agricultural
Experiment Stations

# USDA Research Plan for Water Quality



Advances in agricultural science and technology during this century have profoundly affected our standard of living and way of life. Agricultural chemicals contribute substantially to the productivity and efficiency of agriculture, and their many benefits to the well-being of rural and urban communities throughout the world are recognized and accepted. Even so, concerns about the possible risks to human health, water quality, and a safe environment resulting from a perceived overdependence on these chemicals are being expressed by a broad segment of our community. Better methods for detecting the presence of chemicals at trace levels in surface waters and groundwaters have alerted us to the need to be more judicious in their use and more careful in their management. The U.S. Department of Agriculture is committed to ensuring that this Nation meets the challenge of maintaining the efficiency and productivity of agriculture without compromising the quality of our water resources and the safety of our environment.

This departmental research plan establishes the goals, objectives, and implementation strategy for developing the science and technology needed to maintain and enhance the quality of our Nation's water resources. The need for a major research effort on the full spectrum of water quality problems resulting from agricultural and silvicultural activities is recognized. However, because groundwater is the primary source of drinking water for nearly 90 percent of our rural population and more than 50 percent of our total population, the plan emphasizes improved chemical use and management for protecting groundwater quality. The research will be conducted in cooperation with other Federal agencies with missions and responsibilities for water quality protection. The plan was developed jointly by the Agricultural Research Service and the Cooperative State Research Service, with major contributions from professionals of the State agricultural experiment stations and from other agencies of the Department, including the Agricultural Stabilization and Conservation Service, Economic Research Service, Extension Service, and Soil Conservation Service.

Orville G. Bentley

Orville G. Bentley
*Assistant Secretary*
*Science and Education*

January 1989

Widespread public concern exists that agricultural and forestry activities are contributing to the contamination of the Nation's surface waters and groundwaters. The U.S. Department of Agriculture and State institutions have some excellent research programs that address this concern. The Department now proposes a plan for integrating and expanding these programs to emphasize groundwater research. The plan does not include all the groundwater concerns of the Department but, rather, focuses on the impacts of pesticide and fertilizer use on groundwater quality. The surveys of groundwater quality that have been conducted show small quantities of pesticides and nitrate in some wells. However, the data are inconsistent, and the inconsistencies, for the most part, lack an adequate explanation. The insufficiency of and inconsistencies in available data make it difficult to know how serious the problem is, how widespread it is, and how it should be solved.

The new research plan proposed by the Department calls for a broad partnership with other Federal agencies and State institutions to fill key information and technology gaps in groundwater quality assessment and management. The goals are to determine the seriousness and extent of the groundwater quality problem, improve our understanding of the processes that control chemical leaching, and provide timely and cost-effective remedies for problems that exist.

A major research effort is planned to improve our understanding of the processes that determine agricultural productivity, and the fate and transport of agricultural chemicals. This understanding is essential to the development of new and improved components of economically viable and environmentally safe crop production systems. It will also facilitate the adaptation of field-tested production systems to changes in soil, crop, and climatic conditions. This research will enhance and expand the research already underway in State and Federal laboratories. Significant advances are projected in assessment technologies, sampling and analytical methods, onfarm waste disposal practices, and the development of innovative soil, water, and chemical management practices.

A Midwest Initiative is also planned to assess the severity and extent of the groundwater quality problem in selected corn and soybean production areas of several Midwestern States and to demonstrate a systems approach to problem solving. The assessment strategy will be based on the use of intensively instrumented sites that represent the diversity of soil, geologic, and climatic conditions found in the Corn Belt. A systems approach will be used to determine the combinations of production practices that best satisfy the economic, environmental, and social needs of the region. Emphasis will be placed on corn and soybean production systems that are suitable for use on croplands overlying the major aquifers of the region. Management support systems will be developed to help farmers and others select the practices that improve both farm profitability and groundwater quality. The proposed systems approach will permit the transfer of results to conditions not included in the field program and to areas other than the experimental sites.

A similar systems approach will be used to identify the optimum combinations of crop production practices for other physiographic regions of the country with vulnerability to groundwater contamination by agricultural chemicals. Regions of major concern include those with intensive dryland and irrigated farming, concentrated livestock production, high recharge rates, and shallow groundwaters. Emphasis will be placed on intensively managed croplands overlying aquifers that are important to rural development or that supply the drinking water needs of a large number of people.

Results of this plan will provide definitive answers to many of the questions being asked. Public fears will have been addressed. Whether or not there is a basis for these fears, best management practices will be identified and/or developed so that the leaching of pesticides, nitrate, and other potentially hazardous chemicals can be minimized and managed. Practical, inexpensive pesticide waste disposal systems will be tested for onfarm use. Regardless of the severity and extensiveness of the current problem, major environmental and economic benefits to future generations can be expected.

# Introduction

The Nation's surface waters and groundwaters are being adversely impacted by human activities. Potential water contaminants include sediments, salts, toxic trace elements, animal and human wastes, and agricultural and industrial chemicals. Most of the major surface water quality problems, including the offsite damage from agricultural and forestry practices, have received considerable attention from the research community. While substantial progress has been made in solving some of the water quality problems associated with crop, livestock, and timber production, much more work remains to be done.

A problem that has attracted considerable interest in this decade is the intrusion into groundwater of agricultural chemicals applied to soils and crops. Groundwater quality surveys conducted during this period have detected trace amounts of nitrate and selected pesticides in certain aquifers. The significance of the findings remains inconclusive and controversial because many of these chemicals are detected at very low concentrations, their toxicological effects are not clearly established, and much of the data are of unknown quality.

Nevertheless, public apprehension continues to increase as more attention is focused on the possible health effects associated with some of these chemical residues. These public concerns are increasing the pressures for new environmental legislation and regulations on chemical use and disposal at local, State, and Federal levels. The implications for U.S. agriculture and the future well-being of the farm community could be serious.

The U.S. Department of Agriculture (USDA) is concerned about the health of our rural population, environmental quality, farm profitability, and user liability, even though it has not been possible to assess definitively the significance of the concentrations of chemicals that have been reported. In response to these concerns about chemical residues in groundwater, the USDA now proposes a major Federal and State collaborative plan to determine the magnitude and scope of the groundwater quality problem, and to develop resource management strategies for minimizing any contribution from agriculture to the problem.

# Justification

It is increasingly recognized at State and Federal levels that agricultural research must give more attention to developing methods for assessing and controlling, where appropriate, the environmental consequences of changes in farming and forestry practices. For more than two decades, the public has been concerned about the potential threat that agricultural and other chemicals will enter and degrade the quality of surface waters. This concern led to the enactment of major Federal legislation to protect surface water quality. In turn, the legislation triggered a nationwide effort, involving all levels of government, to evaluate the severity of the problem, develop cost-effective solutions, and regulate the use and disposal of potentially harmful chemicals.

Until recently, there was less concern in the general population and the scientific community about the potential for agricultural chemicals to contaminate groundwater. This lack of broad concern was based on an intuitive acceptance that several feet of soil provides an effective natural filter or reaction zone for removing potentially damaging chemicals. While the filtering effect of the soil is adequate for many chemicals, recent experimental evidence suggests that at least for some soils and chemicals, the soil filter is less efficient than had been assumed. This evidence has, in turn, raised questions regarding the environmental costs of farming practices such as conservation tillage, fall fertilization, chemical control of weeds, and chemigation and fertigation (the application of pesticides and fertilizers, respectively, with irrigation water). Research is needed to answer these questions and to provide solutions to any problems that exist. This research must recognize the intimate relationship between surface water and groundwater.

The potential for groundwater contamination by agricultural chemicals is high in many of the major crop and livestock producing areas of the country (see map). Factors that increase aquifer vulnerability include intensive cropping, high levels of fertilizer and pesticide use, poor water management, permeable soils and subsoils, and shallow water tables. Limited research in these areas indicates that the adverse impacts on groundwater quality of some current agricultural production practices may be significant. An expanded research effort is needed to determine the areal extent and severity of these impacts. Where major problems exist, additional research will be needed to develop and evaluate new practices that adequately protect groundwater quality.

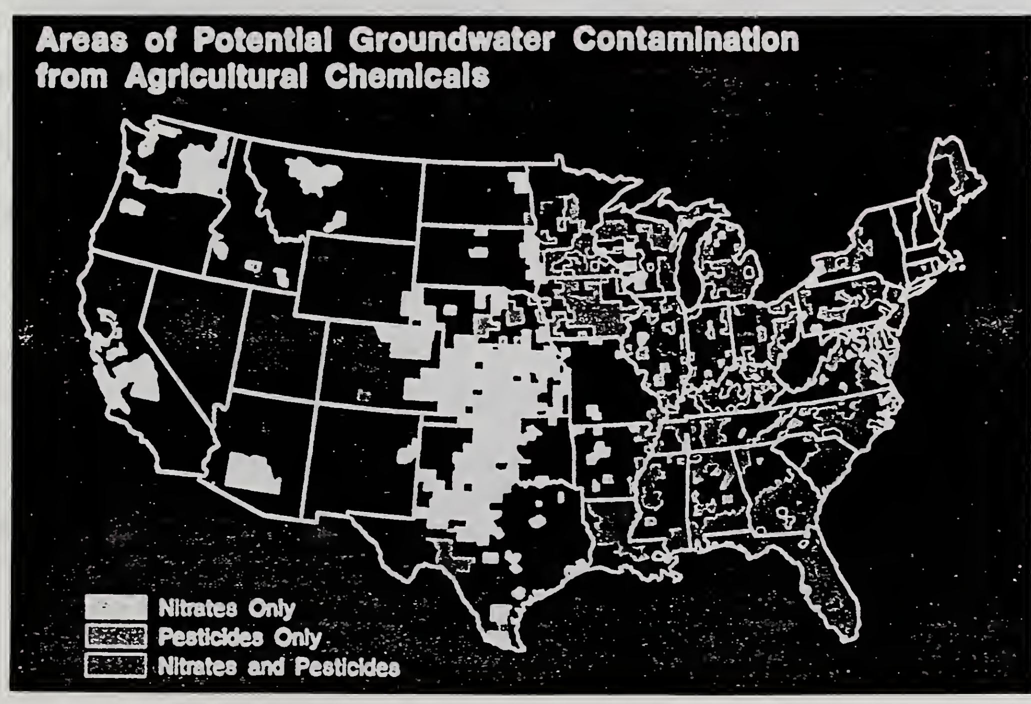
Two critical short-term needs are accurate assessment and cost-effective reduction of the overall contribution of agriculture to groundwater contamination. Meeting these needs will require an expanded research program to identify the separate contributions of a large number of farming practices within a broad range of crop and livestock production systems. Some of these practices and their associated systems are of local concern; others are of regional or national relevance.

New and existing practices that are considered beneficial to the environment include conservation tillage; targeted, low-volume pesticide applications; banded or reduced fertilization; improved nitrogen management through more effective crop rotations; improved water management; integrated pest management; and increased use of soil and plant analyses as a basis for improving the accuracy of fertilizer recommendations. However, the effects of these practices and their adaptability for practical and profitable use are often site specific. They vary with soil type, geology, climate, and cropping system and are affected by economic, social, and political considerations.

A major national concern is the effect on groundwater quality of USDA decisions that promote the use of conservation tillage. During the past two decades, many farmers adopted some form of conservation tillage, replacing conventional moldboard plowing with practices such as ridge tillage, minimum tillage, or no tillage. Initially, these practices require an increased use of agricultural chemicals, particularly herbicides to control weeds that in the past had been partially controlled by conventional tillage practices. Nationwide, the planted acreage in conservation tillage increased from 2 percent in 1968 to 31 percent in 1987. The compliance provisions of the Food Security Act of 1985 are expected to accelerate the adoption of conservation farming practices. While these practices effectively control soil erosion and may provide economic benefits, the implications of their expanded use on pesticide and fertilizer residues in the soil and on groundwater quality are largely unknown.

Without a substantial improvement in our knowledge of the effects of conservation tillage on chemical use, groundwater recharge rates, pest control, and farm profitability, it will not be possible to respond effectively to the concerns of those who feel that USDA's conservation tillage initiatives are exacerbating the groundwater quality problem. Proponents of conservation tillage are convinced that farming systems can be developed that will decrease the loss of agricultural chemicals to groundwater and also reduce contaminant levels resulting from past farming practices.

Some excellent research programs on water quality are already underway in most States and are being conducted by the Agricultural Research Service, Cooperative State Research Service, State agricultural experiment stations,




Potential areas of groundwater contamination from pesticides and nitrate. (Source: Nielsen and Lee 1987).

and the land-grant universities. A few of the programs on groundwater quality are being conducted on a multi-State or regional basis. The expansion, integration, and coordination of these programs according to a single plan with national goals and objectives are a high priority need. The USDA Research Plan for Water Quality is such a plan. It will expedite the development and evaluation of agricultural production practices that protect groundwater quality and adapt readily to local soil, climatic, cropping, and socioeconomic conditions. The applied research programs will benefit materially from current and new knowledge on the source, transport, and fate of agricultural chemicals in the soil, underlying parent material, and groundwater.

## Goals

The general goal of the USDA plan is to safeguard and enhance the quality of the Nation's surface waters and groundwaters in the presence of sustained agricultural activities. Emphasis will be placed on groundwater quality.

The specific goals of the plan reflect this emphasis and are

1. To assess the seriousness and extent of agriculture's impact on groundwater quality.
2. To develop new and improved agricultural systems that are cost effective and enhance groundwater quality.

## Objectives

The following objectives are designed to meet the general and specific goals on groundwater quality:

1. Document the sources and amounts of potentially hazardous contaminants in groundwater which are attributable to current agricultural and forestry practices, and identify the basic processes involved in their movement through soil and into groundwater.
2. Develop new field and laboratory methods for rapidly, reliably, and inexpensively analyzing pesticide residues and for determining the rates at which water and chemicals move through soils to groundwater.
3. Develop new and modified crop and livestock production systems that substantially decrease the movement of potentially hazardous chemicals into groundwater, and determine the effects of these new systems on farm costs, changes in farm inputs, and production choices.
4. Develop simple, inexpensive, onfarm methods for disposing of pesticide containers and other hazardous wastes without contaminating groundwater.
5. Develop decision-aid systems that may be used by technical and farm management specialists, Extension agents, and farm consultants to help individual farmers select, apply, and manage profitable and environmentally sound crop and livestock production practices.
6. Evaluate the economic, social, and political impacts of alternative crop and livestock production systems, policies, and institutional strategies to control groundwater contamination.

## Elements of the USDA Plan

The USDA plan comprises two elements: I. Priority Component Information and II. Selected Geographic Systems.

The Priority Component Information element consists of conducting research to obtain information on the basic physical, chemical, and biological processes that determine the movement of contaminants through soil into groundwater; to develop new and improved crop, soil, and water management components of cropping systems; and to identify the climatic, soil, and hydrogeologic variables that affect the economic and environmental responses of agricultural ecosystems.

Currently, a significant amount of relevant research is being conducted by State and Federal scientists in most areas of the United States. This work must be continued to meet the information needs of the diverse physiographic regions of the country. As envisaged, this element of the plan will enhance current research and support new thrusts identified as critical for maintaining a competitive agriculture in areas where the risks of groundwater contamination are high.

The Selected Geographic Systems element consists of obtaining all the priority component information for selected geographic areas and providing those areas with specific options for managing soils, crops, chemicals, and water to maintain farm profitability and enhance soil and water quality. The Midwest, or Corn Belt, has been selected as the first area for work of this kind. The Midwest initiative will be a major research effort and is expected to demonstrate the soundness and effectiveness of the systems approach to solving problems of groundwater contamination common to a wide area. Work will focus on the development of economically and environmentally sound corn and soybean production systems; and it will be conducted in collaboration with other State and Federal agencies, including the Geological Survey and the Environmental Protection Agency.

## I. Priority Component Information

The priority components of information are discussed according to the sequence of objectives needed to meet the goals of the USDA plan.

### Site Selection, Sampling, and Analytical Methodologies

Initially, priority will be given to solving the problems of sampling, sample integrity, and analytical methodology. A significant body of information shows that spatial and temporal changes in the concentrations of some contaminants in groundwater samples can be substantial. Measured concentrations may vary by an order of magnitude or more. The reasons for this variability in water quality will be given particular attention. Solving these problems will help ensure that the most cost-effective and well-designed protocols will be used throughout all phases of the research, and that action and regulatory agencies will have access to efficient monitoring procedures.

Improved sampling methodologies will provide the means to obtain accurate and representative data at a substantially reduced cost. Thus, they will meet a critical and widespread need by research, action, and regulatory agencies. The tools to be developed will include in situ and low-cost pesticide analytical methods, leachate and groundwater recharge measurement and sampling methods, and sampling strategies that accurately determine spatial and temporal variabilities.


Knowing where and when to sample is important.

The in situ and low-cost methods of pesticide residue analysis to be developed will include promising optical, potentiometric, and enzymatic devices that can be operated in a field laboratory or installed in a well/lysimeter. These methods will be designed to obtain continuous or high frequency data on the amounts of selected pesticide residues present. The analytical strategy will rely primarily on low-cost, efficient analyses, with detailed, highly sophisticated analyses made periodically only as a check. The present cost of nearly $100 per pesticide sample for conventional analysis imposes major limitations on the capability of most agencies to conduct comprehensive monitoring programs.

Because the spatial and temporal variabilities of soil and subsoil properties have a major influence on chemical movement, fundamental work will be undertaken to determine how to use basic soil properties, lithology, and structure in developing efficient field sampling protocols. The variabilities of other site specific characteristics, such as climate, hydrology, and geology, which also affect groundwater recharge and chemical leaching, will be defined and incorporated into simulations and interpretations. Often it is the extreme values of these characteristics, rather than their means, that control chemical leaching.

### Fate of Agricultural Chemicals

One of the priority components of information needed to understand the impact of agricultural practices on water quality is the fate of chemicals introduced into the soil/groundwater system. These chemicals are subject to physical, chemical, and biological processes that act jointly to determine their fate. Prediction of the extent and duration of groundwater contamination depends upon an adequate understanding of these dynamic processes. Although previous work has identified the general character of these processes, their effects on the fate of many of the new chemicals being introduced into the environment are as yet inadequately understood.

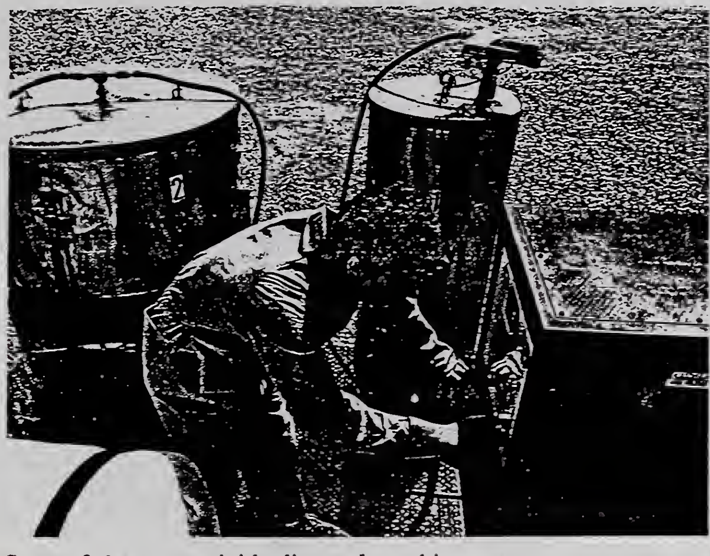
Consequently, further research will be undertaken to more completely define the chemical and biological degradation processes, mobility and leaching processes, and volatilization and plant uptake processes for these agricultural chemicals. Because of the increased use of high residue farming, emphasis will be placed on research to evaluate the effects of crop residues on soil moisture and temperature profiles, nitrogen and pesticide losses, and optimum chemical requirements for plant nutrition and pest control.

Conventional pesticide analyses are accurate but complex and costly.

### New and Improved Management Practices

Mechanical, cultural, biological, manual, and chemical methods can all be used in various combinations to control the growth of weeds and prevent serious losses in crop production. An accelerated effort to develop integrated weed management systems and general pest management systems will be a major thrust of this information component. Research on controlled-release formulations of existing pesticides and the development of innovative methods of weed control will be actively pursued.

Chemigation and fertigation are effective ways to apply pesticides and fertilizers to irrigated crops. Improvements in these practices will be made to minimize the risk of excessive chemical movement below the root zone. The benefits of using advances in water management technol-



State-of-the-art pesticide disposal combines new chemistry with biotechnology.

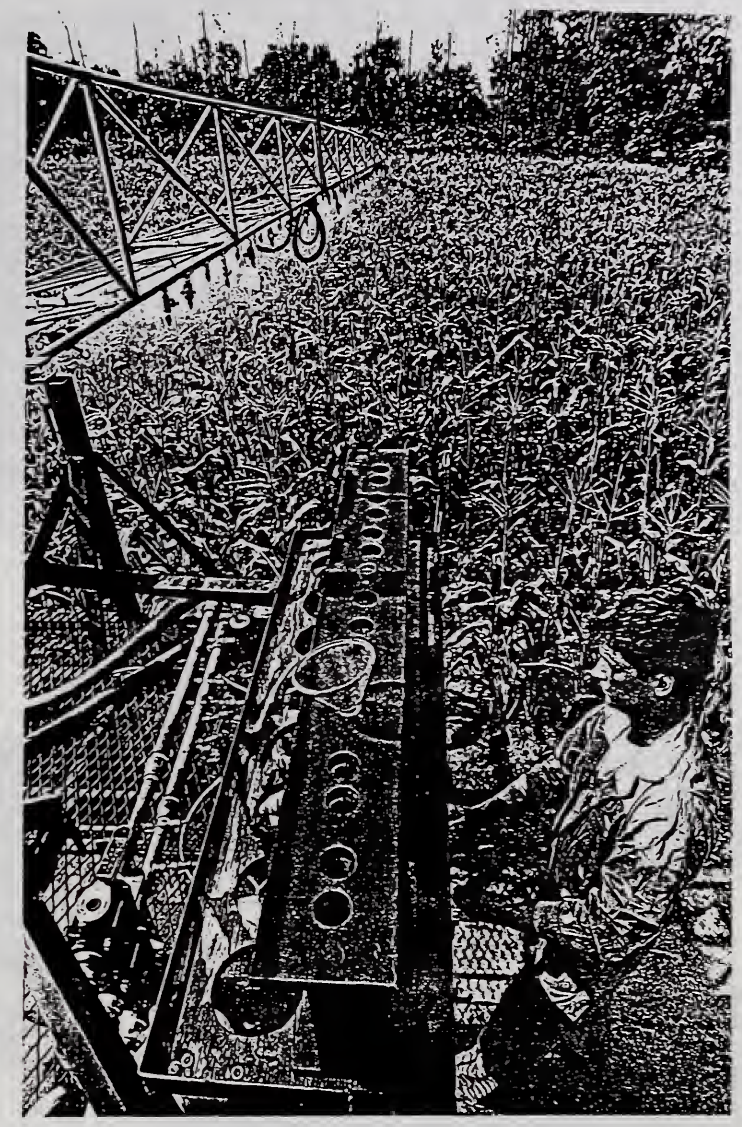
ogy, improved irrigation practices, surface and subsurface drainage, and water-table control, to improve water quality will also be assessed.

### Low-Cost Pesticide Disposal

Improper disposal of pesticide wastes and containers poses potentially significant hazards for contamination of soils, surface water, and groundwater. A simple, inexpensive, pesticide waste-water disposal unit has been developed, and two prototypes have been built. The disposal method uses ozone to fragment the pesticide and soil microorganisms to metabolize the fragments. Improved strains of these organisms will be developed to improve the efficiency of the process. The genes associated with the metabolic process will be isolated and inserted into natural soil organisms to enhance their ability to break down pesticides in soils and contaminated waters.

### Predictive Models and Decision Aids

Models that simulate the behavior of chemicals in the soil/ground system are becoming valuable tools for assessing the fate of potential soil and groundwater contaminants and for extrapolating the data collected at selected sites to other areas. The most detailed forms of these models are used by the research community to test their understanding of the basic physical, chemical, and biological processes operating in agricultural ecosystems. Simplified forms of these tested models are used by community managers and regulatory personnel to predict in broad terms the environmental fate of chemicals introduced into agricultural ecosystems. They



Pesticides properly applied in irrigation water will reduce groundwater pollution.

are also used to identify geographic regions, and cropping and livestock production systems which pose a potentially serious threat to groundwater. They have the potential to be used as decision aids by agricultural specialists and managers working with farmers to design and implement environmentally safe practices.

Despite the substantial progress that has been made, major improvements in accuracy, flexibility, and performance are needed. The research to be undertaken will improve the reliability of these models and decision aids by incorporating improvements in scientific understanding of the processes and components. Model flexibility will be improved by extending the capabilities of existing models to include two-dimensional and possibly three-dimensional simulations of agricultural landscapes.

Computer models identify cropping practices that seriously threaten groundwater quality.

### Economic, Social, and Political Impacts

Groundwater contamination has economic, political, and social consequences, many of which are new to our experience. Further, the complex economic and policy setting in which contamination occurs is poorly understood. Issues to be addressed include analyses of economic and other incentives that influence individual agricultural practices in ways that lead to groundwater contamination, appraisals of the economic and social consequences of alternative agricultural policies, and more effective institutional strategies for minimizing groundwater contamination.

## II. Selected Geographic Systems

The available information on the concentrations of agricultural chemicals in groundwaters and on the comparative vulnerability of different landscapes to the leaching of chemicals indicates that a systems approach to solving the groundwater quality problem is needed for several major crop producing areas. Some examples of crop and livestock production systems that could benefit materially from a regional integration of effort by State and Federal scientists include concentrated crop and livestock production systems in the Northeast, multiple-cropping systems in the South and the Southeast, wheat production systems in the Great Plains States and Pacific Northwest, corn and soybean production systems in the Midwest, and vegetable and horticultural production systems in irrigated areas of the West. The groundwaters underlying all these areas have been identified as vulnerable to contamination by some of the fertilizers and pesticides now in use.

Developing environmentally safe crop production systems that are acceptable to the farm community for the diversity of crops grown, chemicals used, and site conditions needing attention presents a major challenge to the agricultural community. For some crop production systems, the information base needed to select an optimum combination of farming practices might be better developed as a local or State activity. Consequently, a flexible research approach is proposed that will permit the optimum use of Federal, State, and local resources to solve identified groundwater problems.

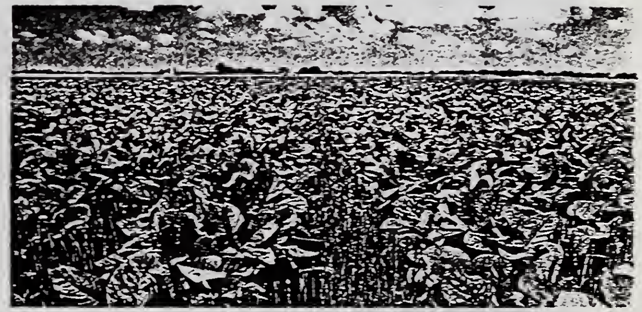
## Midwest Initiative

The Midwest has been selected as the first geographic area for which the systems approach will be used. The selection was based on the following important factors. The Midwest is one of the most extensively farmed areas of the United States, producing more than half of all U.S. corn and soybeans and using a proportional level of agricultural chemicals. Three of the leading pesticides used by the area's farmers—atrazine, alachlor, and carbofuran—have been found in trace amounts in the groundwaters of several Midwestern States. Also, the groundwaters of this area have been identified as potentially vulnerable to contamination by nitrogen as nitrate, and high rates of nitrogen fertilization are used in corn production. Finally, conservation tillage practices, with their expanded use of pesticides and fertilizers, have been widely adopted by midwestern farmers and are now used on 45 percent of their croplands. This percentage is substantially higher than the average for the Nation.

The benefits derived and the lessons learned from the Midwest Initiative are expected to have broad national relevance and significance because the approach and procedures used will be applicable to similar initiatives in other parts of the country.

Pasture and cropland in the Northeast.

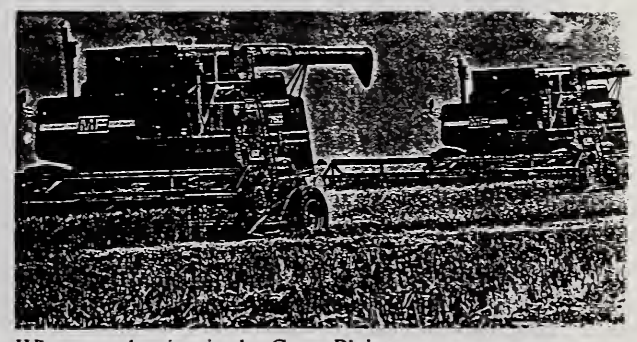
Irrigated agriculture in the Southwest.



Multiple cropping in the Mississippi Delta.

Corn production in the Corn Belt.

Peanut production in the Southeast.



Wheat production in the Great Plains.

A systems approach will be needed to solve groundwater quality problems in major crop production areas.

Conservation tillage is used widely in the Corn Belt: no tillage continuous corn (upper left), no tillage corn/soybean rotations (upper right), and ridge tillage (bottom).

### Approach and Procedures

A two-stage approach is planned. The first stage will focus on an assessment of whether, the extent to which, and the range of conditions under which the agricultural chemicals applied to corn and soybean production areas reach groundwater. The second will focus on the development and evaluation of new or improved management practices that will protect groundwater from contamination by agricultural chemicals while maintaining or increasing farm profitability. Emphasis will be placed on practices particularly suitable for sensitive sites or critical conditions.

#### Assessment

In the assessment stage, the aim is to determine the pesticide and nitrate losses to groundwater for given corn/soybean management practices and to obtain information on the timing and magnitude of groundwater contamination due to these losses. The pesticides to be considered will include the herbicides atrazine and alachlor and the insecticide carbofuran. Others that are widely used in the Corn Belt and have a demonstrated potential to degrade groundwater quality may also be included.

A number of assessment sites will be selected in the Corn Belt. The sites will be representative of corn and soybean production areas that overlie significant groundwater aquifers. Significant aquifers are either extensive, important to rural development, or supply the drinking water needs of large numbers of people. The types of farming systems in use, the climate, and the characteristics of the area's soils, topography, geology, and aquifers will be considered in selecting representative sites. The operational procedures used at each site will be basically the same to facilitate comparisons of data and results.

Each site will be hydrologically distinct and will approximate a farm unit of 80 to 600 acres. The site will be subdivided into a number of large-area plots, the size and number of plots to be determined by the range of local conditions and cultural practices. In laying out plots, site characteristics will be considered to avoid undesirable interplot influences on the observed chemical concentrations in the underlying groundwaters.

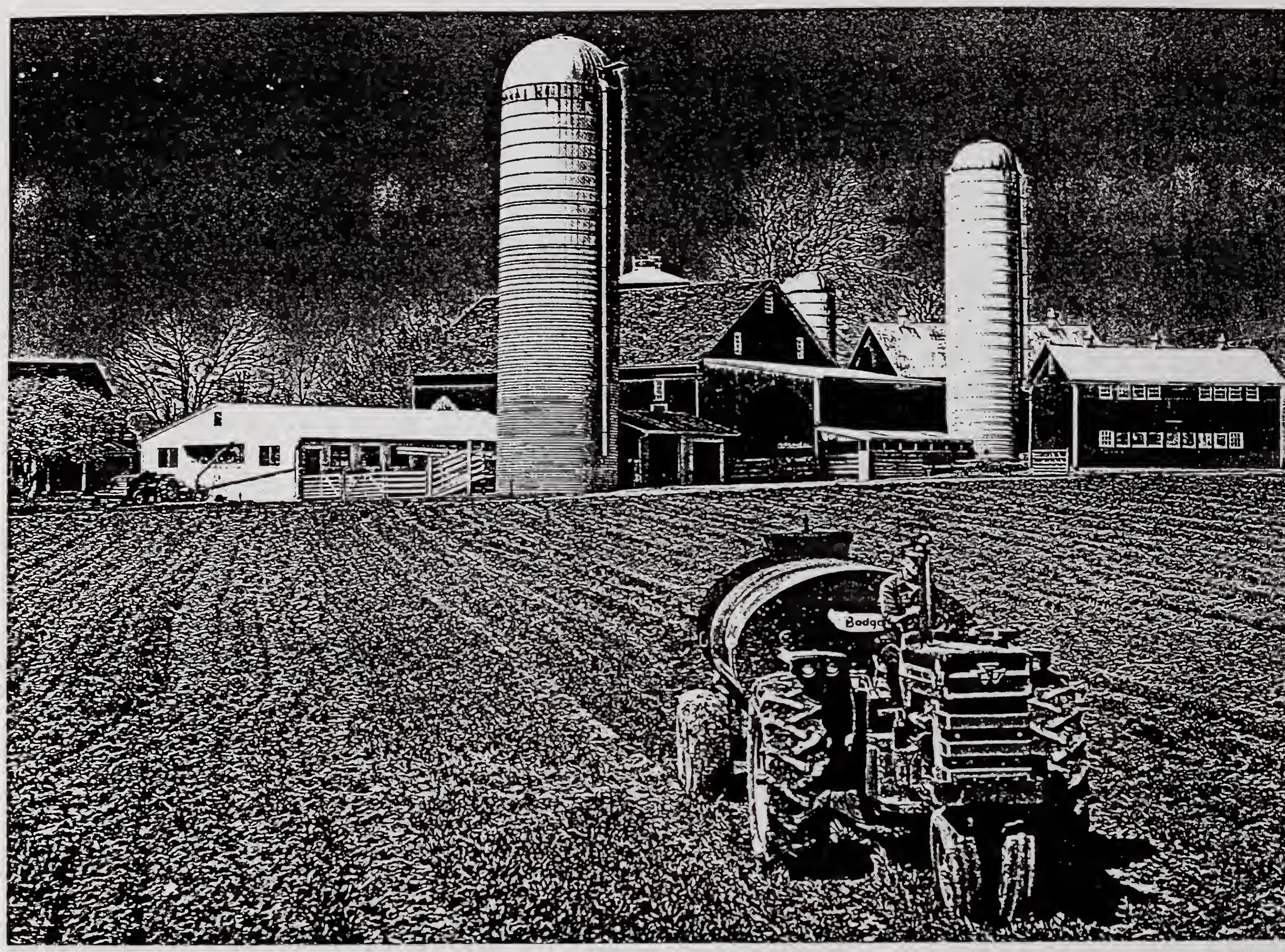
A number of plots will be needed to provide adequate replication of the different corn/soybean cultural treatments. One set of plots at each site will be established at the start of the project to assess and compare chemical movement to groundwater for the cultural treatments used in the vicinity of the site. To compare differences among sites, at least one of these treatments will be common to all sites and will represent a "typical" farming system used throughout the Corn Belt. Other treatments will be selected to represent the more widely used conservation tillage and cultural systems. A second set of plots may be established at each site when new or improved management practices have been identified as promising enough to warrant field evaluation. The decision on whether to proceed with the establishment of these plots will depend on the response time of the soil/groundwater system to proposed changes in the farming system.

Work in the assessment stage will require measuring the key inputs and outputs of water and chemicals for each plot and determining water and chemical transport rates, crop parameters related to growth rate, yield and quality factors, and economic costs and returns. The water and chemical balance measurements will provide the information needed to determine the rates and amounts of losses of chemicals to groundwater and their potential impact on water quality. The economic data obtained should be sufficient to establish the economic and physical relationships between agricultural production, input cost, and water quality for the Corn Belt.

The issue of transferability of information from the selected experimental sites to other corn and soybean producing areas is critical to the development and implementation of sound policies and programs for managing agricultural chemicals. Concepts and procedures will be developed and tested to facilitate the transfer of physical, biological, and economic information, and to evaluate the social, economic, and environmental consequences of national, regional, and State strategies for managing groundwater quality. The performance of the predictive models and decision aids that are developed under the Priority Component Information element of this USDA plan will be tested using real-time data acquired in these experiments.

#### Development of New Management Practices

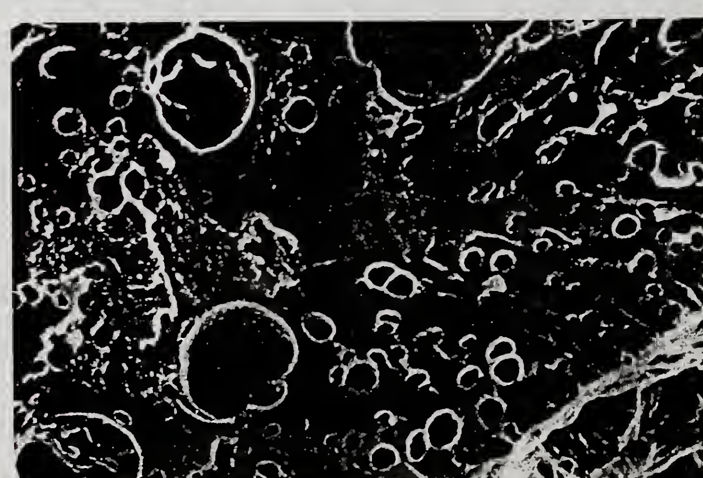
Work in the second, or developmental, stage of the approach involves developing new practices or modifying major components of current practices for producing corn and soybeans, with the aim of reducing chemical losses to groundwater. New fertilizer practices may include the use of various regulators of soil and crop biology to control soil nitrate levels during periods of high leaching potential, management practices that synchronize soil nitrate availability with the nitrogen requirement of the crop, and use of winter cover crops to reduce water and nitrate levels in the soil during noncrop seasons.




A cover crop such as rye reduces residual nitrate levels during noncrop seasons.

New pesticide practices may include the use of pesticides in controlled-release carriers; low-persistence, leachable pesticides; band applications of pesticides; specified application times and rates; split applications; pesticide combinations; and combinations of chemical and non-chemical measures.

Because current pesticide waste disposal practices may be contributing to groundwater contamination, new disposal practices will be developed and tested. Also to be developed are decision aids for enabling corn and soybean producers to select farming systems that will permit them to profitably manage their farms with due attention to groundwater impacts. Finally, methodologies will be developed for analyzing the social and economic consequences of changes in farming systems and in programs and policies associated with chemical use and management.



The vesicular structure of the starch granule (highly magnified) makes starch an effective carrier for the slow release of herbicides.

### Coordination of Research on Midwest Initiative

A technical and coordinating committee will be established, and its members will consist of designated representatives of the cooperating agencies and institutions. Representation on the committee will not be limited to professionals from the target region. The committee will be responsible for developing detailed research and implementation plans, standardizing the procedures to be used where necessary, and providing direction and oversight to the project as a whole. It will have the authority to oversee the reaching of milestones and the development and release of products identified in the research plan.

Multidisciplinary research teams will be organized at several locations in the Midwest. Each team will receive specific research and development assignments from the technical and coordinating committee. Teams will be expected to devote a substantial part of their effort to meeting the stated goals of the overall project. Additionally, each team will be expected to perform project-related research of its own design. The provision for such research is intended to widen the opportunity for discovering innovative, cost-efficient ways of reducing chemical losses through leaching from corn and soybean fields. The committee may, at any time, alter the original research plan to follow up on new and promising discoveries.

A team of scientists, computer programmers, knowledge engineers, and support personnel will be established to design and implement a project data bank. Existing expertise will be used where appropriate. This team will have the important assignment of developing decision aids for corn and soybean producers. Onfarm and local economic impacts will be assessed for each cultural/management system selected for testing. The physical, chemical, biological, and economic data will be made available to Federal, State, academic, and private institutions engaged in research, chemical registration, economic analyses, and farm and resource management.

### Agency Responsibilities for Midwest Initiative

This initiative is envisioned as a major interagency cooperative project involving USDA agencies, State agencies and institutions, and other Federal agencies with missions, responsibilities, or concerns related to water quality protection. All agencies will assist with project planning, selection of sites and farming systems, and analysis and interpretation of the experimental data.

The Agricultural Research Service will be responsible for coordinating the instrumentation and data collection activities. The Cooperative State Research Service will coordinate the project related research undertaken by the State agricultural experiment stations and land-grant universities. The selection of scientists and projects will be competitive to the extent possible to maintain the integrity of the initiative. The Economic Research Service in cooperation with the State agricultural experiment stations will develop cost analyses of farm management practices and evaluations of the economic impacts of water quality management initiatives.

The Soil Conservation Service will provide general soils and landscape information and specific characteristics of soils and topography for the experimental sites. The Agricultural Stabilization and Conservation Service will provide cropping history records for project sites that have been included in a commodity reduction program. The Extension Service will be responsible for ensuring that the research sites are appropriate to serve as a regional and/or topical educational resource for training State and Federal personnel, local leaders, and other pertinent clients.

The Geological Survey and its State counterparts will be asked to provide the expertise needed for the hydrogeologic components of the initiative. The possibility of interfacing this Midwest Initiative with the Midcontinent Initiative being developed by the Geological Survey will be closely examined. The Environmental Protection Agency will be asked to augment this project with data from its planned national survey of pesticides and nitrate in well water samples and to assist with data quality assurance and sampling protocols.

## Coordination and Implementation of USDA Plan

To provide overall policy and technical guidance and to ensure coordination of the research efforts supporting the goals and objectives of the USDA plan, the following organizational structure will be used.

### National Technical Committee

A national technical committee comprising representatives of appropriate Federal agencies and cooperating State and private institutions will be established to provide guidance on policy; provide overview and approval of general guidelines on administrative and technical matters; and facilitate coordination of work by participating agencies, departments, and other institutions.

### Regional Technical and Coordinating Committees

Regional committees, patterned after the regional system of the Cooperative State Research Service, will be formed from representatives of participating agencies and institutions. They will develop priorities and organize and conduct planning and reporting conferences. These conferences will provide forums for reporting the results of research supported by new funds, as well as related but independently supported research. They will help to establish and maintain effective lines of communication, an essential requirement for a well coordinated program.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United States
Department of
Agriculture

Agricultural
Stabilization and
Conservation
Service

Extension
Service

Soil
Conservation
Service

Agriculture
Information
Bulletin
Number 598

# Water Quality Education and Technical Assistance Plan

## 1990 Update

All programs and services of the U.S. Department of Agriculture are offered on a nondiscriminatory basis without regard to race, color, national origin, religion, sex, age, marital status, or handicap.

July 1990

Cover: Water is a national treasure. Maintaining its quality is a social responsibility.

## Foreword

The American agricultural system is unparalleled in its capability to produce food and fiber. Agricultural production, by its very nature, however, involves movement of soil and water and the growing and harvesting of plant material, all of which may affect water quality and quantity. Many farmers view their role toward the natural resources they manage from the standpoint of stewardship of the land. Stewardship, however, requires knowledge about environmental problems, such as ground- and surface-water contamination, and the adoption of practices that preserve long-term soil productivity and water quality.

The effective treatment of nonpoint source ground-water and surface-water pollution in agricultural America requires the timely delivery of educational materials, conservation technology, and financial assistance. The U.S. Department of Agriculture (USDA) strongly encourages voluntary actions to improve or enhance water quality and quantity and to conserve surface and ground water. USDA has an established network of technical specialists and educators and an institutional framework to assist land users through local soil and water conservation districts and other local groups with soil and water resource problems.

USDA's Agricultural Stabilization and Conservation Service (ASCS), Extension Service (ES), and Soil Conservation Service (SCS) have the field delivery systems and networks to meet these requirements. These agencies are staffed with professionals who are experienced in water quality and quantity resource management.

Educational, technical, and financial assistance procedures will be implemented through the ASCS-ES-SCS Education and Technical Assistance (E&TA) process as authorized by law and defined in the President's Water Quality Initiative. The principal objective of this initiative is to provide farmers, ranchers, and foresters with the educational, technical, and financial means to respond voluntarily and independently to onfarm environmental concerns and related State water quality requirements.

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## Nonpoint Source Pollution of Surface- and Ground-Water Resources

For the past 25 years, the United States has carried out a comprehensive effort to improve surface-water quality. This effort has largely emphasized programs to control municipal and industrial point sources of pollution. These investments have improved water quality and associated biological productivity in many areas.

Similar investments have not been made to address the multitude of diffuse pollution sources termed collectively "non-point source pollution." Impairments to water quality due to nonpoint sources have become increasingly evident as point sources are reduced.

Nonpoint source pollution can originate from a variety of sources and activities. Natural nonpoint pollution occurs from such processes as geologic erosion, saline seeps, and dissolution of nutrient-rich rocks and soils. Activities that contribute to nonpoint source pollution include forestry operations, mining, construction excavations, and agriculture.

Water quality and quantity concerns apply to both ground water and surface water.

Integrated pest management including pest scouting and pesticide application management reduce the availability of agricultural chemicals for transport to ground- and surface-water bodies.

In many areas, concern about agricultural nonpoint sources of pollution is focused on the potential risk from manufactured nutrient and pesticide materials. Use of modern agricultural chemicals—insecticides, fungicides, rodenticides, herbicides, and fertilizers—has increased in recent decades, enabling American farmers to increase their productivity and keep food prices low and quality high.

Chemicals, however, can move into surface waters, either attached to sediment eroded from agricultural land or dissolved in runoff, and can infiltrate the soil profile to contaminate ground-water supplies.

## Presidential Water Quality Initiative and the USDA Water Quality Program Plan

President Bush recommended a new initiative for enhancing water quality in his 1990 budget proposal presented to Congress on February 9, 1989. (See table 1.) The President's initiative defines a vigorous effort to protect ground and surface water from potential contamination by agricultural chemicals and wastes, especially pesticides and nutrients. The plan integrates the combined expertise of USDA agencies to promote the use of environmentally and economically sound farm production practices and to develop improved chemical and biological pest controls.

In his statement of principles and policies, the President makes it clear that farmers are ultimately responsible for avoiding contamination of water resulting from management

Crop rotation, terraces, and strip farming conservation practices reduce the runoff transport of nutrients and pesticides that cause impairment to lakes, streams, and ground-water recharge areas.

**Table 1. Water Quality Appropriated Funding for 1990***

| | Participating Agency | | |
|---|---|---|---|
| **Activity** | **ASCS (financial assistance)** | **ES (educational assistance)** | **SCS (technical assistance)** |
| | **(millions of dollars)** | | |
| Demonstration Projects | 0.89 | 0.9 | 1.1 |
| Nonpoint Source Hydrologic Unit Areas | 7.0 | 1.7 | 4.6 |
| Regional Project Initiatives | — | 0.9 | 2.6 |
| Water Quality Special Projects | 11.9 | — | — |
| Technology and Data Base | — | 1.75 | 3.9 |

*After Gramm-Rudman-Hollings sequestration practices they apply to the land. The statement emphasized that the role of the USDA is to conduct research and to provide education and technical assistance that helps producers fulfill their responsibilities by adopting "...farming practices that avoid water quality degradation..." and that are economically viable.

USDA has implemented a Water Quality Program Plan in support of the President's initiative. This plan includes three principal components: Education and Technical Assistance, Research and Development, and Data Base Development and Evaluation.

## Educational, Financial, and Technical Assistance

Educational, financial, and technical assistance will be provided to farmers, ranchers, and foresters in applying new and improved agrichemical and animal waste management practices. This assistance will be based on available research results and new techniques, practices, and systems provided through research and development.

A principal program objective will be to adopt water quality practices to reduce or prevent contamination of ground or surface water by agricultural nonpoint sources where it has been identified as a public concern. Demonstration projects will be established in some of these areas to facilitate the adoption of water quality practices. Educational, technical, and financial assistance will be provided in hydrologic unit areas to remedy identified water quality problems. This assistance will help meet State water quality requirements and specific water quality goals of regional water quality projects. Particular emphasis will be placed on agricultural nonpoint sources of ground-water pollution.

## Goals and Objectives of the Plan

**Goal:**

To provide the agricultural community with the necessary educational, financial, and technical assistance required to restore agriculturally impaired water resources, to prevent additional future impairment, and to evaluate the effects of these activities on ground-water and surface-water resources.

**Objectives:**

• Select, plan, and implement 24 USDA water quality demonstration projects to show locally the effectiveness of selected management practices in relieving conditions of impaired water quality.

• Select, plan, and implement 275 nonpoint source hydrologic unit areas to restore water quality where agriculturally related water quality impairment has been identified or to reduce the potential for additional areas to become impaired.

• Accelerate educational, financial, and technical assistance to support the agricultural elements of regional water quality initiatives, including but not limited to ongoing efforts to protect the Gulf of Mexico, the Great Lakes, Chesapeake Bay, and Puget Sound.

**Goal**:

Implement a coordinated technology development and application process for water quality management practices to support ASCS, ES, and SCS field staff operations.

**Objectives:**

• Revise field office technical guides and adopt policies that support field water quality activities.

• Develop and implement water quality management practices as specific water quality needs are identified.

• Develop and expand geographic information systems (GIS) to meet the complex geotechnical information management requirements imposed by water quality activities for ground and surface water.

• Expand the application of the National Soils and Pesticide Data Base to better support the water quality effort.

**Goal**:

Provide the necessary financial assistance to support the accelerated selection and application of water quality improvement practices.

**Objective:**

• Establish appropriate cost-share procedures for installing practices.

Responsibility for the Education and Technical Assistance activities rests upon the USDA agencies that have major field-delivery capabilities. ASCS will accelerate the installation of conservation practices that improve water quality through financial assistance and local conservation coordination. ES will provide information and educational programs that address the selection and application of agricultural chemicals and will transfer related research findings to field users. SCS will provide technical assistance for project planning and the development, installation, and evaluation of conservation practices for improving and protecting water quality.

**Table 2.Water Resource Treatment Objectives for 1990 Projects and Areas**

| | Principal water resource concern | | Polluting agents | | | | |
|---|---|---|---|---|---|---|---|
| **Demonstration projects** | **Ground water** | **Surface water** | **Pesticides** | **Nutrients** | **Animal waste** | **Mineral salts & elements** | **Sediment** |
| California | | ● | ● | | | | |
| Florida | ● | ● | ● | ● | | | |
| Maryland | ● | ● | ● | ● | ● | | ● |
| Minnesota | ● | | ● | ● | | | |
| Nebraska | ● | | ● | ● | | | |
| North Carolina | | ● | ● | | ● | | ● |
| Texas | ● | | ● | | ● | | |
| Wisconsin | ● | ● | ● | ● | | | |
| **Nonpoint source hydrologic unit areas** | | | | | | | |
| Alabama | ● | ● | ● | | ● | | ● |
| Arizona | ● | | | ● | | | |
| Arkansas | ● | ● | | ● | ● | | |
| California | ● | | ● | ● | | ● | |
| Delaware | ● | ● | ● | ● | ● | | ● |
| Connecticut | ● | ● | ● | ● | ● | | ● |
| Florida | ● | ● | | ● | | | |
| Illinois | ● | | ● | ● | | | |
| Indiana | ● | ● | ● | ● | | | ● |
| Iowa | ● | ● | ● | ● | | | ● |
| Maine | | ● | | ● | | | ● |
| Massachusetts | | ● | ● | ● | ● | | |
| Michigan | ● | ● | ● | | | | ● |
| Minnesota | ● | | ● | ● | | | |
| Mississippi | | ● | ● | ● | ● | | ● |
| Montana | | ● | | ● | ● | | ● |
| Nebraska | | ● | | | | | ● |

Table 2. Water Resource Treatment Objectives for 1990 Projects and Areas—Continued

| | Principal water resource concern | | Polluting agents | | | | |
|---|---|---|---|---|---|---|---|
| Nonpoint source hydrologic unit areas | Ground water | Surface water | Pesticides | Nutrients | Animal waste | Mineral salts & elements | Sediment |
| New Hampshire | ● | ● | ● | ● | ● | | ● |
| New Mexico | ● | ● | ● | | ● | ● | ● |
| New York | ● | | | ● | | | ● |
| North Carolina | ● | ● | | ● | | | ● |
| North Dakota | | ● | | ● | | | ● |
| Ohio | | ● | | | | | ● |
| Oklahoma | | ● | | ● | | | |
| Oregon | ● | ● | ● | ● | | | ● |
| Puerto Rico | | ● | ● | | ● | | ● |
| Rhode Island | ● | ● | ● | ● | | | ● |
| South Carolina | | ● | ● | ● | ● | | ● |
| South Dakota | | ● | | ● | | | ● |
| Tennessee | ● | ● | ● | ● | ● | | ● |
| Texas | | ● | ● | ● | ● | | |
| Utah | | ● | | ● | | | ● |
| Vermont | ● | ● | ● | ● | | | ● |
| West Virginia | ● | ● | ● | ● | ● | | ● |
| Wisconsin | ● | | ● | ● | | | |
| Wyoming | | ● | ● | ● | | | ● |

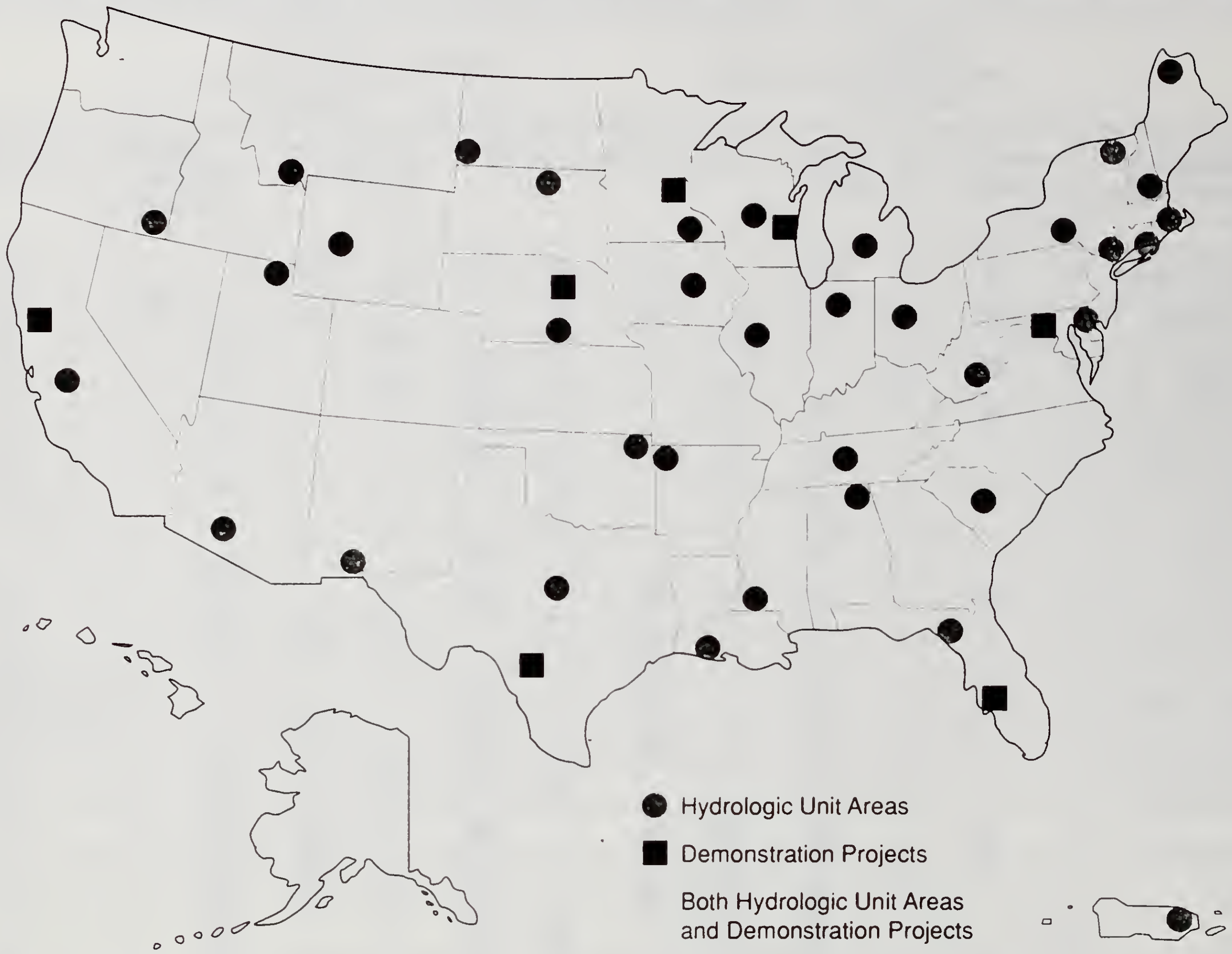
### Nonpoint Source Hydrologic Unit Areas

In selected agricultural watershed or aquifer-recharge areas, called "nonpoint source hydrologic unit areas," SCS, ES, and cooperating agencies will provide conservation planning and technical assistance that will help farmers and ranchers to meet State water quality goals without undue economic hardship. ASCS will provide financial assistance to producers for installing water quality practices in most areas.

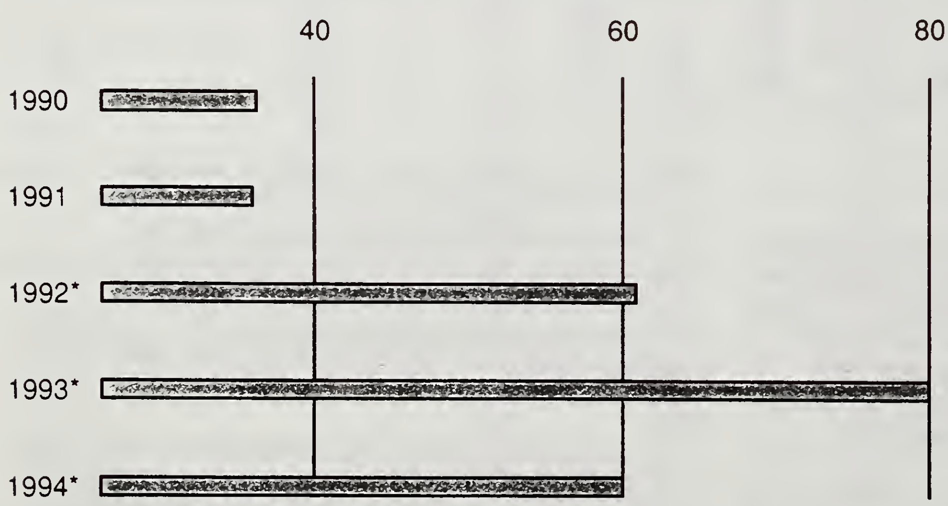
Hydrologic units will be selected in areas where impairment of water quality by agricultural nonpoint sources is significant. In selecting these areas, the State assessment and management reports developed under section 319 of the Water Quality Act of 1987 and other water quality data will be used in consultation with appropriate State agencies and organizations. Selection will be on the basis of (1) significance of the agricultural sources of pollution; (2) relative predominance of such designated pollutants as pesticides, nutrients, and animal wastes; and (3) conformance with other water quality efforts.

Hydrologic unit planning and treatment will be a coordinated effort by Federal, State, and local agencies and will include public involvement. Progress will be monitored to determine the effects of water quality measures on the water quality

FY-1990 Demonstration Projects and Nonpoint Source Hydrologic Unit Areas




Hydrologic unit areas to be selected for implementation 1991-1994




*Estimated to achieve the identified level of 275 hydrologic unit areas by 1994.

Nutrient management practices balance plant needs with natural and applied nutrients and rainfall patterns to reduce contamination of water resources.

problems. The information gathered will provide a basis for expanding application to other areas with similar water quality problems.

The 5-year action plan of the USDA water quality initiative includes an implementation schedule for 275 hydrologic unit areas. Thirty-seven units were initiated in fiscal year 1990. (See map.) Each project will continue for 3 to 5 years, depending on project complexity, and will generally entail the following:

- Start-up (year 1)
- Implementation of conservation practices (years 1-3)
- Technology transfer (years 2-5)
- Progress assessment (years 2-5)

## Water Quality Demonstration Projects

The objective of these projects is to demonstrate the effectiveness of selected conservation practices in treating specific nonpoint source pollution problems and to promote the use of these practices in other areas. These projects will be implemented under the joint leadership of SCS and ES.

There will be 24 projects, representing different sets of agricultural, soil, and geological conditions. For these projects, critical nonpoint sources of contamination will be identified and specific treatment goals will be established with the landowner. These projects will utilize the newest and best information to implement cost-effective production systems that combine efficient production with the producer's water quality goals.

Demonstration projects will follow existing project planning guidance and will include interagency consultation and public involvement. The projects will be evaluated to determine the effects that selected practices have on the water quality problem, the extent to which improved practices are adopted, and the costs of implementing practices. Financial assistance for the demonstration projects will be provided by ASCS's Agricultural Conservation Program (ACP) and other Federal and State programs.

The 5-year action plan of the USDA water quality initiative includes an implementation schedule for 24 demonstration projects. Eight projects per year will be initiated over a 3-year period, beginning in fiscal year 1990. (See map.) Each project will continue for 5 years and will entail the following:

- Start-up (year 1)
- Implementation of conservation practices (years 1-5)
- Technology transfer by SCS, ES, and the Cooperative Extension System (years 2-5)
- Progress assessment by ASCS, SCS, and ES (years 1-5)

At least one of the demonstration projects will address problems of limited-resource, small-scale, or minority farms.

## FY-1990 Regional Water Quality Initiatives


## Regional Project Initiatives

SCS will accelerate current technical and information assistance to multi-State regional projects that include water quality treatment objectives. Examples are the Gulf of Mexico Program, Chesapeake Bay Program, Land and Water 201, Great Lakes National Program, and the National Estuary Program. This assistance will further the development of nonpoint source pollution management plans, including systems of conservation practices, to meet the water quality objectives.

ES will provide educational programs that address the regional initiatives to expand effective nutrient management, integrated pest management, and pesticide selection and application. ASCS will provide cost-share assistance under current ACP procedures and will emphasize water quality improvement practices.

As with the demonstration projects and the hydrologic units, the regional project effort will draw heavily on the experiences of current water quality activities and available agricultural and economic research information. Information gathered on the effects of water quality practices will be used in other problem areas.

## Agricultural Conservation Program (ACP) Water Quality Special Projects

Program funds are reserved by ASCS at the national level to fund Water Quality Special Projects developed by county Agricultural Stabilization and Conservation (ASC) committees. Project emphasis is on improving the quality of ground water and surface water that has been impaired by agricultural nonpoint sources. Various conservation measures authorized under the ACP are available to solve problems identified in the project plans. The projects are administered by ASCS with educational and technical assistance provided by ES and SCS.

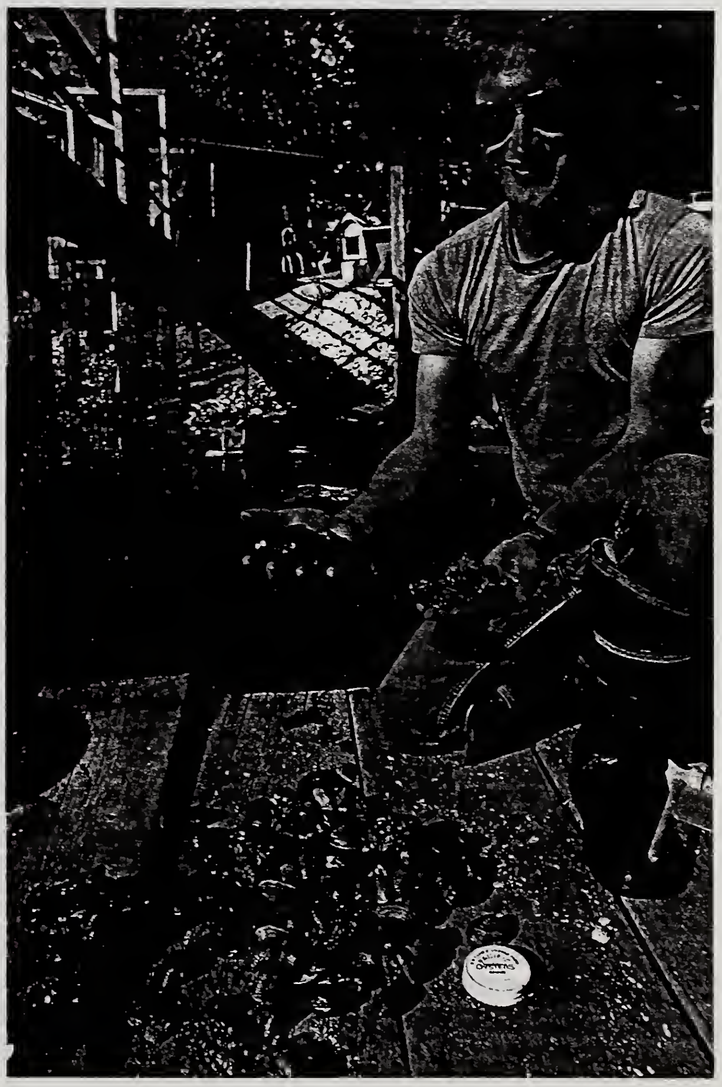
Flexibility is built into the concept of Water Quality Special Projects. These projects can be used to solve problems identified in the hydrologic unit areas and demonstration projects and those identified locally that may also provide significant public benefits to nonagricultural interests. Projects may additionally be designed to support State 319 nonpoint source objectives.

## Technology Development and Transfer

Technology development and transfer are crucial elements of the Department's water quality and quantity objectives. Improved technology—such as the "best management practices" shown in table 3—means better technical assistance to farmers, ranchers, and policy officials and more efficient program management. Updating and strengthening field office technical guides with the best avaliable technical information and other educational resources is an essential part of technology development.

The primary technology objectives will be to (1) develop working procedures that evaluate the effects of agricultural activities on water quality and quantity and (2) formulate resource management systems that improve water quality. The evaluation procedures will be linked to concurrent economic evaluations. To more accurately determine the effects of agricultural contaminants and the level of remedial action required, technology for determining the sources of pollutant loads in watersheds and aquifer recharge areas will be developed through the USDA interagency research effort.

Regional project initiatives include providing education and technical assistance to projects such as the Puget Sound National Estuary where forestry and dairy operations are affecting fishery habitats.



| Table 3. Best Management Practice Summary Guide | Resource Concerns: Surface Water Quality | | | | | | | | | Ground Water Quality | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Key<br>No control to low effectiveness<br>● Low to medium effectiveness<br>▲ Medium to high effectiveness<br>▲ May decrease or increase loading ** | Salinity | Temperature | Sediment | Soluble Nutrients | Adsorbed Nutrients | Soluble Pesticides | Adsorbed Pesticides | 02-Demanding Sub's | Pathogens | Nutrients | Pest. Loss to Grd. Wtr. |
| I. Management Practices | | | | | | | | | | | |
| 1. Nutrient Management | | | | ▲ | ▲ | | | | | ▲ | |
| 2. Pest Management | | | | | | ▲ | ▲ | | | | ▲ |
| 3. Irrigation System, Tailwater Recovery | ▲ | ▲ | ▲ | ▲ | ▲ | ▲ | ▲ | | | ▲ | ▲ |
| 4. Irrigation Water Management | ▲ | | ▲ | ▲ | ▲ | ▲ | ▲ | | | ● | ● |
| 5. Regulating Water in Drainage Systems | ● | ▲ | | ▲ | | ▲ | | | | ▲ | ▲ |
| 6. Soil Salinity Management | ▲ | | ● | ● | ● | ● | ● | | | | |
| 7. Structure for Water Control | | | ▲ | | ▲ | | ● | ▲ | | | |
| 8. Water Table Control | ● | ▲ | | ▲ | | ▲ | | | | ▲ | ▲ |
| 9. Waste Management System* | | | ▲ | ▲ | ▲ | | | ▲ | ▲ | ▲ | |
| 10. Runoff Management System* | | ▲ | ▲ | ▲ | ▲ | | | ▲ | ▲ | ▲ | |
| II. Vegetative and Tillage Practices | | | | | | | | | | | |
| 11. Conservation Tillage | | | ▲ | | ▲ | | ▲ | | | ▲ | ▲ |
| 12. Contour Farming | | | ▲ | ● | ▲ | ● | ▲ | ● | ● | ▲ | ▲ |
| 13. Contour Stripcropping | | | ▲ | ● | ▲ | ● | ▲ | ● | ● | | |
| 14. Filter Strip | | | ● | | ● | | ● | ● | ● | ▲ | ▲ |
| 15. Field Border | | | ● | | ● | | ● | ● | ● | | |
| 16. Cover and Green Manure Crop | | ● | ● | ● | ● | ● | ● | | | ● | |
| 17. Conservation Cropping Sequence | ● | | ▲ | ● | ▲ | ● | ▲ | | | ● | ● |
| 18. Field Windbreaks | | | ● | | ● | | ● | | | | |
| 19. Pasture and Hayland Management | | ● | ● | | ● | | | ● | ● | | |
| 20. Field Stripcropping | | | ● | ● | ● | ● | ● | | | | |
| 21. Grasses & Legumes in Rotation | | ● | ● | ● | ● | ● | ● | | | | |
| III. Structural Practices | | | | | | | | | | | |
| 22. Terrace | ▲ | ▲ | ▲ | ● | ▲ | ● | ▲ | ● | ● | ▲ | ▲ |
| 23. Water & Sediment Control Basin | | ▲ | ▲ | | ▲ | | ▲ | ● | | ▲ | ▲ |
| 24. Diversion | | ▲ | ● | | ● | | ● | | ● | | |
| 25. Grade Stabilization Structure | | | ● | | ● | | | | | | |
| 26. Grassed Waterway | | | ● | | ● | | ● | | | | |
| 27. Streambank and Shoreline Protection | | ▲ | ▲ | | ▲ | | | ● | | | |
| 28. Wetland Development or Restoration | | ● | ▲ | ● | ▲ | ● | ▲ | ▲ | ● | ▲ | |

Note: Because of the general nature of this chart, there may be situations and sites where practices will not perform as indicated.

* Includes all appropriate structural, vegetative, and management practices.

** Depends on soil, crop, practice design, and management characteristics.

A significant component of technology transfer will be the education and training of field office personnel to deliver expanded water quality programs, including the analysis of results and the refinement of technical procedures. ES and SCS will publish informational material to provide technical guidance on the environmentally responsible management of pesticides, nutrients, and waste products for use by farmers, foresters, farm advisors, agribusiness, and local, county, and State agencies. Detailed field guides and organized professional training on new concepts and technologies pertaining to agricultural chemical and waste product management and related environmental stewardship will be developed to enhance that delivery capacity.

## Data Base Development

Data base development and software development to integrate National Resources Inventory (NRI) information, agrichemical data, and soil survey data are essential to the analysis of farm program policy. Enhancement of the soils data base and development of the climatological data base will support development and implementation of conservation practices to reduce agricultural nonpoint source pollution. Specific data base efforts under this 5-year plan will involve but will not be limited to:

- Soils-pesticide interaction characteristics
- NRI data
- National climatological data
- Soil survey data base for modeling
- Plant materials data base

GIS's are becoming an important resource planning tool. Federal and State resource management agencies are rapidly developing data bases to use in GIS's. The layering of data base information in a GIS provides an opportunity to rapidly evaluate different resource management scenarios.

Many Federal agencies currently have or are planning activities to compile and distribute descriptive national data sets. A few relevant examples include: the collection of data on soil properties through SCS and the National Cooperative Soil Survey Program; the National Oceanic and Atmospheric Administration's (NOAA) extensive records of weather and climate data; the Environmental Protection Agency's (EPA) national well water survey; the U.S. Geological Survey's (USGS) compilation of the characteristics of the Nation's hydrologic systems; and ASCS farm and program participation records and the Conservation Reporting and Evaluation System (CRES).

The Education and Technical Assistance data base activities will be coordinated with the efforts of USDA's Economic Research Service (ERS) and National Agricultural Statistics Service (NASS). A digitized GIS for agriculture and water quality will be developed to link nationwide data and statistical information on agricultural productivity, land use, agrichemical use, physical attributes of the land and surrounding watersheds, climate, and water quality. The data will be used to support a variety of policy and program decisions by a number of Federal and State agencies.

## Interagency Coordination

Coordination between agencies and organizations at all levels is essential to an effective program for reducing nonpoint source pollution. To ensure coordination, SCS and ES chair the Water Quality Education and Technical Assistance Committee, comprising some USDA agencies, EPA, USGS, NOAA, the National Association of Conservation Districts (NACD), and the National Association of State Conservation Agencies (NASCA). This committee will review and coordinate water quality objectives, the selection and implementation of hydrologic units, demonstration projects, and assessment activities.

At the local level, SCS and ES State and local offices will initiate coordination efforts with other Federal, State, and local agencies including local soil and water conservation districts and with appropriate conservation organizations. The 1890 land-grant universities and Tuskegee University will be invited to cooperate in determining the effects of water quality conditions and programs on limited-resource, small-scale, and minority farms.

## Water Quality Activity Assessment

**Onfarm Assessments**—Onfarm assessments of water quality practice effects or resource management plans will include such values as reduction in nutrients and chemicals applied, reduction in irrigation tailwater discharge and deep percolation, volume of animal waste managed, and soil erosion reduced. Additional onfarm assessments will include the extent to which management plans are installed for such items as fertilizers, pesticides, animal waste, farmstead chemicals and fuels, and irrigation water.

Onfarm assessments will be made by SCS and ES using practice reporting systems, field staff interviews, and voluntary operator reporting. Limited onfarm measurements will be made of surface- and ground-water chemistry.

Irrigation water management is a vital water quality practice that reduces the potential to transport pesticides and nutrients through the root zone to the ground-water resource.

**Area and Regional Assessments**—Area and regional assessments will be conducted by such agencies as USGS, EPA, ERS, or by an appropriate State agency. Such assessments would include surface- and ground-water monitoring, levels of pesticide and nutrient use, and the economic effects of impairment and treatment. The educational and technical support of these efforts will be provided by ES and SCS as appropriate.

### The Water Quality Information Effort

ASCS, ES, and SCS will provide information about the progress of their operations to benefit water quality and quantity. They will:

- Tell how USDA and farmers and ranchers are working to improve water quality.
- Provide field offices with examples of successes in reducing water quality problems.
- Promote voluntary action in the agricultural community.
- Encourage agencies, universities, farm organizations, farmers and ranchers, and urban dwellers to work together to develop local solutions where local water quality problems exist.
- Explain the overall urban-rural-agricultural water quality situation.

### The National Role in Public Information

The information effort will be conducted in phases. Phase one was implemented in fiscal year 1989 within USDA and associated organizations. It included the following projects:

- Newsletters and educational and technical releases for ASCS, ES, and SCS field personnel.
- Information materials that address the purpose and use of water quality practices.
- Interagency workshops to explain the USDA Water Quality Program Plan.
- Water quality exhibits.

Phase two will inform farmers and ranchers of economical and practical ways to protect and improve surface and ground water and prevent further contamination from agricultural nonpoint sources.

## The State Role in Public Information

The State information effort is key to the success of water quality and quantity operations. Many of the public information activities mentioned are being addressed in the States. The States are expected to continue their public information efforts, tailoring them to local concerns, treatment activities, and water quality effects.

## New Directions and Partnerships

It is clear from the preceding sections that no single planned product from the USDA Water Quality Program is to be produced through the exclusive efforts of a single agency; all are multiagency activities. Also, many of the program's major activities contribute to more than one set of planned products. These activities are coordinated by a network of interagency committees. Many of these committees are in place, and others are currently being formed.

USDA Water Quality Program activities are closely coordinated among USDA agencies and with the related activities of EPA and agencies of the Departments of Interior and Commerce under the President's Water Quality Initiative. USDA recognizes that maintaining and improving water quality is a State responsibility and will assist States in implementing the nonpoint source management program required under the Water Quality Act of 1987. The USDA Water Quality Program will benefit from related past and current departmental efforts in soil and water conservation, public information, research, and extension. It will complement the aims of established programs, such as those addressing integrated pest management and sustainable and alternative agricultural systems.

# 1990 Water Quality Fact Sheet

United States Department of Agriculture

Agricultural Stabilization and Conservation Service

Extension Service

Soil Conservation Service

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Water is one of our Nation's most precious resources. Agricultural and public concern has raised preservation of water quality to both a U.S. Department of Agriculture and Presidential Initiative.

USDA's emphasis is on education and technical assistance, research, and data base development. Eleven USDA agencies are involved in the water quality Initiative, working with state and local governments, other federal agencies and the private sector.

Water quality projects sponsored by USDA are underway in 45 states to address agriculture-related water quality concerns.

Many of these projects were selected from areas identified by states in response to Section 319 of the Water Quality Act of 1987, which directed states to assess and prioritize their most severe water quality problem areas and to develop nonpoint source management programs to solve these problems. Present projects focus on four major areas: Hydrologic Units, Demonstration Projects, Special Projects, and Other Initiatives.

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## ydrologic Unit Areas

Thirty-seven hydrologic unit areas—agricultural watersheds—were selected in 37 states for 1990, with 37 more anticipated in 1991. The goal of hydrologic unit areas is to assist farmers and ranchers in voluntarily applying conservation practices that will help achieve water quality goals.

In each area, cost-sharing will be provided to farmers to install conservation practices such as animal waste control facilities, sod waterways, water management systems and integrated crop management for water quality improvement. Cost-share funds may come from several sources, including Agricultural Stabilization and Conservation Service (ASCS) cost-share funds and state cost-share programs.

The hydrologic unit areas selected in 1990 will be under the joint leadership of two agencies, the Extension Service (ES) and the Soil Conservation Service (SCS). ES will provide information and education assistance, including specific recommendations on the use of nutrients and pesticides, and SCS will help farmers and ranchers develop conservation systems to reduce adverse water quality effects. ASCS will provide cost-share assistance, where appropriate.

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## Demonstration Projects for Water Quality

Demonstration projects were selected in eight states in 1990 to show new ways to minimize the effects of agricultural nonpoint sources of pollution, including nutrients and pesticides, on water quality, especially groundwater quality.

The goals are:
- to demonstrate cost-effective agricultural practices that can be used and shared by farmers and ranchers
- to accelerate the adoption of new water quality technology currently developed but not yet widely used.

Over the next 2 years, 16 more demonstration projects are planned. Each project will be conducted for a period of 3 to 5 years.

USDA's Soil Conservation Service and Extension Service will provide joint leadership for the on-farm demonstration projects. ASCS will provide cost-share assistance to eligible farmers and ranchers who install the demonstration practices.

Specific efforts include demonstrating:
- cost-effective methods to manage fertilizers and animal wastes to lessen the potential for surface and groundwater pollution
- crop and nutrient management systems that maintain farm profitability and reduce pesticide and nutrient loadings to both ground and surface waters in areas with shallow groundwater tables
- integrated, cost-effective use of nitrogen, irrigation, and pest management on irrigated cropland to reduce chemical inputs, production costs and groundwater contamination.

## Water Quality Special Projects

Forty water quality special projects in 29 states have been selected at the national level for fiscal year 1990. Program funds are reserved at the Washington level by ASCS to fund water quality special projects developed by county ASC committees. Project emphasis is on improving ground and surface water quality that has been impaired through pollution from agricultural nonpoint sources. Pollution problems stemming from animal waste, fertilizers, pesticides, and sediment are addressed under the projects. Various conservation measures authorized under the Agricultural Conservation Program (ACP) that aid in the improvement of water quality are available to solve the problems identified in the project plans. The projects are administered by ASCS with educational and technical assistance provided by ES and SCS.

Flexibility is built into the ACP water quality special projects concept. Projects may be used to solve locally identified water quality problems to provide significant public benefits to nonagricultural interests as well as projects that are designed to support state 319 nonpoint source objectives.

## Other Initiatives

As part of its 5-year plan, USDA will continue to support ongoing regional projects: the Chesapeake Bay Program, the Colorado River Salinity Control Program, the Puget Sound Estuary Program, Land and Water 201 Program (includes counties in Alabama, Georgia, Kentucky, Mississippi, North Carolina, Tennessee and Virginia) and the Great Lakes Program.

To facilitate these programs, ES and SCS are developing extensive programs of staff training to ensure that field staff are familiar with the latest technology and its use in helping farmers, ranchers, and landowners to enhance or protect water quality while maintaining profitable agricultural operations.

*This fact sheet provides general information on water quality programs of the U.S. Department of Agriculture.*

Issued May 1990

# 1990 Water Quality ~act Sheet

United States Department of Agriculture

Agricultural Stabilization and Conservation Service

Extension Service

Soil Conservation Service

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Many of these projects were selected from areas identified by states in response to Section 319 of the Water Quality Act of 1987, which directed states to assess and prioritize their most severe water quality problem areas and to develop nonpoint source management programs to solve these problems. Present projects focus on four major areas: Hydrologic Units, Demonstration Projects, Special Projects, and Other Initiatives.

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The hydrologic unit areas selected in 1990 will be under the joint leadership of two agencies, the Extension Service (ES) and the Soil Conservation Service (SCS). ES will provide information and education assistance, including specific recommendations on the use of nutrients and pesticides, and SCS will help farmers and ranchers develop conservation systems to reduce adverse water quality effects. ASCS will provide cost-share assistance, where appropriate.

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Demonstration projects were selected in eight states in 1990 to show new ways to minimize the effects of agricultural nonpoint sources of pollution, including nutrients and pesticides, on water quality, especially groundwater quality.

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Over the next 2 years, 16 more demonstration projects are planned. Each project will be conducted for a period of 3 to 5 years.

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- integrated, cost-effective use of nitrogen, irrigation, and pest management on irrigated cropland to reduce chemical inputs, production costs and groundwater contamination.

## Water Quality Special Projects

Forty water quality special projects in 29 states have been selected at the national level for fiscal year 1990. Program funds are reserved at the Washington level by ASCS to fund water quality special projects developed by county ASC committees. Project emphasis is on improving ground and surface water quality that has been impaired through pollution from agricultural nonpoint sources. Pollution problems stemming from animal waste, fertilizers, pesticides, and sediment are addressed under the projects. Various conservation measures authorized under the Agricultural Conservation Program (ACP) that aid in the improvement of water quality are available to solve the problems identified in the project plans. The projects are administered by ASCS with educational and technical assistance provided by ES and SCS.

Flexibility is built into the ACP water quality special projects concept. Projects may be used to solve locally identified water quality problems to provide significant public benefits to nonagricultural interests as well as projects that are designed to support state 319 nonpoint source objectives.

## Other Initiatives

As part of its 5-year plan, USDA will continue to support ongoing regional projects: the Chesapeake Bay Program, the Colorado River Salinity Control Program, the Puget Sound Estuary Program, Land and Water 201 Program (includes counties in Alabama, Georgia, Kentucky, Mississippi, North Carolina, Tennessee and Virginia) and the Great Lakes Program.

To facilitate these programs, ES and SCS are developing extensive programs of staff training to ensure that field staff are familiar with the latest technology and its use in helping farmers, ranchers, and landowners to enhance or protect water quality while maintaining profitable agricultural operations.

*This fact sheet provides general information on water quality programs of the U.S. Department of Agriculture.*

Issued May 1990

WATER QUALITY PROGRAMS

Program Level
(Dollars in Millions)

| Program | 1991 Actual | 1992 Current Estimate | 1993 Budget |
|---|---|---|---|
| Research: | | | |
| Agricultural Research Service ....... | $42.5 | $45.7 | $46.2 |
| Cooperative State Research Service .. | 32.9 | 32.9 | 32.6 |
| Economic Research Service ........... | 1.8 | 1.8 | 1.8 |
| Forest Service ..................... | 0.1 | 0.0 | 0.0 |
| Subtotal ......................... | 77.3 | 80.4 | 80.6 |
| Data Collection and Analysis: | | | |
| Economic Research Service ........... | 1.9 | 2.4 | 2.3 |
| Extension Service .................. | 0.3 | 0.3 | 0.5 |
| Subtotal ......................... | 2.2 | 2.7 | 2.8 |
| Technology Transfer: | | | |
| Extension Service .................. | 23.4 | 25.2 | 29.3 |
| National Agricultural Library ....... | 0.3 | 0.3 | 0.3 |
| Soil Conservation Service ........... | 44.1 | 45.6 | 46.0 |
| Subtotal ......................... | 67.8 | 71.1 | 75.6 |
| Financial Assistance: | | | |
| Agricultural Stabilization and Conservation Service: | | | |
| Agricultural Conservation Program: | | | |
| Demonstration Projects ........... | 1.8 | 1.8 | 0.0 |
| Hydrologic Units ................. | 12.1 | 12.1 | 0.0 |
| Special Water Quality Projects ... | 9.1 | 9.1 | 0.0 |
| Water Quality Incentives Program . | 0.0 | 6.8 | 10.0 |
| Colorado River Salinity Control .... | 14.8 | 14.8 | 14.8 |
| Conservation Reserve Program ....... | 5.4 | 9.3 | 16.3 |
| Subtotal ......................... | 43.2 | 53.9 | 41.1 |
| Total, Water Quality ........... | $190.5 | $208.1 | $200.1 |

NOTE: Excludes funds for pest control and other programs which protect and improve water quality as a secondary benefit.

The Water Quality Programs are funded at approximately $200 million, an increase of more than 100 percent from 1989, and about the same level as 1992.

Research programs will focus on completion of work in the Midwest and research on specific issues in other areas. Data collection and analysis is continued at the 1992 level. This includes funding for the pesticide use survey, a multi-year program with the objective of generating improved estimates of pesticide use patterns and trends for all major agricultural crops.

Extension and Soil Conservation Service assistance related to the nationally selected demonstration and hydrologic unit projects will be continued. The increase for ES reflects a funding estimate required to fully support these ongoing projects and to enhance staff training in water quality.

Proposals for financial assistance reflect an increase for water quality incentives projects, but other ACP-based water quality programs would be discontinued. Emphasis will now be placed on analyzing the results of the demonstration projects and hydrological units to determine larger scale applicability.

The second signup for the reauthorized Conservation Reserve Program was carried out in July 1991. The 1990 farm bill provides authority to establish eligibility criteria based solely on water quality factors. USDA has implemented this new authority and makes annual payments for such things as sod waterways and filter strips. Participants provide permanent easements to assure that these improvements remain in place. 1993 estimates for CRP reflect plans for the July 1992 signup.

## WATER QUALITY PROGRAMS

Program Level
(Dollars in Millions)

| Program | 1990 Actual | 1991 Current Estimate | 1992 Budget |
|---|---|---|---|
| Research: | | | |
| Agricultural Research Service ....... | $37.5 | $42.5 | $46.5 |
| Cooperative State Research Service .. | 25.0 | 32.6 | 31.2 |
| Economic Research Service .......... | 0.8 | 1.8 | 2.1 |
| Forest Service ..................... | 0.1 | 0.1 | 0.0 |
| Subtotal ......................... | 63.4 | 77.0 | 79.8 |
| Data Collection and Analysis: | | | |
| Economic Research Service .......... | 1.8 | 1.9 | 2.6 |
| Extension Service .................. | 0.3 | 0.5 | 0.5 |
| Subtotal ......................... | 2.1 | 2.4 | 3.1 |
| Technology Transfer: | | | |
| Extension Service .................. | 18.2 | 23.2 | 29.1 |
| National Agricultural Library ....... | 0.3 | 0.3 | 0.3 |
| Soil Conservation Service .......... | 26.5 | 44.1 | 45.6 |
| Subtotal ......................... | 45.0 | 67.6 | 75.0 |
| Financial Assistance: | | | |
| Agricultural Stabilization and Conservation Service: | | | |
| Agricultural Conservation Program: | | | |
| Demonstration Projects .......... | 0.9 | 1.8 | 1.8 |
| Hydrologic Units ................ | 7.0 | 12.1 | 12.1 |
| Subtotal ...................... | 7.9 | 13.9 | 13.9 |
| Operational Programs: | | | |
| Animal and Plant Health Inspection Service ............... | 13.8 | 15.8 | 16.3 |
| Total, Water Quality Initiative ... | 132.2 | 176.7 | 188.1 |
| Other Financial Assistance: | | | |
| Agricultural Stabilization and Conservation Services: | | | |
| ACP Special Water Quality Proj. . | 11.9 | 9.1 | 9.1 |
| Water Quality Incentives Program | 0.0 | 0.0 | 5.0 |
| Colorado River Salinity Control . | 10.4 | 14.8 | 14.8 |
| Conservation Reserve Program a/ . | 2.5 | 5.8 | 22.6 |
| Subtotal ..................... | 24.8 | 29.7 | 51.5 |
| Total, All Water Quality ........ | $157.0 | $206.4 | $239.6 |

a/ Includes enrollment under specific water quality criteria only. In addition, water quality will be a factor in considering bids for other CRP enrollment purposes.

Funds are proposed to continue water quality programs funded in 1991 as part of a coordinated governmentwide initiative. Much of the initiative is being targeted to nonpoint source pollution identified in plans developed by States under requirements of Section 319 of the Water Quality Act of 1987. Agriculture has been identified as a nonpoint source pollution contributor in many States. The major objective of the USDA water quality initiative is to provide farmers, ranchers and other land managers with the information necessary to voluntarily adopt improved, environmentally-sound management practices which do not sacrifice profitability.

Coordination of water quality programs among USDA agencies is conducted through a Working Group on Water Quality of the Secretary's Policy and Coordination Council. At the staff level, committees have been established to assure that planning and implementation of programs is coordinated among involved agencies and to develop the appropriate linkages to assure the relevance of planned activities to the overall objective of encouraging voluntary adoption of both economically and environmentally-sound farming practices. These committees include representatives of other Federal agencies and departments, including EPA and the Departments of Interior and Commerce to assure coordination governmentwide. Representatives of the Economic Research Service are involved in program planning and implementation to assure inclusion of an appropriate framework for economic analysis of projects. Planning and coordination is handled through the Cooperative State Research Service and the Extension Service.

The effectiveness of the initiative will be evaluated based on information relating to the extent of changes in the use of production inputs, in management practices, and in crops and livestock grown. The initiative will also be evaluated based on water quality impacts expected on production factors, management practices and costs of achieving water quality improvements. Highlights of the major program elements funded in 1992 follow:

Research Programs. A $2.8 million increase is proposed for Federal and university research programs. Agencies will continue to pursue research in support of goals and objectives outlined in the USDA Research Plan for Water Quality. Projects will be continued in the Midwest Corn Belt, where concentrated corn and soybean production involves widespread use of nitrogen and pesticides in connection with conservation tillage practices. Work will also be expanded to:

- Assess the role of wetlands and stream borders in modifying the movement of chemicals into water.
- Develop crop rotation systems and means to use animal wastes to maintain and improve water quality without sacrificing profitability.
- Improve the understanding of transport and deposit of agricultural chemicals in soils and water.

- Improve risk assessment with new techniques to assess mutagenic compounds in groundwater.

Ongoing related programs will be continued and expanded to develop more effective biological controls, improved integrated pest management systems and means to better target pesticide applications. Longer-term benefits will also accrue from germplasm enhancement programs to impart natural resistance to pests and to map plant genomes to more quickly target economically important genes.

Data Collection and Analysis. Statistically reliable information on pesticide use and farm practices is needed to assess the impacts of alternative systems and approaches on producers, consumers and rural communities. Other Federal agencies will also use the data to better understand patterns of pesticide use in relation to identified water quality problems. Specific projects include:

- Collection of pesticide use data by NASS for major crops, with State level statistical reliability, in coordination with other agencies and related programs in food safety.

- Analysis by ERS of management practices under development by ARS and the universities to assess the economic consequences of adoption of new farming systems.

Technology Transfer. Voluntary adoption of environmentally sensitive management practices by farmers and ranchers is the major objective of USDA water quality programs. Initial technical assistance and education activities have focused on training field employees to improve information delivery capabilities and priority projects in selected areas identified by state water quality plans. Funds provided for 1991 will permit operation of intensive technical assistance and education programs in 74 hydrologic units and 16 demonstration sites. Efforts will continue to improve field staff training and development of updated technical guides.

A proposed increase of $7.4 million in education and technical assistance programs for 1992 will cover increased operating costs and provide sufficient resources for Extension Service to participate fully in designated projects initiated through 1991. New project starts are not proposed for 1992. Research funded under the initiative is now yielding information and EPA has completed a National well water survey. This information, coupled with experience gained in implementing the initial technical assistance programs, is the basis for stabilizing the directed programs at 1991 levels. Funds will continue to fully support projects in 74 hydrologic units and 16 demonstration sites initiated through 1991. Agencies will be reviewing plans and programs during 1991 to verify and formulate future priorities for education and technical assistance activities.

Financial Assistance. Cost-share programs will be offered to producers in the 90 designated hydrologic unit and demonstration project areas that were initiated in 1990 and 1991. Cost-share assistance in these areas is coupled with intensive education and technical assistance to encourage

the adoption of environmentally sensitive practices and the achievement of area-wide improvement and protection of water quality. These projects are characterized by the interagency selection process, comprehensive planning and multi-year commitment of resources.

ACP special water quality projects will be continued. These projects focus on water quality problems identified by State and local water quality planning agencies. They are characterized by a shorter Federal funding commitments and higher ratios of cost-sharing to planning and technical assistance.

The Colorado River Basin Salinity Control Program cost-shares with landowners to enhance the quality and supply of water in the Colorado River by reducing the salt load for downstream users. Ongoing projects are located in Colorado, Nevada, Utah, and Wyoming.

Two new FACT Act authorities will be implemented. The Water Quality Incentives Program authorizes the Secretary to enter into agreements of 3 to 5 years with farm owners and operators to implement water quality water protection plans. The program features farm level planning, to be provided by SCS, that specifies the use of fertilizers, other crop nutrients, and pesticides, as well as management practices that are to be avoided, in order to achieve water quality goals. Participants will receive incentive payments designed to compensate for additional production costs and/or foregone production values. The 1992 proposal of $5 million, to be funded with an appropriation through ACP, is for up front funding for approximately 100,000 acres in the program.

The FACT Act also provides specific authority to enroll land in the Conservation Reserve Program under water quality related criteria. The estimates reflect plans to use this authority beginning with the next CRP sign-up to enroll such areas as newly created sod waterways and filter strips, wellhead protection areas, and other areas to be determined in the program formulation process now underway.

<u>Operational Programs</u>. APHIS adopts less chemical intensive approaches to pest suppression and eradication when effective alternatives are available. Major programs include biological control and a grasshopper integrated pest management program.

## ..TER QUALITY PROGRAMS

Program Level
(Dollars in Millions)

| Program | 1989 Actual | 1990 Current Estimate | 1991 Budget |
|---|---|---|---|
| Research: | | | |
| Agricultural Research Service ........ | $30.0 | $37.5 | $44.9 |
| Cooperative State Research Service .. | 19.5 | 24.8 | 30.3 |
| Economic Research Service ........... | 0.8 | 1.1 | 1.7 |
| Forest Service ...................... | 0.1 | 0.1 | 0.1 |
| Subtotal ........................... | 50.4 | 63.5 | 77.0 |
| ..ata Collection and Analysis: | | | |
| Economic Research Service ........... | 0.0 | 1.5 | 3.0 |
| Extension Service ................... | 0.0 | 0.5 | 0.5 |
| Subtotal ........................... | 0.0 | 2.0 | 3.5 |
| Technology Transfer: | | | |
| Extension Service ................... | 16.3 | 19.5 | 29.8 |
| National Agricultural Library ....... | 0.0 | 0.3 | 0.3 |
| Soil Conservation Service ........... | 13.7 | 26.5 | 44.1 |
| Subtotal ........................... | 30.0 | 46.3 | 74.2 |
| Financial Assistance: | | | |
| Agricultural Stabilization and Conservation Service .............. | 18.8 | 32.8 | 40.2 |
| Operational Programs: | | | |
| Animal and Plant Health Inspection Service ............... | 10.4 | 10.4 | 12.3 |
| Total, Water Quality ........... | $109.6 | $155.0 | $207.2 |

Increases are proposed to continue and expand water quality programs funded in 1990 as part of a coordinated governmentwide initiative. Much of the initiative will be targeted to nonpoint source pollution identified in plans developed by States under requirements of Section 319 of the Water Quality Act of 1987. Agriculture has been identified as a nonpoint source pollution contributor in many States. The major objective of the USDA water quality initiative is to provide farmers, ranchers and other land managers with the information necessary to voluntarily adopt improved, environmentally-sound management practices which do not sacrifice profitability. With a $45.4 million increase approved by Congress in 1990, planning and initial implementation is well underway in concert with other Federal agencies--including EPA and the Departments of Commerce and Interior. A major research thrust in 1990 will begin to develop a more complete understanding of the problems and will form the basis for the development of improved management practices in the Midwest Corn Belt and

FY 1990
WATER QUALITY INITIATIVE

The scope of the water quality issue is broad; it includes both point and nonpoint sources of pollution and affects both surface and groundwaters. The current water quality initiative is focussed on the contribution of agricultural nonpoint pollution (pesticides, nitrates, and bacteria) to groundwater quality degradation.

The cost to society (including future generations) of water quality degradation is not fully reflected in the price of the agricultural outputs whose production may result in the contamination of the natural resource. The public policy problem is to "price" the natural resource so that the marginal cost of producing the output is the same to the farmer as it is to society. The "regulatory" approach to correcting this cost differential is to restrict the use of the polluting inputs, thereby increasing their cost to the farmer and inducing substitution with (presumably) non-polluting inputs. The "voluntary" approach seeks to persuade farmers to incorporate social costs into their private calculations. The farmer is cast in a public service role as a steward of the environment. As an incentive, the public sector may subsidize the design and adoption of environmentally sensitive farming practices.

These two approaches are represented in the components of the initiative by EPA (essentially ongoing regulatory programs) and USDA (additions to efforts that support existing voluntary programs). Neither approach alone will suffice as a policy instrument to protect groundwater in the short term. The regulatory efforts must present a credible threat of chemical ban in order to raise the expected cost of pesticide use. The voluntary efforts will expedite adoption of environmentally sensitive practices.

The OMB allowance for the initiative funds data gathering and evaluation in support of monitoring groundwater quality, research establishing causality between farming practices and contamination, and development and demonstration of practices designed to avoid contamination. Agencies with primary responsibilities include USDA/ARS, CSRS, ES, and ERS and Commerce/NOAA and Interior/USGS. The allowance funds technical support activities proposed by USDA/SCS and EPA at levels substantially below agency requests. However, significant realignment of agency programs to delivery of groundwater quality objectives is expected. Once information on improved techniques is available from the research effort, additional technical support may be required. In the meantime, the intention is that USDA and EPA will cooperate in rationalizing the State's systems for delivering water quality information to farmers.

All agencies are critical to the success of this initiative. None of the funds allowed for the initiative are to be reprogrammed to other uses. The funds allowed for the initiative should be carried in each agency's baseline for the succeeding fiscal years. OMB makes no recommendations on changes in outyear funding levels pending evaluation of the progress of the initiative after the first year.

The major criteria for evaluating the success of the initiative will be evidence that research efforts are identifying improved farming techniques and that agencies have coordinated their efforts in delivering information and assisting farmers in implementing the techniques. Where required, additional Memoranda of Understanding should be written, similar to one between USDA/SCS and EPA. In particular, the relationship between USDA/ES and EPA in addressing groundwater contamination should be formalized.

WATER QUALITY FUNDING REQUEST/OMB ALLOWANCE
FY1990
BY AGENCY
(million $)

| | ENACTED FY89 | FY90 AGENCY REQUEST | INCREASE TO FY 89 /OMB ALLOWANCE | FY90 TOTAL OMB ALLOWANCE |
|---|---|---|---|---|
| USDA | | | | |
| ARS | $28.4 | 12.2 | 10.0 | 38.4 |
| CSRS | 18.7 | 6.7 | 6.7 | 25.4 |
| ERS | 0.8 | 2.5 | 2.5 | 3.3 |
| SCS | 13.7 | 36.5 | 13.0 | 26.7 |
| ES | 26.3 | 8.5 | 6.5 | 32.8 |
| NAL | 0.0 | 0.3 | 0.3 | 0.3 |
| ASCS | 14.3 | 6.5 | 6.5 | 20.8 |
| FS | 21.7 | 2.3 | 0 | 21.7 |
| APHIS | 13.4 | 0.0 | 0.0 | 13.4 |
| USDA TOTAL | 137.3 | 75.5 | 45.5 | 182.8 |
| COMMERCE* | | | | |
| NOAA (OCEAN) | 0 | 26.2 | 7.5 | 7.5 |
| OTHER NOAA | 14.2 | 0 | 0 | 14.2 |
| TOTAL | 14.2 | 26.2 | 7.5 | 21.7 |
| EPA | | | | |
| WATER** | 13.5 | 32.7 | 0.4 | 13.9 |
| PESTICIDES | 2.9 | 14.5 | 3.3 | 6.2 |
| TOTAL | 16.4 | 47.2 | 3.7 | 20.1 |
| INTERIOR | | | | |
| USGS | 57.2 | 0.4 | 0.4 | 57.6 |
| TOTAL ALL AGENCIES | $ 225.1 | 149.3 | 57.1 | 282.2 |

* Primarily concerned with nonpoint sources (coastal) water pollution.
** Includes only groundwater research, groundwater program, and grants for groundwater.

FY 1990 USDA WATER QUALITY INITIATIVE
(MILLION $)

| ACTIVITY/AGENCY | CHANGE REQUEST | OMB CHANGE ALLOWANCE |
|---|---|---|
| TARGETED RESEARCH AND EDUCATION PROGRAMS: | | |
| Midwest Corn Belt Initiative | $ 12.1 | $ 11.8 |
| ARS | 8.3 | 8.0 |
| CSRS | 3.0 | 3.0 |
| ES | 0.5 | 0.5 |
| ERS | 0.3 | 0.3 |
| Other Regional Projects | 8.4 | 7.0 |
| CSRS | 5.0 | 5.0 |
| ARS | 3.4 | 2.0 |
| Demonstration Projects | 5.2 | 3.2 |
| ES | 1.0 | 1.0 |
| SCS | 3.1 | 1.1 |
| ASCS | 0.9 | 0.9 |
| ERS | 0.2 | 0.2 |
| IMPROVED DATA BASES: | | |
| Data Base Development | 2.8 | 2.8 |
| ERS | 2.0 | 2.0 |
| ES | 0.5 | 0.5 |
| SCS | 0.3 | 0.3 |
| IMPROVED TECHNICAL SUPPORT CAPABILITIES: | | |
| Field Office Technical Guides | 12.0 | 4.6 |
| SCS | 10.0 | 3.6 |
| ES | 2.0 | 1.0 |
| TARGET TECHNICAL AND FINANCIAL ASSISTANCE: | | |
| All Named Regions* | 14.1 | 8.2 |
| ARS | 0.5 | 0.0 |
| CSRS | -0.1 | -0.1 |
| SCS | 8.0 | 2.6 |
| ASCS | 5.7 | 5.7 |

*Chesapeake Bay, Great Lakes, Tennessee Valley, Gulf States, Colorado River Salinity.

| | | | |
|---|---|---|---|
| Other Hydrologic Areas | | 16.2 | 5.5 |
| SCS | | 15.1 | 5.4 |
| ES | | 2.0 | 1.0 |
| ASCS | | -0.9 | -0.9 |
| ONGOING EFFORTS: | | | |
| Specialized Information Center | | 0.3 | 0.3 |
| NAL | | 0.3 | 0.3 |
| Pesticide Data and Research | | -0.5 | -0.5 |
| CSRS | | -0.5 | -0.5 |
| NAPIAP | | 1.3 | 1.3 |
| CSRS | | 0.3 | 0.3 |
| ES | | 1.0 | 1.0 |
| Nutrient & Sediment Research | | -0.8 | -0.8 |
| CSRS | | -0.8 | -0.8 |
| All Other | | 4.4 | 2.1 |
| CSRS | | -0.2 | -0.2 |
| ES | | 1.5 | 1.5 |
| ASCS | | 0.8 | 0.8 |
| FS | | 2.3 | 0 |
| | TOTAL | $ 75.5 | $ 45.5 |

U.S. Department of Agriculture
USDA 1890's Initiative
(thousands $)

| | Enacted FY89 | USDA initiative FY90 | OMB allowance FY90 |
|---|---|---|---|
| Cooperative State Research Service: | | | |
| formula | $24,333 | 1,000 | 25,333 |
| capacity building | 0 | 5,000 | 11,000 |
| highered: strengthening | 1,902 | 2,098 | 0 |
| highered: challenge | 0 | 0 | 0 |
| spec. grants, other | 2,465 | (1,898) | 0 |
| | 28,700 | 8,200 | 36,333 |
| Extension Service: | | | |
| formula | 18,291 | 5,709 | 24,000 |
| extension facilities | 9,508 | 0 | 9,508 |
| | 27,799 | 5,709 | 33,508 |
| All other agencies | 6,000 | 200 | 6,200 |
| TOTAL | $62,499 | 14,109 | 76,041 |

Decision:

o OMB approves the Department's request for an additional $14 million in FY 1990 to support its initiative to strengthen the teaching, research, and extension capacities at the traditionally black 1890 land grant institutions.

o Increases in Evans-Allen and Smith-Lever formula funds and funds for extension facilities are approved as requested. However, all the non-formula CSRS funds should be combined in the competitive, capacity building grants program and a dollar-for-dollar match required from each participating State. OMB believes the institution of a matching requirement on these non-formula funds will begin to establish consistency between 1890 and 1862 land grant funding. The availability of these funds will provide an incentive for States to incorporate the 1890's as integral parts of their higher education systems.

o The critical importance of the Federal formula funds to the 1890's is recognized, and OMB recommends no similar matching be required now. However, the Department's long term goal should be to put the 1890's on the same footing as the 1862's with respect to State funding responsibilities.

FY 1990
GLOBAL CHANGE INITITATIVE

Over the past year, the Committee on Earth Sciences (CES) has been developing an interagency Global Change research program, including the ongoing development of a research strategy document. This process has matured enough that a Global Change Presidential Initiative will be proposed in the FY 1990 Budget and your agency's portion of that proposal is identified in the attached table.

As part of the Initiative, the CES has been tasked to publish a brief summary of the interim Global Change Research Strategy. This publication will accompany the President's FY 1990 Budget. As a member of the CES, your agency should continue to actively support the development of this publication which (with your agency concurrence) must be delivered to OMB via the CES by December 2, 1988. In addition, an update of your agency Global Change crosscut (FY 1989-FY 1994) reflecting decisions made in the FY 1990 budget process is also due to the OMB by December 2, 1988.

The OMB expects the CES to have an active role in the development of the FY 1991 Global Change budget. The CES will be asked to present to the OMB a unified Global Change Budget based on the programs submitted in the FY 1991 Global Change cross-cut. The CES will evaluate and prioritize the individual agency programs based on their relevance to the Global Change Research Strategy. The CES will only address those agency programs submitted in the cross-cut that are consistent with their parent agency's FY 1991 budget request. To ensure that the Global Change Research Strategy is available for guidance in the development of agency FY 1991 budgets, the final Research Strategy, approved by CES Principals, must be delivered to the OMB no later than March 1, 1989.

| FOCUSED GLOBAL CHANGE RESEARCH PROGRAM | (Dollars in Millions) 1989 | 1990 |
|---|---|---|
| TOTAL | 139.2 | 179.2 |
| USDA | 22.0 | 22.7 |
| DOC | 9.0 | 20.0 |
| DOE | 20.2 | 27.2 |
| EPA | 27.5 | 25.0 |
| NASA | 14.5 | 21.5 |
| NSF | 40.7 | 53.5 |
| DOI | 5.3 | 9.3 |
| DOD | 0.0 | 0.0 |
| DOT | 0.0 | 0.0 |
| DO | 0.0 | 0.0 |

# BUILDING A BETTER AMERICA

February 9, 1989

**NOTICE**

There Should Be No Release of This Document Until 9:00 P.M. (E.S.T.) Thursday, February 9, 1989

TO THE CONGRESS OF THE UNITED STATES:

I hereby transmit a supplement to the Message I am delivering to the Joint Session of the Congress tonight. It is titled "Building a Better America," and it contains further description of the plans and proposals mentioned in the Message. I urge the Congress to give favorable consideration to these proposals and renew my invitation to the congressional leadership to work together to assure that America is united, strong, at peace, and fiscally sound.

George Bush

THE WHITE HOUSE,

February 9, 1989.

- The 1986 Tax Reform Act, which eliminated provisions of the Federal tax code that encouraged conversion of wetlands to farmland.
- The 1982 Coastal Barrier Resources Act, which is specifically designed to restrict federally subsidized development of undeveloped coastal barriers and associated wetlands along the Atlantic and Gulf Coasts.

## g. Enhancing Water Quality

### OVERVIEW

Groundwater and surface water contamination from the normal use of pesticides and fertilizers is a growing concern throughout the country. Both public and private efforts are required to promote the adoption of environmentally sensitive farm production practices and to develop safer chemical and biological pest controls.

> *"The protection of the environment and the conservation and wise management of our natural resources must have a high priority on our national agenda. But given sound research, innovative technology, hard work, sufficient public and private funds, and—most important of all—the necessary political will, we can achieve and maintain the environment that protects the public health and enhances the quality of life for us all."*
>
> George Bush

### PRINCIPLES

- The President is committed to protecting the Nation's groundwater resources from contamination by fertilizers and pesticides without jeopardizing the economic vitality of U.S. agriculture.
- Water quality programs must accommodate both the immediate need to halt contamination and the future need to alter fundamental farm production practices.
- Ultimately farmers must be responsible for changing production practices to avoid contaminating ground and surface waters. Federal and state resources can provide valuable information and technical assistance to producers so that environmentally sensitive techniques can be implemented at minimum cost.

### POLICIES

This initiative increases existing funding for coordinated water quality programs in the Departments of Agriculture, Commerce, and Interior and the Environmental Protection Agency by $64 million. Building on an interagency base of $226 million, the 1990 programs will address critical needs in water quality assessment, research, and public education. The Department of Agriculture will spend an additional $47 million, mostly on the development and demonstration of farming practices that avoid water quality degradation. Commerce's National Oceanic and Atmospheric Administration will monitor the effects of agricultural run-off on coastal and inland waterways. The Environmental Protection Agency, working with the relevant state and Federal agricultural agencies, will devote an additional $10 million to improving farmers' understanding of their obligations as stewards of water quality. The U.S. Geological Survey will add funds to its ongoing $57 million effort to measure accurately and monitor surface and groundwater quality. The $64 million initiative represents a permanent increase to base funding for water quality programs. In coming years, as more is learned about the causes and consequences of water quality degradation, program emphasis will shift to ensure adoption and use of environmentally sensitive farming practices.

**PROPOSED CHANGE**
(In millions of dollars)

| | 1989 | 1990 | Dollar Change | Percent Change |
|---|---|---|---|---|
| Budget Authority | 226 | 290 | +64 | +28.3 |
| Outlays | 226 | 290 | +64 | +28.3 |

## h. Reducing the Growing Volume of Waste

### OVERVIEW

America as a nation is filling landfills faster than it can site new ones. Per capita waste production in the United States is greater than in any country in the world. Collectively, this nation produces 160 million tons of garbage a year, and one-half of the municipal landfills in this country will be full by the mid-1990s. The waste problem is not going away. It can no longer be neglected. America can do better.

This country must make every effort to stem the rising tide of garbage and industrial waste through a more aggressive use of waste minimization and recycling practices. In many cases it is in the economic self-interest of industry to avoid polluting by recycling wastes, by minimizing wastes at the source, or by changing to a non-polluting process. The technology is there; what is needed now is the will.

> *"There is, after all, much that we can do ourselves, individually, to benefit the environment: We can reduce our municipal solid waste problem with a greater commitment to recycling. We can improve the outdoor experience simply by picking up the trash we see and not leaving any of our own behind."*
>
> George Bush

### PRINCIPLES

- Reducing waste at the source is the best way to deal with the problem.
- The President believes that EPA's current national goal of 25 percent waste reduction, through recycling and reducing wastes at the source, can be exceeded.
- Waste minimization must start at home and in the local communities. Citizens must be willing to reduce their garbage and separate their wastes for recycling purposes, or else be willing to accept nearby incinerators or landfills.
- Effective waste reduction techniques both in industry and in local communities should be shared.

United States
Department of
Agriculture

# United States Department of Agriculture's Water Quality Initiative 1992 Work Plan

Developed by the
Working Group on Water Quality

October 1991

## U.S. Department of Agriculture's Water Quality Initiative

### Background

President Bush launched an initiative in 1989 to protect ground water and surface water from contamination by fertilizers and pesticides. The Congress has funded the initiative for fiscal years (FY) 1990 and 1991. The President's budget message identified the principles that serve as the basis for the USDA program. They are:

- Water resources must be protected from contamination by fertilizers and pesticides. Protection of these resources must be accomplished while still maintaining the Nation's agricultural economic vitality.

- Water quality programs must address the immediate need to halt contamination and at the same time work to alter fundamental farm production practices.

- Ultimately, farmers are responsible for changing their production practices to stop contaminating ground and surface waters.

The Department of Agriculture, Environmental Protection Agency, Geological Survey, and the National Oceanic and Atmospheric Administration were given definitive roles under the initiative. The USDA released its Water Quality Program in July 1989; a multiyear plan to guide its agencies in implementing activities designed for and directed to protecting water quality.

In the fall of 1989, the Deputy Secretary of Agriculture established a Working Group on Water Quality. Eleven USDA agencies are represented, with the goal of providing coordination on agricultural water quality-related problems among themselves and with other concerned federal agencies.[1] The working group organized four program committees: Education and Technical/Financial Assistance; Research and Development; Data and Evaluation; and Information.

The Food, Agriculture, Conservation and Trade (FACT) Act of 1990 established as Congressional policy "...that water quality protection, including source reduction of agricultural pollutants, henceforth shall be an important goal of the programs and policies of the Department of Agriculture." The FACT Act also provided for a USDA Agricultural Council on Environmental Quality, which was established early in 1991. Under direction of the Council, the Working Group on Water Quality has operational responsibility for coordinating USDA's programs that contribute to the President's Initiative.

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[1]Those previously named, and the Fish and Wildlife Service, Army Corps of Engineers, and the Tennessee Valley Authority, among others.

## The Department's Water Quality Goal

The United States Department of Agriculture's goal is to minimize the risk of contaminating the Nation's ground and surface waters with agricultural chemicals. This will be done by designing and effecting USDA programs that, in conjunction with actions of other federal agencies, state and local governments, and farmers themselves, result in an environmentally sensitive and efficient farming community. The methods developed by the programs will update farming practices, alter management systems, and benefit farm enterprises and the public.

## Specific Goals

By 1995, USDA is to have identified areas where the agricultural threat to water quality is most serious and to teach farmers and ranchers in those identified areas how to use agricultural chemicals in a way safe to the environment, yet economically practical. These new methods will be designed to reduce the loss of agricultural chemicals that leach into ground water or run off to surface water, to ensure that agricultural impacts on water quality are minimized and are consistent with the beneficial uses of the waters. In 1992, the USDA will evaluate the progress of agency programs, to identify strengths or weaknesses, and to make appropriate shifts in programs to increase their effectiveness.

**Objectives:**

The Working Group on Water Quality will:

- Accelerate and expedite program development and delivery to provide education and technical/financial assistance, support research, collect and evaluate data, and provide information to the public.

- Coordinate, monitor, and evaluate the Department's contributions to the Presidential Initiative through the program committees:
  - ♦ Education and Technical/Financial Assistance
  - ♦ Research and Development
  - ♦ Data and Evaluation
  - ♦ Information

- Consult with, and inform, other concerned federal, state, local, institutional, and special interest organizations about USDA water quality activities in the context of the President's Initiative.

- Develop information about the effects of the agricultural industry on water quality, and the progress of this initiative, and provide these to appropriate audiences.

The USDA agencies will:

- Coordinate their respective water quality activities with appropriate Working Group on Water Quality committees.

- Ensure that agricultural chemical users receive intensive training on how to adapt to new practices and production systems, and are educated in the many benefits that come from using the new methods. Cooperating federal agencies and their state counterparts will assist USDA agencies in this training effort.

- Report progress achieved in reducing agricultural impacts on ground and surface water resources.

**Issues:**

- **What are the impacts of agricultural practices?**

  Better assessments of the agricultural impacts on water quality are needed. For example, there is a need to more thoroughly examine the pesticide and nitrate levels in the Nation's underground water reservoirs. Although detectable nitrate levels in many wells may be considered normal in some natural environments, the EPA report did not disclose what proportion of wells contain *intermediate* nitrate levels (3-10 ppm of nitrogen). Because more than two percent of the sampled private wells registered above the 10 ppm critical level, USDA scientists are working to remedy those cases where contamination is caused by traditional farm waste and chemical applications. USDA agencies and their state cooperators are developing and refining systems to help farmers assess their individual farm situations; to focus remedial or preventive efforts in areas of increased vulnerability; and to remedy those cases.

  USDA continues to cooperate with other federal agencies in defining problems. Efforts continue with USGS and EPA on problems of mutual concern.

  EPA, in completing work on its National Pesticide Survey (including nitrate), found that specific chemical use and aquifer sensitivity information is needed to more accurately predict the occurrence of pesticides and nitrate in drinking water wells. Further, a variety of environmental conditions and human activities combine to affect the occurrence of pesticides and nitrate in drinking water wells and that no single factor alone explains the presence of pesticides or nitrates. Among the steps that need to be considered are appropriate reductions in the use of pesticides and fertilizers; site-specific assessments to accurately target vulnerable ground water; identification and protection of ground water recharge areas and protection of well head areas; more careful use of flood irrigation; and continued efforts to identify problem pesticides and other materials to establish more protective use requirements for them.

- **What should USDA do differently?**

  More farmers need to be reached with education efforts and technical assistance if water quality goals are to be met. To begin to accomplish this, there is increasing program emphasis on nutrient and pesticide management to show farmers how to prevent field-applied agricultural chemicals from leaching into the ground beyond the root zone or runoff surface water. USDA also needs to increase programs that teach clientele how to assess farmstead wells for proper construction, siting, and protection. Farmers must understand the importance of preventing agricultural chemicals and manure from leaching into ground water, especially where sources may eventually contaminate drinking and surface water.

- **What are the impacts of current programs?**

  In 1990, as part of the Data and Evaluation component of the Water Quality Initiative, NASS and ERS completed a chemical use and production practices analysis on cotton farms in 14 states, and assessed the potential water quality problems that might be associated with cotton production. Surveys on chemical use and cropping practices were also constructed during 1991 for major field crops and vegetables. Water quality information gained from the 1991 USDA assessment of agricultural chemicals applied to other crops, such as vegetables and selected field crops, will also be used in program planning.

**Strategy:**

To accomplish the objectives of the President's Initiative, the Department developed a Water Quality Program Plan (July 1989) and established a Working Group on Water Quality. This Working Group, through its committees, coordinates the Department's water quality efforts. The Policy Committee provides intradepartmental coordination and identifies current or emerging issues for presentation to the Agricultural Council on Environmental Quality (ACEQ). The Policy Advisory Committee provides interdepartmental coordination of water quality issues. This process enables the Department to manage its water quality program effectively and respond to the spirit as well as the letter of the President's Initiative. These improved internal and external communications promote greater awareness of problems, causes, and possible solutions, and help focus resources on substantive issues.

USDA is carrying out this strategy using the following steps to reach solutions that protect/improve water quality, human health, and the environment.

- Determining the proportions of the problem—the occurrence, distribution, and trends of agrichemicals in U.S. water, and factors influencing their occurrence.

- Identifying the impacts and effects of agrichemical pollutants and the relative priorities for directing USDA efforts to improve agrichemical management in ways that protect/improve water quality.

- Getting information and assistance to farmers to help them apply existing knowledge, technology, and agricultural practices and management systems in ways that will effectively and efficiently protect water quality where agrichemicals are a potential or actual threat.

- Improving and developing new data bases, knowledge, technology, and agricultural practices and management systems that will increase the effectiveness and efficiency of agricultural management while maintaining the economic productivity of agriculture.

- Evaluating the effectiveness and efficiency of USDA programs in helping farmers improve agrichemical management.

- Cooperating effectively with state and other federal agencies concerned with agrichemical management to maximize the effectiveness of USDA efforts.

- Keeping the public well-informed about what the USDA is doing to help farmers improve agrichemical management.

- Reporting the progress made in each of these areas, in terms of input and output accomplishments.

The 1992 Work Plan summarizes the progress made during 1991, and highlights critical milestones for 1992 and beyond. Specific outputs, schedules, and funds were assigned to agencies. The agencies will report their progress to the ACEQ, through the Working Group, They will also issue an annual report. As the work of the agencies is completed, the Nation's water will be protected from degradation and in many cases improved.

**Progress Assessment:**
USDA agencies have made considerable progress in water quality programs during 1991. Specifically:

- ARS has funded 52 Priority Component Research Projects and CSRS has funded 96 competitively selected research projects for FY 1990 and 1991, under the President's Initiative. Some of the more promising accomplishments include:

  - ♦ A modified Erosion Prediction Impact Calculator (ERIC) model has been developed to determine the impacts of applying broiler litter on farmland.
  - ♦ A decision aid computer model called *Nitrogen Leaching and Economic Analysis Package (NLEAP)* has been developed to provide rapid estimates of nitrate leaching along with potential economic impacts.
  - ♦ A procedure has been developed for combining remote sensing, Geographic Information System (GIS) technology, and computer models to determine ground water contamination potential of different hydrologic areas and agricultural management practices and systems.

- Studies have shown that maintaining a permanent high water table will result in both lower concentrations of pesticides and nitrate and higher yields of corn and soybeans.

The Midwest Initiative Management System Evaluation Areas (MSEAs) have become fully operational. Several MSEA program documents are being published. The MSEA projects are showing that fertilizer and pesticide practices can be managed in site-specific ways to protect water quality. New emphasis is being placed in FY 1992 on the development of procedures and models to scale up research results from small plots to field, basin, and regional application.

- NASS and ERS completed a chemical use and cropping practices survey on corn, cotton, potatoes, rice, soybeans, and wheat in the major producing states. Results of this survey were published in March 1991. In addition, a Vegetable Chemical Use Survey in the five major vegetable-producing states was completed. The results of this survey were published in June 1991. Plans were developed to conduct the second annual Field Crops Chemical Use Survey. A Fruit and Nut Chemical Usage Survey also began during 1991, and publication is scheduled for early summer of 1992.

The Research and Development Committee completed a comprehensive review and evaluation of the MSEA program. This included evaluation of the progress made on the overall MSEA program as well as the five MSEA headquarters locations and five satellite research sites. A review of progress and future program needs in Priority Components Research, funded by ARS and CSRS, also was completed.

A comprehensive evaluation strategy was developed to identify key questions that each Initiative component should address and to outline a process for collecting data. The Working Group has used the strategy to assess progress and has suggested corrections to present activities.

- The Working Group on Water Quality has analyzed the problems of nitrate contamination of water from agricultural sources and has produced two documents;

  - Water Quality and Nitrate: Agricultural Sources of Nitrate and Approaches to Reduce Nitrate Contamination of Water. This paper describes the current state of knowledge and identifies things that can be done to reduce nitrate contamination.

  - Nitrate Occurrence in U.S. Waters (and Related Questions). This bulletin analyzes data and summarizes conclusions from a wide range of published sources. It is intended to provide a perspective on the proportion of the problem as identified in published sources.

- ASCS, SCS, and ES, through the ET and FA Committee, will publish this winter (92) detailed information on the progress of their Demonstration, HUA, and Water Quality Special Projects. A brief summary follows:

♦ Demonstrations

Eight projects were initiated in 1991, to address an array of water quality problems. These projects are in Colorado, New York, South Dakota, Michigan, Iowa, Arkansas, Georgia, and Idaho. They will demonstrate new technology, and accelerate its adoption, to address water quality problems. Seven of these projects will address a ground water problem. All of the new projects will address water degradation from plant nutrients; seven will also address pesticides; five, sediment; and two, animal wastes.

♦ HUA's

In 1991, 37 new HUA's were approved in 33 states. Twenty-six of these address ground water problems; 33 address surface water problems; and 22 address both resources. Pesticide management will be addressed in 30 projects; nutrient management in 33 projects; sediment management in 28 projects; animal waste management in 16 projects; and mineral salt and elements in 2 projects. Cost-share assistance of $7.1 million was allocated for these projects, in addition to a total allocation of $12 million for the 37 projects established in 37 states in 1990.

♦ Water Quality Special Projects

Fifteen of these projects will focus on ground water problems; 30 in surface water; and 10 on both ground water and surface water. Allocated funds ($9.1 million) may be obligated through December 1991. ACP Long-Term Agreements may be used, where authorized, in addition to regular and special ACP practices. These projects will address nutrient management (33 projects); animal waste management (26 projects); sediment management (24 projects); pesticide management (18 projects); and mineral salts and elements management (2 projects).

## RESEARCH AND DEVELOPMENT

**Objectives:**

- To improve and expand our knowledge of agricultural practices related to water quality;
- To integrate that knowledge into production management systems that use economically and environmentally sound practices.

The most urgent issues will be addressed during the first 5 years of the President's Water Quality Initiative, with incremental improvements continuing indefinitely.

***Completion Date:*** *1995*

***Principal Contacts:*** *D. A. Bucks, ARS*
*C. B. Rumburg, CSRS*

**Strategy:**

Under the President's Initiative, research is carried out by the Agricultural Research Service (ARS) and Cooperative State Research Service (CSRS), in cooperation with the State Agricultural Experiment Stations (SAES) and other cooperating institutions. This research is comprised of two main elements:

(1) Priority Component Research Projects. These projects expand knowledge of reactions, degradation, persistence, remediation, and many other aspects of agricultural production systems under ARS Special Research Projects and a CSRS competitively awarded Special Research Grants Program.

(2) Geographic Area Systems. This interagency, State-Federal program integrates the most promising individual research components into agricultural management systems for improved crop and livestock production for economic and environmental soundness within a region. The Midwest Initiative on Water Quality is the first Geographic Area System.

The research strategy of the President's Initiative in FY 1992 addresses five primary problem areas as follows:

- Assessment, Sampling, and Testing Methods. Develop improved, inexpensive methods of risk assessment for site-specific potential problem areas, sampling, measuring, and evaluating water quality.

- Fate and Transport. Identify and increase understanding of factors and processes that control fate and transport of agricultural chemicals.

- Management and Remediation Practices or Systems. Develop new and modified agricultural production management practices and systems including remediation techniques that substantially reduce the movement of potentially hazardous chemicals into ground and surface waters.

- Regional Application and Transferability of Results. Develop and adapt procedures, models, and decision aids to apply and transfer water quality research results to other locations or at larger scales by researchers and user agencies.

- Social, Economic, and Policy Considerations. Evaluate the economic, social, and political impacts of alternative agricultural production practices and systems, policies, and institutional strategies to control ground and surface water quality.

**Progress Assessment:**

**Priority Component Research Projects**

ARS funded 52 projects at 24 locations for FY 1990 and FY 1991. For the 2 years, CSRS awarded 96 competitively-selected projects, of which 90 were funded for 2 or 3 years. Many of the ARS and CSRS projects involve researchers from other agencies and scientific institutions. ARS and SAES also have other research that addresses potential water contamination.

**Progress**

Research grants funded by CSRS in FY 1990 and FY 1991 have resulted in:

- Arkansas scientists have developed a modified EPIC (Erosion Prediction Impact Calculator) computer model to determine the impacts of applying broiler litter on farmland for use in developing management practices to protect water quality.

- A biomethylation process using microorganisms is being improved by California scientists for the possible design of a bioreactor to remove selenium from agricultural drainage water.

- In Connecticut studies, the use of iron/hydrogen peroxide reagents shows promise in degrading 2,4-D and 2,4,5-T, and preliminary initial success in transforming metolachlor and atrazine.

- Delaware field studies show no evidence of elevated nitrate levels in ground water initially under soybeans as compared to fescue, but soil nitrate levels became higher under soybeans by harvest, with potential for leaching to ground water, depending on management practices used.

- Several mixed bacterial cultures have been isolated from soil samples by Florida scientists that show capability of degrading two nematicides, Telon II and fenamiphos.

- In Georgia research, winter rye, wheat, triticale, and canola showed promise as winter cover crops on reducing the amount of nitrate leached, with rye being superior in rooting depth, biomass production, and nitrogen uptake.

- Idaho research on microbial detoxification of pesticide containers and rinsates has resulted in optimized preparations of Pseudomonas bacteria that degraded 2,4-D, dicamba and parathion in a few hours to very low or nondetectable levels, using conditions readily attainable by agricultural chemical applicators under farm or field conditions.

- Illinois & Ohio studies indicate that rainfall amount and history following herbicide application will have a strong effect in herbicide entry into macropores, with results showing herbicide and bromide movement through soil macropores reduced an average of 37-76% when a light rainfall preceded a heavier rainfall.

- Studies on glacial till soils in Iowa showed that split nitrogen fertilizer applications at 112 pounds per acre could produce as much corn yield as a single nitrogen application at a higher rate of 156 pounds per acre, with reduction of nitrate-nitrogen concentrations in tile drainage water to mostly less than 10 parts per million, the drinking water standard.

- Preliminary results from a Massachusetts study on the impact of dairy manure application on alfalfa as an alternative to excess manure application to corn suggest that farmers could apply 20 to 30 tons per acre of manure without an adverse effect on ground water quality.

- Missouri researchers found that the pesticide carbofuran degraded faster in the soil near corn roots, indicating that pesticides are affected by the greater activity of microorganisms near root systems than in the bulk of the soil.

- New York scientists have shown promising results in the complete removal of atrazine herbicide from pesticide wastewater by the use of electrochemical precipitation.

- North Carolina scientists have developed a procedure for combining modern remote sensing, Geographic Information System (GIS) technology, and computer models to determine ground water contamination potential of different hydrologic areas under different land management practices.

- Texas research indicates that hydraulic properties of soils, based on field measurements, should be a part of soil survey maps to provide critical information for evaluation of soil resources relative to nonpoint and point source ground water pollution.

- Virginia scientists have developed an inexpensive pesticide waste disposal system for small farms which concentrates the pesticide onto sorbents, such as peat moss, which are then composted, and the pesticide degraded by microorganisms.

Progress made by ARS scientists in FY 1990 and FY 1991 includes:

- Arizona scientists are developing a prototype decision support system for forest ecosystems and planning to assemble a similar system for cropland and rangeland situations.

- Colorado researchers have designed a computer software package, NLEAP (Nitrate Leaching and Economic Analysis Package), to provide rapid, site-specific estimates of nitrate leaching under agricultural crop production along with potential impacts on local ground water resources.

- Georgia has formulated plant nutrient and animal waste components for inclusion in the GLEAMS (Groundwater Loading Effects of Agricultural Management Systems) model.

- Laboratory studies in Indiana, Illinois, Nebraska, and Iowa on leaching of atrazine, alachlor, and metolachlor indicate that starch-encapsulated (SE) formulations significantly reduce the leaching of these herbicides compared to commercially available preparations. Field data from 10 locations in 6 states during the 1990 growing season indicated good to excellent control of most weed species with the SE pesticides.

- Iowa scientists have developed equipment for measuring hydraulically active macropores, to obtain data for use in relating differences in preferential flow of water and solutes for different soil and crop management systems used for different soils, topography, and climate.

- Research plots in Louisiana showed that peak concentrations of atrazine can exceed health advisory limits in the tile effluent soon after application, followed by a slow decrease in pesticide concentration for 2 months.

- A Nutrient Management Expert System (NUMEX) developed by Maryland researchers recommends to farmers the amount of manure, sludge and commercial fertilizer to apply to feed their crops without contaminating surface or ground waters. The NUMEX expert system is based on the residual fertilizer content of a field soil, the nutrient content of the manure or waste material and the history of the field.

- Minnesota scientists have developed a new, rapid method for isopotential extraction of pesticides from soils.

- Seeds of major Corn Belt weeds were collected in Minnesota, Illinois, Iowa, Missouri, and Saskatchewan and used to generate weed emergence models that are state-specific or regional. The models predict daily weed emergence and interact with WEEDSIM, a bioeconomic model.

- Subirrigation studies in Ohio have shown that maintaining a permanent high water table at a depth of 25 cm below the soil surface in most years reduced the concentrations of nitrate, atrazine and metolachlor and increased corn and soybean yields.

## GEOGRAPHIC AREA SYSTEMS

The multiagency, long-term Midwest Initiative on Water Quality, which began in FY 1990, became fully operational in FY 1991. The Midwest Initiative is a model for agency cooperation. Agencies actively participating in the Initiative include ARS, CSRS, SAES, U.S. Geological Survey (USGS), U.S. Environmental Protection Agency (EPA), Extension Service (ES), Cooperative Extension System (CES), Soil Conservation Service (SCS) and various State and local agencies. MSEAs are farm and field size test sites that are used to evaluate the environmental and economic performance of corn and soybean production systems developed for the purpose of reducing the risk of agricultural chemical contamination. The 10 field sites are operated by 5 coordinated research teams in Iowa, Minnesota, Missouri, Nebraska, and Ohio.

### Midwest Initiative on Water Quality

The MSEAs have installed state-of-the-art field equipment to monitor soil and water parameters, characterize the weather, and determine the effects of various crop management systems on water quality. Modifications of prevailing cropping systems were developed for each MSEA site to study ground and surface water contamination. These cropping systems are specifically suited to the soil, geology, climate, irrigation, nitrogen, and pesticide needs, and are a unique feature at each site. Improved pesticide and nitrogen applications are being stressed, although social and economic considerations will ultimately be the dominant factors in the adoption of modified cropping systems by farmers. Quality assurance and quality control procedures have been initiated to ensure a high standard for data collected. Soil and water tests are providing valuable data concerning the fate and transport of agricultural chemicals in the soil profile.

**Individual MSEA reports follow**:

- The Iowa MSEA project has three sites: the western region site near Treynor on a deep loess soil; the northeast region site near Nashua on a glacial loam till soil; and the Central Des Moines Lobe, Walnut Creek watershed, near Boone on a glacial till soil. Stream flow in the Walnut Creek watershed has shown large changes in atrazine and nitrate concentration throughout the year.

- The Minnesota MSEA project has four sites: The Anoka Sand Plain, Princeton, Minnesota; the Oakes Irrigation Research Area, Oakes, North Dakota; the Big Sioux Aquifer area, Brookings, South Dakota; and the Wisconsin River Sand Plains, Arena, Wisconsin. Information is being obtained on the impacts of ridge-tillage practices in a corn and soybean cropping system on rate of transport of atrazine, alachlor, and metribuzin in unsaturated and saturated zones at all the sites.

- The Missouri MSEA project, located in the Goodwater Creek watershed within a claypan soil region, has selected farming systems to be evaluated, developed promotional materials, and informed the general public about the project. Mechanisms responsible for the movement of agrichemicals over and through a clay pan are being deterined.

- The Nebraska MSEA project is evaluating improved furrow and sprinkler irrigation management systems. Plant tissue testing is being used to schedule fertigation (application of fertilizer through an irrigation system).

- The Ohio MSEA project overlies the Scotio River Buried Valley Aquifer near Piketon, Ohio. Soil and hydrogeological site characterization has been completed and ground water monitoring initiated, and a number of project documentation manuals prepared.

**Assessment, Sampling, and Testing Methods**

ARS, CSRS, and SAES will continue to develop, validate, and improve research analytical methods and soil and water testing methods. Also, development will continue of accurate, low-cost, and practical methods for sampling soil and water for contaminants that can be used by field researchers, extension advisors, and private consultants. Continued research will be made to develop and refine remote sensing and Geographical Information Systems (GIS) to detect, monitor, and map water quality parameters at scales ranging from fields to regions. Methods will be developed to assess risks for water contamination due to uncertainties in weather, soils, pests, and to other causes.

**Fate and Transport**

Research will be continued on the role of soil physical and chemical properties affecting the fate and transport of contaminants. Studies will also be conducted to better understand the transformation and movement of nitrogen forms and pesticides in soil and water, and the function of biological agents in affecting these fate and transport processes. Effort will be placed during FY 1992 on development and validation of models to predict the fate and transport of contaminants within the soil vadose zone.

**Management and Remediation Practices or Systems**

During FY 1992, research and development will be conducted to develop equipment and practices to improve application of fertilizers, pesticides, or wastes, and to reduce potential soil and water contamination. New and current management practices will be developed and evaluated to increase the efficiency in the use of agricultural production inputs to croplands and to reduce contaminant loads from farmstead conditions. Animal and other wastes applied to soils will be studied for improved methods of timing, rates, and methods of application to cropland. Irrigation, drainage, and water table management practices to reduce leaching or contaminant loads in soil and water will be refined.

**Regional Application and Transferability of Research Results**

New emphasis will be placed on the development of procedures or models to scale up research results from small plots or field to basin, and regional interpretation, and to adapt and validate models to predict treatment effects on water quality in a region. Techniques will be developed to extend research data to other locations with similar soils, climates, and environments. Water quality decision aid packages will be developed in cooperation with ES, SCS, and other technology transfer agencies.

**Social, Economic, and Policy Considerations**

Increased efforts will be made to develop and evaluate strategies to accelerate the acceptance and adoption of improved water quality practices. Alternative management practices or incentive packages will be developed to protect water resources. Regional, national, and international impacts upon water quality resulting from adoption of alternative management practices, policies, or regulations will be studied.

**Evaluation**

Progress and evaluation reviews of both the Priority Components Research and the Management System Evaluation Areas (MSEAs) programs were conducted.

In June 1991, a review was conducted of the MSEAs program, beginning with a regional review to evaluate progress and future plans of the regionwide issues of the program. This regional review was followed by onsite reviews of each of the five MSEA projects in Iowa, Minnesota, Missouri, Nebraska, and Ohio. This included evaluation of the progress on the objectives of the overall Midwest Initiative, as well as local MSEA research objectives, and onsite visits to each of the five satellite research sites.

A progress/evaluation report has been prepared by the Review Team and shared with the MSEA Management Team and Principal Investigators, and discussed with them at a meeting of the Research and Development Committee of the USDA Water Quality Working Group.

In July 1991, a North Central and Northeastern Regional Program Review and Evaluation Workshop was held in East Lansing, Michigan. The focus of the workshop was to review progress and future program needs in Priority Components Research on the 58 research projects funded by the CSRS Special Grants Program in FY 1989 and 1990, and by ARS in the North Central and Northeast CSRS regions under the President's Initiative. Principal investigators of the funded projects prepared progress reports and presented poster sessions on their research for review and evaluation comments by an external review panel of active scientists.

Working groups of all workshop participants were organized by research problem areas to discuss current research progress, research gaps and needs, and the progress and structure of the program in meeting the objectives of the Presidential Initiative. The review panel and working group leaders prepared progress and evaluation reports that are now being compiled into an overall report. The reports will be used to guide future research, and to serve as a model for similar workshops to be held in the Southern and Western regions to guide future programs in Priority Components Research. A table of Critical Milestones in Research and Development follows.

**Critical Milestones:**

| | Start Date | Due Date | Completion Date | Accountable Agency |
|---|---|---|---|---|
| Assessment, Sampling & Testing Methods | | | | |
| 1. Improved methods of risk assessment | 3/90 | 12/92 | | ARS/CSRS |
| Fate and Transport | | | | |
| 1. Research planning for FY 1992 | 3/90 | 10/91 | 10/91 | ARS/CSRS |
| 2. ARS research assignments for priority components | | 1/92 | | ARS |
| 3. CSRS research proposals and grant awards priority components | (proposals)<br>(awards) | 1/92<br>7/92 | | CSRS |
| Management and Remediation | | | | |
| 1. Field evaluation begins on current systems for MSEA sites | 3/91 | 12/92 | | ARS/CSRS |
| 2. Select for accelerated development at least one new alternative management system for MSEA sites | 11/90 | Spring 92 | | CSRS/ARS/ES/SCS |
| 3. Develop systems for pesticide rinsate cleaning and disposal | 8/89 | 12/91 | | ARS/CSRS |
| 4. Release an initial set of models and decision aids | 11/90 | 12/91 | | ARS/CSRS |
| Regional Application & Transferability | | | | |
| 1. Testing application of new technology for use in a region | 3/92 | 12/94 | | ARS/CSRS/ES/SCS |
| 2. Transfer tested technology to producers across a region | 7/92 | 12/94 | | ARS/CSRS/ES/SCS |
| Social, Economic & Policy Considerations | | | | |
| 1. CSRS research proposals and grant awards priority components | 3/92 | 1/92 | | CSRS |
| 2. Midwest Initiative/MSEA sites | 3/92 | 12/94 | | CSRS/ARS/SCS/ES/EPA |
| Evaluation | | | | |
| 1. Completion of initial scientific evaluation of priority components and Midwest Initiative on Water Quality | 3/91 | 4/92 | | ARS/CSRS |

## EDUCATION, TECHNICAL, AND FINANCIAL ASSISTANCE

**Objective 1:**

Continue educational, technical, and financial assistance through Demonstration Projects, Nonpoint Source Hydrologic Unit Areas (Hydrologic Units), ACP Water Quality Special Projects, Regional Project Initiatives, and ongoing program/project activities to encourage users to voluntarily adopt profitable and environmentally sound production practices and systems, to maintain and restore water quality.

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|---|---|
| ***Completion Date:*** | *1998* |
| ***Principal Contacts:*** | *James R. McMullen, ASCS*<br>*Peter M. Tidd, SCS*<br>*Andrew J. Weber, ES* |

**Strategy:**

The existing CES, SCS, and ASCS field organizations are capable of delivering information and education, technology, and financial assistance to resolve agriculture related water quality concerns. An interagency, multiyear water quality plan (Water Quality Education and Technical Assistance Plan-1990 Update) was developed to guide program delivery.[2] Coordinated efforts are crucial to success in identifying and implementing Demonstration Projects, Nonpoint Source Hydrologic Unit Areas, ACP Water Quality Special Projects, and Regional Project Initiatives. Budget levels, including funds available for cost sharing, are the constraining factor. Additional water quality emphases and priorities are contained in the Food, Agriculture, Conservation and Trade Act (FACTA) and in the Coastal Zone Management Act Amendments of 1990.

**Progress Assessment:**

ASCS, ES, and SCS jointly chair the ET&FA committee and provide leadership and guidance needed to manage the USDA Water Quality Program Plan's Education, Technical, and Financial Assistance elements. Sixteen Demonstration Projects and 74 Nonpoint Source Hydrologic Unit Areas are in operation. Ongoing regional project initiatives were reprogrammed to add education and technical assistance activities needed to achieve Objective 1, and are on schedule. Particular areas of increased emphasis within this group are the Estuaries of National Significance.

- Implementation of the 16 Demonstration Projects and 74 Hydrologic Unit Areas is progressing as planned. Operating plans have been completed and are being implemented

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[2]This plan is supplemented by individual agency water quality operations plans.

for all Projects and Unit Areas. Annual progress reports are provided at the close of each fiscal year, with plans of work for the follow-on year. The reports received on November 1, 1991, will be combined into a Report of Project and Unit Area Progress to be available January 31, 1992.

- *Interim Guidelines for Annual Reporting of Demonstration Project and Hydrologic Unit Area Accomplishments and Impacts* have been promulgated to the projects. These guidelines identify annual reporting elements, including reduction in use or application of agricultural chemicals and manure; containment; load reduction to surface ground water; chemical, physical, and biological changes observed in water bodies; and economic impacts. The first reports were received November 1, 1991.

- A summary of the first year annual reports on 37 Hydrologic Unit Areas and 8 Demonstration Projects initiated in 1990 was produced in July 1991.

- Technical assistance was funded by the SCS for 13 Estuaries of National Significance, and 1 near Coastal Waters Project. Water quality plans are being completed for each in coordination with the Environmental Protection Agency and state agencies. Education programs that focus on agricultural nonpoint source contaminants were initiated in three Estuaries of National Importance by the ES. Their programs are coordinated at the local level with Federal and state agencies.

- An assessment of Demonstration Project Implementation for the 1990 Projects was completed. The purposes of the assessment were:

  (a) Recommend project modifications;
  (b) Review SCS/ES strategies for selecting succeeding projects; and
  (c) Develop materials and workshops to strengthen all Demonstration Projects.

An assessment report will be delivered by January 31, 1992. A table of Critical Milestones for Objective 1 of Education, Technical, and Financial Assistance follows:

**Objective 1:**

**Critical Milestones.**

| | *Start Date* | *Due Date* | *Completion Date* | *Accountable Agency* |
|---|---|---|---|---|
| 1. Selectively expand ES and SCS technical capability to ensure that an adequate level of professional support for water quality improvement is available. | October 1989 | Continuing | | ES/SCS |
| 2. Continue a coordinated approach to the revision and adoption of the SCS Field Office Technical Guide to support field water quality activities. | October 1989 | Continuing | | SCS |
| 3. Coordinate the development and implementation of water quality management practice technology as specific water quality needs are identified. Complile a resume of practices developed or planned for development, and identify additional water quality practices needed. | October 1989 | Continuing | | ES/SCS |
| 4. Implement an interagency effort for the delivery of the farmstead assessment program to rural private well water users. | May 1991 | Continuing | | ES/SCS/EPA |
| 5. Coordinate national education, technical and financial assistance, policy and program implementation procedures. | December 1989 | Continuing | | ES/ASCS/SCS |
| 6. Develop fact sheets that address causes and treatment of agriculturally related water resource problems. | October 1990 | Continuing | | ASCS/ES/SCS |
| 7. Develop water quality treatment practice standards and specifications that support water quality treatment needs. | October 1990 | Continuing | | SCS |

**Objective 2:**

- Strengthen professional and technical resources and the availability of financial resources for WQSP's within ASCS, ES, and SCS to develop and deliver education and technical assistance programs that accelerate the voluntary adoption of profitable and environmentally sound agricultural practices; and

- Develop additional field guides and professional training that maintain and broaden capabilities to deliver state-of-the-art concepts and technologies that improve agricultural chemical and waste product management.

*Completion Date:* *1992*

*Principal Contacts:* *James R. McMullen, ASCS*
*Peter M. Tidd, SCS*
*Andrew J. Weber, ES*
*Joseph Howard, Director, NAL*

**Strategy:**

Additional field guides and organized professional training on new concepts and technologies for managing chemical and waste products are required to broaden existing expertise. USDA technical capabilities must complement and support ASCS fincial efforts in addressing NPS problems and other federal and state agency endeavors. The National Agricultural Library is contributing substantially to the ETFA effort by establishing a Water Quality Information Center to develop information needed by researchers, educators, farmers, and other consumers. The scientific resources and monitoring expertise of other federal and state agencies will assist the USDA education and technical/financial assistance efforts. The technology and information transfer schedule is somewhat dependent on the availability and knowledge of specific research results. Changes to the Clean Water Act in 1992, and the recent Coastal Zone Management Act amendments will affect program and technical requirements.

**Progress Assessment:**

Developing needed technology for improved water quality practices, nutrient and pesticide standards, and water quality guidelines to field office technical guides are proceeding as scheduled. Technology workshops were completed for coordinating staffs of all Demonstration Projects and Hydrologic Unit Areas in 1991. Field staff training is progressing in most states, particularly with respect to water quality problem assessment and the application of new management practices for water quality.

- Coordinated training programs have been established in each state. Agencies have shared resources and expertise, and used joint training to ensure meeting mutual objectives. The ES continues targeted program efforts in each state to strengthen water quality education delivery to teach producers how to better manage pesticides, nutrients, animal waste, and wellhead protection. Last year, ES and SCS implemented, with EPA, a nationwide Farmstead Assessment program pilot test.

  The SCS National Water Quality Development Staff is continuing to develop water quality-related technology requested by field delivery staffs. A Technology Status Report was published on July 8, 1991, and provided progress at that time for the following items:

  Water Quality Tools Matrices
  Water Quality Model User Requirements
  A soil-pesticide Water Quality Screening
  Phosphorus Index of Transport
  Animal Waste Storage Pond/lagoon Seepage Study
  Water Budget Model
  Pesticide Strategy (EPA)
  A Soil Temperature Data Base
  Water Quality Computer Systems
  Water Quality Model Evaluation
  A soil-pesticide Water Quality Screening Procedure
  Private Rural Well Protection Video Series
  Trophic State Of Lakes
  SCS Training Study for Water Quality
  Water Balance Program
  Nitrogen Action Plan
  Water Quality Technology Notes

  A complete copy of the status report is available on request.

- The ES developed a national compendium of water quality education materials including print, audiovisual, and computer software materials. ES also originated a national information program in every county in the nation to provide public information to interpret EPA National Well Water Survey results. Shared interagency efforts are continuing to develop state-of-the-art decision aids and supporting data bases to describe impacts of agrichemicals on water quaiity. These systems help users better understand the immediate and specific dangers of practicing traditional, outmoded chemical management.

- Reducing or eliminating agricultural nonpoint source contaminants requires site recommendations specific to each site. Mechanisms were established to ensure that states would share latest production recommendations with local ES and SCS staff. Initial recommendations have focused on pesticide and nutrient reduction.

- ES and SCS have jointly developed a national Nutrient and Pest Management Standard. It provides individual state standards and specifications guidelines currently being developed and incorporated into Field Office Technical Guides.

## Critical Milestones.

| | *Start Date* | *Due Date* | *Completion Date* | *Accountable Agency* |
|---|---|---|---|---|
| 1. Selectively expand ES and SCS technical capability to ensure that an adequate level of professional support for water quality improvement is available. | October 1989 | Continuing | | ES/SCS |
| 2. Continue a coordinated approach to the revision and adoption of the SCS Field Office Technical Guide to support field water quality activities | October 1989 | Continuing | | SCS |
| 3. Coordinate the development and implementation of water quality management practice technology as specific water quality needs are identified. Compile a resume of practices developed or planned for development, and identify additional water quality practices needed | October 1989 | Continuing | | ES/SCS |
| 4. Implement as inter-agency effort for the delivery of the farmstead assessment program to rural private well water users. | May 1991 | Continuing | | ES/SCS/EP |
| 5. Coordinate national education, technical and financial assistance policy and program implementation procedures. | December 1989 | Continuing | | ES/ASCS/SCS |

## Critical Milestones Continued.

| | *Start Date* | *Due Date* | *Completion Date* | *Accountable Agency* |
|---|---|---|---|---|
| 6. Develop fact sheets that address causes and treatment of agriculturally related water resource problems. | October 1990 | Continuing | | ASCS/ES/SCS |
| 7. Develop water quality treatment practice standards and specifications that support water quality treatment needs. | October 1990 | Continuing | | SCS |

## DATA AND EVALUATION

**Objectives:**

- To develop, analyze, and report timely, statistically reliable data on the accumulated use levels of pesticide, fertilizer, and other chemical compositions.

- To evaluate the expected environmental and economic effects of a comprehensive research, education, and technical and financial assistance program to reduce potential water quality problems to agriculture.

***Completion Date:*** *1995*

***Principal Contacts:*** *Sam Rives, NASS*
*Michael LeBlanc, ERS*

**Strategy:**

Using a multiple-frame sampling approach, ERS will use a cross-sectional, time-series data collection process to determine effects on water quality of onfarm agricultural chemical use and production practices. Data collection will be done in several cycles, consisting of 3 to 4-year surveys. The first surveys were begun early in 1990, and will continue, covering all major and several minor commodities over each period before repeating the cycle. Collected data will be, at a minimum, statistically significant to states. States and other government agencies will have opportunity to add to survey funds to pay for more site- and field-specific, locally relevant data. Survey results will be summarized and distributed in print and electronic media.

A broad set of economic, social, and technical analyses are planned to identify the economic benefits and costs associated with alternative policies to improve water quality. Research, education, and technical assistance project results will be combined with chemical use and other survey data, and with information on the agricultural resource base to form an information base to analyze water quality policy. The broad set of studies will be synthesized to highlight the scope and extent of agriculture related water quality problems, the role of economic incentives and technological change for shaping the current and future use of farm chemicals, and the benefits and costs of alternative policies for improving water quality.

**Progress Assessment:**

A comprehensive evaluation strategy was completed and adopted for review of Initiative components. Agricultural chemical data development and collection has progressed in several areas, including state-level, statistically reliable estimates for a wide range of pesticides and fertilizers for several field crops and vegetables. Additional surveys are planned and will be executed in the coming year to provide data on agricultural chemical use on fruits as well as more effectively linking chemical use and economic information on major field crops. Final plans have been laid for the collection of agricultural chemical and farm practice information in a manner that can be directly related to the agricultural resource base. A study that will identify areas most likely to have a potential for ground water quality problems based on soil-leaching potentials, rainfall patterns, irrigation, pesticide-leaching properties, and chemical use information is nearing completion. A table of Critical Milestones for Data and Evaluation follows.

## Critical Milestones.

| | *Start Date* | *Due Date* | *Completion Date* | *Accountable Agency* |
|---|---|---|---|---|
| 1. Chemical Use and Production Practices Survey of cotton (14 States) | October 1989 | December 1989 | December 1989 | ERS/NASS |
| 2. Cropping Practices and Chemical Use Survey of corn, cotton, potatoes, rice, soybeans, and wheat for crop year 1990. | May 1990 | December 1990 | December 1990 | ERS/NASS |
| 2a. Publish results of survey. | | | March 1991 | ERS/NASS |
| 3. Develop evaluation strategy and distribute. | May 1990 | January 1991 | | ERS/NASS |
| 4. Conduct prototype "area study" for pesticide use, economic decisions, and water quality in Delmarva Peninsula. | June 1990 | July 1991 | August 1991 | ERS/NASS |
| 5. Develop farm-level economic assessments of demonstration and research technologies. | July 1990 | July 1992 | | ERS/SCS |
| 6. Evaluation of baseline chemical use in agriculture and potential water quality linkages. | July 1990 | July 1993 | | ERS/NASS/ ES/SCS |
| 7. Vegetable Chemical Use and Economic Survey in five major producing States for 1990 crop year. | November 1990 | June 1991 | June 1991 | ERS/NASS |
| 7a. Publish results of Vegetable Survey. | | | June 1991 | ERS/NASS |

## Critical Milestones Continued.

| | *Start Date* | *Due Date* | *Completion Date* | *Accountable Agency* |
|---|---|---|---|---|
| 8. Cropping Practices and Chemical Use Survey of corn, cotton, peanuts, sorghum, rice, soybeans, and wheat for crop year 1991. | May 1991 | December 1991 | | ERS/NASS |
| 8a. Publish results of survey | | | March 1992 | ERS/NASS |
| 9. Measure production and natural resource linkages in first round for area studies. | September 1991 | June 1992 | | ERS/NASS |
| 10. Fruit and Nuts Chemical Use and Economic Survey 1991 crop year (14 States) | November 1991 | June 1992 | | ERS/NASS |
| 10a. Publish results of survey. | | June 1992 | | ERS/NASS/ ES/SCS |
| 11. Estimate the likely adoption of demonstration and research technologies. | **STAGE 1** January 1992 | June 1993 | | ERS/NASS/ ES/SCS |
| | **STAGE 2** January 1992 | June 1995 | | ERS/NASS/ ES/SCS |
| 12. Assess the potential environmental and economic impacts of major demonstration and research technologies. | January 1992 | June 1993 | | ERS/NASS |
| 13. Measure production and natural resource linkages in second round of area studies. | September 1992 | June 1995 | | ERS/NASS |

## Critical Milestones Continued.

| | *Start Date* | *Due Date* | *Completion Date* | *Accountable Agency* |
|---|---|---|---|---|
| 14. Evaluate the probable economic and environmental effects of water quality policy actions in the area study regions. | September 1992 | September 1993 | | ERS/NASS |
| 15. Assess the likely economic and environmental consequences of a comprehensive strategy of voluntary education, technical assistance, and cost sharing programs relative to baseline conditions and other strategies. | June 1993 | September 1994 | | ERS/NASS |

# COMMUNICATIONS

**Objective:**

The USDA Water Quality Working Group's Water Quality Information Committee will develop materials to interpret USDA water quality policy and distribute information about the water quality issue as related to the food and agriculture industry.

***Completion Date:*** *1992*

***Principal Contact:*** *Patricia Calvert, ES*
*Chair, USDA Water Quality Information Committee*

**Strategy:**

The Water Quality Information Committee is composed of top information officers from each USDA agency involved in water quality at the Working Group level. This provides departmentwide coordination. The committee designed a many-pronged communication program to support Administration water quality policy and to inform the food and agriculture industry, policymakers, legislators, and the public about USDA's commitment to preserving and enhancing our nation's water supply.

**Target Audiences:**

USDA Water Quality Working Group and Subcommittees
USDA public affairs offices
USDA policy level executives not directly involved in water quality
USDA employees in general
Environmental and conservation groups
Farmers/ranchers/producers
Farm organizations and commodity groups
Communities, families, and youth
Food industry and agribusiness
Consumers
Other federal and state agencies
Legislators (federal, state, and local)
Land-grant universities and state departments of agriculture
Media
Librarians
Teachers (all grade levels, urban and rural)
Community service organizations
Other formal and informal information networks as identified
Soil conservation districts
Agribusiness (financial sources, consultants, dealers)

**Progress Assessment:**

This team continues to promote communication and information exchange among USDA agencies to better support the Department's 5-year *Water Quality Plan* and work with the USDA Water Quality Working Group. Accomplishments for 1991 include:

- Publishing and distributing four issues of the *Water Quality Update* newsletter.
- Distributing to the media several USDA press releases on key Water Quality programs.
- Providing USDA Water Quality materials to the Agriculture Journalists Conference, the Food Journalists Conference, the Farm Broadcasters' Conference, the Water Quality Working Group, the Water Quality Steering Committee, and other government agencies.
- SCS and ES developed comprehensive agency Water Quality communications plans and distributed materials widely, through their field offices, to farmers and consumers.
- ES and SCS, cooperating with ASCS, developed fact sheets on the hydrologic unit and demonstration projects.
- ES held a national satellite videoconference, "Working with the Media," as a followup to two risk communications workshops for field staff.
- ES developed a National Drinking Water Week packet in cooperation with Michigan State University and the private sector.
- ES developed an electronic bibliography of Water Quality Educational materials.

A table of Critical Milestones for Communication follows.

**Critical Milestones.**

| | Start Date | Due Date | Completion Date | Accountable Agency |
|---|---|---|---|---|
| 1. USDA Water Quality Annual Report | February 1992 | April 1992 | | All |
| 2. Media coordination and participation in WQ field days, regional workshops, project announcements, farm radio boardcasts and satellite TV releases. | January 1991 | (ongoing) | | All |
| 3. Radio actualities and Press releases for announcement of projects, study results etc., and to support and expand reach of agency contacts | February 1991 | (ongoing) | | All |
| 4. Inventory agencies' WQ initiative programs and materials for bibliography and placement in WQ information | March 1991 | July 1991 | | NAL |
| 5. Develop fact sheets on WQ demo and hydrologic unit projects and other pertinent USDA WQ projects | February 1991 | (ongoing) | | SCS/ES/ASCS |
| 6. Produce water quality issue bulletin/ newsletters for dissemination as appropriate | February 1991 | (ongoing) | | All |
| 7. Develop National Drinking Water Week materials for national dissemination | January 1992 | March 1992 | | ES |
| 8. Develop twice-a-year tabloids on major WQ educational efforts | January 1992 | (ongoing) | | ES |

## INFORMATION RESOURCES

**Objective:**

To improve access to information relevant to water quality issues by:

- Collecting, organizing, and making accessible scientific findings, educational materials, progress reports, and general information significant to the protection and enhancement of water quality.

- Developing information services, products, and networks to facilitate the dissemination of this information.

| | |
|---|---|
| ***Completion Date:*** | *1995* |
| ***Principal Contacts:*** | *Janice Kemp, Coordinator*<br>*Water Quality Information Center*<br>*NAL* |

**Strategy:**

The National Agricultural Library (NAL) serves as a major national resource for agricultural information. It is recognized as a leader in developing new technology applications to meet information needs. In 1990, NAL established the Water Quality Information Center (WQIC) to serve as a focal point of NAL's many activities related to water quality information. Through this Center, the resources and expertise at NAL will be used to improve access to information related to agricultural/agrichemical management practices and to other water quality-related issues. The Center provides information and referral services and strengthens NAL's collection and the library's bibliographic database, AGRICOLA, which provides access to this collection. WQIC develops and publishes information products targeted to the needs of researchers, educators, farmers, and other consumers. It also facilitates communication and information dissemination through the Water Information Network (WIN), a new conference on NAL's electronic bulletin board. The Center will work closely with the Working Group on Water Quality, key USDA and other governmental agencies, land-grant universities, and other groups to innovatively augment present information delivery systems.

**Progress Assessment:**

The Water Quality Information Center was established in FY 1990. Database searching, referral services, and other basic information services are now being provided to USDA agencies, other federal and state agencies, private organizations, educators, farmers, and the general public. In FY 1991, WQIC provided assistance to personnel involved in the Water

Quality Initiative from SCS, ES, and ARS. A contact network of federal, state, and nonprofit organizations interested in water quality issues is being developed.

The WIN, managed by WQIC, is now available on NAL's electronic bulletin board. This service enables persons interested in water quality issues to communicate with each other electronically. Additionally the Water Information Network alerts users to upcoming meetings, WQIC services and publications, and other pertinent information through bulletins prepared by the Center staff. Additional information services will be added to WIN in FY 1992.

Over 40 NAL bibliographies related to managing agricultural practices for water quality protection and to other water quality concerns are currently available. Significant collection development projects are underway. More than 4,500 citations related to water quality were added to the AGRICOLA database in FY 1991. Additionally, in FY 1991 the Pesticide Education, Safety, and Training Hypermedia Database (PEST), and the related bibliography of training materials, a cooperative project of NAL, EPA, and ES, were completed. These tools were developed for use by trainers of pesticide applicators, advanced practitioners, and those interested in pesticides, water quality, or pest management.

Levels of funding available for information services have forced a limited approach to the development of information products and services. Resource limitations have affected the Center's ability to plan and implement services targeted at fulfilling the needs of USDA agencies working on the Presidential Initiative for Water Quality, networking with other agencies, outreach to the public, and other activities related to improving information access. The establishment of the repository of planning documents related to agriculture and water quality mandated by the FACT Act of 1990 cannot be initiated without additional funding. A table of critical milestones for information resources follows:

## Critical Milestones:

| | Start Date | Due Date | Completion Date | Accountable Agency |
|---|---|---|---|---|
| 1. Develop user guide to WIN conference on bulletin board. | | | | |
| 2. Market WIN conference to USDA and other potential users November 1991 | April 1992 | Ongoing | | NAL |
| 3. Distribute Pesticide Education Safety, and Training Hypermedia Database and Bibliography. Support evaluation and revision of these products. | October 1991 | December 1991 | Ongoing | NAL |
| 4. Produce brochure and other promotional materials describing the WQIC. | October 1991 | May 1992 | | NAL |
| 5. Collect, catalog, and make accessible the water quality educational materials produced by the Cooperative Extension System. | July 1991 | Ongoing | | NAL |
| 6. Develop a mechanism of listing, obtaining, and making available all published documents produced as part of the Presidential Initiative on Water Quality. | November 1991 | February 1992 | Ongoing | NAL |
| 7. Conduct departmental and external reviews of prototype information packet on nitrates and drinking water (begun in FY 1991). | April 1992 | September 1992 | | NAL |
| 8. Expand on services targeted to ARS, CSRS, SCS, and ES personnel involved in water quality-related programs. | December 1991 | Ongoing | | NAL |
| 9. Develop cooperative projects with USDA and other governmental agencies to develop needed information projects. | November 1991 | July 1992 | | NAL |



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# Issue Bulletin

## Initial Report of The Water Quality Working Group

*United States Department of Agriculture*
*Second Quarter FY 1990*

In the first third of the century, when the American public was barely aware of the importance of water quality, the U.S. Department of Agriculture (USDA) began to discover some of the relationships between the way we utilize land and the stability of water supplies. This led to concerted efforts in conservation. Later, as research in that area led to knowledge about what happens to water—how it travels above and below ground, what it carries with it, how its composition changes as it moves—water quality began to emerge as a key priority for USDA. Since the 1980's, USDA has taken a leadership role in forging cooperative efforts for water quality among its own agencies and with other government organizations, with the private sector, the academic community, and neighboring countries. USDA is working at the local, state, federal, and international levels, in both rural and urban environments, to correct conditions and practices that threaten our water supply. Not only does the department work with farmers and the food industry, providing educational and practical assistance; in addition many of the materials developed by USDA teach urban and suburban citizens about pollution from pet waste and excessive use of lawn fertilizers. Researching new methods of biological control of weeds and insects (reducing use of chemicals) is fundamentally important to USDA leadership in water quality, as is soil conservation, measurement, analysis and continuing development of ever more sophisticated methods.

USDA has an obvious interest in protecting the viability of the water supply as an agricultural resource. So too, farmers themselves have a vital interest in water quality -- the land they live on and will pass on to future generations can only be farmed if safe, dependable water is available. Similarly, farmers and their families are consumers, concerned about the food they eat and the water they drink. Agriculture depends on water more than on any other element. If our water supply were ruined, so would be our food supply.

In recent years emphasis on water quality has continued to grow, and, in fact, the President has put forward a Water Quality Initiative as one of his priorities for the 1990's. This report, the first of a series by the USDA Working Group on Water Quality, will describe actions currently underway to address water quality issues now and in coming years. It will also provide a review of past activities that have led up to the current USDA emphasis on water quality.

## 1990 and Beyond

USDA's response to President Bush's Water Quality Initiative is articulated in the department's aggressive strategic 5-year plan, with a goal of implementation beginning in 1990. Secretary of Agriculture Clayton Yeutter gave significant emphasis to the mission in naming Dr. Harry Mussman as chairman of the USDA Working Group on Water Quality. Dr. Mussman is deputy assistant secretary for science and education.

Under his leadership, USDA will implement the three major components of the President's initiative: 1) research, 2) data base improvement, and 3) education and technical assistance.

As agricultural priorities shift in response to increased environmental knowledge, understanding, sensitivity, and demand, USDA has a responsibility to assist the American farmer to adjust. American farmers have contributed in a constant, dependable manner to the well-being of their fellow Americans. Our country owes a great debt of gratitude to these dedicated producers of our life sustenance. Flexibility to respond appropriately and voluntarily to the need for change will be one of the most important aspects of implementing that change.

The farmer's most important need is information about what to do to protect ground water quality. That information, as well as education and assistance to help put it in place, is the basic thrust of the USDA Water Quality Plan.

Research, education, and voluntary cooperative efforts in testing, evaluation, planning, and decision making are key components in creating our future. From the farmer to the consumer, Americans have the right to expect responsible agricultural practices which are ecologically sound while also productive and profitable. That reasonable expectation is integral to USDA's mission.

All 50 states now have completed water quality action plans for both FY 1989 and 1990. Educational programs addressing soils, nutrients, pesticides, and water quality, as well as safe drinking water and water quality assessment will be evaluated and reported to the department, the executive branch, and the Congress.

A multiple-agency team will implement eight proposed demonstration projects and document the rate and extent of adoption of recommended practices with impact on water quality.

Another multi-agency team will develop and implement 37 non-point source hydrologic unit projects in FY 1990 and begin planning for an additional 37 projects in FY 1991.

Building on needs assessment conducted in FY 1989, staff are updating the USDA Technical Guides, working cooperatively with EPA to train federal and state staffs on water quality issues.

USDA is engaged in a cooperative project with EPA and the U.S. Geological Survey to develop pesticide use databases. These will be established for crops associated with major pesticide usage and will be updated on a 5-year cycle. Another cooperative USDA effort extends from government into the private sector to develop and deliver nationally materials in support of National Safe Drinking Water Week. Regional initiatives, also cooperative, include the Midwest Initiative, the Chesapeake Bay project, and programs in the Great Lakes, the Gulf of Mexico, the Colorado River, and Puget Sound.

Approaching publication in 1990 is the third installment of USDA's strategic groundwater research plan. Introduced in 1988, the first two parts deal with pesticide and nitrate contamination of groundwater. The new release will address salinity and toxic trace elements. A fourth installment, on biological pest control, is in development. This plan seeks to guide research leading to the continued safe and economical use of chemicals in agricultural production while diminishing negative impact on water quality. The challenge of the present is to ensure the future with environmentally sound and economically feasible agricultural management practices that minimize the movement of agricultural chemicals to ground water, while maintaining farm profitability — a balance vital to the economic stability of our nation as well as to the health of our people.

Bringing to bear a wide range of knowledge in this task, USDA will need to cooperate ever more closely with state research systems and agricultural experiment stations, with the Environmental Protection Agency and Department of the Interior, drawing upon expertise in agronomy, biology, engineering, economics, entomology, geology, hydraulics, hydrology, and a range of other scientific disciplines. Communication then becomes the key to making use of new knowledge.

An important cooperative effort resulted, in 1989, in the USDA Water Quality Program plan, in effect the department's road map for developing the science and technology needed to maintain or improve water quality in the years ahead. The plan has three major goals:

- Determine the precise relationship between agricultural activities and groundwater quality.
- Develop and transfer new technology and management practices that farmers and resource managers can use.
- Develop comprehensive, consistent, periodic national data on agricultural chemicals, related farm practices, and links with the physical environment.

USDA will first concentrate on the Midwest — the largest producing area in the country for corn and soybeans, both chemical-intensive crops in conventional production. Research will particularly focus on five objectives:

1. Identify groundwater contaminants, find the starting point, and determine how they travel.

2. Develop water analysis methods to quickly and accurately ascertain contamination.

3. Develop production systems and pesticide disposal systems for onfarm use.

4. Enhance computerized decision models for farmers and technical specialists.

5. Evaluate economic and social effects of proposed changes.

USDA agencies, in cooperation with other federal agencies and the state agricultural experiment stations, will accelerate their activities through a repetitive cycle of research, development, education, and technical assistance. The goal: rapid development of scientifically based technology and rapid transfer of that technology into farm use. The time has come to translate on-shelf research knowledge into new management alternatives that farmers can use immediately. This will be done through demonstration projects already in the early stages. At the same time, continuing research is needed to develop improved science and technology — circling back through continuing education, technology transfer, and technical assistance to ensure that new developments can become the basis for enduring resource protection.

In very simple terms, USDA must offer the landowner reasonable alternatives for solving water resource concerns, must help farmers and ranchers understand and comply with federal, state, and local regulations, and must help nonagricultural people understand the agricultural perspective, in order to foster the most productive cooperation between all interested groups and individual American citizens.

The greater the flexibility allowed in the approach of the department and the food and agriculture industry to solving agricultural problems, the greater the potential for leadership and creativity in discovering the best answers and implementing them.

To understand the productive relationship of government and the industry in solving problems related to water quality, it can be helpful to trace its development backwards from the present.

## *USDA Initiatives in the 1980's*

A shift began to occur in the 1970's, as USDA moved from flood prevention and drainage to water quality management. In 1982, the USDA National Conservation Program established water quality improvement as a national concern of the U.S. Department of Agriculture. Assessing the state of water quality had become part of six major long-term USDA priorities for the decade. The program included a goal of "...zero-level discharge of toxic pollutants as soon as possible" and set policy giving "highest priority to areas where the threat to human health and safety is greatest...."

The Conservation Reserve Program authorized under the Food Security Act of 1985 protects about 400,000 acres of wetlands. Over 6,000 miles of filter strips have been installed. Soil erosion is being reduced by over 675 million tons per year on the 34 million acres under 10-year contracts.

Also beginning in 1985, a department-wide survey of past hazardous waste disposal practices assessed the scope of those problems of a persistent nature. Then, in 1988, the department embarked on a multiyear program to remedy the problems uncovered in the survey.

From 1986 to 1988, as water quality and quantity became top priorities in USDA's 1988-98 National Conservation Program, the department developed comprehensive policy on nonpoint source pollution and on ground water quality, as well as creating strategies for training and technology development. Technical training accelerated in 1988, with regional workshops conducted in conjunction with a range of government, private, and academic institutions. The workshops laid the groundwork for field office training and for state action plans integrating water quality and quantity in field office technical guides.

Department policy developed in 1987 positions USDA in the proactive mode of taking responsible, appropriate, timely action to restore, preserve, and protect water quality in ways that preclude the need to regulate use of those chemicals essential to agricultural production.

In 1988, a USDA working group established by the secretary of agriculture set out to review USDA policy on agricultural chemicals and to develop strategies for management of these chemicals. Out of this effort grew the current USDA Working Group on Water Quality. Concurrently, funded for the first time in 1988 was the Sustainable Agriculture Program designed to enhance the long-term sustainability, profitability, and competitiveness of U.S. agriculture while reducing pollution of water supplies and hazards to human health associated with excessive use of synthetic chemical pesticides and fertilizers. The Sustainable Agriculture program in 1989 included a total of 76 demonstration and research projects across the nation. Reduction of agrichemical use is a major component of each project.

Research continues on improved ways of reducing nitrogen contamination through improving the timing and amounts of fertilizer applications, accounting for "nitrogen credits" in the soil from the previous crop, and developing computer models as decision aids for farmers. One computer model, Water Erosion Prediction Project (WEPP), will help soil conservationists and farmers predict how much erosion will occur under various conditions of soil type and farm management. In the summer of 1989, field testing of WEPP began.

Continuing the Agricultural Conservation Program (ACP), with regular practices such as development of animal waste control facilities and water management control systems, an additional 53 water quality special projects have been funded just since 1988.

## *Early USDA Efforts*

The American food supply is affordable, abundant, safe, and nutritious. Americans spend less of their income on food than almost any other society. Agricultural research, education, and technology in the United States make it possible for the 2 percent of the population who are farmers to feed the entire nation as well as many others. In some countries, as much as 60 percent of the population are engaged in farming and are unable to adequately feed the people. Reaching that level of efficiency in America resulted in part from reduction in crop loss through development of chemical pest and weed controls.

As chemicals became more vital to agriculture, USDA was given responsibility for enforcing the Federal Insecticide, Fungicide, and Rodenticide Act (providing registration of pesticides for agricultural and other use), until the early 1970's when the Environmental Protection Agency (EPA) was established.

Over the last 20 years, USDA has been working to develop alternatives to these chemical controls, because the department, in the forefront on water sampling, measuring, and evaluation, found that some of these chemicals were showing up in water resources along with pollution by non-agricultural contaminants such as construction, mining, and urban runoff, and industrial waste.

Even earlier, in taking on the challenge of conservation under the department's congressionally authorized Agricultural Conservation Program (ACP) in 1936, USDA began work in an area that eventually would have a profound relationship to water quality. The department formed a farmer-government partnership to ensure the present and future of our agricultural resources, providing cost-sharing assistance to farmers and ranchers to solve water resource problems, including both water saving and water quality enhancement practices.

Many of the earliest voluntary initiatives by USDA were designed to preserve the water supply and did not directly address water quality. Fortunately, these ongoing programs have had significant influence on water quality, such as the erosion control effort begun by the department in the 1930's, which not only helped with soil productivity and flood control but also reduced sedimentation and other water contaminants. Then, in the early 1960's, USDA launched a four-state study in the South, to assess farmer use of **conservation plans,** mainly terracing and crop rotation, to reduce soil erosion and manage water runoff. The results suggested that conservation plans were reducing soil erosion by about 132 million tons a year, contributing significantly to reduction of sedimentation of southern waterways.

Other USDA initiatives have addressed water quality over the years:

- upstream flood protection reducing sedimentation **(Small Watershed Program)**
- assessment of watershed conditions affecting water quality and quantity and wildlife habitat conditions **(River Basin Survey and Investigations Program)**
- reduction of water pollution in National Forests by monitoring condition of sanitary facilities (1970)
- preservation and improvement of major wetlands, including their water quality, as habitat for migratory waterfowl and wildlife (1972 **Water Bank Program**)
- a cooperative training program for pesticide applicators developed and implemented by USDA and the Cooperative Extension System (CES) to reduce excessive pesticide use and teach responsible and

environmentally safe application and disposal, reaching more than 1.5 million chemical applicators (**Pesticide Applicator Training,** PAT)

• educational efforts in every state to discourage indiscriminate pesticide spraying and help farmers shift to biological controls, with careful monitoring of pest populations and well-timed, precise application of agricultural chemicals (**Integrated Pest Management** program in the 1970's)

• a joint program in 1977 by seven USDA agencies and a division of EPA to evaluate several alternatives developed by states for water quality management, with voluntary farmer participation (**Model Implementation Program,** 1978-82)

• cooperative assistance to rural communities (**Resource Conservation and Development Program**)

• a snowmelt-runoff monitoring program for managers of streams, reservoirs, and lakes plus farmers and ranchers concerned about irrigation and stock water management, salinity control, and water conservation (**Snow Survey and Water Supply Forecasting Program**)

• resource protection for ranchers and farmers in 518 counties (**Great Plains Conservation Program**)

• joint USDA and U.S. Department of the Interior efforts (**Colorado River Salinity Control Program**)

• cooperative efforts with state and local agencies to provide soil maps and technical data needed in solving water quality problems (**Soil Survey Program**)

• the nation's most comprehensive study available on the condition and trends of soil, water, and related resources (**National Resources Inventory**)

• conservation and development of unreclaimed surface mines (**Rural Abandoned Mines Program**)

• an experimental cooperative effort between farmers and USDA in 21 watersheds to protect lakes, streams, and ground water in a practical manner (**Rural Clean Water Program**)

• an innovative, ambitious effort involving one-on-one technical assistance to landowners to provide farmers and ranchers information and detailed plans for conservation of their resources and improvement in water quality (**Conservation Technical Assistance** to individual landowners), with accelerated on-farm conservation planning.

USDA research, often in cooperation with state agricultural experiment stations, likewise has focused on water quality for some time. Accomplishments include control devices to trap sediment in streams, practical filters for reducing movement of feedlot nitrogen to surface waters, erosion control practices that reduce surface waters, erosion control practices that reduce the movement of sediment and attached chemicals into surface waters, precision applicators and other nutrient management devices and practices that can greatly reduce amounts of nitrogen applied to crops, effective biological alternatives to synthetic pest control, environmentally safe methods of composting organic waste and disposing of sewage sludge, discovery of natural predators to control weeds, computer models for estimating environmental impact of alternative farm management practices, for example, CREAMS (Chemicals, Runoff, and Erosion from Agricultural Management Systems) and GLEAMS (Groundwater Loading Effects of Agricultural Management Systems), both developed by USDA and in extensive use internationally.

Educational efforts also have proven particularly effective. In 1975, USDA and EPA jointly published the manual "Control of Water Pollution from Cropland", which provides farmers and environmental planners with necessary information on the sources, causes, and potentials of various agricultural water contaminants. Prepared primarily by USDA scientists, it was the first in-depth treatise on these problems and remains a primary source of information and treatment methods.

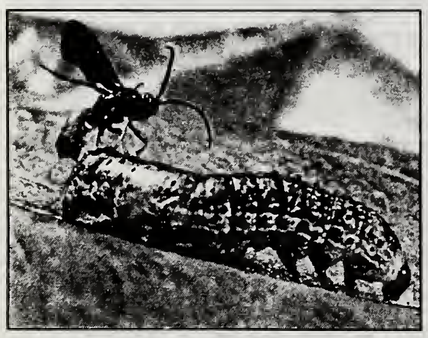
Annually, more than three million farmers, homeowners, and gardeners use soil sample testing in order to avoid unnecessary application of fertilizers. USDA staff work with local public officials in rural communities to understand the relationship between water quality and local land use and to develop effective community strategies to protect water resources. Educating the food industry, USDA has been able to help food processors revise procedures and reduce discharge of wastes into community water systems. Educating the consumer and homeowner, USDA has focused primarily on safe drinking water, well-water testing, water use and conservation, safe disposal of household chemicals and pesticides, and waste and trash recycling, with emphasis on the potential impact of individual decisions on water quality. Many agricultural producers have been trained by USDA and have adopted Best Management Practices (BMP's), that is, the most effective practical means for preventing or reducing pollutants from nonpoint sources.

USDA's vigorous programs of education and technical assistance have helped farmers and ranchers apply these and other conservation and resource management practices in millions of acres of farm and ranch land across the nation.

# Epilogue

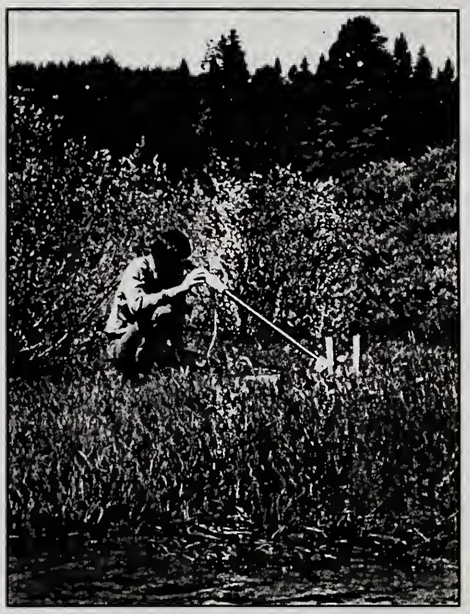
Through the years, USDA and the food and agriculture industry slowly and carefully have built a responsible, interactive, comprehensive effort toward protection of water quality. Those cooperative efforts are beginning to be reflected in measurable results. A tradition of voluntary compliance with USDA suggested conservation methods gradually has been established as educational efforts and technical assistance by USDA have permeated the industry. When the department was created, USDA's congressional mandate was to provide education to the agricultural community. That mandate is as pertinent today as it was in the 19th century. There is an ongoing need for knowledge. Now that we have reached the high level of agricultural productivity that our nation enjoys, we must continue to research and disseminate methods of production and distribution which are compatible with our relatively new knowledge about the fragility of our environment and which support the conservation of that environment.

*These are examples of biological controls that reduce levels of pesticides needed. From top:*
*A sevenspotted lady beetle captures a pea aphid, one of its favorite dinners. (0678X780-17)*
*A Mexican bean beetle larva becomes a meal for the spined soldier bug. (0484W406-3)*
*The parasitic wasp Microplitis croceipes lays her eggs in a tobacco budworm. (88BW0705-14)*

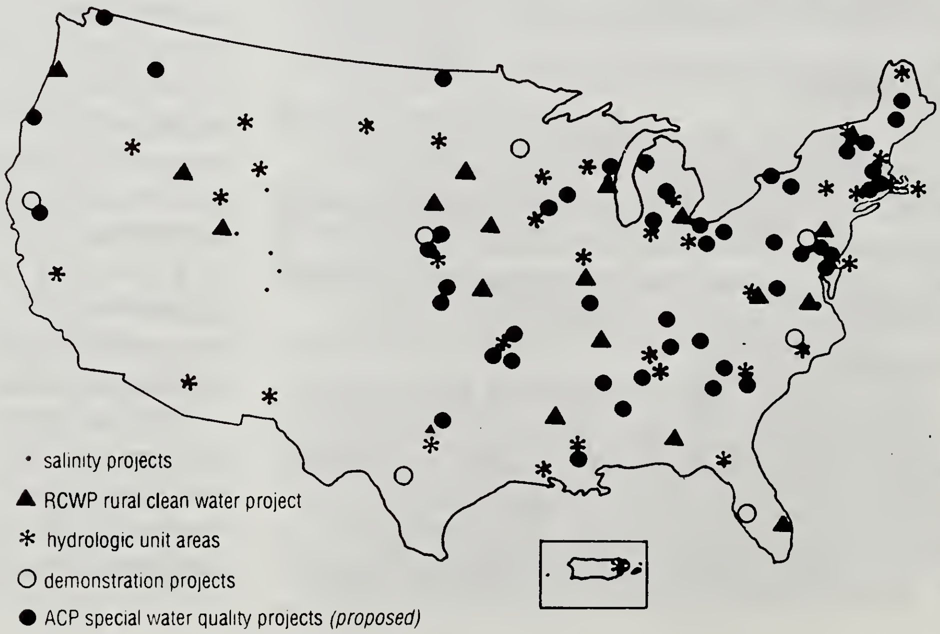


*By combining two crops with different growth cycles in the same field, water and fertilizer requirements are reduced while maintaining economically attractive production levels. This is an example of a reduced input/sustainable agriculture practice. (KS-2053-32)*

*Pesticide-degrading bacteria on the surface of a grain of sand at Plains, Georgia. Original magnification of 5,000. (88BW1165)*



*Livestock grazing, logging, mining, road building, and recreational uses can harm streambank ecology. Without the plants needed to stabilize them, soil eroding from streambanks sends sediment down to clog drinking water reservoirs, reduce fish populations, and block hydroelectric dams. Tony Svejcar of USDA works on streamside root growth. (89BW1021-31).*





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# Issue Bulletin

## Water Quality Research

### Second Report of the Working Group on Water Quality

*United States Department of Agriculture*
*June 1990*

Research is the foundation for improving water quality, as it is for other aspects of agriculture. Research will help us understand how and why agriculture contributes to contamination of water supplies. It will also lead to new technology and management systems for solving existing problems and preventing new ones.

The United States Department of Agriculture has been conducting research to improve water quality for many years. Now, with impetus from President Bush's Initiative on Water Quality, the Department has accelerated its water quality research effort. Research is developing new and improved components of environmentally sensitive farming systems, and is focusing on selected geographic areas as testing grounds for existing and new farming technologies and management techniques. Further, USDA is working more closely than ever with other Federal and State water agencies to improve water quality.

This second issue bulletin from the Working Group on Water Quality highlights the Department's water quality research program.

## The Midwest Initiative

USDA recently announced the first of what are expected to be several geographic initiatives for testing water quality practices. In the Midwest Initiative, five land areas overlying aquifers have been chosen as primary research locations called Management Systems Evaluation Areas (for additional details see back page).

In the Midwest Initiative, scientists will test promising farming practices and new management systems as well as many now in wide use. Systems selected for testing will occupy whole fields and will be subject to both environmental and economic evaluation. Scientists will measure chemical inputs and outputs along with such variables as precipitation, runoff, and the quality of ground and surface waters.

Research began this spring, and scientists hope to characterize the physical and chemical aspects of each site by the end of the growing season. New research results will be available each year, but it will take several years to evaluate farm management systems with confidence.

Scientists from USDA and the State Agricultural Experiment Stations will conduct the research with colleagues in State and local agricultural, natural resources, and environmental agencies; the U.S. Geological Survey (USGS); and the U.S. Environmental Protection Agency (EPA). They will also consult farmers, community leaders, local agribusiness interests, and environmental groups at each research site.

Why the Midwest? It's one of the most extensively farmed areas of the United States. It produces more than half of all U.S. corn and soybeans, two highly chemical-intensive crops when farmed conventionally. Pesticides used by the region's farmers have been detected in groundwater. Midwestern groundwater is also vulnerable to contamination by nitrate nitrogen, which is applied heavily to corn. The knowledge gained in the Midwest will be useful in planning research to determine environmentally sound practices for other parts of the country.

The Midwest Initiative has, in effect, merged with USGS's Midcontinent Herbicide Initiative to form a single research program studying groundwater contamination in the central United States. USGS participates with USDA and the State Agricultural Experiment Stations on a Program Management Team to coordinate the research, with assistance from EPA.

In general, USDA and State Agricultural Experiment Station scientists will be looking at the processes in the movement of agricultural chemicals through the plant rooting zone -- the upper, unsaturated part of the soil -- and into the saturated soil below. USGS scientists will examine similar processes in the lower soil and saturated groundwater system. Together, scientists from USDA, State Agricultural Experiment Stations, and USGS will address questions of chemical interactions with the entire environment, not just groundwater.

## USDA Water Quality Research in Perspective

USDA's earliest water-related research was aimed mostly at conservation and effective use, not improvement of quality. Nevertheless, improved water quality resulted from some of the research. For example, USDA researchers, often working in cooperation with State Agricultural Experiment Stations, developed conservation practices to control soil erosion and reduce movement of sediment, fertilizers, and feedlot wastes into lakes and streams. Since the Dust Bowl days of the 1930's, researchers have continued to develop new and better practices to protect millions of acres of farmland and maintain surface water quality.

As a primary area of investigation, however, water quality was largely overlooked until USDA and State researchers began to undertake nutrient and pesticide studies in the early and mid-1960's. From that point on, research on water quality became increasingly important.

In 1975, USDA and EPA jointly published the manual "Control of Water Pollution from Cropland." This two-part manual provides farmers and environmental planners with information on the sources, causes, and potential problems associated with various agricultural water contaminants. Prepared primarily by USDA scientists, it was the first in-depth treatise on these problems and remains a primary source of information and treatment methods.

Early water quality research focused on surface water because scientists believed the soil adequately filtered out contaminants before they could seep into groundwater. The discovery in the 1970's of pesticides in groundwater in several locations exploded this myth. In the 1980's, therefore, the research emphasis expanded most rapidly on problems of groundwater contamination.

## USDA Water Quality Research Plan

In January 1989, USDA's research agencies and cooperating State Agricultural Experiment Stations prepared a comprehensive plan outlining their water quality research strategies. The USDA Water Quality Research Plan focuses on protecting groundwater quality through improved chemical use and management. Its goals:

- To determine how and why groundwater contamination occurs, and how serious the problems are;
- To improve understanding of chemical leaching processes; and
- To provide timely, cost-effective ways to eliminate existing or potential problems.

The plan will expedite the development and evaluation of farm production and conservation practices that protect groundwater; that can be readily adapted to local soil, climatic, and cropping conditions; and that producers will accept and can adopt without undue economic strain. Continuing research will build on new knowledge about the source, transport, and fate of agricultural chemicals in the soil, underlying parent material, and groundwater.

The USDA Water Quality Research Plan sets forth two major strategies:

- A *geographic focus* will concentrate crop and soil management systems research on the specific water quality problems of a single area or region. The first of these geographically focused efforts are the Management Systems Evaluation Areas of the Midwest Initiative.
- *Components research* will investigate the various elements of production and conservation practices. This research will obtain basic information on the physical, chemical, and biological processes in soils that influence the fate of pesticides and nitrate used in crop production. The research will also examine how these soil characteristics relate to the chemical contamination of groundwater.

Additionally, the components research will develop new crop, soil, and water management practices that can be integrated into cropping systems and will identify the climatic, soil, management, and hydrogeologic variables that affect groundwater contamination from agricultural practices.

The key to research success is not just finding solutions. Success also comes through getting those solutions into the hands of farmers, ranchers, and other landowners. Therefore, new research results will continually be incorporated into USDA's nationwide system of water quality demonstration projects [illegible] logic unit sites (37 this year, eventually 275). Demonstration projects and hydrologic unit sites will also help identify new research needs.

[illegible] searchers and landowners choose practices that best combine resource protection and economic efficiency. The Cooperative Extension System and the Soil Conservation Service have programs in all States to incorporate findings as they become available.

## Beyond the Midwest Initiative

USDA research on the physical or environmental aspects of water quality is carried out in two general areas. One is the Agricultural Research Service (ARS), the principal in-house research agency of USDA. ARS has some 60 locations for natural resources research located strategically in all of the major crop production regions of the United States. Of these, about 50 actively conduct research on water quality.

The other general area for USDA-funded research is the nationwide system of State Agricultural Experiment Stations. Part of the work at each station is supported by funding from USDA's Cooperative State Research Service (CSRS). CSRS Special Grants for water quality research in 1990 are supporting 46 investigations in 32 States.

USDA-funded research is seeking solutions to a number of problems. These include: (1) sources, assessments, and prevention of contamination; (2) resistance, disappearance, and transport of agricultural chemicals; (3) improvement of contaminated water supplies; (4) socioeconomic implications of changing farming practices; and (5) agricultural management for water quality improvement.

ARS and the State Agricultural Experiment Stations are currently working on a number of projects. Scientists are examining pesticide and nutrient movement in the environment, methods to better target pesticides (and thus reduce amounts needed), improved disposal methods for pesticide containers, safer cleaning practices for pesticide application equipment, and improved computer-based aids for both researchers and farmers.

Research also continues on the phenomenon of preferential flow -- the rapid movement of water and associated chemicals through worm and root channels and natural fissures in soil and rock instead of filtering slowly and evenly through the soil.

In addition to physical, biological, and chemical research, USDA is also conducting research on the economic effects of water quality practices and technologies, and on the broader economic implications of water quality policies in the agricultural sector.

This research, which is being conducted by the Economic Research Service (ERS) and the State Agricultural Experiment Stations, identifies:

- The relationship between agricultural policy and programs and water quality;
- Water pollution's economic costs to Americans;
- Socioeconomic impacts of various water quality policy options.

ERS and the State Agricultural Experiment Stations will also integrate data from the physical research to study the farm-level economic impacts of policy alternatives. Such concepts as cropping sequences, biological pest controls, and economical farming practices designed to improve water quality will be incorporated into the analyses in a whole-farm context.

The experimental data needed for the economic assessments will help scientists design alternative farming practices. ERS and State economists will also evaluate the economic impacts of the adoption of new practices throughout the country.

## Preventing Groundwater Contamination

It is clear that pesticides, fertilizers, and other agricultural chemicals are contaminating groundwater supplies. Groundwater contamination is therefore a major concern within the Federal Government and in farming communities.

Yet the exact source of much of this contamination remains unclear. In addition to field application of agricultural chemicals, groundwater pollution can originate in disposal sites for pesticide application equipment, chemical transfer points, septic systems, barnyards, and elsewhere -- especially where such sites are near wells. Wells that are improperly installed or in poor repair can provide a rapid conduit for groundwater contaminants.

Current and future research needs to more fully determine the impact of these contamination sources and must develop improved techniques and technology that farmers can use to minimize the introduction of excess chemicals into the environment.

# Management Systems Evaluation Areas

## Iowa

Evaluation of the Impact of Current and Emerging Farming Systems on Water Quality. (ARS Soil Tilth Laboratory, Ames, Iowa; and Iowa State University)

**Objectives:** Quantify physical, chemical, biological factors affecting fate and transport of agricultural chemicals; determine effects of farm management practices on water quality, locally and throughout the research area; evaluate socioeconomic effects of current and newly developed management.

## Minnesota

Northern Corn Belt Sand Plains Proposal. (ARS Soil and Water Management Research Unit, St. Paul, Minnesota; the University of Minnesota; North Dakota State University; South Dakota State University; and the University of Wisconsin)

**Objectives:** Evaluate influence of farm management practices on water quality; assess economic and social characteristics of various farming systems; evaluate influence of new technologies on water quality.

## Missouri

Alternate Management Systems for Enhancing Water Quality of an Aquifer Underlying Claypan Soil. (ARS Cropping System and Water Quality Research Unit, Columbia, Missouri; and the University of Missouri)

**Objectives**: Assess influence of various cropping sequences for potential effects on water quality, including evaluation of the profitability of different systems; evaluate fundamental processes responsible for fate and transport of agricultural chemicals on claypan soils.

## Nebraska

Management of Irrigated Corn and Soybeans to Minimize Groundwater Contamination. (ARS Soil and Water Conservation Research Unit, Lincoln, Nebraska; University of Nebraska; and Kansas State University)

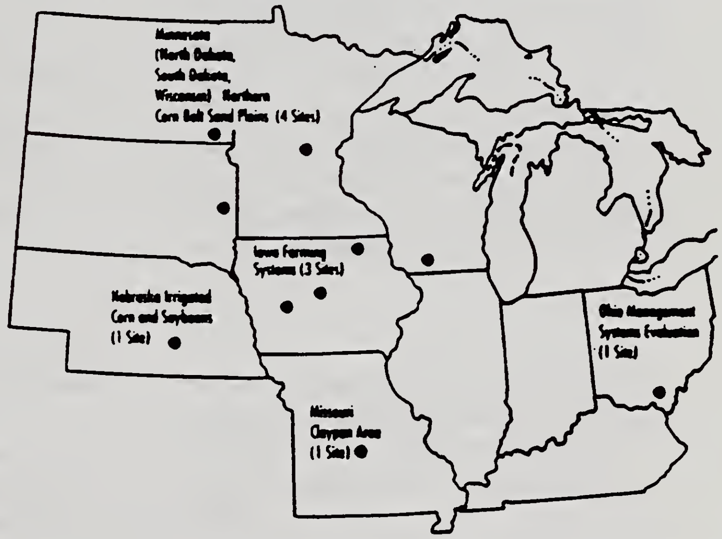
**Objectives:** Evaluate physical and economic effects of current and new management and technologies on pesticide and nitrate contamination of groundwater; assess attitudes and other social factors that influence producers' acceptance of alternative practices.

## Ohio

The Ohio Buried Valley Aquifer Management Systems Evaluation Area. (ARS Soil Drainage Research Unit, Columbus, Ohio; and Ohio State University)

**Objectives:** Develop improved farm management systems and practical predictive models and expert systems; develop comprehensive education programs and materials for both the agricultural community and the general public.

***MSEA's – USDA Midwest Initiative***

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# USDA Working Group on Water Quality

## Progress Update #1, February 12, 1990

### About This Letter

From time to time, USDA's newly formed Working Group on Water Quality will issue brief progress updates to executives in the Department. All updates will be presented on this letterhead.

The Working Group on Water Quality is one of six such teams already assembled in the Department, all reporting directly to deputy secretary Parnell under the authority of the Secretary's Policy Coordination Council. The others: Climate Change; Food Safety/Pesticide Legislation; Food Safety Data Initiative; Commercialization of Industrial Agricultural Products; and Rural Development.

The importance of water quality has been underscored by the President's Water Quality Initiative, which defines a vigorous effort to protect ground and surface water from potential contamination from agricultural chemicals and wastes, especially pesticides and nutrients.

### About the Working Group

The Working Group on Water Quality is chaired by Dr. Harry C. Mussman, deputy assistant secretary for Science and Education. It is made up of the appropriate under and assistant secretaries and representatives of the following agencies:

- Agricultural Research Service;
- Agricultural Stabilization and Conservation Service;
- Animal and Plant Health Inspection Service;
- Cooperative State Research Service;
- Economic Research Service;
- Extension Service;
- Farmers Home Administration;
- Forest Service;
- National Agricultural Library;
- National Agricultural Statistics Service;
- Soil Conservation Service.

The working group will also work closely with three other federal agencies—the Environmental Protection Agency; the National Oceanic and Atmospheric Administration, U.S. Department of Commerce; and the U.S. Geological Survey, U.S. Department of the Interior—to coordinate overall federal water quality policy.

### The Objectives of the Working Group

The working group first met on December 7 and reviewed its objectives:

- To review, and revise if necessary, USDA's existing policy on water quality;
- To ensure coordinated Departmental action;
- To coordinate USDA's water quality work with that of other federal agencies;
- To inform the public regularly of USDA's progress and initiatives in water quality.

### USDA Water Quality Policy

One subgroup of the working group, chaired by Vivan Jennings of the Extension Service, is now analyzing USDA's current water quality policies with an eye toward updating them to meet current needs. The subgroup's forthcoming recommendations will ensure that USDA maintains a high profile and a leadership position on this issue.

## Committee Structure

A second subgroup, chaired by Wilson Scaling of SCS, recommended the formation of three separate committees:

• Education and Technical Assistance Committee, co-chaired by ES and SCS;

• Research Committee, co-chaired by ARS and CSRS;

• Data Base and Evaluation Committee, co-chaired by ERS and NASS.

An executive committee will advise the group on policy, program direction, and legislative strategies. An interagency committee will coordinate the group's activities with other federal, state, and local agencies, interest groups, and the public. A public affairs issue management team will develop and carry out a strategy for a water quality public information effort under the guidance of the working group.

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## Reciprocal Meetings With USGS

On December 19, policy officials from the U.S. Geological Survey came to the South Building to brief the working group on USGS programs. On January 25, Dr. Mussman and others from the working group briefed USGS on their turf. What became clear from these meetings is that in demonstration projects and at hydrologic sites, there are many opportunities for joint projects in collaboration with USGS.

---

## H.R. 3574

Rep. Fred Grandy of Iowa has introduced H.R. 3574, a groundwater infrastructure bill that would establish an independent director of groundwater policy and coordination within USDA. The bill's intent is to institutionalize and coordinate USDA's groundwater activities and to make USDA more aggressive in dealing with groundwater concerns and problems.

Staffers from Rep. Grandy's office attended a recent meeting of the working group to explain the intent and provisions of the bill. The Department will continue working with Rep. Grandy and his staff to further improve on water quality alternatives within the Department.

---

## EPA Well Water Survey

EPA has recently completed fieldwork for a nationwide survey of pesticide and nitrate contamination of rural wells and is currently analyzing data from the survey. This survey could be a good starting point in zeroing in on specific problem areas for well water contamination.

Harry Mussman

**Harry C. Mussman**
Chairman, USDA Working Group
on Water Quality

*If you have questions or comments, please contact Jim Benson, Agricultural Research Service, Beltsville, MD; telephone 344-4504. This update may be photocopied.*

# Update on **Water Quality**

*United States Department of Agriculture*

## Progress Update #2, March 30, 1990

### USDA Announces Water Quality Projects

The Department has announced the selection of 37 hydrologic unit areas, 8 demonstration projects, and 39 special projects for addressing water quality concerns. (See the map on the back of this letter.) Representing a national cross-section of nonpoint source problem treatments, these projects are part of USDA's accelerated water quality effort for the 1990's.

Planning for these new projects is already underway, and we expect all to be fully operational by late summer.

### Hydrologic Unit Areas

The 37 hydrologic unit areas are watersheds with identified nonpoint source water quality problems. These initial areas were selected according to the severity of water contamination, kind of contaminant, and feasibility of treatment. With assistance from cooperating agencies, local landowners will apply conservation practices to meet State water quality goals without undue economic hardship.

ES and SCS will jointly administer this part of USDA's Water Quality Program Plan. ASCS will provide cost-sharing for appropriate water quality practices. ES will work with Cooperative Extension in each State to provide local landowners with information, including specific recommendations on use of nutrients and pesticides and IPM techniques and programs. SCS will provide similar information and in addition will help landowners evaluate problems and select and install water quality practices. ERS will evaluate the cost-effectiveness of alternative management practices and collect data for broader applications. EPA, USGS, and State and local agencies will be involved in both implementation and evaluation.

Plans are to select 37 more hydrologic unit areas for next fiscal year and eventually to target assistance to 275 hydrologic unit areas nationwide.

### Demonstration Projects

The eight demonstration projects are primarily educational and technical assistance efforts for showing farmers and ranchers cost-effective new agricultural production techniques and systems that minimize movement of pesticides and nutrients into water supplies.
Elements of these systems will include nutrient management, alternative cropping systems, IPM, alternative pest control strategies, appropriate chemical application and disposal techniques, and integration of weather data into farm decisions.

The projects will demonstrate not only that environmental protection and profitable farm production are compatible, but also that agriculture is taking the lead in solving agricultural problems. The goal is to accelerate the adoption of water quality technology that has been developed but that hasn't yet been widely recognized and used.

ES and SCS share leadership for planning and setting up the projects, with assistance from appropriate State and local agencies. ASCS will provide cost-sharing for participating farmers. ARS and the State agricultural experiment stations, using CSRS grants, will provide research support. ERS will cooperate with ASCS, ES, and SCS in evaluating the effectiveness of the projects, both from the viewpoint of individual farmers and for gathering regional and national data. EPA and USGS will help collect and analyze data.

Another eight locations for demonstration projects will be identified next year. Eventually, there will be 24 projects representing different agricultural, soil, and geologic conditions across the country.

## Special Projects

The 39 special projects will extend cost-sharing assistance to farmers and ranchers for installing approved water quality practices under the Agricultural Conservation Program. Practices installed will reduce nonpoint pollution stemming from animal waste, fertilizers, pesticides, and sediment.

ASCS will administer the program. ES and SCS will provide education support and technical assistance to parcipating farmers and ranchers. All 39 projects have been funded and many are already in operation.

## Expectations

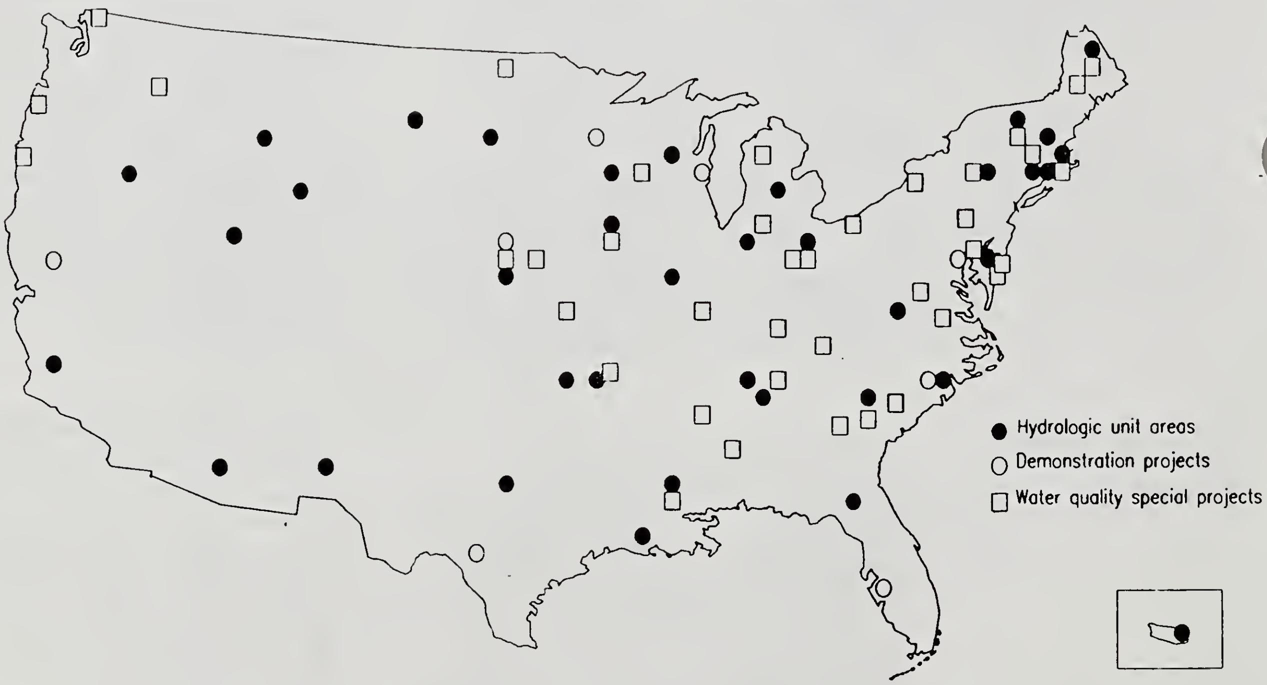
Hydrologic unit areas, demonstration projects, and special projects will encourage landowners to respond voluntarily and independently to water quality concerns and farm or ranch management needs. As new technology becomes available, it will be used at existing and new locations.

However, although reductions in pollutant loading can be achieved relatively quickly, it may take years for improvements in water quality—especially groundwater quality—to become evident.

Harry Mussman

**Harry C. Mussman**
Chairman, USDA Working Group
on Water Quality

Approximate locations of hydrologic unit areas, demonstration projects, and special projects




*For more information on hydrologic unit areas or demonstration projects, contact Pat Calvert, ES, 447-6133, or George Stapleton, SCS, 447-5240. For information on water quality special projects, contact Ray Waggoner, ASCS, 447-5237. This letter may be photocopied for further distribution.*


*Published by the Office of Public Affairs' Water Quality Issue Team*

# Update on Water Quality

*United States Department of Agriculture*

## Progress Update #3, April 18, 1990

### EPA, USDA Continue Cooperative Efforts

Marion Mlay, director of the Environmental Protection Agency Office of Groundwater Protection, explained aspects of EPA's groundwater policy at the April 6 meeting of the Working Group on Water Quality. She described EPA's new efforts through its Ground-Water Task Force to develop a Statement of Ground-Water Principles and a new Policy on State/ Federal Relations. According to EPA's Statement of Ground Water Principles, dated January 19, 1990, the "overall goal of EPA's Ground-Water Policy is to prevent adverse effects to human health and to protect the environmental integrity of the nation's ground-water resources." Since USDA's efforts are focusing on prevention, EPA's and USDA's philosophies are moving in the same direction.

Because prevention is far more economical in the long run than cure, EPA and USDA figure to be permanent partners in water quality activities. Already, USDA and EPA work together on the President's Water Quality Initiative through State water quality efforts, data management, and research. The agencies have exchanged staffers on long-term details. Staffers from both agencies meet frequently to exchange ideas and formulate cooperative working plans. Also, Secretary Yeutter and EPA Administrator William Reilly testified jointly on water quality before the Senate Agriculture Committee last January. *Contact: Jim Meek, OSEC, 447-5035*

### Revised USDA Groundwater Policy Expected Soon

The ad-hoc subcommittee for USDA groundwater policy has issued a second draft policy for comment within the Working Group. The policy is close to completion and should be available soon to supercede the current policy, as set forth in Secretary's Memorandum 9500-8 (November 9, 1987). The subcommittee is also developing recommendations for revising USDA's nonpoint source water quality policy, contained in Secretary's Memorandum 9500-7 (December 5, 1986). *Contact: Pat Calvert, ES, 447-6133*

### SCS-ES Water Quality Meetings Held, More Scheduled

A March 13-15 meeting in Washington brought together ES and SCS water quality coordinators from each state to review USDA's water quality educational and technical assistance goals and objectives. The two agencies have also announced that regional meetings will be held at four sites this spring and summer: Little Rock, AR, April; Providence, RI, June; Reno, NV, July; and St. Paul, MN, August. These regional meetings will focus on technology transfer and local coordination. *Contact: Pat Calvert, ES, 447-6133; George Stapleton, SCS, 447-0527*

### ASCS Adds Another Water Quality Special Project

ASCS has added another water quality special project to the ones already announced and highlighted in the March 30 update. The newest addition is Peacheater Creek, Adair County, Oklahoma, which brings the total of water quality special projects to 40 for fiscal year 1990. *Contact: Ray Waggoner, ASCS, 447-5237*

**Selection Process Begins for 1991 Water Quality Projects**

The March 30 update outlined progress in establishing water quality special projects, water quality demonstration projects, and hydrologic unit areas across the country. In March, ASCS, ES, and SCS issued a joint request for proposals on additional special projects, demonstration projects, and hydrologic unit areas to be implemented in 1991. Sites will be selected this summer. Funding and operations are scheduled to begin October 1, 1990, the first day of fiscal year 1991. *Contact: Ray Waggoner, ASCS, 447-5237 (special projects); Pat Calvert, ES, 447-6133, or George Stapleton, SCS, 447-0527 (demonstration projects, hydrologic unit areas)*

**States Enact Water Quality Legislation**

State legislatures are more frequently willing to enact water quality legislation, according to a recent article in *Successful Farming* magazine. The story reports that more than 300 groundwater protection bills were introduced in 44 States last year, and at least 84 of those bills are now law. In general, the States favor manditory controls on agricultural point source pollution and voluntary adoption by farmers and ranchers of Best Management Practices to reduce agricultural nonpoint source pollution. Some states are now taxing fertilizer sale or use to fund environmental activities. *Contact: Kevin Pifer, OPA, 447-6643*

**Water Quality Research Sites Announced**

The research and Development Committee has announced the selection of five Management System Evaluation Areas (MSEA's) in the Cornbelt. These research sites are located in Ohio, Minnesota, Iowa, Nebraska, and Missouri. More details on these in a later update. *Contact: Jim Benson, ARS, 344-4504*

Harry Mussman

**Harry C. Mussman**
Chairman, USDA Working Group
on Water Quality

*Published by the Office of Public Affairs' Water Quality Issue Team*

# Update on **Water Quality**

*United States Department of Agriculture*

## Progress Update #4, May 21, 1990

### USDA Announces Midwest Research Initiative

The Research Committee of the USDA Working Group on Water Quality has chosen five areas overlying aquifers in nine Midwestern States as primary locations for new water quality research. The research will lead to better understanding of the dynamics of groundwater contamination by agricultural chemicals and better practices and technologies for lessening the risk of contamination.

Scientists from the Agricultural Research Service, State Agricultural Experiment Stations (working with Cooperative State Research Service Special Grants), and U.S. Geological Survey will conduct collaborative research. State and local agricultural, natural resources, and environmental agencies and the U.S. Environmental Protection Agency will cooperate. The researchers will consult farmers, community leaders, local agribusiness interests, and environmental groups at each site.

### Why the Midwest?

The Midwest is one of the most intensively farmed regions of the U.S. It produces more than half of all U.S. corn and soybeans—crops that normally are grown with large inputs of pesticides and fertilizers. Some pesticides used by the region's farmers have been detected in groundwater. Midwestern groundwater is also vulnerable to contamination by nitrate nitrogen. The lessons of the Midwest, therefore, should have broad national significance.

### Cooperation With USGS

USDA's Midwest Initiative is a combined effort with the U.S. Geological Survey's Mid-Continent Herbicide Initiative. A Program Management Team from ARS, the State Agricultural Experiment Stations, USGS, and the Environmental Protection Agency is providing overall coordination and management for the initiative.

In general, USDA and State research will focus on the upper, unsaturated part of the soil, including the rooting zone; USGS will emphasize the underlying unsaturated soil and parent material and the saturated groundwater system. However, at times both USDA and USGS researchers will likely work in all parts of the hydrologic continuum. USDA, State, and USGS researchers together will address questions of chemical interactions with the entire environment, not just groundwater.

### Study Areas

A USDA panel selected five research proposals to establish Management Systems Evaluation Areas (MSEA's) for the Midwest/Mid-Continent Initiative. Criteria for selection included: Past and present farming systems; climatic, soil, topographic, geological, and groundwater characteristics; and expected collaboration in support, planning, and implementation.

MSEA's will allow scientists to evaluate the performance of management systems on field- to farm-size units—areas large enough to support economically and environmentally significant agricultural production systems. Associated research projects of focused experiments, designed for more precise measurements or more intensive sampling, will also be carried out.

Full characterization of sites and installation of sampling equipment, instrumentation, and cropping systems will begin this growing season. Most MSEA's will be fully operational by next year, and the rest by 1992.

Primary study areas will be located in Iowa, Minnesota, Missouri, Nebraska, and Ohio. Research associated with the Minnesota site will be conducted in North Dakota, South Dakota, and Wisconsin.

## Objectives

The Midwest/Mid-Continent Initiative will evaluate the influence of farming practices and systems on groundwater quality and assess the economic and social characteristics of various farming systems needed for enhancement of water quality. As with any research, the ultimate goal is technology transfer. Consequently, the nationwide network of water quality demonstration projects, special projects, and hydrologic unit areas will provide further testing grounds and points of technology transfer for systems tested on the MSEA's.

Technology transfer is built into the MSEA's. The Cooperative Extension System and the Soil Conservation Service are involved in program planning, and they are developing education and action programs that will tie in with the MSEA's.

## Other Research

The Midwest Initiative is only part of ongoing USDA research on water quality. The USDA Water Quality Research Plan, published in January 1989, calls for two distinct kinds of research. *Geographically focused systems research* includes regional initiatives such as the Midwest Initiative.

The second kind of research, called *Priority components research,* includes:

• Obtaining information on the basic physical, chemical, and biological processes that determine movement of contaminants through soil into groundwater;

• Developing new farm management practices;

• Identifying the climatic, soil, and hydrogeologic variables that affect groundwater contamination from agricultural practices.

Priority components research at State Agricultural Experiment Stations (supported by CSRS Special Grants) and in ARS is investigating sources and prevention of contamination; breakdown and transport of agricultural chemicals; remediation; socioeconomic implications of changing farming practices; and agricultural management and water quality. Additionally, ongoing research in the Economic Research Service and in the States is addressing the economic implications of various farming and policy alternatives at farm, regional, and national scales.

Harry C. Mussman

**Harry C. Mussman**
Chairman, USDA Working Group
on Water Quality

*Published by the Office of Public Affairs' Water Quality Issue Team*

# Update on **Water Quality**

*United States Department of Agriculture*

## Progress Update #5, July 2, 1990

### Water Quality Policy Revision Nearly Complete

The Working Group has revised existing USDA water quality policies. A single, comprehensive USDA policy for water quality protection and enhancement is being developed to replace the two existing USDA water quality policies—on groundwater quality and nonpoint source contamination. The final draft policy has been forwarded to the Secretary's Policy Coordinating Council for approval and signature by Secretary Yeutter. *Contact: Vivan Jennings, ES, 202-447-5623.*

### SCS-EPA Workshop Held

The annual SCS-EPA water quality workshop was held May 7-10 in Seattle, WA, to strengthen coordination of water quality programs between the two agencies. Major focus of the workshop was discussion of problems encountered in project implementation under Section 319 of the Clean Water Act.

Seattle was selected as the site for this year's workshop because it allowed participants to view water quality treatment results in the Puget Sound National Estuary. Also, the EPA region that includes Seattle is the only one with water quality liaison officers from three USDA agencies (ES, FS, and SCS). *Contact: Peter Tidd, SCS, 202-382-1870.*

### Research Funds Transferred to Midwest

ARS and CSRS have transferred funds to researchers in the five Management Systems Evaluation Areas (MSEA's) in the Midwest Initiative. (See Update #4.) States, other Federal agencies, and industry are contributing an additional $2.3 million in funds and equipment to supplement the $4 million in Federal funding for the research. *Contact: Dick Amerman, OSEC, 202-447-5979.*

### AGU to Include Water Quality Session at December Meeting

Two members of the MSEA program management team, Charles Onstad, ARS, and Michael Burkart, USGS, have been asked to organize a half-day session, "Agricultural Chemicals and Water Quality," at the December American Geophysical Union Western Meeting in San Francisco. They have called for papers on the following topics: (1) processes affecting fate of nutrients and pesticides; (2) occurrence of these chemicals in the hydrologic system; (3) agricultural practices that reduce risk of chemical contamination of water; and (4) methods of evaluating chemical contamination over large areas. *Contact: Dick Amerman, OSEC, 202-447-5979.*

### Water Information Clearinghouse Established

USDA is cooperating with the U.S. Geological Survey in establishment of a water information clearinghouse at USGS. USGS's charges from Congress are to disseminate information on groundwater protection and on remedies for contaminated groundwater, and to explore the relationship between the quality of ground and surface waters. *Contact: Janice Kemp, NAL, 301-344-3875.*

## 1990 Projects Reviewed, '91 Projects Planned

ASCS, ES, and SCS held a successful regional water quality technology exchange meeting June 5-7 in Providence, RI. EPA and USGS were also represented at the meeting. Planners and leaders for current demonstration projects, hydrologic unit areas, and special projects in the Northeast exchanged ideas on successes, problems, and procedures for these projects.

This was the second of four planned regional technology exchange meetings. The first was held in Little Rock, AR, in April; the next will be in Reno, NV, on July 17-19; and the final meeting will be in St. Paul, MN, Aug. 14-16.

Interagency teams from ASCS, ES, and SCS have received and are reviewing proposals for fiscal year 1991 demonstration projects, hydrologic unit areas, and water quality special projects. The agencies are planning to select 1991 projects during the summer. *Contact: Jim McMullen, ASCS, 202-447-6221; Fred Swader, ES, 202-447-5369; Peter Tidd, SCS, 202-382-1870.*

## Fact Sheet on Water Quality Projects Available

ASCS, ES, and SCS have jointly prepared and issued a fact sheet on the 37 hydrologic unit areas, 8 water quality demonstration projects, and 40 water quality special projects. (See Update #2.) The fact sheet describes the three kinds of projects and lists the name and location of each. *Contact: Ray Waggoner, ASCS, 202-447-5237; Pat Calvert, ES, 202-447-6133; George Stapleton, SCS, 202-447-4543.*

## Minnesota Water Quality Tour Planned

Federal water quality policy and program leaders will get a firsthand look at research and demonstration projects in Minnesota. EPA and USDA have organized a trip for July 9-11 to brief some 30 selected officials in USDA, EPA, NOAA, and USGS on:

- *Existing research results* being applied by farmers at the Anoka Sand Plains demonstration project, a cooperative project of ES and SCS;
- *Planned research* at the Northern Corn Belt Sand Plains Management Systems Evaluation Area, conducted cooperatively by ARS, CSRS, the Minnesota Agricultural Experiment Station, and USGS;
- *Research needs*, and how the various agencies will identify and support needed investigations.

A major purpose of the tour is to ensure continued coordination of research and technology transfer among the Federal agencies with water quality programs.

The Minnesota Pollution Control Agency and the University of Minnesota Center for Agricultural Impacts on Water Quality will also be involved. *Contact: Lee Bridgman, EPA, 202-382-5691.*

Harry Mussman

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*Published by the Office of Public Affairs*
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# Update on **Water Quality**

*United States Department of Agriculture*

## Progress Update #6, July 13, 1990

### NAL Establishes Water Quality Information Center

The National Agricultural Library is establishing a Water Quality Information Center (WQIC) this fiscal year. As one component of USDA's coordinated water quality plan, the Center anticipates disseminating information on water quality and is seeking ways to facilitate communication among professionals, organizations, governmental agencies, and the public.

WQIC provides a variety of services, such as assistance in locating information and referrals to other agencies, organizations, and individuals. Other services are being planned. Because WQIC is in its formative stages, this is an opportune time for other agencies to share their ideas about what kind of information is needed, who needs it, and what format would be most useful. WQIC is especially interested in developing innovative collaborations that will make water quality information more accessible to those who need it. *Contact: Janice C. Kemp, NAL, 301-344-4077.*

### Water Quality Conference Planned

USDA, USGS, and EPA are jointly planning a major water quality conference, "Interagency Progress and Perspectives on the President's Water Quality Initiative," for February 6-7, 1991, in Crystal City, VA. Researchers and staff from Federal executive agencies, legislative offices, State agencies, and environmental, conservation, agricultural, and other organizations will be invited.

The conference will initially focus on cooperative water quality research programs, including various components of the Management Systems Evaluation Area research sites in the Midwest. The second day of the conference will cover USDA's education and technical assistance program, including existing and proposed demonstration projects; discussions of decision aids for researchers, field technicians, and farmers; and data development, assessment, and analysis. *Contact: Charles A. Onstad, ARS, Morris, MN, 612-589-3411.*

### OTA Releases Groundwater Report

Despite considerable uncertainty about the full extent and implications of agrichemical contamination of groundwater, it is clearly an issue of public policy. This is the conclusion of the Office of Technology Assessment in a recently released 78-page summary of their report *Beneath the Bottom Line: Agricultural Approaches to Reduce Agrichemical Contamination of Groundwater*. The full report is scheduled for release in August.

The report describes the primary issues of agrichemical contamination of groundwater, discusses the ways in which agricultural chemicals enter groundwater, and assesses agricultural technologies and management systems that might reduce contamination. It explores policy options for information collection and management as well as for coordination and management of government programs. It also examines incentives, regulations, and education as means for improving water quality. *Contact: Alison Hess, Project Director, Food & Renewable Resources, OTA, (fax) 202-228-6098.*

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*Published by the Office of Public Affairs*
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# Update on **Water Quality**

*United States Department of Agriculture*

## Progress Update #7, August 10, 1990

### The Data and Evaluation Committee

The Data and Evaluation Committee of the USDA Working Group on Water Quality is co-chaired by the Economic Research Service (ERS) and the National Agricultural Statistics Service (NASS). Two basic questions guide the Committee's efforts: (1) What are the levels and composition of pesticide and fertilizer use? (2) What are the economic and environmental implications of various practices and programs to reduce potential water quality problems?

### Activities Planned

Three data collection activities are underway to help answer questions associated with aggregate chemical-use patterns. These data are important not only to the President's Water Quality Initiative, but also to USDA's Food Safety Data Initiative, benefits assessments, and other pesticide-related activities. The planned data activities are a cropping practices survey, a whole-farm chemical use and economic survey, and area study surveys.

In addition to the surveys, the Committee is exploring ways to coordinate related data from the Research and the Education and Technical Assistance components of USDA's Water Quality Program to assist in practice and program evaluation.

### Cropping Practices Survey

Beginning this summer, NASS will survey producers of major field crops, including corn, soybeans, wheat, cotton, rice, and potatoes. Major items of interest include pesticide- and fertilizer-use levels by crop, acreage, yields, method of application, and tillage and planting operations. Fertilizer and pesticide information will reveal active ingredients used. Future plans are to extend coverage to include other field crops such as peanuts, tobacco, and sorghum. The plan is to report on agricultural chemical use at a State level of statistical reliability beginning in early 1991.

### Whole-Farm Survey

The whole-farm chemical-use and economic survey will provide data for economic analysis of fertilizer and pesticide-use policies. Using whole-farm data, analyses can be conducted on crop substitution, input substitution, and input-crop substitution opportunities under different chemical-use situations.

In 1990, a survey of pesticide use on vegetable crops will be conducted in five States: Arizona, California, Florida, Michigan, and Texas. The survey will cover about 80 percent of U.S. fresh-market vegetable production. Plans call for surveying fruit and nut producers in all major fruit- and vegetable-producing States in 1992.

The whole-farm survey will collect data permitting a better understanding of production practices, decisions, and responses for assessing the economic trade-offs in pesticide-use adjustments.

## Area Study Surveys

Surveys of selected geographic areas will help clarify the linkages between fertilizer and pesticide applications, environmental characteristics, and potential water quality concerns. Comprehensive farm information will be tied to natural resource data.

The surveys will be conducted by NASS and ERS in close cooperation with other USDA agencies and others, including the U.S. Geological Survey and Environmental Protection Agency. The first area study site is the Delmarva peninsula. Other area studies are under consideration to cover the range of major agricultural activities and natural resource conditions.

## 1989 Cotton Survey

As a pilot test, NASS and ERS conducted a survey of cotton producers in 14 Southern and Western states in the fall of 1989. Information from the survey provides a comprehensive accounting of field applications of pesticides and fertilizers on the 1989 cotton crop. The survey also provided an opportunity to test data collection procedures and begin the accumulation of chemical-use data that will cover all major field crops, vegetables, fruits, and nuts by 1993.

Detailed analysis of the survey, which accounted for production practices on 10.2 million cotton acres, is currently underway within ERS. Results will be released as studies are completed. Some highlights of the survey:

- Ninety-eight percent of the surveyed acreage received one or more applications of pesticides—herbicides, insecticides, fungicides, dessicants/defoliants, and growth regulators—in 1989.
- The proportion of cotton acres fertilized ranged from 65 percent in the Southern Plains to over 98 percent in the Delta and Southeastern states.
- Nearly 60 percent of cotton farmers use commercial scouting programs as part of their pest management programs. Scouting involves systematic visits to cotton fields to determine insect presence and population levels followed by specific control measures as needed. This practice was most intensively used in the West, with an average of 25 field visits.
- About 40 percent of the cotton acreage contained a well within the surveyed field, and three-quarters of the acreage was within one-half mile of a well. In most cases, either the well had not been tested for potential chemical contamination or respondents did not know whether testing had been done. Just over 20 percent of the acreage was within 1 mile of a river or stream, and nearly half was within 1 mile of a pond or natural lake.

Future analyses will explore the possible relationship between chemical applications on cotton and natural resource conditions related to water quality. For example, the nature of fertilizer and pesticide use in relation to the vulnerability of an area to groundwater leaching and surface runoff is of particular interest.

Harry Mussman

**Harry C. Mussman**
Chairman, USDA Working Group on Water Quality

*Please direct questions or comments about this Update to David Ervin, ERS, 202-786-1401, or Sam Rives, NASS, 202-447-2324.*

*Published by the Office of Public Affairs Water Quality Issue Team*

# Update on **Water Quality**

*United States Department of Agriculture*

## Progress Update #8 — May 1991

### National Drinking Water Week: USDA Targets Communities with WQ Information

National Drinking Water Week (NDWW), May 5-11, was a joint effort of public and private organizations, including the Cooperative Extension System. NDWW's objective is to increase public awareness of drinking water issues and the benefits of safe drinking water. A NDWW resource packet, prepared by the Extension Service, USDA, Water Quality Initiative Team and the CES staff at Michigan State University, was recently distributed nationwide to all states and counties for community/consumer education and use. This year's packet included the first Spanish-speaking factsheets on Water Quality issues. Copies of the packets were also sent to state Agriculture in the Classroom contacts. Requests for additional packets are now being filled, including a request from one state for materials for all secondary schools as part of their environmental and agriculture education programs.

### Other Education Activities

The ES-USDA Water Quality Initiative Team also developed a slide-tape and video presentation on the Agency's Water Quality Initiative and the interrelationship of this initiative with USDA programs and the Presidential Initiative on WQ. As part of its joint Water Quality communications project with Michigan State University, the team also published a comprehensive Water Quality newsletter/tabloid highlighting Water Quality educational programs and activities nationwide. For single copies of the slide set, tabloid/newsletter, or National Drinking Water Week Packet contact Myra Jarrell, ES-USDA, Communications, Information, and Technology Staff, Rm. 3326-South Bldg., Washington, D.C. 20250; telephone: 202-447-6133.

### Nitrogen Action Plan

A Northeast regional research and Extension Committee (NEC-82) met recently to discuss the late spring soil nitrogen test in the Northeast Region. Last year, 20 percent of Connecticut farmers, 5 percent of Vermont producers, and 1,700 Pennsylvania farmers used the soil test. Results indicate about a third less nitrogen fertilizer use than previously.

Survey results indicate that farmers using the test had a high level of confidence in it. The main constraint to more widespread use of the test is lack of resources in the testing areas to increase farmer contacts. For additional information contact Clay Ogg, Environmental Protection Agency, 202-382-2300 or Francis Thicke, Extension Service, 202-447-5369.

### Water Quality Reports Focus on Cotton

Two new publications available from ERS are: "Cotton Agricultural Chemical Use and Farming Practices in 1989" ($4.00 per copy) and "Cotton Production and Water Quality" (single copies free.)

To order either of these publications call 1-800-999-6779 or write to: ERS-NASS, P.O. Box 1608, Rockville, MD 20849-1608.

### USDA Reports Research Progress in WQ

A recent sampling of ARS progress under the President's Water Quality Initiative to keep pesticides and fertilizers out of ground and surface waters includes:

**Tifton, GA**—USDA's premier groundwater model for pesticides is being expanded to include fertilizers.

**Beltsville, MD**—The problem is being attacked on two fronts: a computer database helps farmers choose pesticides and a machine degrades what's leftover. Also, a tiny bait minnow is being tested as an environmental sentinel for East Coast estuaries.

**University Park, PA**—By comparing oxygen atoms in rainwater, scientists might be able to advise farmers which fields are losing chemicals.

**Tucson, AZ**—A computer program evaluates environmental/economic consequences of farming practices.

**Fort Collins, CO**—A computer model is being developed to show how much nitrogen fertilizer is headed toward groundwater.

**Ames, IA**—Well samples are helping scientists learn how chemicals move.

**Morris, MN**—Researchers study ways frost affects chemical movement, and search for better detection methods.

Contact Don Comis, ARS, USDA 301-344-2773 for additional information.

### Soil Productivity—The Key to Healthy Forests

Soil condition is a good indicator of overall land productivity. Loss of soil productivity indicates a problem with the ecosystem as a whole. Soil changes are measurable and can be used to infer changes in biomass and hydrology in the rest of the ecosystem.

Because of this, the Forest Service recently established a nationwide soil monitoring system based on soil quality standards. These standards serve as threshold values and as early warning signals of deteriorating soil conditions. The agency has set a 15 percent reduction in inherent soil productivity potential as the basis for establishing the threshold values.

To develop information and assist the monitoring endeavor, the Forest Service has also initiated a nationwide research program on soil productivity. The major focus of this program is to quantify the effects of soil disturbances from management activities; validate soil quality standards; and understand the fundamental relationship between soil properties, long-term soil productivity, and forest management practices.

The first-phase plan of the program is to establish studies in major forest ecosystems throughout the United States: Kistachie National Forest, Louisiana; Plumas National Forest, California; and Chippewa National Forest in Minnesota. Contact Pamela Finney, Forest Service, 202-447-3584 for additional information.

Harry Mussman

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*Published by the U.S. Department of Agriculture's Water Quality Information Committee*

# *Update on* ***Water Quality***

*United States Department of Agriculture*

**Progress Update #9 — July 1991**

## Chesapeake Bay Water Quality Field Trip

Keith Bjerke, Administrator, Agricultural Stabilization and Conservation Service (ASCS); Bill Richards, Chief, Soil Conservation Service (SCS); and Myron Johnsrud, Administrator, Extension Service (ES); participated in a water quality field trip May 17-18 on Port Isobel Island in Tangier Sound along the lower Chesapeake Bay. Senior staff from each USDA agency responsible for administering national water quality programs, accompanied the group. Other participants included ASCS and State and local staff, State Extension Directors and Administrators, and SCS State conservationists from Maryland, Pennsylvania, and Virginia.

Discussions focused on:

- The vital role tidal and upland wetlands play in providing food and habitat; controlling excess nutrients from livestock waste and runoff; storing flood waters; and filtering pollutants.
- Land-based problems—erosion from improper agricultural and development practices; excess nutrients from sewage treatment plants, septic tanks, and nonpoint source runoff; and toxins from industry, agriculture, and households.
- The role of governments and the private sector in the overall Bay cleanup, including the need to coordinate research, evaluation, and the monitoring of water quality efforts to assure success.

The trip was coordinated by The Alliance for the Chesapeake Bay, Inc., a coalition of more than 100 business, industry, citizen, and environmental groups working on policies that will lead to a cleaner Bay. For additional information, contact Gerald Calhoun, Water Quality Liaison, ES/SCS, and member of the Alliance's Board of Directors, at 202-447-4946.

## Animal Waste Management Forum

At Extension's invitation, experts from industry, government, and land-grant universities will attend a public forum, July 29-31, 1991, in Kansas City, MO, to explore present and future impacts of livestock, poultry, and aquaculture waste on water quality.

Cooperating with Extension Service in sponsoring the forum are the USDA's Agricultural Research and Soil Conservation Services, Michigan State University, the Environmental Protection Agency, and the Tennessee Valley Authority.

For additional information on the forum, scheduled to be held at the Westin Crown Center Hotel, Kansas City, contact Richard Reynnells, ES-USDA National Program Leader, Poultry Science, Room 334, South Building, Washington, DC 20250-0900. Telephone: 202-447-4087.

## Paper on Nitrate Contamination Sources

USDA's Working Group on Water Quality recently prepared a paper on "Water Quality and Nitrates: Agricultural Sources of Nitrate and Approaches to Reduce Nitrate Contamination of Waters." Eight USDA agencies developed this information piece that gives an overview of nitrate occurrence in U.S. waters. The paper emphasizes USDA's work to minimize the impact of nitrate from agricultural activities.

Copies were sent to respective agency field staff. For additional information, contact Francis Thicke, ES-USDA National Program Leader for Soil Science, at 202-447-5369.

## USDA-CSRS Water Quality Activities

*Priority Components Research Program:*

Twenty-three water quality research grants were competitively selected for awards in 1989 and 46 in 1990 under the Cooperative State Research Service (CSRS) Water Quality Special Research Grants Program, with another 44 to be awarded by CSRS in 1991. These projects are part of CSRS's major program component under the President's Water Quality Initiative.

The following are selected examples of progress being made on some of these research grants:

- Progress is being made by South Carolina scientists in the use of an electromagnetic (EM) technique to map underground concentrations of certain chemicals leaking from farm lagoons.
- Research in North Carolina shows progress in mapping the potentials of soils for poultry litter application as based on soil characteristics.
- Promising new methods for safe on-farm disposal of pesticide wastes are being developed by Arkansas scientists.
- Greater understanding is being obtained by scientists on the degradation, persistence, and movement of pesticides, such as atrazine and metolachlor and other chemicals at several locations. Early results in Montana studies show dicamba movement through soils was reduced as more time was allowed between chemical application and irrigation.
- Missouri research shows that movement of pesticides through soil cracks and large pores was decreased if irrigation was delayed after application of chemicals.
- Less preferential flow of water and solute occurred in soils if applications of chemicals were made to wet soils after irrigation rather than to dry soils before irrigation in Arizona research.
- Detoxification of contaminated soils and water by inoculation with microbes or by application of enzymes holds promise of being more cost-effective than presently-used physical-chemical treatments, according to research in Pennsylvania.
- West Virginia studies of the bacterial quality of water passing through activated charcoal filters, show promise for cleaning up drinking water in home water systems.
- In Washington and Oregon, economic costs are being determined of farm management changes that could result from policies to abate possible nitrate build-up in ground water. Records of chemical use and field operations are being combined with soil and other factors to improve prediction models of chemical contamination of ground water.
- Improved models are the result of research in Oklahoma and Florida that can better match soils and crop management strategies for use by Extension, Soil Conservation Service, and farm managers.
- In New York research, improved simulation models and geographic information system (GIS) maps are being developed, improved, and tested to predict chances of pesticide movement to ground water.

## Monocacy Project Tour

A Farm Demonstration Tour of one of the USDA Demonstration Projects in Maryland, will be held Friday, July 26th. The focus of the program is to show Monocacy target area farmers how Best Management Practices (BMP's) are being implemented on neighboring farms. The idea is to let farmers talk to farmers about the pros and cons of various practices, and discover what options might work well on their own operations. ES, SCS, and ASCS are cosponsors of this project near Frederick, MD. For information about the tour call the Monocacy Project office at (301) 899-0133.

Harry Mussman

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*Published by the U.S. Department of Agriculture's Water Quality Information Committee*

# Update on **Water Quality**

*United States Department of Agriculture*

**Progress Update #10 — August/September 1991**

## National Animal Waste Workshop

Commodity groups and individuals representing aquaculture, beef, dairy, poultry, and swine developed suggestions for additional educational and technical assistance, and research, necessary to improve each group's response to water quality concerns .

The consensus was developed at the National Livestock, Poultry, and Aquaculture Waste Management Workshop held in Kansas City, MO, in July. Extension Service, Soil Conservation Service, Agricultural Research Service, Cooperative State Research Service, the Tennessee Valley Authority, the U.S. Environmental Protection Agency, and Michigan State University—jointly sponsored the workshop.

All agreed that waste from animal production and processing has long been associated with contamination of ground and surface waters in the United States. Federal and state agencies, and the animal industries, are actively seeking ways to minimize the negative effects of animal production on water quality. Commodity group representatives requested increased educational programs and technical assistance to cover all aspects of animal waste management and water quality.

The general session presented the latest available information on animal waste. Participants also refined recommendations that will improve communication and cooperation between government agencies, environmental groups, farmers, colleges and universities, and the individual industries.

For additional information contact Richard Reynnells, ES-USDA National Program Leader, Poultry Science, Room 3334, South Building, Washington, DC 20250-0900. Telephone 202-447-4087.

## 1992 Water Quality Special Project Requests

The Agricultural Stabilization and Conservation Service (ASCS) is accepting water quality special project proposals for Fiscal Year 1992 through September 20. Initial allocations will be limited to a maximum of $500,000 per project. In Fiscal Years 1990 and 1991, as part of the President's Water Quality Initiative, ASCS funded 75 such projects, all designed to restore impaired water resources where agricultural nonpoint source pollution has continued to have a detrimental effect.

State ASCS offices are limited to submitting two proposals per state. Each proposal must detail the support provided by Soil Conservation Service and the Extension Service, as well as assistance from other federal, state and, local agencies responsible for water quality, recreation, and wildlife.

ASCS guidelines for the 1992 program also encourage project participation by public and private schools, sports enthusiasts, civic and church organizations, and from environmental groups.

## SWCS Conservation Conference

The Soil and Water Conservation Society sponsored a conference on Crop Residue Management for Conservation, in Lexington, KY, August 8-9, 1991.

The major conference objective was to encourage producers to adopt residue management practices to achieve conservation compliance. Approximately 80 percent of current conservation plans rely on crop residues as a means of controling erosion.

Vivan Jennings, Deputy Administrator, ES-USDA, Agriculture Programs, and William Richards, Chief, Soil Conservation Service, delivered the opening and closing remarks. Much of the conference discussion centered around state-of-the-art crop residue management.

For more information, contact Francis Thicke, ES-USDA National Program Leader, Soil Science, at 202-447-5369; or Internet: fthicke@es-cit.esusda.gov.

## Farm*A*Syst—National Coop Program

A national cooperative program will soon be underway to assist farmers and their rural neighbors in identifying and reducing potential and current sources of groundwater and drinking water contamination from farmsteads and rural residences. This program, supported by Extension Service (ES), Soil Conservation Service (SCS), and the Environmental Protection Agency (EPA), stems from enthusiastic response to Farm*A*Syst, an education and assessment tool developed by Wisconsin and Minnesota Cooperative Extension Services and Region V EPA. Current agricultural water quality programs, including the USDA Water Quality Initiative, focus on reducing water contamination risks from field practices.

Farm*A*Syst is unique because it comprehensively addresses potential groundwater contamination from 10 significant potential sources near the farmstead drinking water well. Farmers and rural residents use Farm*A*Syst to assess current structures and practices such as pesticide and fertilizer mixing, loading practices, and maintaining petroleum product storage tanks. Site conditions that affect pollution vulnerability are assessed to help farmers prioritize actions to reduce or prevent pollution.

Farm*A*Syst identifies technical expertise and financial assistance to enable implementation of preventive and corrective actions. Nationwide program expansion will facilitate rapid, cost-effective modification of the materials and implementation of the program so that local needs, policy requirements, and site condition in other interested states are accurately reflected. For more information, contact Susan Jones at (608) 262-2031, or Gary Jackson at (608) 262-1916.

## USDA Symposium Highlights Groundwater Research

An Agricultural Research Service (ARS) groundwater research symposium at Beltsville reported:

- The first soil nitrogen test developed for the humid east successfully identified sites where no additional nitrogen fertilizer was needed. Grass cover crops reduced nitrate losses. Soil sampling down to 12 feet showed no-till methods can lower nitrate concentrations. **(J.J. Meisinger)**
- Atrazine, carbofuran, and diazinon biodegrade faster in no-till cornfields than in plowed fields. Groundwater flowing through Wye River forests generally seemed cleansed of nitrate running from surrounding farmland. Microbes fed by carbon from decaying roots may be removing the nitrate molecules. **(J.L. Starr)**
- An intensive study of farm chemical movement is now in its 6th year, and promises much-needed answers. An apparatus has been designed to study pesticide degradation at depths of 6 feet or more. A rain simulator carousel, designed for greenhouse use, quickly screens for pesticide-soil-rainfall combinations least likely to cause leaching. **(A.R. Isensee)**
- A new prototype for a machine that converts waste pesticides to water, ammonia, and carbon dioxide is being tested this summer. **(D.R. Shelton)**
- Bioengineering of super bacteria offers hope of a new way to rapidly degrade atrazine and other pesticides. **(J.S. Karns)**
- Well water at Beltsville, the Eastern Shore, Pennsylvania, and Iowa is being genetically tested for mutagenicity. The SOS Chromotest, was originally used to screen industrial chemicals, but has been adapted by ARS to study both the effects of chemicals in groundwater and the effects of dietary fat. **(R.M. Pfeil)**
- NUMEX (Nutrient Management Expert System) is now being used by the University of Maryland's soil testing lab. This computer program advises farmers on the amounts of manure, sludge, and commercial fertilizer to apply to maintain yields without contaminating water supplies. It is being adapted for use in the Midwest. **(V.R. Reddy)**

Contact Don Comis, ARS, USDA 301-344-2773 for additional information.

Harry Mussman

**Harry C. Mussman**
Chairman, USDA Working Group on Water Quality

*Published by the U.S. Department of Agriculture's Water Quality Information Committee, Patricia Calvert, ES. Chair*

United States Department of Agriculture

# Update on Water Quality

Progress Update #11 October/November 1991

## Swader Is New WGWQ Executive Secretary

Dr. Fred N. Swader, National Program Leader for Water Resources for the Extension Service, was named Executive Secretary for the Working Group on Water Quality in October.

Recently returned from a detail as a Visiting Water Quality Specialist with the University of Hawaii Cooperative Extension program, Swader began his Extension career as a soils specialist for Cornell (University) Cooperative Extension in New York.

Dr. C.R. Amerman, who served as Executive Secretary since November 1989, returned to the National Program Staff of the Agricultural Research Service October 15.

Swader's office is 324-A, telephone (202) 720-4751, FAX (202) 690-2842, and Email: fswader@esusda.gov.

## USDA Takes It's Water Quality Initiative to Central and Eastern Europe

In late September, program managers and scientists from the U.S. Department of Agriculture's (USDA's) Agricultural Research Service, Cooperative State Research Service, (CSRS), Extension Service (ES), and Soil Conservation Service (SCS), the U.S. Environmental Protection Agency, the U.S. Geological Survey, universities, and industry joined colleagues in Central and Eastern Europe (CEE) at a workshop on agriculture related water quality needs of that area. The meeting was held in Poznan, Poland, under the leadership of Dr. Jerry Walker of USDA's Office of International Cooperation and Development. Representation from CEE countries included delegations from Bulgaria, Czechoslovakia, Hungary, Poland, Rumania, and Yugoslavia.

Workshop participants exchanged program technology/information and discussed regional water quality problems relating to, or affecting, agriculture. Several areas of possible technical assistance were identified including demonstration projects similar to the ongoing efforts of SCS and ES under the USDA Water Quality Initiative. These opportunities relate to both agricultural point and nonpoint source concerns identified by the CEE delegations. A list of opportunities for technical exchange was drafted for further consideration by USDA and the U.S. Agency for International Development. Contact Peter Patterson, telephone (202) 720-1867, FAX (202) 720-0630, for further information.

## Nitrate Occurrence In U.S. Waters

USDA's Working Group on Water Quality recently issued a reference summary entitled "Nitrate Occurrence In U.S. Waters." The report includes data from a wide array of surveys, reports, and studies by federal, state and private sources. Six USDA agencies, EPA, the U.S. Geological Survey, the Tennessee Valley Authority, the National Oceanic and Atmospheric Administration, and the Leopold Center for Sustainable Agriculture at Iowa State University assisted John Fedkiw, Associate Director, USDA Office of Budget and Program Analysis, in preparation of the 35-page report.

The summary provides a broad perspective on the proportions of the problem of ground water, surface water, and estuary contamination associated with nitrate from agricultural sources. It is part of the USDA's effort for helping farmers and rural residents understand water quality problems, where they occur, and their dimensions. The USDA is working with other federal agencies and the states to help farmers operate in a way that minimizes or prevents pollution form agricultural sources.

Copies were distributed to various federal and state agencies, as well as organizations in the private sector. For additional information, contact John Fedkiw, OBPA, at (202) 720-7063.

## Progress Reporting for HUA's and Demonstration Projects

By January 1992, the Extension Service and the Soil Conservation Service plan to prepare a comprehensive report on fiscal year 1991 progress in all 90 Nonpoint Source Hydrologic Unit Areas and Demonstration Projects. The report will include information on:

- Reduction in use or application of nutrients, pesticides, animal waste, sediment, and salt and toxic elements;
- Load reduction below the root zone or beyond the edge of fields;
- Monitored changes in the physical, chemical, and biological conditions of the water resource;
- Type and extent of water quality education and technical assistance provided; and
- Economic effects and producer acceptance of practices recommended.

## Fifth Year Groundwater Project

ARS scientists in Beltsville, Md., are in their fifth year of building one of the most complete data sets in the country on the movement of agricultural chemicals. Researchers at the ARS Pesticide Degradation Laboratory are measuring just about everything involved in the movement of water carrying atrazine, alachlor and cyanazine herbicides across and under cornfields.

The rain that falls on the fields is measured. The water evaporating from the fields is accounted for. The soil is sampled at 4-inch increments, down to 20 inches, to see how far the chemicals are moving down with the water. The groundwater is sampled from 128 wells drilled to depths ranging from 5 to 36 feet.

And the water that flows off the field is channeled through stainless steel flumes where ultrasonic sensors measure water levels in the flumes. Flowmeters connected to the ultrasonic sensors electronically convert the readings into flow rates and volumes. The meters also trigger automatic water sampling for every 75 or 100 gallons of flow. The samples are analyzed for herbicide content.

With both no-till and conventional till, pesticides aren't reaching the deepest wells, where groundwater might be used for drinking water. Even when chemicals enter the shallower wells, they are usually well below EPA health advisory levels for drinking water. When levels approach or exceed those levels, they drop back within two or three days as the aquifer dilutes them.

Although the measurement of surface runoff only began last year, preliminary observations have confirmed that no-till can cut surface runoff and accompanying pollution by at least half. The data from this research should help create computer models that can account for regional differences and predict pollution potential nationwide.

Contact Don Comis, ARS, USDA 301-344-2773 for additional information.

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## PAC Will Assist in New ACP Practices

Agencies represented on the Policy Advisory Committee of the Working Group on Water Quality pledged cooperation and coordination with the Agricultural Stabilization and Conservation Service as it introduces four new water quality cost sharing practices under the Agricultural Conservation Program.

These new practices are:

- Integrated Crop Management (SP53); which demonstrates the use of crop management measures that encourage efficient use of pesticides and nutrients and demonstrate ecological benefits while maintaining farm income.
- Agricultural Waste Control Facilities (WP4); which can reduce the existing water, land, or air pollution by agricultural wastes. The modified practice is applicable to areas of farmland where agricultural wastes from the farm constitute a significant pollution hazard. A new component was added for composting. This component will assist in addressing the problem of disposal of dead birds.
- Pesticide Containment Facilities (SP55); which are sealed sloping concrete (or equivalent) pads that reduce the potential for contamination of soil, water, and air associated with the mixing, storing, and handling of pesticides. Spillage or rinsate associated with the spray operation drains into a shallow sump or above-ground storage tank for proper disposal according to the pesticide label.
- Constructed Wetland Systems for agricultural waste water treatment (WP6); which uses constructed wetlands for treating agricultural waste water and is based upon using specifically characteristics, such as wetland hydrology and vegetation.

The Soil Conservation Service is providing technical assistance and will issue technical standards and specifications for these practices. For more information contact Jim McMullen, ASCS-USDA, telephone 202/720-6221.

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Harry Mussman

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United States Department of Agriculture

# Update on Water Quality

Progress Update #12

January/February 1992

## First WQIP Signups Held in February

In February, farmers and ranchers in existing Hydrologic Unit Areas, Water Quality Demonstration Projects, and 1991 Water Quality Special Projects began signing up for technical assistance through Water Quality Incentive Projects (WQIP).

Before the signups began, the three U.S. Department of Agriculture agencies cooperating to carry out the new program, ASCS, ES and SCS, held five joint teleconferences between national program leaders and state and local water quality project managers to answer questions on WQIP.

Funded through ASCS's Agricultural Conservation Program (ACP), WQIP is part of the Water Quality Incentive Program authorized by the Food, Agriculture, Conservation and Trade Act of 1990. The goal is source reduction of agricultural pollutants by use of environmentally and economically sound management practices.

WQIP incentive payments will be for integrated crop management and other management practices such as waste utilization, contour farming, conservation tillage, nutrient management, and similar cultural practices. Although they may be a part of the Water Quality Resource Management Plan, structural practices such as terraces, waterways, animal waste storage facilities, irrigation systems, ponds, and other similar practices, will not be eligible for WQIP incentive payments. However, they could be cost shared with regular ACP funds or other cost share programs.

For more information, contact Dan Smith, Soil Conservation Service, at (202) 720-3524, Mike Linsenbigler, Agricultural Stabilization and Conservation Service, at (202) 690-0224, or Francis Thicke, Extension Service, at (202) 720-5369.

## Water Quality Projects Assessed

Three multiagency committees recently heard the University of Nebraska's assessment of the organization and implementation of USDA's eight FY 1990-94 water quality demonstration projects. Findings and recommendations from the assessment by Kay Rockwell and De Lynn Hay, et al, have already been used to improve the Water Quality Demonstration Projects initiated in FY 90 and FY 91

The complete report was sent to State Extension Directors, State Administrators of the Soil Conservation and Agricultural Stabilization and Conservation Services, and to the 74 nonpoint hydrologic units across the United States. For further information, or additional copies of the report, contact Claude Bennett, Extension Service, USDA, at 202-690-4550.

## USDA Looks Anew At Atrazine; USGS, EPA Complete Team Review

Atrazine, a corn herbicide that is widely used in the Upper Midwest, has come under careful review over the past 3 months. USDA's Working Group on Water Quality Policy Advisory Committee requested a review of both policy and programs that relate to the herbicide.

This action was prompted by a U.S. Geological Survey (USGS) interim report by Donald Goolsby, entitled "Distribution of Selected Herbicides and Nitrate in the Mississippi River and Its Major Tributaries, April Through June 1991." Goolsby reported his findings in a public briefing held at USDA, November 20, 1991.

Atrazine was detected in all 146 samples collected in April, May, and June 1991, with median concentrations ranging from 0.29 parts per billion (ppb) to 3.2 ppb. The Environmental Protection Agency's Maximum Contaminant Level (MCL) was exceeded at five of the eight sampling sites: White River, IN; Illinois River, IL; Platte River, NE; Missouri River at Hermann, MO; and the Mississippi River at Thebes, MO.

Following the presentation, the Policy Advisory Committee, which includes representatives from the Environmental Protection Agency (EPA), the National Oceanic and Atmospheric Administration (NOAA), the Corps of Engineers, the Fish and Wildlife Service, the Tennessee Valley Authority (TVA), and USDA agencies including the Agricultural Research Service (ARS), the Agricultural Stabilization and Conservation Service (ASCS), Cooperative State Research Service (CSRS), Economic Research Service (ERS), Extension Service (ES), National Agricultural Statistics Service (NASS), and the Soil Conservation Service (SCS), established two work groups, one to review policy questions, and a second to review technical issues presented by the USGS findings.

These work groups reported their initial findings at a February 4 Policy Advisory Committee meeting. Additional review is underway to consider what further steps should be taken to programmatically address this matter.

[continued on page 2]

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Atrazine was first registered for United States use in 1958. More than 80 percent of the annual usage (53.3 million pounds) is on corn. It also is used on sorghum, sugar cane, macadamia nut and guava trees, Christmas tree plantations, and on non-cropped industrial lands.

More than 70 percent of the atrazine usuage is concentrated in 10 Midwest states. Nearly 25 percent of the atrazine used in those 10 states is applied by farmers in Illinois and Nebraska, with another 25 percent applied by farmers in Indiana, Iowa, and Kansas.

The Safe Drinking Water Act, administered by EPA, requires that maximum contaminant levels (MCL) be established for drinking water. The MCL for atrazine, promulgated on January 30, 1991, is 3 parts per billion. EPA regulations require public drinking water suppliers to begin monitoring for atrazine in January 1993. For additional information, contact Fred Swader, WGWQ, (202) 720-4751.

## Area Study Sites Set By ERS

ERS and NASS recently completed selection of Area Study survey sites. Each site corresponds to a National Water Quality Assessment Study Unit established by the USGS.

Newly selected sites include the Mississippi Embayment (MS, LA, AR, TN, KY, MO); San Joaquin-Tulare (CA); Southern Arizona (AZ); Southern High Plains (TX, NM); and Red River of the North (MN, ND).

Studies to be conducted this year include the Albemarle-Pamlico Drainage (NC, VA); Southern Georgia (GA, FL); Iowa-Illinois (IA, MN, IL); and Upper Snake River Basin (ID, WY, NV).

Area studies started in 1991 included Central Nebraska (NE); White River Basin (IN); Lower Susquehanna Basin (PA, MD); and Mid-Columbia Basin (WA).

For additional information, contact Bob Kellogg, ERS, (202) 219-0403.

## Soil Testing, Nitrate Usage Issues Emerge From Workshop

Participants in a recent Nitrogen Workshop made suggestions for an expanded research program in soil testing and a position paper on the level of nitrate needed in the soil for economical production of crops.

Workshop participants included representatives from ARS, ES, SCS, EPA, the Nitrogen Action Committee (EPA and USDA), and scientists from five CSRS regional research committees.

The Soil Testing Research Program will address improvements in present tests for nitrogen availability to crops; development of new tests, as needed, to assess the impacts of nitrates on water quality; integration of soil tests into farm-scale nitrogen recommendation systems, and development or improvement of tests to determine excess nitrate and the leaching potential at the end of the crop production system. Funding was identified to initiate new or enhance ongoing research programs.

The position paper on nitrogen is targeted for completion in April.

For additional information contact, Maurice Horton, CSRS, (202) 401-4504.

## The Hidden Benefits of Water Quality Programs

An often overlooked benefit of a Federal program is attracting private sources to water quality projects with a high probability of success.

The nonpoint hydrologic unit areas (HUA), in Ohio are one case in point. One area received an additional $300,000 in funding from an environmental organization, and $100,000 from a major industry in the watershed. In another, the EPA participated in the purchase of $500,000 worth of conservation equipment for demonstration purposes.

A California HUA project attracted 30 growers who committed 13,034 acres to improved practices. Cooperating agencies expanded to include the California Departments of Fish and Game, Food and Agriculture, and Regional Water Quality Control Board; the Center for Irrigation Technology and Engineering Institutes, both at California State University, Fresno; three local water districts; ARS; the U.S. Fish and Wildlife Service; and the Lemoore Naval Air Station. This HUA has attracted in excess of $200,000 in funding from non-HUA sources.

## Nitrate Occurrence In U.S. Waters

Copies of the USDA's Working Group on Water Quality publication "Nitrate Occurrence In U.S. Waters" remain available following initial distribution to Federal and state agencies, as well as organizations in the private sector. For additional information, contact John Fedkiw, OBPA, (202) 720-7963.

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# Update On Water Quality

U.S. Department of Agriculture

Progress Update #13 April/May 1992


## Seminars of Risk Assessment Management

The Deputy Secretary of Agriculture, Ann Veneman, has endorsed the presentation of informative seminars for USDA executives on risk assessment, management and communication.

The initial seminar was presented in December by Dr. Warner North, President of the Society for Risk Analysis. He spoke of the role of science and decisionmakers in risk analysis and management. His emphasis was on the utility of the disciplined approach provided by risk analysis methods for defining the dimensions of problems and developing information on the nature and of risk associated with action options. The May seminar by Dr. Peter Sandman addressed the factors contributing to the public's "outrage" when involuntarily exposed to environmental hazards and how to communicate under those circumstances.

These seminars are being arranged to encourage USDA executives and their agencies to deal with hazards, risk and uncertainties in a more systematic manner and to communicate risk more effectively to the public. Science and Education has the responsibility for arranging the seminars, working with the USDA agencies and their policy officials. For more information contact John Fedkiw, OBPA, 720-7963.

## USDA To Evaluate Water Quality Projects

As part of the President's Water Quality Initiative, 16 USDA Demonstration Projects or Hydrologic Unit Area projects have been selected for assessment of their effects on water quality.

They were chosen to represent the Demonstration Projects and HUA sites that will address, over the next few years, the impact of agricultural practices on surface and ground water quality. The projects are under the joint leadership of the Soil Conservation Service (SCS), Extension Service (ES), and Agricultural Stabilization and Conservation Service (ASCS).

The 16 projects represent a broad spectrum of physical conditions-soil, terrain, hydrology, and climate and farm types and agricultural practices. The projects are located in Alabama, California, Delaware, Florida, Illinois, Indiana, Maryland, Michigan, Minnesota, Nebraska, New York, North Carolina, Oregon, Texas, Utah, and Wisconsin.
A paramount aim of the USDA Initiative is to provide agricultural producers with the knowledge and means to voluntarily take action on their water quality concerns. Because it is difficult to accurately relate improvements in water quality to specific changes in agricultural management, the assessment will emphasize the implementation of land treatment measures that improve the efficiency of nutrient and pesticide use on problem soils.

The assessment team will ensure accuracy of data by monitoring the work of project staff and providing technical assistance and training.

The findings will be applied in developing future USDA water quality programs. Assessment reports are expected to be available in March 1993 and March 1995. For more information call John Sutton, SCS, at (202) 720-0122.

## Improving Quality of Water Entering Estuaries

A conference in Providence, Rhode Island, this October will be the setting for discussing ways to improve interagency coordination, accelerate activity, and the use of existing funding to improve the quality of water flowing into the Nation's estuaries. Attending will be nonpoint source coordinators for the U.S. Environmental Protection Agency, regional representatives of the National Oceanic and Atmospheric Administration (NOAA), and the Soil Conservation Service (SCS) liaisons to EPA regional offices. Discussions will center on the new Coastal Zone Management Guidance to be issued this summer, work being done under the Water Quality Act of 1987, and USDA's water quality initiative. For more information call Harvey Mack, SCS, at 720-1871.

## Nutrient And Pesticide Training Workshops

Nutrient and pesticide management are an intergral part of most conservation management systems. Chemical and organic fertilizers, along with pesticides, are often identified resources. Each State needs to tailor specific actions for the management of these chemicals using the framework of SCS's National Standards and Specifications for Nutrient and Pest Management.

To be prepared for this effort, a course for agrichemical water quality training was developed in two phases, which has been held monthly from December 1991 to March 1992 at SCS's four National Technical Centers (NTC). The NTC's are located in Portland, OR (West NTC), Ft. Worth, TX (South NTC), Lincoln, NE (Midwest NTC), and Chester, PA (Northeast NTC).

The purpose of Phase I training was to provide guidance on how to develop and implement nutrient and pest management components in conservation planning at the field office level. Phase I was a "Train-the-Trainer" approach for State and NTC agronomists, environmental engineers, and other technical specialists involved in nutrient and pest management programs in SCS. Participants of Phase I training will deliver Phase II training on nutrient and pest management to State, area, and field office personnel. All guidance and planning documents and training materials developed during Phase I training will be provided to the participants to assist them in organizing and developing their Phase II State level training.

## Coordinator To Work In Great Lakes

The U.S. Department of Agriculture's Soil Conservation Service (SCS) has assigned a nonpoint source expert to coordinate its water quality activities in the eight Great Lakes states. Duties include working with the U.S. Environmental Protection Agency (EPA), state water quality agencies, and local officials on remedial action plans for 43 identified areas of concern and lakewide management plans for the drainage basins of the five Great Lakes.

The SCS Great Lakes coordinator will also provide technical leadership to SCS staff assigned to state water quality agencies. For more information contact Harvey Mack, SCS, at 720-1871.

## Program To Identify Areas Prone To Problems

The national water quality technology development staff of the U.S. Department of Agriculture's (USDA) Soil Conservation Service is working with the USDA Economic Research Service and the National Center for Resource Innovations to produce a document that identifies areas in the United States that have the potential for ground water contamination from agricultural chemicals. A Geographic Information System was used to apply National Resource Inventory sample points, soils data, and a pesticide-use data base to a vulnerability model.

Limited copies will be available in June 1992. For more information call George Rohaley, SCS, 720-5405.

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Working Group on Water Quality, Fred Swader, Executive Secretary

# Working Group On Water Quality

U.S. Department of Agriculture

*Waterfax: 030* 11-16-92

# EPA's National Pesticide Survey
## Summary of Phase II Results

### Survey Summary

The Survey was the first national study of pesticides, pesticide degradates, and nitrate in drinking water wells. Phase 1 developed national estimates of the frequency and concentration of the presence of pesticides and nitrate in drinking water wells. Phase II studied how detections and pesticides and nitrate in drinking water wells are affected by the sensitivity of ground water to contamination, use of fertilizers and pesticides, precipitation, irrigation, the chemical characteristics of pesticides, and the age, depth, construction and location of drinking water wells.

The Survey identified statistical associations* between the presence of pesticides and nitrate in drinking water wells and agricultural activity, such as the use of fertilizers, and livestock operation. A number of factors affecting transport of chemicals to ground water, including precipitation, the presence of surface water close to the sampled well, and other wells operating near the sampled well were found to be related to the presence of pesticides and nitrate in well water. Older wells and shallower wells were also found to be more likely to contain detectable amounts of pesticides and nitrate. The probability of detecting pesticides or nitrate was found to be greater in wells with low water temperature or pH. Pesticides with longer half-lives were more likely to be detected.

### Findings

**Site-specific assessment needed for pollution potential of well water**
Localized or site-specific assessments are necessary to obtain adequate evaluations of the sensitivity of drinking water wells to contamination.*

**Certain measures of agricultural activity, pesticide use, and fertilizer sales associated with detections**
The indirect measures of pesticide and nitrate use showed strong associations between use and detections. The market value of crops was highly related to pesticide detections in rural domestic wells. Pesticide detections were less likely for areas with fertilized pasture and rangeland and less likely to be associated with numbers of beef cattle. The market value of livestock was related to nitrate detections. The amount of fertilizer sold in a county was found to be associated with concentrations of nitrate in wells in that county.

**Pesticide use data from Survey did not show strong associations with detections**
The Survey's provided direct measures of agricultural pesticide use near the sampled wells. The pesticide use data from the questionnaires did not show strong associations with detections. Pesticides were detected where they were

*Editors note: It should be emphasized that "statistical associations" or "relations" do not indicate, much less prove, cause-and-effect linkages.

A Monsanto survey of 1,430 randomly sampled drinking water wells in 26 states found nitrate-nitrogen above 10 mg/L in 4.9 percent of the wells. For farmstead wells, however, the frequency was 10 percent.

EPA's national assessment of agricultural chemicals estimated that 52 percent of the community water system wells contain some detectable levels of nitrate (more than 0.15 mg/L), but that only 1.2 percent of these community systems nationwide contain nitrate levels above the drinking water standard. About 57 percent of private wells in the U.S. are estimated to contain detectable levels of nitrate, including 2.4 percent with levels above the MCL.

**What are the seasonal and spatial patterns associated with nitrate concentrations in wells?**

Contaminated wells or pockets of high nitrate contamination in aquifers are most frequently associated with unconfined shallow aquifers or karst settings with overlying shallow, sandy or gravelly soils. The wells that are most susceptible to contamination are old, of shallow depth (20 to 100 feet), and located close to sources of contamination.

There are locations in at least 14 highly productive agricultural states where nitrate contamination was caused by fertilizer applications. In some cases leaching of nitrate is accelerated by irrigation.

Contamination of farmstead drinking water wells can be associated with farmstead sources such as barns, barnyards, feedlots, and silos, which contribute nitrate, and with storage, handling, and mixing of fertilizers. Evidence is accumulating that links both urban and rural septic tanks to nitrate contamination of wells in some locations.

**How is USDA responding to the problem of nitrate in America's drinking water?**

USDA is helping farmers apply existing technology to avoid contamination by providing education, technical assistance, and cost-sharing assistance to farmers in areas identified with water quality problems.

USDA is developing technology for predicting nitrate movement toward groundwater, and production practices or systems that will reduce nitrate loss from the crop root zone.

Future Waterfax will examine some of the relevant USDA and State efforts to reduce nitrogen movement into the water resource.

**(Excerpted from USDA Summary Report, December 1990)**

For additional information, contact the USDA Working Group on Water Quality, 324-A Administration Building, Washington, D.C. 20250-0100, telephone (202) 205-5853/FAX 720-1767.