

# ARKANSAS WATER PLAN UPDATE

## PROJECT SUMMARY

## Foreword

*Water is vital to the prosperity and health of Arkansas's people and their natural surroundings. As such, water must be managed in a sustainable manner to support local and state economies, protect public health and natural resources, and enhance the quality of life for all citizens by applying appropriate policies and best practices with limited regulation and preservation of private property rights.*

Extensive public participation, interagency cooperation, and detailed technical evaluations were the hallmarks of this 2014 Update of the Arkansas Water Plan (AWP). The plan recognizes that while we continue to struggle with known water issues, the recommendations in this plan, when implemented, can meet the water demands of the citizens of the State of Arkansas (State) through 2050. We have identified six critical initiatives that are essential to securing Arkansas's water future—

1. **Groundwater Declines:** Critical groundwater areas in eastern Arkansas continue to experience declining groundwater levels and a groundwater gap as large as 7 million acre-feet per year (AFY) is projected for 2050. Adopting on-farm application efficiency and other conservation measures can reduce the magnitude of this projected groundwater gap; it will be necessary to develop infrastructure-based solutions to convert more irrigated acres currently supplied by groundwater to surface water.
2. **Insufficient Infrastructure:** Arkansas needs to construct and maintain water and sewer systems that furnish safe, clean, and reliable water supplies for its citizens and communities. The State's future viability and growth, especially with respect to the State's smaller rural communities, is threatened by the failure to provide these basic services. Resolution of this problem will require the combined commitment and actions of citizens and elected officials who must identify creative financing solutions and take advantage of regional infrastructure opportunities and shared sources of supply.
3. **Maintenance of Critical Infrastructure:** The safety of Arkansas's citizens and protection of property depends on maintaining and replacing, as necessary, flood and drainage infrastructure. Navigation and dams are another type of critical infrastructure that are necessary for economic health. We will encourage the federal government to complete projects that have been started and provide adequate operations and maintenance funding for this critical infrastructure.
4. **Proactive Management:** We have initiated proactive, systematic, and measured evaluation of existing water laws and procedures involving relevant agencies and appropriate stakeholders. The steps taken in this direction will help to maintain the stable and orderly use of water that is so critical to Arkansas's economic welfare and quality of life.
5. **Regional Planning:** Integral to the AWP was the recognition of regional issues and priorities identified by citizens, water users, and stakeholders. Statewide water planning will continue to provide the direction for water management. Engaging local citizens who are more in touch with their unique needs, challenges, and potential solutions is critical to regional water planning.
6. **Reliable Data:** The combined efforts of elected officials and the agencies and entities associated with managing and protecting the State's water must be informed by quality information to justify extremely consequential and potentially costly decisions. Sound planning and decision-making regarding Arkansas's water resources requires data, information, and analysis of water uses and water availability. Acquiring this data means the expansion of the network of stream gages, monitoring wells, water quality monitoring sites, and improved information on water use as well as the tools necessary to quantify, manage, and allocate surface and groundwater resources confidently.

The 2014 AWP is the strategy for making meaningful progress on each of these initiatives as described in the priority issues and recommendations and their respective implementation plans.

J. Randy Young, P.E.

Executive Director  
Arkansas Natural Resources Commission

# Introduction

*Arkansas is a state of distinct regions, from the low lying areas along the eastern and southern edges of the State to the mountains above the fall line that adorn the western edge. The occupations of the people of Arkansas are similarly varied – crop production, livestock production, aquaculture, silviculture, mining, industry, tourism, and recreation. What binds the people and regions of Arkansas together is the need for water – for living and working. As the Natural State, the importance of clean water to support healthy ecosystems cannot be understated. Quite simply, water is crucially important for Arkansas. Water is the common denominator that underlies the quality of life and economic well-being of Arkansas.*

Arkansas is a water-rich state. Surface water is abundant, with over 44 million acre-feet (AF) of water flowing through nine major river basins every year (Figure 1). This amount of surface water alone would provide about 4 acre-feet per year (AFY) of water for every person in Arkansas. However, surface water supplies are subject to seasonal fluctuations so that supplies are frequently at their lowest when demand is the highest. In some areas of the State, groundwater supplies have been easy to access through shallow wells and have been a plentiful source of water. As a result of over a century of agricultural reliance on groundwater for crop irrigation, the water levels in these aquifers have been declining and our projections suggest that by 2050, there will be demand for about 7 million AFY of groundwater that cannot be met with groundwater supplies.

Despite the relative abundance of water, many citizens lack access to dependable water and wastewater services due to distance to supplies, insufficient infrastructure or storage, water quality constraints, and other limiting factors. A fundamental conclusion of this AWP is that investments in infrastructure, drinking water, wastewater service, and irrigation will be required to support growth and economic development for the next 40 years.

The 2014 AWP Update is the culmination of 2 years of data analysis and synthesis to understand the complexity of sources, available supply, and demand for water in Arkansas. The AWP is based on planning level projections of

water demand and availability developed using consistent methodology on a statewide basis. The demand and availability analytical methodology was reviewed and concurred upon by stakeholder workgroups. The workgroups were created by inviting recognized experts throughout the State to assist in developing the 2014 AWP.

The State was divided into five water resource planning regions (Regions) comprised of areas with distinct geographic, topographic, ecologic, and sociologic characteristics (Figure 1).

Water-related issues were identified and prioritized by stakeholders in the planning regions of the State. This 2014 AWP Update is founded on the best available data, the knowledge and experience of a wide range of agency experts, and the critique of stakeholders and the public throughout the process.

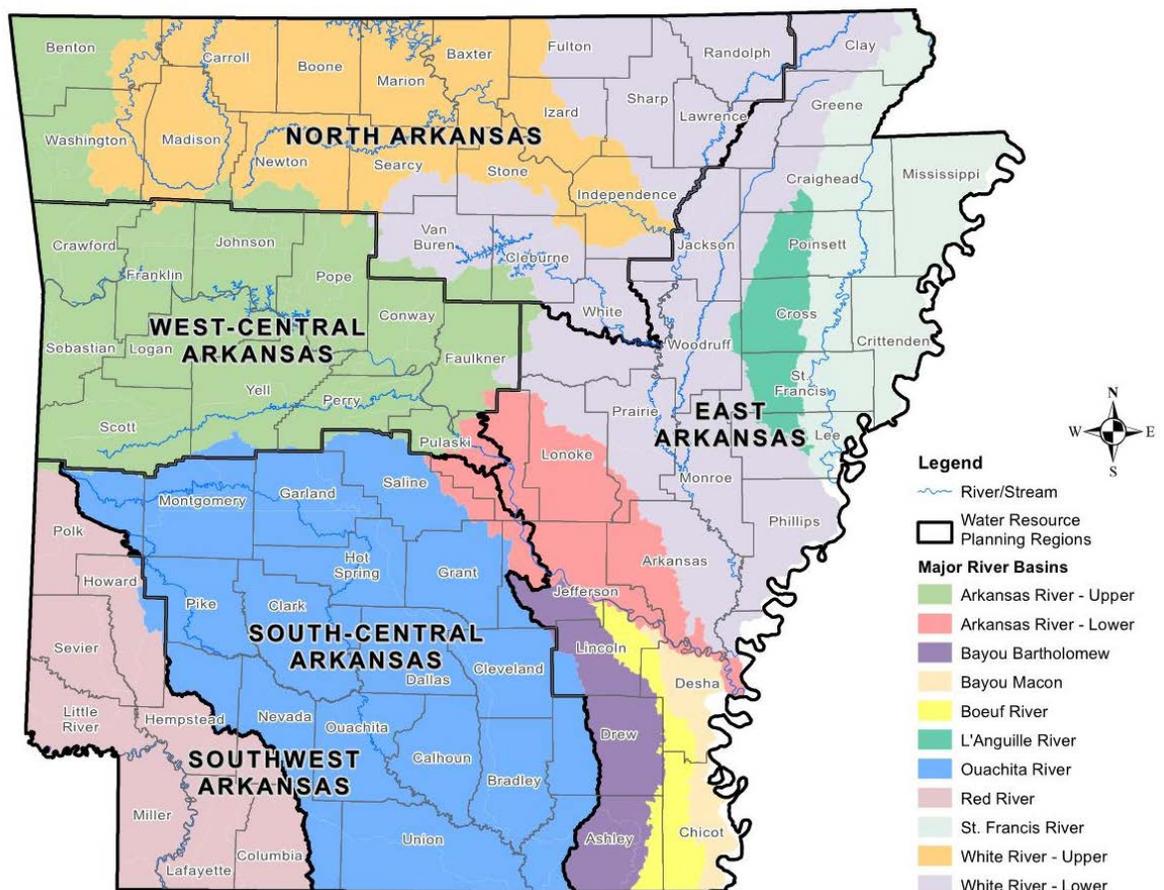


Figure 1. Overlay of Water Resources Planning Regions on Major Surface Water Basins

## Arkansas Water Plan Goals

Goals for the AWP were developed as part of an initial mission, vision, and goals workshop by a multi-agency group. The goals are:

- First and foremost, meet the drinking water needs of the State.
- Optimize the use of surface and groundwater for the differing economies of the unique regions of the State.
- Reliably meet agricultural water needs.
- Reliably meet industrial water needs.
- Manage water resources in a manner that protects the ecological needs of fish and wildlife.
- Reliably meet the water quantity and quality needs to help support navigation, recreation, and tourism.
- Use the best available science, data, tools, and technologies to support water resource decisions.
- Employ the latest supply management and water efficiency technologies among the different sectors of use including residential, commercial, industry, natural resources, and agriculture.



Mammoth Spring Lake - Photo courtesy of ANRC

- Identify and address emerging water resource management needs as identified through the water planning process.
- Use best available science and data to update and implement the AWP, and identify and address data gaps and needs.
- Optimize existing water, wastewater, and flood control infrastructure, including identifying opportunities to cooperatively address regional water and wastewater needs.
- Maximize the current infrastructure reliability including dams, levees, and treatment and conveyance facilities.

- Plan for changing demographics and related infrastructure maintenance and operation implications.
- Improve and update existing infrastructure and address aging infrastructure.
- Sustainably use surface and groundwater sources for the multiple intrastate uses while complying with interstate compacts.
- Refine criteria for declaring drought, water shortages and excess water, and advance policies and procedures for allocating water during times of shortage or drought.
- Identify and recommend procedures and criteria to improve upon existing instream flow methodologies taking into consideration water quality, fish and wildlife needs, aquifer recharge, and navigation needs at the statewide and basin-specific level.



Watershed - Photo courtesy of USDA-NRCS

- Include recreation and tourism as nonconsumptive water uses.
- Identify opportunities to manage water, wastewater, and stormwater to improve the quantity and quality of water, while providing for wise land management, wetland, and riparian protection for fish and wildlife sustainability.
- Identify implementable water resources alternatives that are socially, fiscally, technically, and environmentally feasible to protect, enhance, and wisely use surface and groundwater.
- Identify and implement alternatives that are fair and equitable.
- Allow for adaptability with changing technology, water uses, and socioeconomic conditions.
- Provide education and open communication about the AWP and its implementation.
- Work cooperatively with other regions and states, and among agencies and entities responsible for stewardship of the State's natural resources.

# Key Findings

## Demand Projections

- Statewide water demand is expected to increase 14 percent from the current 12 million AFY (11 billion gallons per day [gpd]) up to about 14 million AFY (12.5 billion gpd) by 2050.
- Overall, about 71 percent of statewide water demand is supplied from groundwater sources and that is assumed for planning forecasts to remain the same through the 40-year planning horizon. Reduction of groundwater use depends on successful implementation of conservation, surface water use, and delivery of excess surface water. Water demand for crop irrigation is about 80 percent of the total statewide water demand, primarily in the East Arkansas Region.



White River - Photo courtesy of USDA-NRCS

- One factor in estimating the projected demand for crop irrigation is the water application rate for each crop. While the best available data was used for the 2014 AWP analysis, stakeholder input suggests that the reported application rate, particularly for rice, is too high. The alternatives analysis suggests that increasing the accuracy of water use reporting could decrease the crop irrigation water demand figures by about 1.3 million AFY.
- Livestock water demands are projected to increase approximately 9 percent to about 33,600 AFY in 2050. Future water demands for aquaculture are held constant at baseline period levels of 115,300 AFY for planning purposes.
- Industrial water demand (both municipally-supplied and self-supplied) are projected to decrease by 31 percent from 325,945 AFY in 2010 to 226,300 AFY in 2050. The decrease is attributed to a downward trend in water intensive manufacturing.
- Mining water demand for silica sand, construction sand and gravel, and crushed stone mining are forecasted to increase by 132 percent from 6,825 AFY in 2010 to 15,658 AFY in 2050.
- Water demand for shale gas exploration and production is met with surface water. The demand for water for shale gas extraction in nine counties is projected to

decrease by 26 percent from 11,680 AFY in 2010 to 8,395 AFY in 2026, depending on the price of gas and innovations in production technologies.

- Statewide municipal and self-supplied drinking water supply demand is projected to increase by about 25 percent from 462,500 AFY in 2010 to 578,000 AFY in 2050, assuming “passive conservation” (federally-required installation of low-flow plumbing fixtures).



Ouachita River Alternative Water Supply Project intake structure in Union County near El Dorado - Photo courtesy of Union County Water Conservation Board

- Total surface water withdrawals for thermoelectric power production is projected to increase 15 percent from 1.3 million AFY in 2010 to 1.5 million AFY in 2050. However, the majority of water withdrawn for thermoelectric power production is returned, so the consumptive use is 0.09 million AFY in 2010 and is projected to increase to 0.1 million AFY in 2050.
- Water needed to maintain ecosystem viability is estimated using the Arkansas Method (Filipek et al. 1987) for the 2014 AWP. However, there is a recognized need to shift to using empirical, risk-based ecological response/flow relationships as the foundation for determining fish and wildlife flows in the future.
- Improved methodologies for estimating fish and wildlife flows, if adopted by ANRC, could be used to evaluate permits for nonriparian withdrawals, pre-allocation studies, and allocation in times of water shortages, as well as in future updates of the AWP.

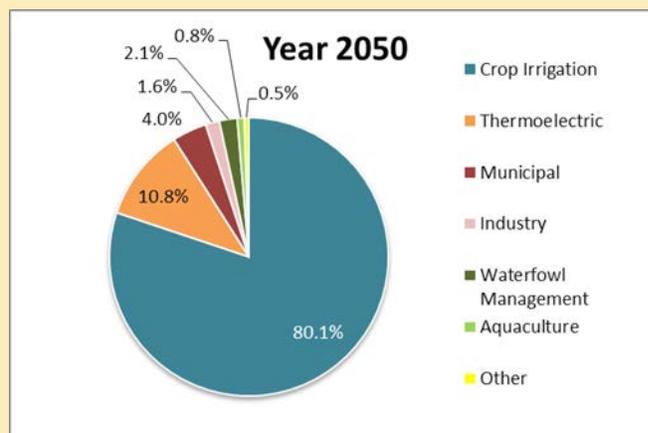


Figure 2. AWP Water Demand Forecast by Sector for the Year 2050

## Water Availability

- For the State of Arkansas, on an average annual basis, there is estimated to be 8.7 million AFY of excess surface water available for interbasin transfer or use by nonriparians. It is important to note that, although there is an abundance of water available on an average annual basis, demands for that water do not necessarily occur during the times of year when that water is available in a stream.
- Groundwater modeling of the Mississippi Embayment aquifers (primarily the East Arkansas Region) suggests that, under sustainable pumping conditions, only a fraction of the water demand can be met with groundwater in 2050. Groundwater availability in Regions outside the Mississippi Embayment model is assessed in the U.S. Geological Survey (USGS) report “Aquifers of Arkansas” (Kresse et al. in review). The general conclusions are that water supplies are limited by low yield and water quality concerns.

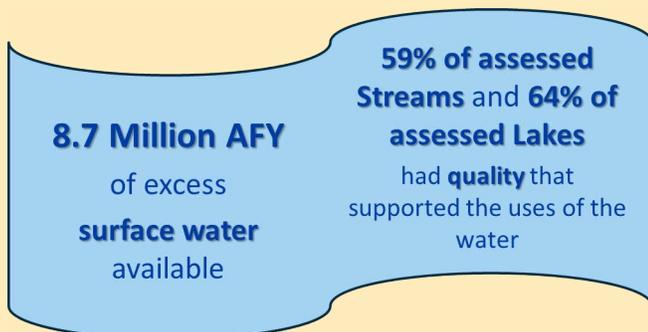


Figure 3. Water Availability

## Water Quality

- Surface water quality assessments in 2008 showed that the quality of some streams and lakes is not adequate. There is no statewide pattern of use impairment or causes of impairment, except fish consumption (mercury).
- In surface water, there have been declining trends in suspended solids across most Regions from 1990 to 2008.
- Groundwater quality in the Mississippi Embayment sedimentary aquifers in the East Arkansas and South-central Arkansas Regions is generally good in the recharge areas and deteriorates to the southeast where the aquifers are deeper.
- Groundwater quality in the Interior Highlands of Arkansas is generally good, except where impacted by human activities.

## Gap Analysis

- The projected annual average 2050 groundwater gap (the difference between supply and demand) across the State is approximately 8.2 million AFY assuming sustainable groundwater pumping. The groundwater supply gap is projected to occur primarily in the East Arkansas Region. Once complete, the Grand Prairie and Bayou Meto Projects will reduce this gap by providing surface water to 15 percent of the farmed acreage in east Arkansas.
- There is sufficient excess surface water in four major river basins to close the projected groundwater gap: Arkansas River, Ouachita River, Red River, and White River. However, the appropriate infrastructure may not be in place to use all of the excess surface water supply.
- Three major river basins are projected to have a water supply gap in 2050 taking into account both groundwater and surface water supplies: Bayou Macon, Boeuf River, and L'Anguille.
- The Boeuf River Basin is projected to experience a surface water gap (supply less than demand) in June, July, and August based on average flow conditions over the period of record.

## Water and Wastewater Infrastructure

- The cost of infrastructure to deliver excess surface water to farms where groundwater has declined is high, but must be considered in the context of the \$9.7 billion annual market value of agricultural products in Arkansas.
- The Grand Prairie Area Demonstration Project and Bayou Meto Water Management Project, when complete, will provide surface water sources for irrigation to 15 percent of the farmed acreage in East Arkansas with projected groundwater gaps.
- Arkansas water providers will need to spend \$5.74 billion and wastewater providers will need to spend \$3.76 billion to build, maintain, and replace required infrastructure through 2024.
- Small water and wastewater providers pose a unique challenge when planning at the statewide level.
- Many of these providers also face the challenge of shrinking population and resulting in reduced revenue streams, following the national trend of increased urban dwelling.

## Issues and Recommendations

The Regional Issues and Recommendations (I&R) Workgroups were first asked to identify issues and prioritize those issues using a voting process. The Workgroups were then asked to develop recommendations to address the issues. The recommendations were also prioritized using a voting process. All of the I&Rs identified by the I&R Workgroups are presented in the *Issues and Recommendations Workgroup Process and Outputs Technical Memo*.

The final step in the I&R process was the ANRC selection of priority issues. The Commissioners considered all of the I&Rs identified and prioritized by the I&R Workgroups and selected nine priority issues and one supporting issue. Each of the priority issues are presented here along with the prioritized recommendations and an implementation strategy.



Issues and Recommendations Workgroup Meeting - Photo courtesy of Terry Horton

### Conjunctive Water Management and Groundwater Decline Priority Issue

**Issue:** *Declining groundwater levels in the aquifers and the need to move toward sustainable use of the groundwater.*

**Recommendations:**

The following were recommended to address groundwater decline:

1. ANRC will seek authority to purchase, install, and read meters on selected alluvial wells including the authority to lease or condemn sites for meter installation.
2. Develop and implement conjunctive water management strategies based on storing surface water, during months when excess water is available, for use during the summer irrigation months when excess surface water is not available (Figure 4). Groundwater use would supplement surface water use, rather than being the primary irrigation water source.
3. Encourage and increase irrigation water use efficiency through integrated irrigation water management and conservation practices over the next decade.

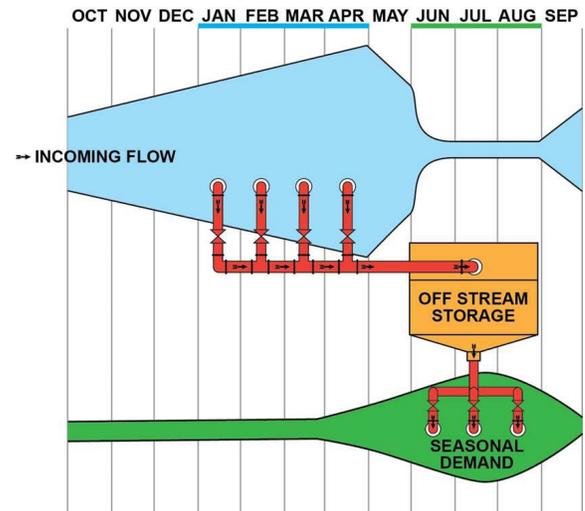


Figure 4. Operational Example of Conjunctive Water Management  
Original Illustration by Bill McMurry

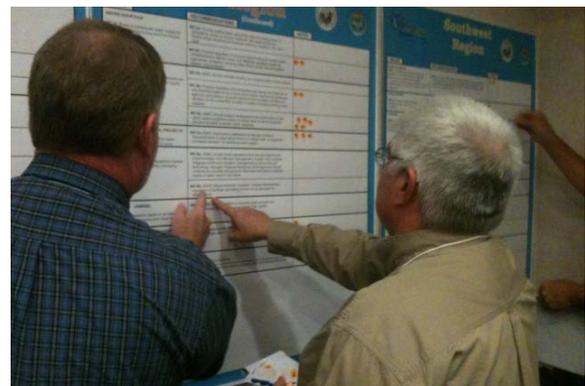
### Drought Contingency Response Priority Issue

**Issue:** *Planning for allocation during drought is needed before droughts occur.*

**Recommendations:**

The following were recommended to address drought contingency responses:

1. Develop a coordinated drought contingency response network among State and federal agencies; drinking water utilities, organizations, and institutions; and the private sector for alerting the public about impending droughts, sharing consistent messages and information, and providing information on voluntary conservation measures to reduce water use.
2. Seek funding and ensure stream gaging networks throughout the State are adequate to provide streamflow information needed to make informed decisions about impending or advancing droughts statewide and within each planning region.



Identifying issues - Photo courtesy of Terry Horton

## Excess Water for Nonriparian Withdrawal and Use Priority Issue

**Issue:** *The statutory definition of excess water should be based on sound science.*

### **Recommendations:**

The following are recommended to address the excess water issues:

1. Remove the 25 percent limitation for estimating excess water available for nonriparian transfer and conduct scientific studies to determine what proportion of the total available water is seasonally appropriate to satisfy the required uses specified in statute by major basins and subbasins in each planning region, beginning with the East Arkansas Region, and followed by, in order, South-central, West-central, North, and Southwest Arkansas Regions. This study should be conducted in consultation with the AGFC and ADEQ.
2. Continue to use the Arkansas Method in estimating the proportion of total available water needed to satisfy fish and wildlife flow needs in estimating excess water for nonriparian withdrawals and transfers. Through adaptive management, the ANRC will evaluate and assess alternative methods for estimating fish and wildlife flows, or other instream needs and uses, as more accurate, scientifically reviewed, and defensible methods become available.
3. Engage stakeholders in the planning regions through an open and transparent process as the scientific study is being conducted by ANRC and as better scientific approaches become available and are proposed for use.

## Funding Water Resources Development Projects Priority Issue

**Issue:** *State-issued general obligation bonds are vital to finance and refinance the development of water; waste disposal; pollution control, abatement, and prevention; drainage, irrigation, flood control, wetlands, and aquatic resources projects to serve the citizens of the State of Arkansas.*

### **Recommendations:**

The following were recommended to address additional funding for water resources development projects:

1. As an initial step, authorize an additional \$300 million under the Water, Waste Disposal, and Pollution Abatement Facilities General Obligation Bond Program at the appropriate time. Additional authorization will be requested as needed to finance and refinance the development of these water resources projects.
2. ANRC will seek the authority to merge water and sewer systems where necessary in order to bring them into economic viability.

## Improving Water Quality through Nonpoint Source Management Priority Issue

**Issue:** *Water quality is affected by nonpoint sources of pollutants and nonpoint source management projects need State funding in addition to federal funding.*

### **Recommendations:**

Recommendations for improving water quality include:

1. Propose legislation to designate funding specifically for financing NPS pollution management programs and implementing NPS management practices.
2. ANRC will collaborate with ADEQ and AGFC through the biennial Clean Water Act (CWA) water quality review processes, and the water quality criteria review to determine attainment or nonattainment of water quality standards in streams and identify the sources and causes of nonattainment:
  - a. Streams impaired because of NPS pollution will be considered as priority streams for restoration through the NPS management program.
  - b. Streams currently attaining water quality standards in priority watersheds will be considered for protection through the NPS management program.
3. Study whether nutrient management plans should be required outside current nutrient surplus areas.
4. Leverage funding from multiple sources such as Source Water Protection under the Safe Drinking Water Act, administered through the ADH, to address NPS pollution in watersheds with drinking water sources.

## Public Awareness and Education Priority Issue

**Issue:** *Public awareness and education are critical for water planning in Arkansas.*

### **Recommendations:**

The following is recommended to address the need for public awareness and education:

1. The ANRC will collaborate with the Arkansas Water Foundation, the Arkansas Association of Conservation Districts, the University of Arkansas (U of A) Cooperative Extension Service, and others to develop and disseminate public information. This information should focus on water conservation practices being implemented by agriculture in Arkansas, the contributions of agriculture to the economy, food security, the quality of life in Arkansas, advances in water conservation technology, and trends in groundwater and surface water use.

### Public Water and Wastewater Infrastructure Priority Issue

**Issue:** *Public water and wastewater infrastructure is failing, and in need of repair and replacement throughout Arkansas.*

**Recommendations:**

The following are recommended to address the infrastructure issues:

1. Public entities operating water and wastewater infrastructure or flood control and drainage projects should develop sustainability plans that evaluate:
  - a. Current infrastructure status and historical trends in status;
  - b. Needed infrastructure repairs, replacement, and maintenance and associated schedules;
  - c. Federal and State programs available to support infrastructure projects; and
  - d. Contingency plans, including the potential for regionalization or privatization (private water wells, septic systems, decentralized systems, etc.), if the utilities are assessed to be unsustainable.
2. Receivership proceedings should be initiated for public water and wastewater providers that have defaulted on loans.
3. Training programs should be developed for utility boards of directors on sustainability planning and how these plans relate to the operation of their facilities and infrastructure. Utilities that submit a sustainability plan with funding applications could receive lower rates on loans.

### Reallocation of Water Storage in Federal Reservoirs Priority Issue

**Issue:** *Reallocation of water storage in USACE reservoirs is needed to increase available water for existing and new uses.*

**Recommendations:**

Reallocation of water storage in USACE reservoirs, based on the revised 1977 Water Supply Act guidance manual, should be sought if there is a documented need for additional water for domestic, municipal, or industrial water supply.

### Tax Incentives and Credits for Integrated Irrigation Water Conservation Priority Issue

**Issue:** *Tax incentives and credits are needed to encourage the implementation and management of integrated irrigation water conservation practices.*

**Recommendations:**

The following were recommended for tax incentives and credits to encourage increased water use efficiency and conservation:

1. Determine the current irrigation water use efficiency for various crops and subwatersheds in the East Arkansas Region and establish a goal or target efficiency to be achieved for integrated irrigation water management and conservation practices.
2. Evaluate the effectiveness of the existing tax credits and incentives and, based on this assessment, consider:
  - a. Increasing the percentage of the total project cost available for tax credits based on applicants improving their irrigation water use efficiency compared with the goal or target efficiency,
  - b. Extending the period for claiming tax credits for implementing water conservation practices,
  - c. Increasing the annual cap on tax credits so additional tax credits can be claimed, and
  - d. Tracking the acreage on which water conservation practices have been implemented along with the tax credits.



On-farm reservoirs increase water security and mitigate the impact of drought - Photo courtesy of USDA-NRCS

For more information please visit the following website:  
[ArkansasWaterPlan.Arkansas.gov](http://ArkansasWaterPlan.Arkansas.gov)

If you would like to send comments please email them to [ArkansasWater@CDMSmith.com](mailto:ArkansasWater@CDMSmith.com) or by mail to:  
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