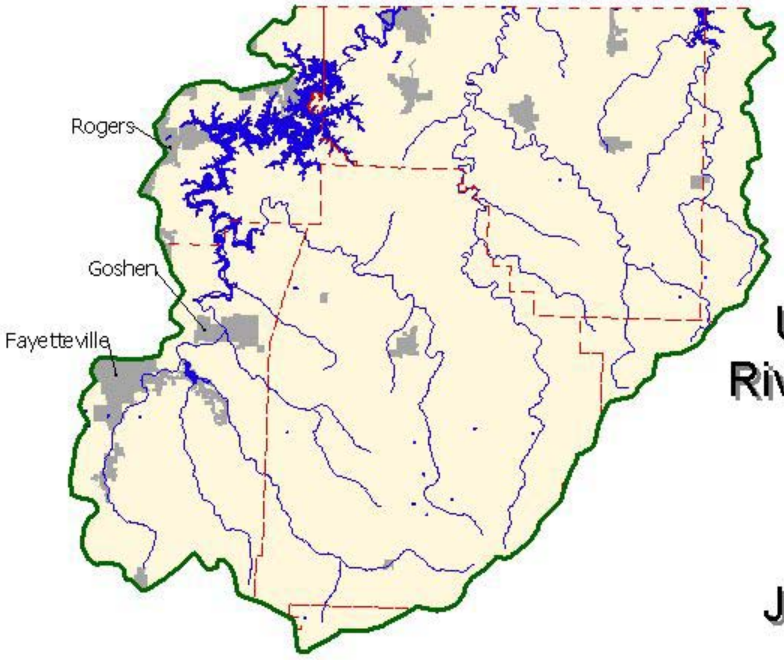
Watershed Management Strategy



Upper White River Watershed

January 2004

Introduction

In 1987, Congress amended the Clean Water Act (CWA) to establish the section 319 Nonpoint Source Management Program because it recognized the need for greater federal leadership to help focus State and local nonpoint source efforts to reduce nonpoint source pollution. Under section 319, State, Territories, and Indian Tribes receive grant money which support a wide variety of activities including technical assistance, financial assistance, education, training, technology transfer, demonstration projects, and monitoring. Since 1990, the Arkansas Soil and Water Conservation Commission (ASWCC) has been the lead agency for Nonpoint Source (NPS) pollution management in Arkansas. Through grants funded by the Environmental Protection Agency (EPA), the ASWCC provides assistance to conservation districts, academic institutions, state government agencies, and other organizations, groups, or entities. The ASWCC accepts workplans for projects to manage, reduce, or abate NPS pollution.

The intended goal of this document is to be a comprehensive strategy for the control of nonpoint source pollution (NPS) within the Upper White River Watershed in Arkansas, Hydrologic Unit Code (HUC) 11010001. This watershed includes the Beaver Lake Watershed, the Kings River, Yocum, and Long creeks. This document is intended to be a practical and workable solution to the problems of nonpoint pollution. All issues will be addressed and implementation will focus on all aspects of NPS pollution. To be a

workable strategy, all contributors to the problems must participate in the planning and application of the strategy and funding will determine the rate of implementation.

- **Goal:** To provide a generalized strategy to control NPS pollution within the Upper White River Watershed

To be practical, all aspects and impacts of the problems and proposed solutions will be considered. Planned solutions must be reasonable and within the ability (and budget) of the people who will carry them out. This strategy is intended to be ongoing and continually modified, evolving to meet the changing conditions in the watershed; thus a living document.

Nine Element Watershed-Based Strategy

Nine Elements of a Watershed Strategy

1. Identification of Causes and Sources of NPS Pollution
2. Estimated Load Reductions
3. Management Measures
4. Technical and Financial Assistance
5. Information/Education
6. Schedule of Implementation
7. Milestones and Reevaluation
8. Performance Criteria
9. Monitoring Component

The Clean Water Action Plan, initiated by the Environmental Protection Agency (EPA) and United States Department of Agriculture (USDA), asks states to prepare watershed based strategies, for impaired waters, that are designed to identify the sources and causes of impairment and provide a roadmap to achieve water quality standards. These watershed strategies are currently prepared for priority watersheds. There are nine elements to be addressed in each strategy that list specific water quality problems, identify sources of contaminants causing those problems, identify the relative contribution of the sources, provide a schedule of action items that will be undertaken to address those sources, and estimate the funding needs for those action items. These elements also include an estimate of load reductions, description of management measures, interim milestones, performance criteria, monitoring component and an information/education component.

To date, no approved strategies exist within Arkansas; therefore this is a new approach to watershed management. To prepare a strategy, a number of different resources will be utilized. First and foremost, the strategy will rely on the 1998-2002 Nonpoint Source Management program. This program is currently under revision and will include the addition and removal of priority watersheds. Currently, the program lists the Illinois River, Upper White River, Buffalo River, Big Piney Creek, Poteau River, Strawberry River, Smackover Creek, Cadron Creek, Lower Little River, and Bayou Bartholomew as priority NPS watersheds. Additional resources include The Unified Watershed Assessment, 2002 Water Quality Inventory Report, Arkansas Department of Environmental Quality's (ADEQ) 2002 Proposed 303(d) list, and other miscellaneous publications.

Element 1: Identification of Causes and Sources of NPS Pollution

Goal: To identify the causes and sources or groups of similar sources that will need to be addressed to achieve the water quality goals of the watershed based strategy.

These resources are assembled to address each of the nine elements required in the strategy. First and foremost, the causes and sources of NPS pollution must be identified. Previous studies, visual assessments, GIS coverage, and water quality data will be used to identify causes and sources of NPS pollution. Information from

conservation districts and landowners will also aid in the identification of NPS problems. Arkansas' priority watersheds and TMDL streams is where the first watershed based strategies will be created.

The second element of a watershed based strategy is the estimated load reductions necessary to achieve water quality standards. In areas where a TMDL has been established, load reductions estimates will be derived from those standards. In areas where a TMDL has not been developed, load reductions need to be addressed as those that will support the water body's designated uses. Tools available include empirical relationships, relationships between load and water quality, and the use of computer models.

Element 2: Load Reductions

Goal: To estimate the load reductions necessary to achieve water quality standards.

Once load reduction estimates are completed, those management measures needed to achieve the goaled load reductions need to be identified. Factors to consider are what areas should be targeted for initial control, the relative importance of the impaired waterbody within the watershed, the magnitude of impairment, existing loads, estimated load reductions, feasibility of implementation, the areas of priority, the approach for implementation of BMPs, and added benefits to other resources such as wetlands, floodplains, and groundwater. Also, the selection of the appropriate BMPs, the tools available to select and/or evaluate the effects of potential BMPs and the process for selecting BMPs or a system of BMPs need to be considered.

Element 3: Management Measures to Achieve Load Reduction

Goal: To describe the nonpoint source management measures that will need to be implemented to achieve the identified load reductions.

The fourth element of the strategy includes the technical and financial assistance needed to implement the strategy. Factors which affect the cost of implementation include the BMP type, installation costs, maintenance costs, topography, and the availability of technical and financial resources. Resources include the EPA's 319 program, EQIP, CRP, state funds, landowner contributions, or groups dedicated to the protection of our natural resources.

Element 4: Technical and Financial Assistance Needed

Goal: To estimate the amounts of technical and financial assistance needed, associated costs, and/or the sources and authorities that will be relied upon to implement the watershed-based strategy.

The fifth element of the watershed-based strategy includes an information/education component. The goal of this component is to provide an outreach to enhance the public understanding of the watershed strategy and encourage their participation in selecting, designing, and implementing nonpoint source management measures. First you need to identify your target audience, identify their concerns and priorities, review the goals and

Element 5: Information/Education

Goal: To provide an information/education component that will be used to enhance public understanding of the watershed strategy and encourage their participation in selecting, designing, and implementing nonpoint source management measures.

objects for the strategy, then identify media campaigns currently in place, identify state partnerships, identify a strategy for delivering the message, and determine the schedule for delivery of the message.

The sixth element is the schedule of implementation of the strategy. This will include the implementation of all elements identified in the watershed strategy to achieve water quality standards. The schedule includes all responsible parties involved in the strategy, those involved in implementation, those tracking the strategy's progress and those measures to track the strategy's progress, the accomplished milestones, and evaluations of implementation.

Element 6: Schedule

Goal: To provide a schedule for implementing the nonpoint source management measures identified in the watershed-based strategy.

Element seven identifies those measurable milestones for determining whether nonpoint source management measures or other control actions are being implemented. Goals should be within the scope of the project and include spatial and temporal goals, watershed priority, coordination efforts, and funding. Milestones should be evaluated and identify the party responsible for evaluations, the schedule for evaluation, the process of evaluation and criteria for whether the milestones were met. If milestones are not being accomplished, a process for determining a reasonable course of action should be identified, potential actions, criteria for deciding actions, and a new schedule for meeting milestones.

Element 7: Milestones and Reevaluation

Goal: To describe interim, measurable milestones for determining whether nonpoint source management measures or other control actions are being implemented.

Element eight identifies a set of indicators for determining if loading reductions are being achieved and progress is being made towards attaining water quality standards, and if not, the decision criteria for determining if the watershed-based strategy needs to be revised. Indicators for evaluating water quality progress should establish interim goals, loading targets, in stream targets, timeline, spatial and temporal targets. Water quality values should be used to track water quality improvement and if the water quality is on track, ahead of schedule or behind schedule. A process for revision should also be made if necessary.

Element 8: Criteria to Evaluate Loading Reductions and Water Quality Progress

Goal: To identify a set of indicators for determining if loading reductions are being achieved and progress is being made towards attaining water quality standards and, if not, the decision criteria for determining if the watershed based strategy needs to be revised.

The final element of the strategy is monitoring the effectiveness of the strategy. This component is one of the most important elements since it will identify if the goals of the strategy are being achieved. Site locations, frequency of monitoring, parameters to monitor, as well as improving existing monitoring stations and using existing data will be used. Identifying responsible

Element 9: Monitoring

Goal: To establish a monitoring component to evaluate the effectiveness of the implementation efforts.

parties, funding, alternate resources, and comparability to pre-implementation monitoring are factors considered in this element.

These nine elements will be used as a guide to achieve water quality standards. No single element of the strategy is ever "carved in stone". It is viewed as guidance and intended to be ongoing and continually modified, evolving to meet the changing conditions in the watershed and changing technologies. Planned solutions must be reasonable and within the ability (and budget) of the people who will carry them out.

Total Maximum Daily Load

The Total Maximum Daily Load (TMDL) is a calculation of the maximum amount of a pollutant a waterbody can receive and still meet water quality standards. Water quality standards are set by the State of Arkansas and the uses for each waterbody are also identified, such as, drinking water supply, contact recreation (swimming), and aquatic life support (fishing). A TMDL is the sum of the allowable loads of a single pollutant from all contributing point and nonpoint sources. The calculation must include a margin of safety to ensure that the waterbody can be used for its designated uses and must also account for seasonal variation in the quality of water. Section 303 of The Clean Water Act (CWA) establishes the water quality standards and TMDL programs. TMDLs can help in the creation of watershed management strategies by setting goals of implementation measures and indicating where implementation should occur. Currently, a TMDL does not exist for the entire Upper White River Watershed, only for nitrates on Town Branch and Holman Creek (see http://www.adeq.state.ar.us/custsvs/pa/tmdl_sum.asp for complete TMDL). The source of the nutrient problem is a municipal point source. To protect the drinking water designated use for this segment the target for TMDL will be established as 10 mg/l nitrates; thus 166.8 lbs/day was established as the allowable load of nitrates. The Arkansas Department of Environmental Quality (ADEQ) is the responsible agency for setting TMDLs in the State of Arkansas.

303(d) List

According to ADEQ's 2002 Proposed 303(d) list, "Section 303(d) of the Clean Water Act requires that States identify waters which do not meet or are not expected to meet applicable water quality standards. These water bodies are compiled into a list known as the 303(d) list. The regulation (40 CFR 130.7) requires that each 303(d) list be prioritized and identify waters targeted for Total Maximum Daily Load (TMDL) development in the next two years. As a result of several lawsuits concerning past 303(d)/TMDL processes, EPA has issued numerous administrative interpretations, administrative procedures, policies and guidance from both headquarters and regional offices for preparation of the 303(d) list. Currently, major revisions in the TMDL regulation process have been proposed; however several controversial sections in the proposal have resulted in a stay of the new regulations. As a result, the 303(d) process is driven by previous guidance and administrative directives. Recent EPA guidance requests that the 303(d) Impaired Waterbody List be submitted with the 305(b) report as an *Integrated Water Quality Monitoring and Assessment Report*. Much of this guidance was used to develop the current 303(d) listing". There are three segments on the 303(d) list from the Upper White Watershed. They are listed in Table 1 and shown in Figure 1 below.

Table 1 Impaired waterbodies

Stream Name	Reach	Miles	Major Source	Minor Source	Major Cause	TMDL status
White River	11010001-23	6.2	road construction	agriculture	siltation/ turbidity	2005
West Fork	11010001-24	27.2	road construction	agriculture	siltation/ turbidity	2005
Holman Creek	11010001-59	9.1	point source		nutrients	complete

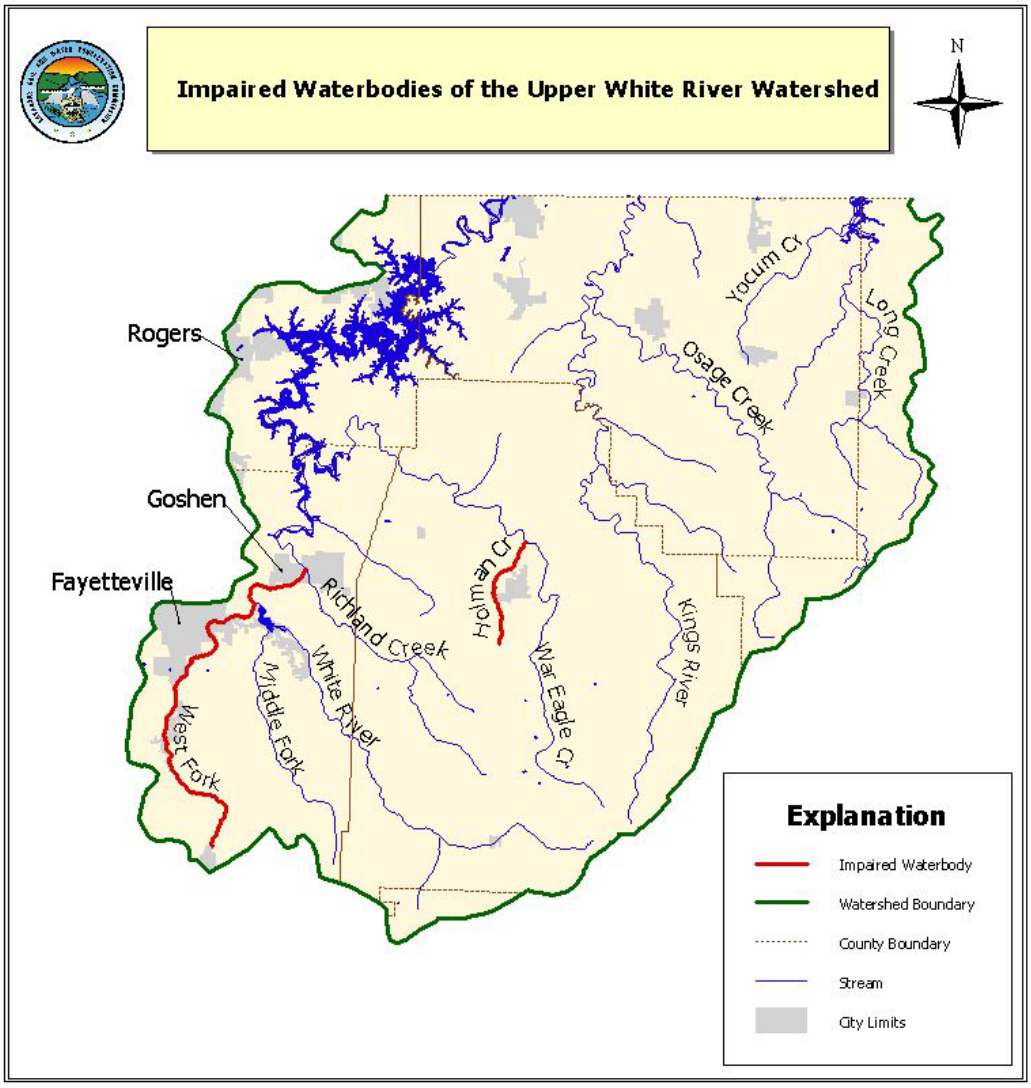


Figure 1 Impaired Waterbodies

ADEQ's 305(b) Assessment of the Upper White River Watershed

Segment 4K

Segment 4K includes portions of Washington, Benton, Madison and Carroll counties in northwest Arkansas. This segment encompasses a 66-mile reach of the White River and its tributaries and an 85-mile reach of the Kings River and its tributaries. It also includes Long Creek and Yocum Creek.

All waters within this segment are designated for propagation of fish and wildlife, primary and secondary contact recreation, domestic, agricultural and industrial water supplies. Also, about 20 percent of these waters are designated as outstanding state or national resource waters. A total of 208 miles of streams were monitored for use support utilizing data from 11 routine monitoring stations. An additional 193.3 miles were evaluated. Aquatic life use was assessed as not supported in 33.4 miles of the West Fork of the White River. The major cause was high turbidity levels and excessive silt loads. A comparison of the monthly turbidity values in the West Fork with the other two forks of the upper White River was done. The West Fork consistently has the highest values. The probable sources are: (1) agriculture land clearing; (2) road construction and maintenance; and (3) gravel removal from stream beds. A point source discharge to Holman Creek has impaired the drinking water use of the lower section of this stream by discharges of excessive levels of nitrates. A TMDL has been completed for this stream segment for nitrates.

Identification of Causes and Sources of NPS Pollution

In Figure 2 below, the land use distribution is shown throughout the entire watershed. Land use is discussed in the sub-basin sections below. The significance of land use distribution to the development of this watershed management strategy is illustrated in the "NPS Management Measures, Load Reduction Estimates, Technical and Financial Assistance" section. In this section, land use is the key factor is determining what type, how many and cost of BMPs to improve the water quality in the watershed.

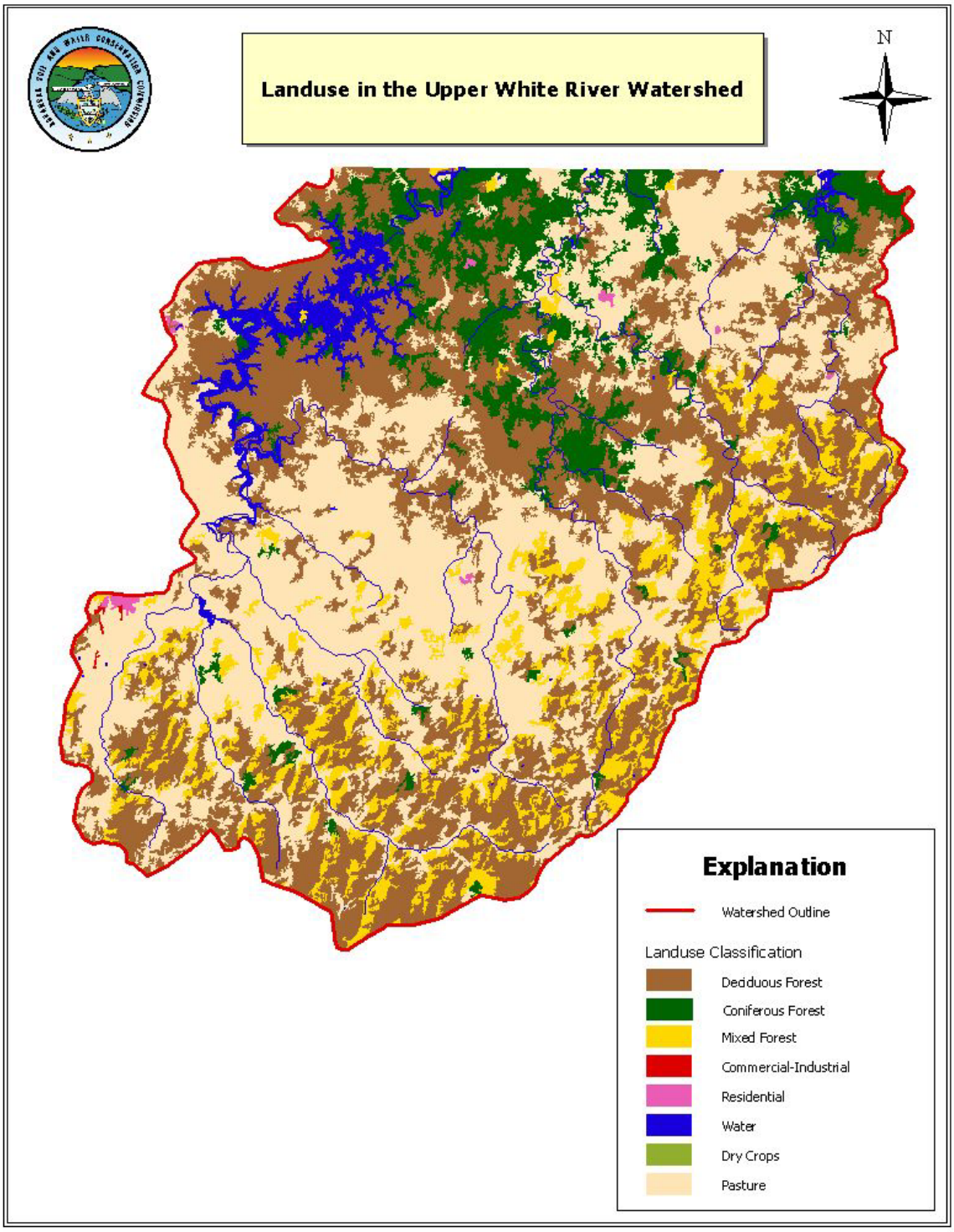


Figure 2 Land use distribution

Beaver Lake Watershed

The Beaver Lake watershed is located in the western portion of the Upper White River Watershed. The geographic region of the Beaver Lake Watershed spans four counties and has an estimated population of 140,000 individuals, while the reservoir serves more than 260,000 as a public water supply. The West Fork, Middle Fork, and Main Fork of the White River; Brush Creek; Richland Creek; and War Eagle Creek are included in this watershed. The total watershed area is approximately 763,138 acres. The land use in the watershed is estimated to be approximately 68% forestland, 27% agricultural land (primarily pasture with some row crop production), 4% water (including Beaver Lake and Lake Sequoyah), and 1% urban.

The recent rapid growth in urban and agricultural activities within the watershed has accelerated the clearing of forestland for conversion to residential areas and pasturelands. Rapid land use change associated with urbanization has resulted in increased erosion and transport of sediment to Beaver Lake. Increased agricultural activity has resulted in increased nutrient production in the watershed and hence in the runoff. This has resulted in deterioration of stream and lake water quality within the watershed[1]. Water quality issues in the watershed are: (1) eutrophication conditions in Beaver Lake, (2) aquatic life impairment of tributary streams, and (3) loss of support for drinking supply in Holman Creek[2]. The identified causes of these impairments are turbidity, excessive silt, pathogens, phosphorus, and physio-chemical parameters. Accelerated eutrophication has been attributed to increased nutrient inputs at the watershed level. The specific origin of these nutrients within such a complex system remains uncertain. The Arkansas' NPS Pollution Management Program for 1998-2002 has listed agricultural operations (confined animal and pasture), rural roads, and resource extraction as potential sources of nonpoint source pollution in the watershed. Other potential sources include erosion from construction sites, loss of riparian zones, on-site septic system failure, and ineffective or overburdened municipal wastewater treatment plants.

Agricultural operations within the watershed produce approximately 111 million chickens, turkeys, and Cornish hens; and 264 thousand head of livestock (beef and milk cows, pigs, etc.) annually. Historically, animal manure was applied to fields based on nitrogen (N) demand of crops or simply to comply with hygiene requirements for removing waste materials from animal houses; only recently, in limited areas animal manure has been applied on a phosphorus (P) basis. The environmental consequences of N based applications include high loads of P, heavy metals, and organic compounds in runoff, and eventually in reservoirs. From 2.2 to 7.3% of total P (TP) in poultry litter applied to pasture surfaces can be lost in runoff, 80% of which is in the dissolved reactive form[3]. Annual fertilizer use in the White River Basin has increased by 77% for P and by 200% for N between 1965 and 1985. A recent estimate of the annual loads between 1992 to 1996 for ortho-P has been reported to be 75,000 to 117,000 kg, and for N to be 970,000 to 3,400,000 kg per year.

Currently, the majority of the waters in the state being placed on the ADEQ 303(d) list are due to excess sediment and/or nutrients. The Beaver Lake Watershed is not any different. Confined poultry, swine, beef, and dairy operations may have been a contributor of nutrients. Rural roads, increased construction, streambank erosion, and

timber harvest are likely contributors of elevated sediment loads. Intense urban expansion is rapidly becoming a major concern in the watershed, as well. With increased urban development and the accompanying population growth, projects related to water quality education related to urbanization will become increasingly important in the coming years.

The resulting conflict between agricultural production and urban resource needs, especially drinking water, has threatened the viability of the animal production in this watershed. The end point of interest in this watershed is Beaver Lake, the primary drinking water source for more than 260,000 people in the area. In addition, this lake is used for recreation and several tributaries are identified as critical for supporting aquatic biodiversity.

A cooperative effort between the Arkansas Department of Environmental Quality (ADEQ) and the Arkansas Soil and Water Conservation Commission (ASWCC) resulted in the formation of the Beaver Lake Watershed Partnership (BLWP) and is currently functioning as a "citizens" stakeholder group. A "technical" group known as the Beaver Lake Project Group, consisting of various State and Federal Agencies, Water District operators and managers, and academia has also been developed.

To develop a watershed management strategy for the Beaver Lake watershed to protect the lake water quality, the linkages among land use activities, stream water quality, and lake water quality must be understood. Sediment transport in the tributaries and to the Beaver Lake is identified as a major problem in the watershed. It is possible that poor riparian habitat is contributing significantly to the erosion and sediment transport problem. There is a need to accurately delineate the riparian areas and identify the areas with poor riparian habitat so that sediment monitoring and stream rehabilitation plans could be developed. Similarly, any effect of land use practices must be analyzed and BMPs developed to protect the lake water quality. This may not be possible without accurate baseline water quality information of the Beaver Lake. There is also a need to develop, implement, and evaluate a GIS-based decision support system (DSS) for developing a comprehensive watershed management plan. The DSS will link effects of various land use activities on nutrient, sediment, and pathogen loading into streams and in-stream processes controlling delivery of nutrients to lakes. Also, the DSS would provide a lake water quality model quantifying the effect of sediment and nutrients on the lake eutrophication. The development of the DSS will also help identify current data gaps within the watershed that are necessary for developing a watershed management plan. This will minimize the collection of redundant data that may not be useful for watershed management plan development and water quality improvement, while ensuring that all the critical data needed are collected. Various state, federal and local agencies, such as Arkansas Soil and Water Conservation Commission, Arkansas Department of Environmental Quality, NRCS, Beaver Lake Partnership, and County Extension, and city administration can use this DSS to analyze the impact of land use changes and land use activities on the Beaver Lake watershed and can benefit from it in making watershed management decisions.

This watershed was selected in Arkansas' Unified Watershed Assessment[4] as "the top priority" for implementation of watershed restoration practices. The unified watershed

assessments and watershed restoration priorities in Arkansas were developed through state and federal agencies using existing assessment reports and data. The scale used for the assessment reports were at the 8-digit HUC code. The characteristics and conditions of waters within the watershed and the overall health of the aquatic system were used by dividing it into four categories.

- Category I – Watersheds in need of restoration
- Category II – Watersheds meeting goals, including those needing action to sustain water quality
- Category III – Watersheds with pristine/sensitive aquatic system conditions on lands administered by federal, state, or tribal governments
- Category IV – Watersheds with insufficient data to make an assessment

Beaver Lake falls into two Categories, I and III. Category I watersheds do not meet or face imminent threat of not meetings clean water and other natural resource goals. Category I watersheds were based on the number and type of water bodies meeting clean water and other natural resource goals. Considered in the factoring are:

- 8-digit hydrologic unit watersheds containing Arkansas Department of Pollution Control and Ecology 303(d) impaired streams
- 8-digit hydrologic unit watersheds containing Arkansas Department of Health monitored drinking water systems with multiple occurrences of constituents recorded above maximum contaminant or action levels
- 8-digit hydrologic unit watersheds containing Arkansas Department of Heritage streams with imperiled or critically imperiled aquatic species
- 8-digit hydrologic unit watersheds containing Arkansas Soil and Water Conservation Commission section 319 priority watersheds

Category III watersheds contain pristine or sensitive aquatic systems and drinking water sources that are located on lands administered by federal, state, or tribal governments. States work with federal land managers to identify these watersheds. Pristine conditions reflect immeasurable impacts from point or nonpoint sources. Sensitive conditions include rare and endangered, restricted endemics, and are known to be intolerant to environmental disturbances. These areas include currently designated and potential candidate Wilderness Areas, Outstanding Natural Resource Waters, and Wild and Scenic Rivers.

The rational for the Beaver Lake Watershed selection as the top priority was that the watershed included the following:

- One state extraordinary water resource
- One imperiled aquatic species
- Drinking water supplies for about 250,000 persons
- Two state impaired water body (West Fork and White River segment)
- Numerous state waters of concern
- Three USDA Environmental Quality Incentive Program (EQIP) projects
- One state nonpoint source priority area
- Interstate waters of concern

Kings River

According to the 1998-2002 Nonpoint Source Pollution Management Program, the Kings River is a tributary to the upper White River and discharges into the Table Rock Lake located just across the state line in Barry County, Missouri. The watershed is located within the Upper White River Watershed. The watershed area in Arkansas contains 4 eleven-digit subwatershed areas with Osage Creek the major tributary. The watershed is located primarily in Carroll and Madison Counties with a small portion in Boone and Newton Counties. The Kings River is designated under ADEQ Regulation No. 2 as an Extraordinary Resource Waters as well as a Natural and Scenic Waterway and mandates certain restrictions on land use.

Tributary	Subwatershed Area (acres)
090 – Upper Kings	113,586
100 – Dry Fork-Kings River	27,000
110 – Lower Kings River	115,804
120 – Osage Creek	105,414
Total Area	**361,804**

The 1998-2002 NPS management program listed portions of the Kings River (including Osage Creek) as partially supporting aquatic life due to sediment and turbidity from the 1996 Arkansas Water Quality Inventory Report (305b). Sources of pollution were listed as agricultural operations, resource extraction and road construction. Nutrients from confined animal operations are a problem within the watershed, primarily from the improper application or over-application of animal manure to pasture areas. A secondary potential source is septic tank/infiltration residential waste treatment systems.

The Middle Reach of the Kings River Water Quality Incentive Program, dated 1993, states that recreational standards for primary contact are not being maintained on the majority of tributaries and mainstem of the Kings River. Data from ADEQ's monitoring stations during 1989-1991 revealed average phosphorus concentrations at 0.25 mg/L which exceeds the 0.1 mg/L guideline for eutrophication. Nitrogen concentrations averaged 0.51 mg/L. These concentrations are sufficient to cause excessive vegetative growth that has reduced the esthetic quality of the stream and primary contact recreation. Water quality degradation may also have a detrimental effect on the Cave Crawfish and other threatened and endangered karst ecosystem inhabitants. Land use at the time was approximately 58 percent pastureland (209,850 acres), 29 percent forestland (104,900 acres) with a small amount of cropland area. Other land uses include urban areas, roads, orchards, vineyards, dairies and confined animal facilities. The 305b report listed four permitted discharges in the watershed under the NPDES permit program.

Yocum/Long Creek

Yocum Creek watershed is located in northern Arkansas in Carroll County, adjacent to the Missouri state line. Yocum Creek is a tributary to Table Rock Lake on the White River and Long Creek is located adjacent to and just east of Yocum Creek in portions of Carroll and Boone Counties. Dry Creek is listed as a tributary to Yocum Creek but actually is a tributary to Long creek just upstream from its discharge into Table Rock Lake. The 1998-2002 NPS management program listed portions of Long Creek as not supporting aquatic life, all of Yocum and Long creek as not supporting swimming, due to pathogens, sediment and turbidity based on the 1996 Arkansas Water Quality Inventory Report (305b).

Tributary	Watershed Area (acres)
140 – Indian Creek	24,491
150 – Yocum-Dry Creeks	77,424
160 – Long Creek	96,574
170 – Table Rock Laterals	4,366
Total Area	**202,855**

Sources of pollution were listed as agricultural operations and municipal point discharges. Studies conducted within the watershed have documented water quality degradation over time. Surface waters are high in nitrates, phosphorous and occasionally high in bacteria and low in metals. Total phosphorus readings on Long Creek below Denver, Arkansas showed values increasing at a very slow rate since 1983[5]. Readings since 1988 have been averaging over 0.05 mg/L with a few concentrations exceeding the 0.10 mg/L streamflow guideline by EPA. Fecal coliform bacteria have also increased since 1983 averaging almost 1,000 colonies per 100 ml by 1987. Two peaks exceeded 6,000 colonies per 100 ml.

Studies indicate that waters violated the fecal coliform standard for primary contact recreation[6]. Approximately half the violations were from nonpoint sources of livestock grazing or natural soil bacteria. Nutrients from confined animal operations are a problem within the watershed, primarily from the improper application or over application of animal manure to land areas. The total annual waste produced in the Long Creek watershed is about 6 tons for every acre of pastureland in the watershed when the acceptable application rate is about 4 tons per acre.

Summary of Management Activities and Projects

Agriculture:

Beaver Lake Watershed Project (99-1100 Task 4): This project task provides for technical assistance to implement BMPs in Washington County Conservation District. The District has completed 30 plans this past year. The District has completed a total of 74 plans.

Beaver Lake Watershed Project (99-1100 Task 5): This project task provides for technical assistance to implement BMPs in Madison County Conservation District. The District has completed 32 plans this past year. The District has completed a total of 162 plans.

Beaver Lake Watershed Project (99-1100 Task 6): This project task provides for cost share to implement BMPs in Washington and Madison County Conservation Districts.

Carroll County Table Rock Tributaries Watershed Cost Share Project (02-600): This project provides for the proper and efficient use of nutrients from all sources and reduction of soil loss to help reduce nutrient and sediment loads to Table Rock Lake by providing technical and financial assistance.

Development of a Decision Support System and Data Needs for the Beaver Lake Watershed (02-1200): This project involves compiling all the watershed water quality data collected by various agencies in a common database, linking the database with GIS

watershed information, publishing the GIS-linked database on a website created for this project, and developing, implementing, and evaluating an adaptive management decision support system (DSS) for developing comprehensive watershed management plans.

Streambank Erosion:
Beaver Lake Watershed Project (99-1100 Task 4): This project task provides for technical assistance to implement BMPs in Washington County Conservation District. The District completed 1,234 feet of streambank erosion restoration.

Rural Roads:
Beaver Lake Watershed Project (99-1100 Task 5): This project task provides for technical assistance to implement BMPs in Madison County Conservation District. The District has hydromulched 2,120 feet of county road shoulder and ditch.

Urban:
Beaver Lake Watershed Project (99-1100 Task 7): The City of Rogers has completed its Urban Watershed Management Plan.

Beaver Lake Watershed Public Awareness and Education Project (01-1200): This project will generate community awareness of nonpoint source pollution potential impacts through public education programs throughout the Beaver Lake Watershed.

Summary of NPS Projects in the Upper White River Watershed

Table 2 Recent NPS projects in the Upper White Watershed

Project #	Project Cooperator	Project Emphasis
99-1100	Cities, Counties, and CES	Beaver Lake Watershed Restoration
00-800	Arkansas Game & Fish Commission	Stream Bank Restoration
01-1200	Cooperative Extension Service	Public Awareness and Education
02-600	Carroll County Conservation District	Education, BMP Implementation, Cost Share
02-900	City of Rogers	Monitoring, Education, and Demonstration
02-1200	University of Arkansas	Developing a Decision Support System (modeling)
03-500	Audubon Arkansas	Education and Demonstration

NPS Management Measures, Load Reduction Estimates, Technical and Financial Assistance

Conservation Planning and Management Measures

Animal agriculture dominates in all counties with poultry and beef/cattle production being the most predominate. Generally farms are a combination of poultry and beef/cattle production but in some instances only poultry or beef/cattle is produced. Conservation plans are developed by the Conservation Districts and usually are nutrient based. The average farm size within the watershed varies by county as do the BMPs planned and implemented. Below is Table 3 depicting the watershed's typical farm size, type, BMPs planned/implemented and the average cost of implementation by county. Note: The table below was derived by information provided by the county conservation districts and is representative of a typical conservation plans developed by that individual county. County location is shown in Figure 3.

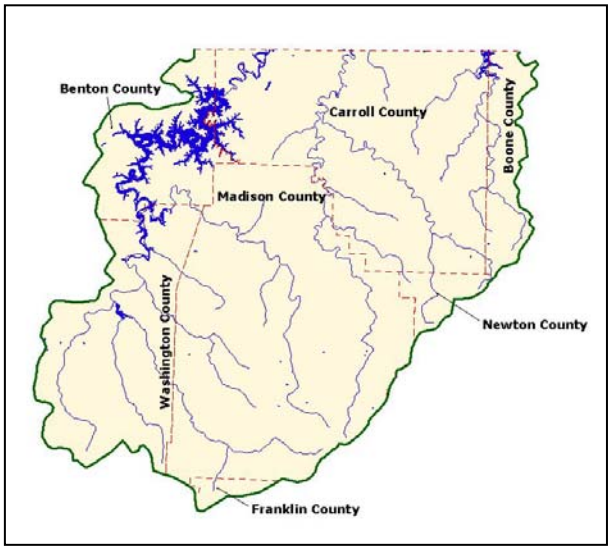


Figure 3 County Map

Table 3 Farm and BMP Information

County	Typical Farm Size	Type(s) and approximate # of farms	USDA – NRCS Practice # of the BMPs implemented**	Average Cost
Benton	120 Acres	Poultry 4 Cattle 46 Poultry/Cattle 1,150 **Total 1,200**	313 382 512 580 614	$6,000
Boone	210 Acres	Poultry 9 Cattle 1,092 Poultry/Cattle 92 **Total 1,193**	313 378 382 512 614	$15,000
Carroll	225 Acres	Poultry 40 Cattle 645 Poultry/cattle 360 **Total 1,045**	313 378 382 512 614	$5,000
Franklin	0 Acres	N/A	N/A	N/A

Madison	217 Acres	Poultry 47 Cattle 970 Poultry/cattle 233 **Total 1,250**	313 382 512 580 614	$4,000
Newton	175 Acres	Poultry 0 Cattle 53 Poultry/cattle 3 **Total 56**	313 378 382 512 614	$9,000
Washington	91 Acres	Poultry 15 Cattle 330 Poultry/cattle 423 **Total 778**	313 378 382 512 561 614	$9,400

****See Table 4 for the description of the BMP

Table 4 is a list of the typical Best Management Practices (BMPs) and estimated cost (based on NRCS- EQIP approved cost) that are incorporated into conservation plans within the counties of the Upper White Watershed:

Table 4 BMP Names and Costs

USDA – NRCS Practice #	**USDA – NRCS Practice Name**	**Cost****
313	Waste storage structures	$6.25 sq. ft.
378	Ponds	$1.25 / yd.
382	Fencing	$1 / linear ft.
614	Livestock watering facilities	$450 / tank
512	Pasture & Hayland establishment	$180 / acre
561	Heavy Use Areas	$2.50 sq. ft.
580	Streambank & shoreline protection	$45 / linear ft.

****Cost** – is based upon each Conservation District's experience in planning and subsequently the landowner implementing the BMP. These costs were then averaged watershed wide. Some practices are multifaceted and have many variable components.

Rural roads are a significant source of siltation/excess turbidity in this watershed as well. Road construction and maintenance are listed as major sources of sediment in two of the impaired stream segments of the watershed (White River and West Fork). Management measures applicable to rural roads are:

- Restoration of vegetation following maintenance practices
- Treatment of road crossings and culverts
- Critical area treatments
- Proper erosion and sediment control on highway construction

In Arkansas, the responsibility for maintenance of rural roads lies with the County Judge for county roads, the Arkansas Highway and Transportation Department for state highways, and the National Forest Service for forest roads in the National Forest that are not under county maintenance. Segments of county roads will be targeted for BMPs or NPS projects based on prioritization established by county conservation districts. Such an effort requires the cooperation of the responsible party for the specific road, ASWCC and the conservation districts.

Prioritization of Sub-watersheds

The active 319 project "02-1200 Development of a Decision Support System and Data Needs for the Beaver Lake Watershed" will be used to prioritize sub-watersheds. The objective of the project is to provide a viable method to evaluate and develop watershed management strategies. This will be accomplished through the following steps: (1) organize the water quality data collected by various agencies involved with monitoring the Beaver Lake watershed into a GIS-linked database; and (2) develop a decision support system (DSS) with limited scenario analyses to quantify effects of land management on stream and lake water quality. This project is discussed further in the "Beaver Lake" section of this report. This project has an expected completion date of July 31, 2005.

Three sub-watersheds of concern include the War Eagle, West Fork and Lower White. These sub-watersheds all include impaired stream segments. Many 319 projects are already active in these areas including 01-1200 Beaver Lake Watershed Public Awareness and Education Project, 02-1200 Development of a Decision Support System and Data Needs for the Beaver Lake Watershed and 03-500 West Fork of the White River Watershed Coordination.

Load Estimates and Associated Cost

It is estimated that approximately 43% of the pasture in the watershed is moderate to poor and is in need of some implementation of BMPs for improvement. Within the watershed 43% equates to approximately 244,444 acres or 1,111 farms (based on 220 acres per farm). At a ***minimum*** the financial resources needed to make a noticeable impact on NPS within the watershed in pastures alone would be $44,026,603.

Waste generated by CAFO's is generally land applied to supplement nutrient needs for pastures. Obviously waste can not be applied at all times of the year, therefore waste storage facilities are needed. It is estimated each poultry house generated roughly 75 tons of waste per year. Generally most farms have a minimum of 3 houses with some farm having in excess of 8 houses. Based upon an accumulation rate of 75 tons per house and 3 houses per farm approximately 225 tons of waste would be generated a year.

Poultry waste is generally "dry stacked" in a constructed covered structures commonly referred to as a "stacking sheds". "Stacking sheds" vary in size but generally are 60'x40'=2400 sq. ft. in size. Approximately 60 tons of waste can be put into a "stacking shed" based upon a depth of 4 feet and average moisture content. If waste were to be stored for all poultry and poultry/cattle farms (estimated total of 2,375) within the watershed for a calendar year, at the current rate of waste accumulation (estimated at 225 tons per year) and a "staking shed" can store an average of 60 tons, a minimum of 8,906 "stacking sheds" would be needed. The cost for these structures based on 2002 price indexing would be approximately $15,000 each or $133,590,000 for the watershed.

Funding Resources

All farm plans developed in the watershed have multiple BMPs planned and implemented. Generally most BMPs implemented do not generate revenue for the landowner, therefore the landowner is somewhat reluctant to implement them. Sources of State financial assistance are becoming non-existent. Those that do exist provide a minimal amount of assistance. In Arkansas budgets are being reduced to address other needs for the greater public need such as education. Private institutions and endowments willing to contribute are virtually non-existent. Those of the private sector willing to contribute look for a "higher profile" pollutant, or clean-up effort seemingly more news worthy.

Therefore, to facilitate implementation of BMPs, financial assistance is often made available through the 319(h) program or USDA – NRCS EQIP commonly referred to as "cost share". Without "cost share" landowners would be unable to assume the cost of implementation. "Cost share" is specifically designed to offset the cost of implementation by providing up to 75% of the dollars needed to implement the BMP while the landowner contributes a minimum of 25%. Cost share rates vary depending on the program to be utilized. Generally the implementation cost for the BMPs within 319(h) funded projects can be cost shared two ways:

1) ASWCC cost share program – an approved 319(h) project within the watershed must have an incorporated cost share element that dedicates a portion of the project funds for financial assistance for BMP implementation. If so, cost share is administered by ASWCC and must conform to ASWCC's cost share rules. Rules currently state a landowner with a conservation plan and implementing an approved practice(s) can be cost shared at a rate of 40% of the total cost of the practice(s) not to exceed $7,500. Generally 319(h) projects can fund only a limited number of landowners and most conservation plans include multiple practices that easily exceed the $7,500 limit for implementation.

2) USDA – NRCS, EQIP – EQIP may also be utilized by landowners. In 2003 EQIP funding in the Upper White watershed was estimated to be $585,000. Table 5 indicates the county, number of applications received, funded and total dollars awarded and resource area of concern funded.

Table 5 NRCS Arkansas Fiscal Year 2003 EQIP Funding By County

County	Number of Applications	Total Funding Requested	Number of Contracts	Total Funding Contracted	Funding by Resource Concern		
					Water Quality Grassland	Water Quality Animal Waste	Plant Health Forestry
Benton	221	$2,550,784	27	$678,242	$57,431	$620,811	
Boone	62	$463,203	5	$56,879	$41,858	$15,021	
Carroll	43	$758,268	8	$167,251	$18,142	$149,109	
Franklin	35	$557,562	7	$193,582	$3,318	$190,264	
Madison	53	$621,830	2	$69,126		$69,126	
Newton	30	$127,627	11	$54,293	$51,684		$2,609
Washington	108	$1,546,168	7	$218,529		$218,529	

NOTE: Funding amounts are representative of the total county and not the Upper White River watershed alone.

As depicted by the table, 67 of 552 applications were funded over a seven county region. Within the Upper White watershed alone it is estimated that less than 30 applications were funded.

Below is a summary of the changes that occurred to the EQIP program in Arkansas. This information was provided by the USDA – NRCS Arkansas State Office.

EQIP - Arkansas Summary

The 2002 Farm Security and Rural Investment Act, signed May 13, 2002, provided significant program changes and funding increases for Farm Bill programs, most notably, EQIP.

Program changes included:

- Producers can receive payments in the same year the contract is approved.
- Applications will be evaluated for funding based on state- and locally-developed procedures to optimize environmental benefits.
- The "bid down" provision (competitive cost-share reduction among program participants) has been eliminated.
- The minimum length of an EQIP contract has been reduced to one year after implementation of all practices.
- The maximum length remains ten years.
- Although the maximum cost-share rate remains at 75 percent, limited resource producers and beginning farmers and ranchers may be eligible for up to 90 percent cost-share.
- Livestock operations are eligible to receive cost-share payments for waste storage facilities. Contracts for confined livestock feeding operations must include the development and implementations of comprehensive nutrient management plans (CNMP).
- Conservation priority areas are no longer required.
- Total cost-share and incentive payments have been increased to $450,000 per individual or entity during the life of the 2002 Farm Bill, regardless of the number of farms or contracts.

- Starting in fiscal year 2003, no individual or entity may receive EQIP payments in any crop year in which the individual or entity's average adjusted gross income for the preceding three years exceeds $2.5 million, unless 75 percent of the income is derived from farming, ranching, or forestry interests.
- At least 60 percent of the funds for EQIP shall be targeted to livestock production practices, including grazing.

Additionally, NRCS Arkansas received $11.5 million in EQIP financial assistance funding for fiscal year 2003. This is a 64 percent increase from fiscal year 2002 funding of $6,918,000.

In light of these substantial changes, NRCS Arkansas, with the guidance of the Arkansas State Technical Committee, virtually recreated the Environmental Quality Incentives Program in the state.

During fiscal year 2002, Arkansas received a total of $6,918,000 in EQIP financial assistance: $3,604,600 based on the 1996 Farm Bill (with "bid down", 50 percent cost-share, conservation priority areas, and $50,000 per person contract cap), and $3,313,400 based on the 2002 Farm Bill. Since most applicants had already been contacted regarding funding determinations under the 1996 rules, NRCS Arkansas felt contractually bound to uphold agreements with applicants who so desired, and offer a new application period for those wishing to apply under the 2002 rules. Not all states faced this dilemma, nor dealt with it as NRCS Arkansas did.

As for EQIP funding decisions in the current fiscal year, NRCS Arkansas, with the recommendations of the Arkansas State Technical Committee, developed three categories of competition:

1. Resource Concerns
   a. Water quality (animal waste/nutrient management) – 40 percent
   b. Water quality (sediment/erosion)
      i. Cropland – 10 percent
      ii. Grassland – 20 percent
   c. Water quantity (irrigation) – 15 percent
   d. Plant health (forestry) – 10 percent
   e. Wildlife – 5 percent
2. Special Competitive Groups
   a. Limited resource and new/beginning farmer – 10 percent
   b. Waste impoundment closures – 7 percent
   c. Illinois River/Eucha-Spavinaw watershed – 11 percent
   d. Alternative crop – 2 percent
   e. Statewide – 70 percent
3. County Base Allocation - All counties guaranteed to receive at least $50,000 if applicants are available, but not more than $75,000.

Four counties (Jackson, Miller, Monroe, and Poinsett) had no applications selected in the statewide sorting of groups and concerns and their highest ranked application exceeded $75,000.

13 counties would not have received any contracts (and several more would have received less than $50,000) if NRCS Arkansas had not used the county base allocation.

As demonstrated by the FY 2003 EQIP Register for the Upper White Watershed in Table 5, NRCS Arkansas received 552 EQIP applications during fiscal year 2003, totaling more than $6.6 million in funding requests. EQIP is a popular program in this watershed and in the state and will always attract more applications than funding levels will support. The fiscal year 2003 EQIP funding decisions for EQIP were based on the above described ranking process.

As is the case in the first year of many new programs, the administration of the Environmental Quality Incentives Program will continue to adapt to our customer's needs, while adhering to national guidelines and federal law.

Public Education/Awareness

Nonpoint source pollution is a problem generated not by a single action or person, but a cumulative effect of many actions or persons having a small effect. These actions are not intended to pollute a stream or lake, and likely are not even noticeable at the time. But, when hundreds or thousands of small actions are added up, they become significant. In fact, NPS is likely the largest contributor to pollution in the Upper White River watershed. Therefore, it is necessary that the public be aware of the causes of NPS pollution and the necessary management measures. It is also necessary that the public be made aware of and given credit to the practices that other groups have already implemented.

There are several excellent public awareness programs already being conducted in the watershed. Specifically project 01-1200, the Washington County Cooperative Extension Service has developed and implemented a program for the City of Fayetteville and is now expanding that program to the entire Beaver Lake watershed. Continued support for the CES in this program is essential to success of the Beaver Lake program.

Another 319 project, 01-1000 Statewide Awareness Project, was initiated due to a lack of knowledge about NPS pollution across the state. As a part of this project, presentation materials were developed and utilized in a mobile presentation or traveling "road show". The "road show" was/is able to attend approximately 10-12 different public festivals/events per year. A NPS PowerPoint show is presented to 10-12 civic organizations in various areas of the state per year as well. This approach takes advantage of locales where large numbers of people, whose daily activities rarely expose them to other 319(h) projects, will be gathered. This method offers the greatest amount of exposure in the most economical and efficient manner. The tasks outlined below were completed for the mobile awareness trailer and/or the presentation element of this project:

1. A table top information and photo display
2. General information pamphlets regarding NPS pollution
3. Video and/or power point presentation(s)
4. Rainfall demonstration simulator
5. Truck, customized trailer, and portable kiosk
6. Statewide billboard campaign
7. Developing and scheduling the "Road Show"

A summary of the events attended in the Upper White Watershed and contact numbers is given in Table 6. This project continues through July 2004 and more events are being scheduled for the 2004 year.

Table 6 Summary of events attended by statewide NPS Awareness Coordinator

EVENT TYPE		DATE	City	FESTIVAL NAME	Contact #s	Contact #s
FESTIVAL OR FAIR	*CLASS OR MEETING*				*CLASS OR MEETING*	*FESTIVAL OR FAIR*
X		5/17/02	*Bentonville*	Flood Awareness Month		**300**
	X	7/9/02	*Alpena*	Conservation Church Camp	**60**	
	X	8/22/02	*Springdale*	Beaver Lake Watershed Conference	**255**	
	X	9/12/02	*Fayetteville*	Washington County Quorum Court	**45**	
X		10/12-13/02	*Fayetteville*	Autumnfest		**150**
	X	05/23/03	*Bentonville*	Springhill Middle School	**325**	
	X	06/24/03	*Fayetteville*	Fayetteville	**30**	
X		10/6-7/04	*Springdale*	AFMA annual conference		**105**
3 Festivals	5 Presentations			Contact Totals=	**715**	**555**

As the EPA's Phase II Storm Water regulations came into effect in March 2003, much of the CES's adult education efforts over the past year have focused on the history, justification, and implementation process of these new regulations, particularly as they relate to the Beaver Lake Watershed. There are 12 cities (Fayetteville, Springdale, Rogers, Bentonville, Lowell, Farmington, Johnson, Little Flock, Elkins, Bethel Heights, Greenland, Elm Springs) in Benton and Washington County, as well as the two counties themselves and the U of A, that meet EPA's criteria for "small" municipal separate storm sewer systems (MS4s) and must be permitted to manage and discharge storm water under Phase II Storm Water regulations. Therefore, urban nonpoint pollution prevention education programs have targeted the city mayors, engineers, planners, city council members, planning commission members, county judges and the quorum court JPs (Justice of the Peace) in Benton and Washington Counties as well as the U of A campus planner and physical plant staff.

In January, the Cooperative Extension Service coordinated a "Phase II Storm Water Forum" at the Town Center in Fayetteville for more than 160 local city and county officials. Speakers from the U of A Civil Engineering Department, EPA Region VI in Dallas, and an environmental law firm in Little Rock spoke on construction BMPs, the Phase II permitting process, and the legal implications of being out of compliance, respectively. An 8-page fact sheet explaining the new regulations in layman's terms was developed, printed and distributed to more than 200 individuals involved in local government and storm water management. Follow-up PowerPoint presentations were given to the Washington County Quorum Court Services Committee, the Washington

County Planning Commission, the NWA "Storm Water Focus Team", and the Fayetteville Environmental Concerns Committee. Six 36" x 36" posters highlighting each of the six required minimum control measures were also developed and used at the forum, at several city council and county planning meetings, and at a statewide "Urban Storm Water Education" In-Service Training.

The other major effort since October 2002 has been hands-on youth water quality education programs. When the Madison County Steering Committee met last December, members wanted youth education to be a priority this year. As the superintendent for Hunstville schools serves on the committee, he offered to make contacts with teachers. In May, programs on runoff and water quality (using chemical and biological parameters) were conducted for all six classes of Hunstville 3rd graders (170 students). In much the same way, the County Extension Agent in Madison County has conducted a "M.A.R.S. Exploration Camp" each Spring for Huntsville 5th grade students over the last 15 years. In April, he arranged for 3 days of programs on the water cycle, watersheds, and water quality to be included in the camp for 175 youth. Other new youth audiences reached over the past year included the NOARK Girl Scouts, Westwood Elementary School Animal Club Day Camp, the Fayetteville Boys and Girls Club Summer Day Camp, and the Kid Care Summer Day Camp.

Milestones and Criteria for Loading Reduction Effectiveness

The following criteria are established either in state regulation no.2, "Regulation Establishing Water Quality Standards for Surface Waters of the State of Arkansas," or in published assessments as being acceptable conditions of a fully "restored" watershed. The long-term goal is to work toward a fully "restored" watershed. At this time it is not known if this goal is fully achievable. The following criteria have been established to reach this goal:

Aquatic Life: Improve Rapid Bio-Assessment Scores in the watershed to 80% of reference stream score.

Primary Contact Recreation: Between April 1 and September 30, the fecal coliform content of streams (with greater than 10 mi^2 drainage areas) shall not exceed a geometric mean of 200 per 100 ml. Furthermore, no more than 10 percent of the total samples during any 30-day period exceed 400 fecal coliform per 100 ml.

Eutrophication: Numerical nutrient criteria have not been established for either the stream system or the Beaver Reservoir. However, a long-range goal has been established to meet the current water quality standard, that "materials stimulating algal growth shall not be present in concentrations sufficient to cause objectionable algal densities or other nuisance aquatic vegetation". When the ADEQ develops numeric criteria for nutrients in the Upper White River watershed, then this goal will be revised.

Schedule of Implementation

To achieve the milestones discussed above, a large set of action items have been developed. These items were derived from the Beaver Lake Watershed Action Strategy[7]. These action items are grouped in tables of related items.

Data Collection and Organization

Action Item	Potential Cooperators	Target Completion Date
Develop a conceptual model of the watershed showing general land uses, potential water quality stressors and the available data.	AWRC	June 2002
WMT reviews data collection proposals to assure compatibility	Watershed Management Team	On-going
Conduct geomorphological surveys of each sub-watershed in the basin to determine, normal bankfull flow, regions of aggradation/degradation, streambank stability, bedload and riparian zone condition.	ADEQ/ASWCC	2008
Conduct periodic bioassessments of fish species and benthic macro-invertebrates by sub-watershed.	ADEQ	2005
By sub-watershed, inventory potential sources of NPS pollution.	ADEQ, ASWCC, Conservation Districts	2008
Maintain funding for the NPS Load Sampling Stations at West Fork and Twin Bridges	ASWCC	Ongoing
Install new NPS Load Sampling Stations on Richland Creek at Twin Bridges and War Eagle Creek at War Eagle	AWRC/ASWCC	2008
Install additional rain and weather stations	AWRC, ASWCC, NWS	2005
Secure SSURGO soils data bases for Washington, Benton and Carroll Counties.	NRCS	2004
Develop a series of models to represent sediment and nutrient loads in the watershed, instream processes and lake response.	AWRC	2002 through 2004
Maintain an on-line library of all data.	University of Arkansas	2005

Public Education/Awareness

Action Item	Potential Cooperators	Target Completion Date
Participate in the annual National Sechi Disk day program	Local Watershed Coalitions and NGOs	Ongoing
Hold and annual Beaver Lake Environment Day	Local Watershed Coalitions with support from ADEQ EP Division	Ongoing
Develop and maintain a Beaver Lake Watershed website. Site is to contain pertinent information about the Beaver Lake watershed and links to data collected and studies conducted in the last five years.	Local watershed coalition with support from Arkansas Watershed Advisory Group and ADEQ	Dec. 2004
Cooperate with and support the efforts of local Non-Government Organizations to develop and deliver environmental education programs with a local emphasis.	Local Watershed Coalitions, Ozark Natural Science Center, The Nature Conservancy, The Audubon Society	Ongoing
Develop a "Beaver Lake Watershed" fact sheet to educate the general public about water quality and issues in the Beaver Lake Watershed.	ASWCC; NGOs, AWAG	Dec. 2004

Construction

Action Item	Potential Cooperators	Target Completion Date
Conduct educational programs on Construction BMPs for Developers, Contractors and Engineers	AWRC, ASWCC, ADEQ, AHTD	Ongoing
Develop a Regional Watershed Authority to: • Develop standards for construction erosion and sediment control practices • review development plans for Water Quality Impacts.	Northwest Arkansas Regional Planning Commission	2004

Agricultural Runoff

Action Item	Potential Cooperators	Target Completion Date
Implement provisions of the ASWCC's poultry growers registration program.	ASWCC	July 2004
Develop an annual training program for poultry producers concerning proper water quality management.	CES	Dec. 2004
Provide technical assistance to agricultural producers through development of site specific Comprehensive Nutrient Management Plans.	MCCD, WCCD	2008, then ongoing
Provide financial assistance to watershed farmers for implementation of CNMPs with emphasis on alternative watering supplies, fencing of riparian areas, restoration of riparian areas, streambank stabilization and use of alum as a litter additive	ASWCC, NRCS, FSA, MCCD, WCCD	Ongoing
Modify the Phosphorus Index to reflect the characteristis of litter from phytase supplemented poultry.	AWRC	2004

On-site Waste Disposal (Septic Tanks)

Action Item	Potential Cooperators	Target Completion Date
Conduct a regulatory and literature review of on-site waste water management practices and impacts	AHD, AWRC	2004
Perform a survey of on-site wastewater systems in the watershed-based on age, soils, location to determine the current status of individual waste management.	AHD, AWRC, ASWCC	2006
Organize and implement workshops on proper installation and maintenance of septic tanks, alternate technology and cluster developments.	AWRC, AHD	Ongoing

Urban Runoff

Action Item	Potential Cooperators	Target Completion Date
Conduct Technology Transfer Workshops for City Planners, County Officials, Developers, Students, and Property Owners on: 1. Storm Water Pollution Prevention Plans 2. Proper Installation and Maintenance of Erosion and Sediment Control 3. Low Impact Development 4. Greenways 5. Cluster development to minimize impervious area.	AWRC, ASWCC, ADEQ	Starting in 2002 and Ongoing
Demonstrate greenways and low impact development as Urban BMPs.	AWRC, NGOs	Ongoing
Develop and environmental review team to comment on all new and proposed developments in the watershed at the planning stage.	Northwest Arkansas Regional Planning Commission	2004
Expand the Washington Counties Urban NPS Public Awareness program to the entire area.	CES	2006
Encourage development of Urban Forestry projects in municipalities within the watershed	AFC, CDs, CES, NGOs	Ongoing
Hire an Urban Watershed Coordinator	NWARPC	2004

Rural Roads

Action Item	Potential Cooperators	Target Completion Date
Identify severe erosion sites on rural roads in the remaining sub-watersheds.	Conservation Districts, ASWCC	2005
Utilize the WCCDs Hydromulcher to assist county judges in treating roadsides and ditches	WCCD	Ongoing
Work with the County Judge to develop an erosion control plan for severe erosion sites identified in rural road surveys	WCCD	Ongoing
Provide training courses to County Planning officials, Road Departments, Developers and POAs on proper road desigh and maintentance to reduce erosion and sedimentation.		2004

Hydrologic Modification

Action Item	Potential Cooperators	Target Completion Date
Complete the West Fork Geomorphologic Survey	ADEQ	2004
Conduct geomorphologic survey of Middle Fork	ADEQ/ASWCC	2004
Utilize remote sensing and GIS software to identify areas in other watersheds needing more extensive surveys	AWRC, ASWCC, ADEQ	2004
Conduct needed geomorphologic survey of East Fork	ADEQ/ASWCC	2005
Conduct needed geomorphologic survey of Richland Creek	ADEQ/ASWCC	2006
Conduct needed geomorphologic survey of War Eagle Creek	ADEQ/ASWCC	2007
Conduct training sessions on soft engineering practices for streambank stabilization	ASWCC/AGFC	
Provide tax credits for streambank stabilization projects	ASWCC	Ongoing
Provide technical assistance to landowners wishing to implement streambank projects	ASWCC/AGFC	Ongoing
Provide direct financial assistance to landowners with planned streambank stabilization projects	ASWCC/AGFC	Ongoing
Conduct follow up geomorphologic surveys	ADEQ/ASWCC	2008 on
Work with the COE to survey the Beaver Lake shoreline for highly erodible areas and stablize.	COE, ASWCC	2008

Recreation

Action Item	Potential Cooperators	Target Completion Date
Develop fact sheets for boaters on proper waste disposal and the potential impacts	COE, CES	2008
Install informational signs on pollution management at boat ramps and marinas	Local Watershed Coalition	2004

The eleven ADEQ water quality monitoring stations will be the primary source of data to determine whether loading reductions are being achieved. These monitoring stations are discussed in the section of this report entitled "Monitoring".

Short-term Goals

The following goals will help reach the milestones set in this strategy. These goals will be completed by 2007 as long as sufficient funds and personnel are available.

- Contact 1,200 persons through public awareness programs.
- All CAFOs will be utilizing a Comprehensive Nutrient Management Plan for manure management. Registration of CAFOs has been initiated.
- Stabilize selected river reach sites based on prioritization by conservation districts/ADEQ.
- Address road erosion through education, awareness and demonstration of erosion prevention/BMPs.

Monitoring

The ADEQ is responsible for maintaining the state's water quality inventory. They maintain eleven monthly monitoring stations within the Upper White River Watershed. The sites are listed in Table 7 and shown in Figure 4. As indicated by the table, there are stations maintained by the USGS and the ASWCC at the location of several of the ADEQ sites. Real-time flow data is available at the USGS stations as well as some water quality data. Three additional real-time USGS sites exist within the watershed: 7053250, 7048800 and 7048600, all shown in Figure 4. The ASWCC monitoring stations focus on sediment, nitrogen and phosphorus-related parameters which are most significant in assessing nonpoint source pollution. The routinely sampled parameters at each ADEQ site are shown in Table 8.

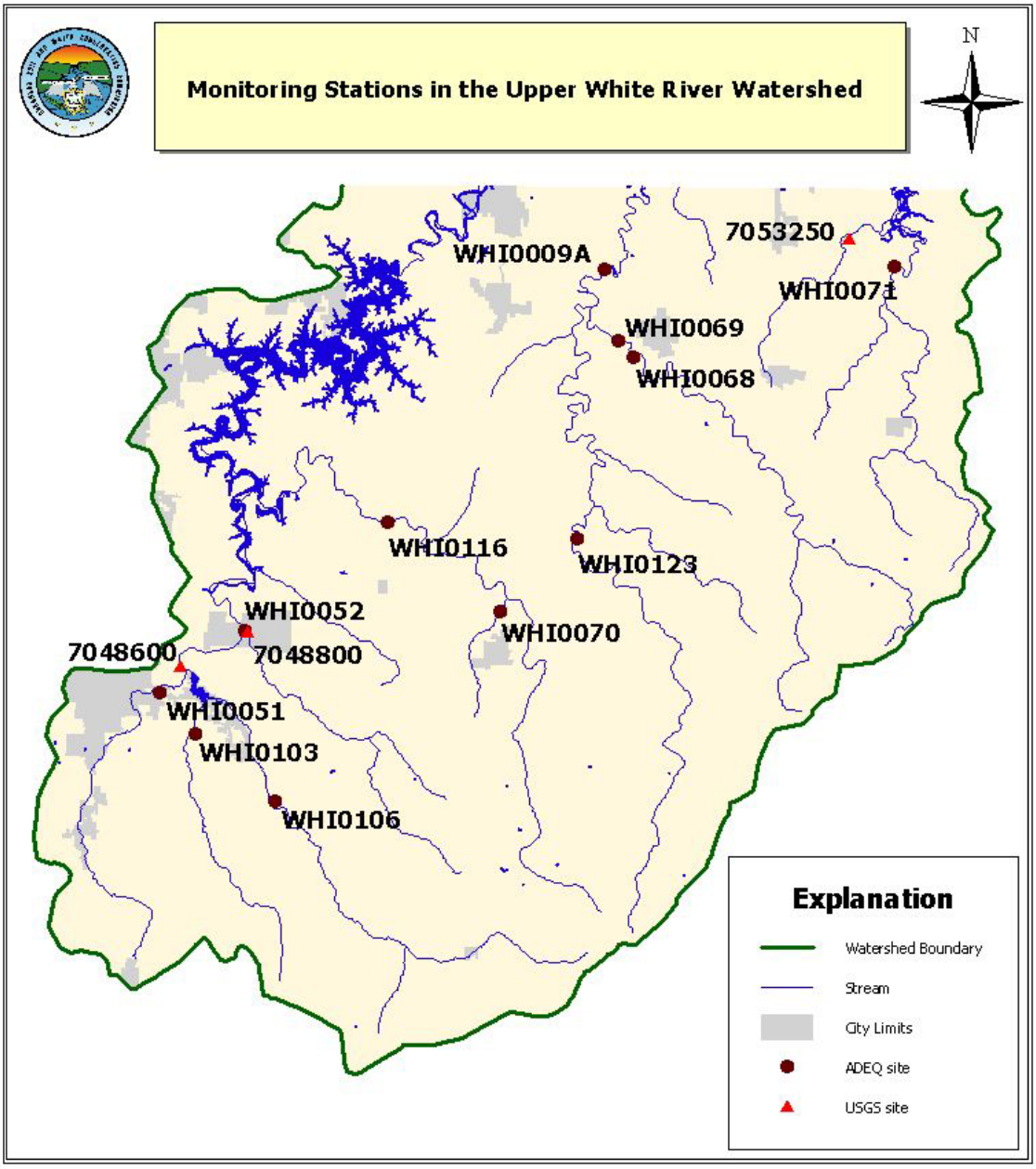


Figure 4 Sampling site location map

Table 7 ADEQ monthly water quality monitoring sites

ADEQ Station Number	Station Name	USGS Real-time Gauging station	ASWCC Water Quality Station
WHI0071	Long Creek below Denver		
WHI0070	Holman Creek below Huntsville		
WHI0009A	Kings River north of Berryville	7050500	Yes
WHI0123	Kings River NE Alabam		
WHI0103	Middle Fork White River W. Elkins		
WHI0068	Osage Creek above Berryville		
WHI0069	Osage Creek below Berryville		
WHI0116	War Eagle Cr. @ Hwy 45, N. Hindsville	7049000	
WHI0051	West Fork White River near Fayetteville	7048550	Yes
WHI0052	White River near Goshen	7048700	Yes
WHI0106	White River @ Durham		

Table 8 ADEQ Routinely monitored parameters

Routinely Sampled	
Air Temperature	Boron
Water Temperature	Beryllium
pH	Barium
Turbidity	Cadmium
Dissolved Oxygen	Chromium
5-day Biochemical Oxygen Demand	Copper
Filtrable Residue	Calcium
Non-filtrable Residue	Lead
Chlorides	Zinc
Sulfates	Iron
Ammonia Nitrogen	Potassium
Nitrite + Nitrate Nitrogen	Magnesium
Total Phosphorus	Manganese
Ortho-Phosphorus	Sodium
Total Hardness	Nickel
Vanadium	Cobalt

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