USDA NRCS
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Natural Resources Conservation Service

Conservation Resource Brief

Water Management

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Key Points:

- More than 50 percent of the benefits from improved irrigation water management are off-site benefits and are accrued by the public.
- Improvements on irrigated acres between 1998 and 2003 have resulted in reduced water use on 18.5 million acres, improved crop yield on 18.7 million acres and decreased energy cost on 15.3 million acres.
- The U.S. Geological Survey reports the average irrigation application rate decreased from 3.55 acre-feet per acre in 1950 to 2.48 acre-feet in 2000.
- USDA Farm and Ranch Irrigation survey reports that $1.13 billion was invested in irrigation equipment, facilities, and improvements during 2003. This represents an average investment of $13,056 per farm with 73 percent of this total for irrigation equipment and machinery.

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NRCS Web site at www.nrcs.usda.gov.

Helping People Help the Land

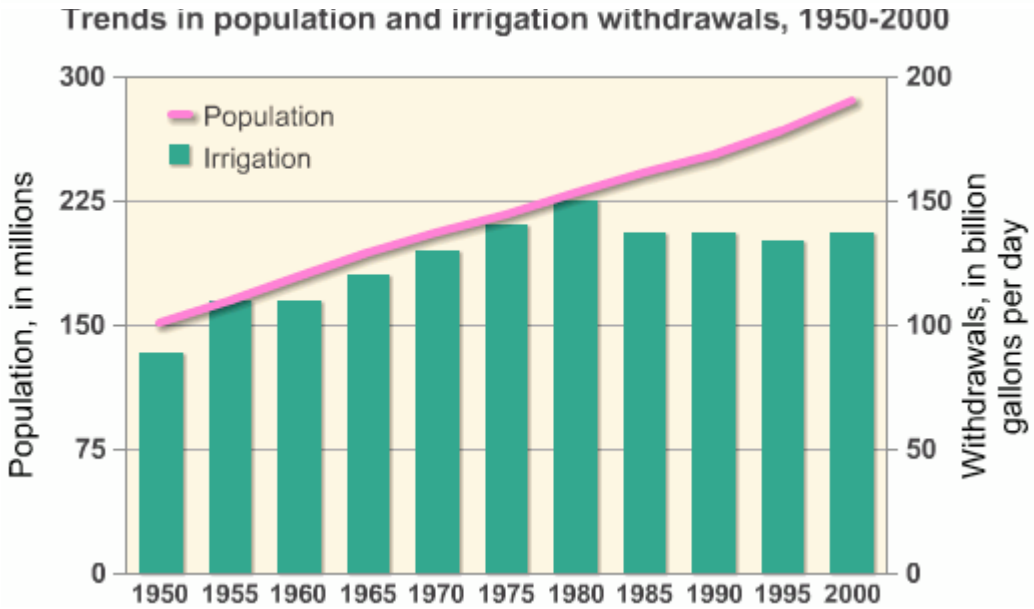
Description

According to U.S. Geological Survey estimates, total fresh and saline water withdrawals in the United States were estimated at 408 billion gallons/day in 2000 for all off-stream water-use categories (public supply, domestic, commercial, irrigation, livestock, industrial, mining, and thermoelectric power). After a peak estimated water use in 1980, conservation efforts and technology shifts helped keep water use reasonably steady since 1985 despite the nation's growing population. Regional differences in water availability, climatic variability, drought, expected population distribution changes, concern about stream base flows for fish, wildlife, and recreation, and sustainability of water supplies will continue to pose challenges.

Agriculture is a major user of ground and surface water in the United States. Irrigation accounted for 65 percent of the Nation's consumptive fresh water use in 2000. In the same year, the 17 western states used more than 85 percent of fresh water that was withdrawn for irrigation. Groundwater decline over large areas, increased competition among water uses especially in urban areas. Increased energy cost are key drivers that require continued improvements to irrigation systems, enhanced irrigation water management, and increased water use efficiency.

Current Conditions and Trends

The number of farms and ranches irrigating fell 2 percent since 1998 and the total land irrigated declined about 3 percent. Actual irrigation water use has declined, even with a 13 percent increase in U.S. population in the 1990s. Nevertheless, water problems will remain in the West, where irrigation and groundwater mining are essential to meet demand. Where the West once had the majority of irrigated lands (92 percent in the 1960s), the East now has about a quarter of total irrigated acreage. Water wars are being waged in the Southeast with potential water shortages in Alabama, Florida and Georgia, and critical groundwater declines occurring in Arkansas, Mississippi and Louisiana.



Major Opportunities and Barriers

There are many Federal, state, and private organizations that recognize the importance of regional, state, national, and international water use planning, and the need to supply planners with tools to enable them to assess water availability and use. There are also a number of coordinated efforts underway among state and Federal water planning agencies to cooperate and pool resources to address water use issues. The "Bridging-the-Headgate", Declaration of Cooperation is an excellent example of this type of effort. This declaration signed by representatives of seven organizations formalized intent to cooperate as members of a "Bridging-the-Headgate" partnership. The organizations agreed to work together whenever and wherever possible throughout the 17 western states to promote and educate the public on the benefits of sustainable and efficient use of agricultural water supplies. "Bridging-the-Headgate" supports a continued commitment on the part of Federal, state, local, and industry organizations. This effort emphasizes proactive, voluntary, participatory and incentive-based approaches to water resource management and conservation assistance programs throughout the western states.

Farmer desires to make more efficient use of soil and water resources, have led to a heightened awareness of irrigation water management (IWM). Many producers have made significant investments to more efficient irrigation systems (i.e. micro-irrigation, surge flow and low pressure spray sprinkler systems). Any pumped irrigation system that reduces water application, reduces system operating pressure, or reduces losses has potential for energy savings. The water supply available for an agricultural operation (volume, availability, timing, sufficiency, and water quality) often determines alternatives that can be made available to producers wishing to maintain an economically viable operation. Water utilization comes with challenges whose potential impact on other resources must be considered during the planning process. Water is a "driver" for most other resource issues. Its availability is necessary for all food and fiber production, but it can also transport sediments, nutrients, and pesticides to surface and groundwater. Good water management is critical.

Proper management of efficient irrigation systems enable producers to pump less water while maintaining target yields, thereby reducing energy use and costs. In some cases, productivity can increase while using less water. Additional water supplies can sometimes result from recycling of previously applied or utilized water. Irrigation water savings can make ground or surface water available for marketing to other water users and can provide downstream users, environmental and conservation groups, fish and other wildlife, and endangered species benefits from maintained or increased spring and base flows.

There are barriers to achieving progress with water supply and use, planning and management. It can be difficult for competing water users to recognize the view of other groups when working together on

water use planning. Local or state law or regulations often determine potential destinations for irrigation water savings. Building trust among competing groups is critical to group planning.

A survey completed and published in the USDA Farm and Ranch Irrigation Survey issued in November 2004 reported the following barriers to farmer investment in water conservation improvements:

- 19 percent of the farmers who irrigate do not believe the investment in water conservation will be offset by income,
- 17 percent report they cannot finance the investment required for improvement,
- 12 percent report they cannot invest in improvements because they are uncertain about future water availability,
- More than 50 percent of the benefits from improved irrigation water management are off-site benefits and are accrued by the public, and
- About 50 percent of responding farmers listed economic concerns and concerns about availability of water as limitations for investing in water conservation improvements.

Science and Technology Status

Recent research by the Agricultural Research Service (ARS) has included measuring and improving irrigation system performance at the field level. It looked at details of water consumption by agriculture and influence of the operator on performance of irrigation systems. It found limitations to performance of various irrigation systems, and developed methods for improving irrigation system performance. The results indicate that there are many misconceptions about water use, particularly as related to irrigated agriculture. Potential water savings that might result from increases in irrigation efficiency are usually overestimated. Other research looked at irrigation system operation with the objective of applying the required amount of water at the correct time with the best possible distribution. The research examined irrigation efficiency, application efficiency, and distribution uniformity for various systems including surface irrigation, sprinkler irrigation, micro-irrigation, and subsurface irrigation. The results indicate that with proper system selection and design, coupled with scheduling and competent operation, significant water use reduction can be achieved.

Ongoing and planned research and demonstration projects include examining techniques such as controlled drainage, variable rate irrigation, precision irrigation using GPS, tailwater capture and reuse, weather station networks for scheduling irrigation, improved sprinkler design and automation. Nitrate loss in drainage water from agricultural land is a significant source of nitrates in the surface water. Controlling and managing the outflow of drainage systems holds a great deal of promise in reducing this nitrate source. The Natural Resources Conservation Service (NRCS) is currently participating with industry, ARS and university researchers to install demonstrations of these practices around the country to communicate the results.

The Conservation Innovation Grants (CIG) is a voluntary program intended to stimulate the development and adoption of innovative conservation approaches and technologies. This program demonstrates many new and innovative technologies to address water quality issues.

Resource Investment

NRCS administers a wide range of programs that help improve water conservation measures, including making improvements to irrigation systems and enhancing management of those systems on the Nation's private lands.

The snow survey and water supply forecasting program uses its Water and Climate Information System (WCIS) to receive data, exercise quality control, and maintain the databases. The system supports snowpack analyses and forecasts of spring and summer streamflows, and allows development of

climate analyses and assessment of drought potential. Stream flow records, climate records, and reservoir storage data also are available for the current and previous water years.

Numerous routines and interactive programs for analysis, calculation, and modeling to determine statistical regression based water supply products are included in the Air and Water Data Base (AWDB), located at the NRCS National Water and Climate Center (NWCC) in Portland, Oregon. The traditionally produced, seasonal volume forecasts of stream flow amounts are now supplemented by additional modeled information on the characteristics of daily stream-flow, such as volumes, peaks, and low flows.

The data and applications for snow, climate, water supply and drought assessment are available via web services at http://www.wcc.nrcs.usda.gov. This system of data and information tools was developed and is operated by the NWCC. Over 11,000,000 web accesses were made during the last water year (2005) to NRCS, WCIS to obtain data or information products. This system is the primary focal point for snow survey data analyses, streamflow forecasting, data exchange, climate analyses, and soil moisture and product dissemination. It serves as the delivery system to make snow survey and related planning information available to local conservation districts and NRCS offices where it is incorporated into their conservation application programs. It is complementary to the NRCS eFOTG information and automation of conservation planning activities. WCIS also provides access to hydrologic data and interpretative products for a wide variety of governmental agencies, academic institutions, climate researchers, and the general public.

The NRCS WCIS database consists of historical and current data for all of the manual snow courses, numbering as many as 2,200 in the historical record that dates back to 1910. Information from over 700 USGS stream gauges and storage data from over 300 reservoirs are included. The heart of the WCIS that supports all of the analyses products is the daily and hourly data readings from the 715 NRCS SNOwTELemetery (SNOTEL) and 115 Soil Climate Analysis Network (SCAN) remote sites. On-line availability of all current significant climate information from across the nation will soon be available through the NRCS eFOTG system and data warehouse through the Agricultural Climate Information System (ACIS). Data are exchanged routinely with the National Weather Service and numerous agencies, as well as private entities.

USDA/NRCS programs can impact water use. Total water use related to on-farm financial assistance funding provided through the Environmental Quality Incentives Program from 1997 through 2004 included almost $208 million, or about $22.16 for every 100 acres of cropland in the United States. During 2004, about 10 percent (4) of the 41 Conservation Innovative Grants (CIG) awarded dealt with water use. Obligated 2004 funds for water-use-related projects totaled a little over $2.1 million, or about $531,000 per grant. This represented almost 15 percent of the total money obligated through CIG for 2004. The Conservation Security Program (CSP) provides stewardship payments to producers for maintaining conservation systems that address water resources critical to their watershed. The CSP also provides enhancement payments for exceptional conservation efforts by producers.

Conservation Connection

Environmental Quality Incentives Program (EQIP) incentive payments have been provided to producers for installing water conservation practices. Irrigation related incentive payments have been provided on activities including: conversion to more efficient irrigation systems, installing irrigation pipeline or ditch lining, land leveling, and enhanced Irrigation Water Management. Under the umbrella of the EQIP program, the Conservation Innovative Grant (CIG) Program has provided grants to demonstrate limited irrigation no-till cropping systems that maximize economic returns and irrigation efficiency while sustaining and enhancing groundwater levels. The Conservation Technical Assistance (CTA) Program continues to provide technical assistance supported by science-based technology along with tools to help people conserve, maintain, and improve their natural resources. The CTA Program provides the technical capability, including direct conservation planning, design, and implementation assistance, that helps people plan and apply water conservation on the land.

Improvements on irrigated acres between 1998 and 2003 have resulted in reduced water use on 18.5 million acres, improved crop yield on 18.7 million acres and decreased energy cost on 15.3 million acres.

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NRCS Program Funding, Water Management 2002-2005

Program	Financial Assistance Funding 2002-2005	Technical Assistance Funding 2002-2005	% of FA	% of TA
Conservation Technical Assistance (CTA)	$0	$285,600,000		60%
Environmental Quality Incentives Program (EQIP)	$551,980,366	$120,152,322	75%	25%
Ground & Surface Water Conservation (GSWC)	$130,418,987	$28,357,113	18%	6%
Conservation Innovation Grants (CIG)	$5,325,460	$26,804	1%	0%
Conservation Security Program (CSP)	$4,707,233	$706,085	1%	0%
Resource Conservation & Development_ (RC&D)	$0	$24,227,002		5%
Wildlife Habitat Incentives Program (WHIP)	$1,890,851	$333,127	0%	0%
Agricultural Management Assistance (AMA)	$7,663,764	$1,805,190	1%	0%
Watershed Protection and Flood Prevention Program (WP&FPP)	$34,561,600	$13,526,400	5%	3%
Wetlands Reserve Program (WRP)	$0	$1,799,294		0%
Total	$736,548,261	$476,533,337	100%	100%

The RC&D program provides benefits for a multiple number of resource issues. Dollar amounts given reflect a percentage of total program funding for RC&D for FY 2002-2004. This figure is pro-rated based on data analysis conducted for the national program evaluation conducted in FY2004 & FY 2005. The same dollar amounts are under water management and water quality which are captured under the water management element in the RC&D statute.

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