

## STATE OF ARKANSAS 2010 INTEGRATED WATER QUALITY MONITORING AND ASSESSMENT REPORT

### PART II – CHAPTER 3 - COST /BENEFIT ANALYSIS

The CWA requires states to provide an “estimate of the environmental, economic and social costs and benefits needed to achieve the objectives of the CWA and an estimate of the date of such achievement.” A comparable procedure is needed to conduct a state-wide economic analysis of environmental, economic and social costs. However, that procedure does not currently exist.

A true costs/benefits assessment (CBA) will require assessment of the value of incremental improvements in water quality from a variety of programs, some of which were implemented within the previous reporting cycle (Phase 2 storm water Regulations, for example). Water quality assessment methodologies presently are inadequate to truly capture the benefits of CWA implementation on water quality. While ADEQ has monitored water quality as directed by CWA § 305(b) guidance provided by the EPA, these protocols are biased towards reporting failures, with little provision for reporting successes.

USEPA implemented the Wadeable Streams Assessment Protocol (WSAP) for statistically assessing water quality of Wadeable streams across the central and eastern US during FY 2004 to address this concern. ADEQ participated in this process through the University of Arkansas, sampling 30 randomly selected sites in Arkansas across four ecoregions, in collaboration with USEPA Region 6. Those data are not yet available for reporting, but will be available by the next reporting cycle, and will be included in that analysis at that time.

Recent advances in valuing benefits such as ecological services may provide insight into the true benefits of CWA regulations that have not been represented economically in previous assessments. However, protocols for including those benefits are not yet established. Therefore, pertinent accessible information has been utilized for this water quality CBA in order to provide the required information under the CWA. Future water quality reports will provide a more comprehensive CBA that will address questions critical for the effective management of water quality in Arkansas.

#### Cost Information

It is difficult to separate out the costs attributable to water quality pollution control efforts across state, regional, and local governments. The environmental benefits from the environmental resources protected by ADEQ are more important than ever, as evidenced by implementation of programs by agency personnel across Arkansas.

The costs for implementing CWA regulations are summarized in this report as agency programmatic implementation expenses, pollution abatement capital expenditures and operating costs for Arkansas. Much of the water quality related budget is self-generated through permit fees; however, a portion is derived through federal grants (Table II-1). These include the \$104 grant for research investigations, training and informational demonstrations; \$106 grant for water

Table II-1. Summary of Costs  
Associated With Implementing CWA Programs in Arkansas for FY 2005.

<b>Funding Source</b>	<b>Principal Activities</b>	<b>Program Cost (FY 2005)</b>
State Budget - ADEQ	Permitting and enforcing CWA provisions in Arkansas	\$3,699,586
State Budget - ANRC	Nonpoint source pollution prevention, control, and remediation	\$3,260,900
Federal CWA §104 Budget	Assess overall quality and ecological characteristics of Arkansas's water bodies	\$315,000
Federal CWA §106 Budget	General water pollution control/water quality management program	\$2,683,019
Federal CWA §319 Budget	Prevent, control, and remediate nonpoint source pollution throughout Arkansas	\$3,800,000
Federal CWA §604 Budget	Survey work on streams not meeting designated uses	\$100,000
	<b>TOTAL</b>	<b>\$13,858,505</b>

pollution control activities; the §319 grant for nonpoint source management issues, and the §604 grant for state water quality management planning activities. Money from each of these grants is divided throughout the appropriate water-quality related state program as directed by each grant, and provides funding for personnel, equipment, survey and research work, and ambient monitoring. Total costs for FY2005 were estimated at over \$13.8 million (Table II-1)

#### State of Arkansas Budget for Water Quality Control Activities

The ADEQ has primary responsibility for permitting and enforcement of CWA provisions in Arkansas, but the implementation of water quality control activities are distributed across several state agencies, including ADEQ, ANRC, Arkansas Department of Health (ADOH), Rural Water Association of Arkansas (RWA), and the Arkansas Division of Agriculture (ADA), among others. The state budget for ADEQ water quality control activities for 2005 included \$896,525 in general program funds, \$73,283 in waste water licensing, \$2,624,443 in permit fees, and \$105,335 in environmental education fees, for a total of \$3,699,586 (Table II-1). Funds received through penalties, fines, and other actions are returned to State funds for redistribution. In FY 2005, ANRC and its partners spent \$3,260,900 in non-federal funds for nonpoint source pollution prevention, control, and remediation.

### Federal CWA Section 104 Budget

Research monies provided by §104 grants support the activities within ADEQ to assess overall quality and ecological characteristics of Arkansas's water bodies. In 2005 ADEQ received \$315,000 in Federal funding for these activities.

### Federal CWA Section 106 Budget

The §106 grant program provides funding for ADEQ's general water pollution control/water quality management program. Activities funded under the §106 grant include ambient water quality monitoring, assessment of ambient water quality data, development of the *Water Quality Inventory* (now known as the Integrated Report), revision of Arkansas's Water Quality Management Plan, development and revision of surface water quality standards, development and issuance of waste water discharge permits, compliance inspections, complaint investigations, and development of enforcement actions. In 2005 ADEQ received \$2,683,019 in Federal funding for these activities.

### Federal CWA Section 319 Budget

The CWA §319 grant for nonpoint source management issues in Arkansas is implemented by the Arkansas Department of Natural Resources (ADNR). ADNR works with universities, city and regional officials, private industry, and the federal government to prevent, control, and remediate nonpoint source pollution throughout Arkansas. In 2005 ANRC completed 39 multi-year projects, managed 26 on-going projects, and initiated 19 new projects that target NPS pollutants from urban runoff, forestry, agriculture, sand and gravel operations, and on-site waste treatment systems. Furthermore, ANRC worked with the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service to implement 26 Best Management Practices (BMPs) designed to improve environmental quality on more than 1,100 Arkansas farms. This has resulted in load reductions of more than 50,000 lbs phosphorus, 176,000 lbs nitrogen, and 24,000 lbs of sediment in 2005 within Arkansas. ANRC continues to work closely with USDA to make progress in reducing nonpoint source pollutants and improving water quality. Part II, Chapter 2, Nonpoint Source Pollution Control has more information on this topic as well as other efforts by the Nonpoint Source Program (see ANRC 2005 Annual Report, ANRC, Little Rock, AR). In 2005 ANRC received \$3,800,000 in Federal funding for these activities.

### Federal CWA Section 604 Budget

Section 604 grant monies are used to fund survey work on streams not meeting designated uses. These surveys provide data for development of total maximum daily loads (TMDL) and waste load allocations (WLA). This data assists permit writers in establishing water quality protective effluent limits for dischargers. In 2005 ADEQ received \$100,000 in Federal funding for these activities.

## Benefits Information

Arkansas has over 283,000 hectares (699,293 acres) of surface water with some 11,900 miles of streams and rivers and more than 500,000 acres of lakes. Over 800 billion liters of high quality groundwater are contained in aquifers capable of yielding over 2,000 liters per minute. 1 Agriculture, Forestry & Fishing Industry accounted for \$3.154 billion or 3.9% of Arkansas Gross State Product (GSP) in 2004 (Arkansas GSP: \$80.902 billion).<sup>2</sup>

### Fishing and Aquaculture Benefits

Arkansas is renowned for fishing and hunting, as well as a myriad of water related recreational activities including sailing and scuba diving. Many of the streams in Arkansas are utilized for recreational floating. The quality of recreational fishing is directly related to the quality of surface water in Arkansas. Three current world-record fish (brown trout, walleye and hybrid bass) were hooked in Arkansas waters. There are 18 high-profile waterways for canoeing/rafting/kayaking in Arkansas: Big Piney Creek, Buffalo River, Caddo River, Cadron Creek, Cossatot River, Crooked Creek, Eleven Point River, Illinois Bayou, Kings River, Little Missouri River, Little Red River, Mulberry River, Ouachita River, Saline River, Spring River, Strawberry River and White River.<sup>3</sup>

Arkansas is an important state nationally for aquaculture. Specifically, Arkansas ranks second in the U.S. in catfish production, and leads the nation in baitfish, goldfish, sport-fish, largemouth bass, hybrid striped bass, and Chinese carp production. Aquaculture has a total economic impact of over \$1.1 billion in Arkansas, primarily in the impoverished Delta region. In Chicot County alone, the catfish industry accounted for 2,665 jobs and \$22 million in tax revenue.<sup>4</sup>

Recreational fishing is a major tourist attraction for Arkansas contributing \$446 million to the state's economy annually through direct expenditures. In 2001, 782,000 people (residents and non-residents) over the age of 16 fished a total of more than 13,000 days. They spent almost \$184 million on trip-related expenses, and almost \$208 million on equipment. Thus, aquaculture and fishing, which benefit directly from water quality, provide \$1,456 million in direct and indirect benefits to the State of Arkansas.<sup>5</sup>

---

1 Information concerning water surface and the Agriculture as a % of GSP is available at the Arkansas Department of Economic Development website:  
[http://www.1800arkansas.com/data\\_demographics/files/Arkansas%20Profile2005.pdf](http://www.1800arkansas.com/data_demographics/files/Arkansas%20Profile2005.pdf)

2 Information concerning the dollar values of Agriculture industry and GSP is available at the Bureau of Economic Analysis website:

<http://www.bea.gov/bea/regional/gsp.htm>

3 Information is available at the Arkansas Department of Parks and Tourism website:

<http://www.arkansas.com/outdoors/default.asp>

<http://www.arkansas.com/outdoors/fishing/>

<http://www.arkansas.com/outdoors/Canoeing-Rafting-Kayaking/>

4 The Aquaculture/Fisheries Center of Excellence at the University of Arkansas at Pine Bluff.

<http://www.uaex.edu/aqfi/research/>

5 2001 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation, Arkansas, U.S. Department of the Interior, Fish and Wildlife Service and U.S. Department of Commerce, U.S. Census Bureau

### Hunting Benefits

The most recent year for which data exists regarding the economic impact of hunting is 2001. In that year, Arkansas had 430,694 registered hunters with an economic impact for all hunting-related activities of \$905,815,861 based on direct, indirect, and induced effects. The impact of deer hunting during that period was over 42 percent of the total value, or \$383,007,221. The economic impact of migratory waterfowl and upland bird hunting was almost 30 percent of the total, or \$270,286,245. Clearly, not all of this nearly billion dollar industry is dependent on or resulting from water quality, but a significant portion of the deer and migratory waterfowl industry benefits from and is dependent upon well managed water resources. A conservative estimator of the benefit derived from high quality water for those two hunting components would be 50 percent, resulting in a direct benefit of approximately \$327 million in total benefit from hunting.<sup>6</sup>

### Eco-Tourism Benefits

Eco-tourism in Arkansas is calculated as the combination of watchable wildlife recreation (particularly bird watching) and general tourism less special attractions, hunting, fishing, and historic tourism. For 2001, the most recent year for which data is available, 841,000 people participated in watchable wildlife activities. Anecdotal evidence suggests the number of ecotourists visiting Arkansas has escalated significantly with the possible discovery of the ivory-billed woodpecker in the Cache River area, but hard data are not yet available. The total economic benefit of wildlife-watching in Arkansas in 2001 was almost \$456 million, most of which was for equipment (Table II-2).

The Arkansas tourism industry experienced a year of record growth in 2004, with travel expenditures increasing from \$3,942,501,328 to \$4,253,958,933 (7.9%). Visitors increased from 19,668,336 to 20,691,089 (5.2%). These estimates are calculated using the *Travel Industry Association of America (TIA) 2001 Impact of Travel on Arkansas Counties* as a reference. During 2004, visitors to Arkansas totaled 20,691,000 person-trips. Visitors spent an average of \$205.60 per trip, resulting in \$4.3 billion in total travel expenditures, \$238 million in state taxes and \$89 million in local taxes. The Arkansas travel industry employed 59,287 persons and paid \$940 million in wages and salaries. When asked the main purpose of their trip during Welcome Center Surveys, visitors surveyed responded in order of preference: visiting friends or relatives (39%), sightseeing (18%), entertainment (15%), business (9%), recreation (9%), family affairs (7%) and other (3%). According to the Internet Conversion Study (2004), tourists participated in the following activities: sightseeing 36.8%, attractions 7.0%, historic sites 3.9%, camping 16.0%, hiking 5.1%, fishing/hunting 6.7%, water sports 4.4%, bird watching 0.3%, other 7.8 percent.<sup>7</sup> Separating bird watching from the total, the remaining eco-tourism benefit statewide during 2004 was estimated at 25.5 percent of total tourism. A conservative estimate of the economic benefit derived from well-managed water resources to ecotourism would be half of all ecotourism, or 13 percent of the total, for an economic benefit of more than \$553 million plus half of bird-watching, \$237 million, for a total impact of \$790 million. The perception of clean water is central to the advertising campaign of Arkansas as the "Natural State".

---

<sup>6</sup> 2001 Economic Importance of Hunting in America, The Animal Use Issues Committee of the International Association of Fish and Wildlife Agencies, Washington, DC

<sup>7</sup> Arkansas Tourism Report 2004, Arkansas Department of Parks and Tourism, Littlerock, AR

Table II-2: 2001 Economic Impacts of Watchable Wildlife Recreation in Arkansas

	<b>Resident</b>	<b>Non-Resident</b>	<b>Total</b>
Retail sales	\$232.0 million	\$11.9 million	\$244.0 million
Salaries & wages	\$101.2 million	\$ 4.8 million	\$106.0 million
Full & part-time jobs	4,532	238	4,770
Tax revenues:			
State sales tax	\$12.0 million	\$957,000	\$12.9 million
State income tax	\$5.0 million	\$260,000	\$5.2 million
Federal income tax	\$14.9 million	\$783,000	\$15.7 million
Total economic effect	\$454.1 million	\$21.7 million	\$475.7 million

Data source: The 2001 Economic Benefits of Watchable Wildlife Recreation in Arkansas (Report prepared for the Arkansas Game and Fish Commission.)

### Water-Critical Industry Benefits

The principal industries in Arkansas are manufacturing, agriculture, forestry, business services and tourism (Table II-3). These industries are dependent upon, and thus benefit from, high quality water resources. Determining the direct benefits from CWA implementation to these industries is difficult due to a wide variety of intermingled variables. However, a conservative estimate of the benefit of implementing the CWA and thus achieving high quality water can be made by subtracting fishing from the Agriculture, Forest, and Fishing category, and considering a marginal value of 10 percent for high quality water. The benefit to industries in Arkansas from implementing the CWA was estimated to be \$1,049 million.

### Summary of Benefits

The cumulative benefits of implementing CWA programs in Arkansas for FY 2005 were estimated to be more than \$3.7 billion (Table II-4). These benefits are rough estimates made with a variety of assumptions, many arbitrary in their magnitude. However, these assumptions were conservative (that is, likely underestimated) and based upon the most recent data available. In addition, these estimates do not consider other critical benefits that were not available for this CBA, including the cost of water treatment for drinking water, the health effects of untreated poor quality water, etc.

### Cost/Benefit Assessment

In conclusion, based upon the data collected, analyzed, and reported in this CBA, the costs for implementing the CWA in Arkansas in FY 2005 were approximately \$13.86 million, and benefits were \$3,712 million. Thus, the State of Arkansas received more than 267 times return on each dollar invested in implementing the CWA in FY2005.

*Table -3: Economic Benefits from Industries in Arkansas by Category, 2004*

<b>Industry Category</b>	<b>2004 Revenues (million)</b>	<b>Percent GSP (\$80.902 billion)</b>
Agriculture, Forestry & Fishing	\$3,154	3.9
Nondurable Goods Manufacturing industry	\$7,095	8.8
Accommodation and Food Services industry	\$1,784	2.2
<b>TOTAL</b>	<b>\$12,033</b>	<b>14.9</b>

Source: Arkansas Department of Economic Development, Bureau of Economic Analysis

*Table -4: Summary of Benefits  
Associated With Implementing CWA Programs in Arkansas for FY 2005.*

<b>Economic Source</b>	<b>Principal Activities</b>	<b>Economic Benefits (Million)</b>
Fishing	Aquaculture and recreational fishing	\$1,546
Hunting	Migratory waterfowl and riparian game (deer, upland game birds)	\$327
Ecotourism	Bird watching, recreational water sports, etc.	\$790
Water-Critical Industries	Ag, forestry, manufacturing, accommodations, etc.	\$1,049
	<b>TOTAL</b>	<b>\$3,712</b>