DRAFT ENVIRONMENTAL ASSESSMENT

GRAND PRAIRIE AREA DEMONSTRATION PROJECT
POST GENERAL REEVALUATION DESIGN CHANGES

March 2, 2004

PROJECT DESCRIPTION

The Grand Prairie Area Demonstration Project (GPADP) is located in eastern Arkansas and includes significant portions of Arkansas and Prairie counties and small portions of Monroe and Lonoke counties (Figure 1). The GPADP provides agricultural water supply, water conservation, aquifer protection, waterfowl management, and prairie grass restoration. A general reevaluation report (GRR) and final environmental impact statement (EIS) were prepared by the U.S. Army Corps of Engineers (Corps), Memphis District, and circulated for public review in December 1999. The record of decision was signed in February 2000. These documents can be viewed on the GPADP web site at http://www.mvm.usace.army.mil/grandprairie.

The selected plan as presented in the GRR and EIS would include a 1,640-cubic feet per second (cfs) pumping station to divert excess surface water from the White River to the 362,662-acre project area, 8,849 acres of new on-farm irrigation reservoirs, on-farm tail water recovery systems, establishment of native prairie vegetation on approximately 3,000 acres of canal rights-of-way, and the annual flooding of 38,529 acres of harvested rice fields for waterfowl. In addition to the pumping station, the project delivery system would incorporate 184 miles of new canals, 177 miles of pipelines, and the use of approximately 291 miles of existing streams and channels. One hundred twenty weirs would be constructed in existing streams, and numerous other hydraulic structures (e.g., gated check structures, wasteways, culverts, siphons, turnouts) would be constructed in association with the water delivery system.

NEED/PURPOSE

During detailed design of the project, it became obvious that modifications to the project (as presented in the GRR and EIS) would increase project efficiency and flexibility, resolve landowner disputes, and/or reduce project costs. The project team continually reexamines the project for possible improvements. Additional information was gathered through coordination with landowners, surveys and borings, detailed design of the delivery system, and field investigations. This information verified the capability of the project to achieve stated goals and also provided opportunities to refine the original design. All proposed changes were coordinated with an inter-agency environmental team. It is important to note that this environmental assessment (EA) covers all project changes to date. Detailed designs for project construction items are at various stages of development (Table 1). No significant changes to the project, in addition to those disclosed in this EA, are anticipated. However, the project will continually be reviewed in order to ensure compliance with the National Environmental Policy Act (NEPA).

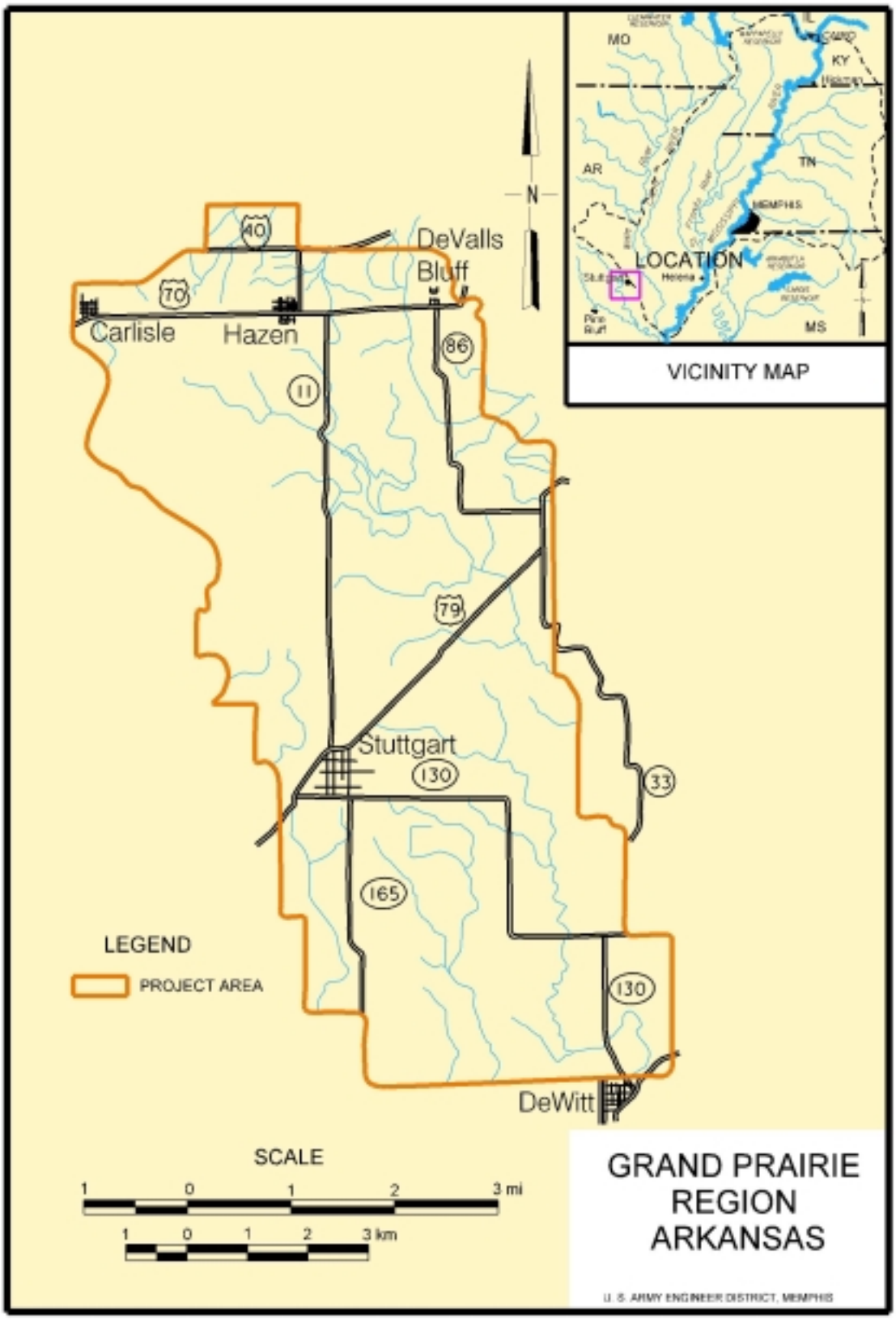

Figure 1. Project Area Map

TABLE 1
Status of Project Design as of February 2004

	Percent of Item Complete				
	0%	**35%**	**60%**	**95%**	**100%**
Pumping Station					X
Discharge Pipe & Outlet Structure					X
Admin Office & Control Room		X			
Control System Software Specs					X
Structures Design Memorandum					X
Canal 6000 @ Hwy. 79 & Union Pacific Railroad		X			
Item 3				X	
Item 4				X	
Item 5				X	
Item 6		X			
Item 7				X	
Item 8			X		
Item 9			X		
Item 10				X	
Item 11	X				
Item 12	X				
Item 13	X				
Item 14	X				

PROPOSED MODIFICATONS

Following completion of the GRR, detailed design of the GPADP was initiated. Several potential changes are now being considered to improve the project. Proposed changes were disclosed to an inter-agency team at various meetings. Most of the changes were first discussed in detail at inter-agency meetings in September 2000. The team was provided revised maps and detailed design reports for review and comment. Potential modifications under consideration are: (1) conversion of approximately 29 miles of small canals to pipelines, (2) elimination of the use of existing streams (and associated weirs) for delivery of irrigation water, (3) 113 acres of borrow pits, (4) a separate building to house the control system and associated offices, (5) a 235-acre regulation reservoir, (6) alignment changes to canals and pipelines, (7) replacement of Canal 3200 with multiple pipelines, and (8) rehabilitation/alteration of existing reservoirs. These proposed changes have no significant, unmitigated environmental impacts. These modifications would increase impacts to upland hardwoods but would lessen adverse impacts to wetlands (see Table 2).

TABLE 2
Summary Comparison Between GRR and Proposed Modifications

	GRR Analyses	Proposed Modifications
Miles of Canal	184	102 (82-mile decrease)
Miles of Pipeline	177	290 (113-mile increase)
Miles of Natural Streams	291	0 (291-mile decrease)
System Total	652	392 (260-mile decrease)
Weirs	120	0
Acres of Temporary Wetland Impacts	57	28
Acres of Permanent Wetland Impacts	128	102
Acres of Temporary Upland Hardwood Impacts	65	43
Acres of Permanent Upland Hardwood Impacts	59	113

RECENT PROJECT HISTORY

ENGINEERING REVIEW

In order to reach a compromise that would allow project construction to begin, congressional interests requested and hosted a meeting with project proponents and opponents on April 11, 2000, to discuss issues and concerns surrounding the GPADP. Representatives from the Corps, White River Regional Irrigation Water Distribution District (Irrigation District), Arkansas Soil and Water Conservation Commission (ASWCC), The Nature Conservancy, and several individuals opposed to the project attended this meeting. It was agreed upon, as a provision of the compromise, that an engineering review of the project would be completed prior to initiating construction of the project delivery system. However, all parties agreed that construction of on-farm features of the GPADP should begin as soon as possible. A joint statement released by former Congressman Jay Dickey's office is quoted as follows:

> After lengthy dialogue regarding the Grand Prairie and White River Irrigation Project, we as a group, have come to a compromise for this coming fiscal year in order to move together in an effort to conserve groundwater and wildlife resources.
>
> We will ask for funding this year, only for designated on-farm storage of water and to facilitate International Paper Company in withdrawing from the Arkansas River. We will seek a law that will state that not one penny will be spent for pumping water from the White River in FY 2001.

As this irrigation project moves forward, the future of the project will be studied and re-evaluated by all of the interested parties.

Wording was also inserted in the U.S. House of Representatives Report 106-693, which accompanied the fiscal year 2001 Energy and Water Appropriations Act that directed the Corps to perform an engineering review of the water sources. This wording is quoted as follows:

> *Grand Prairie Region, Arkansas* – The Committee has provided $22,800,000 for the Grand Prairie Region, Arkansas, project, the same as the budget request. Within the amount provided, the committee directs the Corps of Engineers to use $2,000,000 for an engineering review of additional water sources. None of the funds provided for the project may be used for construction of features to withdraw water from the White River until the engineering review of other water sources is completed and a specific appropriation of funds is made by Congress for construction of those features. In addition, the Committee directs the Corps of Engineers to work with large industrial users of groundwater to develop alternative sources of water, including the Arkansas River.

Prior studies and reports were reviewed to examine the rationale and decisions for selecting the White River as the project water source. The reliability of the Arkansas River to supply the water needs of the area was also assessed. The groundwater model prepared by the U.S. Geological Survey (USGS) was updated for the Alluvial and Sparta aquifers. Possible water sources were again considered. A cost-benefit analysis and impact assessment were conducted to determine the economic and engineering feasibility of using the Arkansas River as an alternative water source to the White River.

The ASWCC led an oversight committee for the engineering review of water sources for the project. The review found that the White River was the appropriate water source for the project, and the Governor of Arkansas urged expeditious construction of the project in a letter dated March 6, 2001. His letter stated that speedy construction of the project is necessary to preserve both the Alluvial and Sparta aquifers and prevent catastrophic losses in the agricultural-based economy. The report, entitled *Engineering Review of Water Resources*, was submitted to Corps headquarters in March 2001 and forwarded to the Assistant Secretary of the Army for Civil Works in July 2001. The report can be accessed via the GPADP web site at http://www.mvm.usace.army.mil/grandprairie.

OTHER REVIEWS

Since the record of decision to proceed with the GPADP was signed, several more alternatives were considered in addition to those identified in the engineering review. Farmers south of the project area, in conjunction with a large industrial user of the Sparta Aquifer located well south of the project area, proposed one of these plans. In a letter dated September 7, 1999, the U.S. Fish and Wildlife Service (FWS) and U.S. Environmental Protection Agency (EPA) requested that the plan submitted by farmers and industrial concerns south of the project area be analyzed. This plan was evaluated at the request of the Irrigation District. The plan contained

minor deviations from plans previously analyzed and used in the formulation and optimization of the GPADP recommended plan. It was analyzed and found not to warrant additional development under the project. The plan (referenced as Bogard Plan), FWS/EPA letter, and Memphis District response can be found on the GPADP web site (http://www.mvm.usace.army.mil/grandprairie).

In a letter dated June 26, 2001, the FWS requested that a plan proposed by environmental organizations be considered. The plan, entitled "A Sustainable Alternative to Replace the Grand Prairie Area Demonstration Project," was evaluated and found not to be technically achievable. The plan would not protect the aquifers nor sustain irrigated agriculture. This proposed alternative, FWS letter, and Memphis District response can also be found on the project web site (http://www.mvm.usace.army.mil/grandprairie).

At the request of the FWS, a special meeting was held on May 15, 2001, in Little Rock, Arkansas, to discuss and consider irrigation technologies. Representatives from the Corps, ASWCC, Irrigation District, FWS, Natural Resources Conservation Service (NRCS), Arkansas Game and Fish Commission (AGFC), and University of Arkansas Agriculture Extension Service attended the meeting. Extension Service irrigation experts agreed with the NRCS that the 70% irrigation efficiency estimate used in the GPADP general reevaluation was appropriate. Extension Service representatives informed the group that it would not be possible to achieve overall irrigation efficiencies greater than 70% over the project area. A memorandum for record that summarizes this meeting can be found on the project web site (http://www.mvm.usace.army.mil/grandprairie).

ENVIRONMENTAL TEAMS

In addition to the original inter-agency planning team, other inter-agency environmental teams have been formed to coordinate on-going project activities. These include an on-farm review team, a mitigation team, and project monitoring team. A weir review team was formed but has never met because the use of existing streams would likely be eliminated from the project. The teams include representatives from the Corps, Irrigation District, NRCS, ASWCC, AGFC, Arkansas Natural Heritage Commission (ANHC), Arkansas Department of Environmental Quality (ADEQ), FWS, and EPA.

NEW USGS REPORTS

Two new reports released by the USGS, in cooperation with the ASWCC and the Corps, provide information on the outlook for groundwater levels in the alluvial aquifer under potential groundwater pumpage scenarios for the next several decades. These reports describe the results of computer simulations used to predict groundwater levels resulting from several potential scenarios and to estimate the amount of water that can be withdrawn indefinitely from groundwater and surface-water sources while maintaining water levels above specified levels.

Groundwater is being removed for irrigation at a rate that could cause portions of the alluvial aquifer in eastern Arkansas to go dry by the year 2009. Areas most affected are the Grand Prairie in Lonoke, Prairie, Jefferson, and Arkansas counties and the area between the White River and Crowleys Ridge from Lawrence County in the north to Phillips County in the south. Continued withdrawal at 1997 rates is predicted to cause almost 275 square miles of the aquifer to go dry by the year 2029. The dry area is predicted to increase to about 400 square miles by 2049. However, if groundwater withdrawals continue to increase at the rates observed over the last 35 years, nearly 1,100 square miles of the aquifer are predicted to go dry by 2029.

These models confirm the data used in the GPADP analyses and shows the severity of the groundwater depletion problem. The only way to address the problem and sustain irrigated agriculture is through a combination of increased efficiency, storage, and importing excess water as proposed in the GPADP. For more information concerning these reports, contact USGS, Arkansas District Office, at (501) 228-3600 or visit their web site (http://ar.water.usgs.gov).

ON-FARM CONSTRUCTION

Funds for project construction were included in the fiscal year 2002 Energy and Water Appropriation Act. However, the Office of Management and Budget directed the Corps to limit construction to on-farm project features. No action could be taken to initiate construction of the delivery system (pump station, canals, pipelines, and associated structures).

The NRCS began executing contracts for the construction of on-farm features in November 2000. To date, 227 on-farm contracts have been executed for over $34 million; construction of 88 on-farm plans has been completed. A Section 404 general permit for the Grand Prairie on-farm features was coordinated and issued.

DELIVERY SYSTEM CONSTRUCTION

The 2004 Energy and Water Appropriation Act directs the Corps to initiate construction of water withdrawal features (delivery system) with previously appropriated funds. The Corps is authorized to reprogram approximately $3.6 million to initiate construction of the delivery system. A right-of-way request for the pump station site and an adjacent project mitigation area was sent to the project sponsors. Contracting for the pumping station is proceeding with a schedule that calls for opening bids on May 1, 2004 and awarding the contract on June 1, 2004. No features that could be impacted by project changes would be constructed until the NEPA process for those features is completed.

AUTHORITY

The Grand Prairie Region and Bayou Meto Basin Project was originally authorized in Section 203 of the Flood Control Act of 1950 and later deauthorized by the Water Resources Development Act of 1986. The Water Resources Development Act of 1996 reauthorized the

project adding groundwater protection and conservation, agricultural water supply, and waterfowl management as project purposes. The GRR was completed and approved by Corps headquarters in September 1999.

Design of the project was initiated following approval of the GRR. The project cooperation agreement was executed in August 2000, and funds were provided to the NRCS in September 2000 to develop on-farm plans and to initiate execution of on-farm contracts. Design of the delivery system has continued. Optimization of project features is constantly performed during design and value engineering activities in order to provide the best product with the lowest life-cycle costs, including first costs and operation and maintenance. All proposed changes presented in this document were developed as a result of improving the engineering design to accomplish the same project purposes at the same authorized level of service.

PROJECT MODIFICATIONS

MODIFICATION 1 – Relocation of Administrative Offices/Control Room

Alternatives Considered

1. **No Action** – Under this alternative, the irrigation district administrative offices and system control room would remain situated in the pumping station as assumed during the general reevaluation.

2. **Relocate Administrative Offices/Control Room to Approximate Geographic Center of Project Area (Modified Plan)** – The Irrigation District's administrative offices and system control room would be located in the approximate geographic center of the project area in order to better serve the public and more effectively operate the project. The maintenance facility would also be co-located with the offices and control center. The central location of this complex would be more convenient to project customers. The administrative offices, control room, and maintenance facility would be constructed on a 5.5-acre site. Although no specific location has been determined, it would be located on a cleared, non-wetland agricultural site to minimize environmental impacts.

MODIFICATION 2 – Construct Pits to Obtain Borrow for Canal Levees

Alternatives

1. **No Action** – The project would be constructed as presented in the GRR and EIS. Depending on topography, irrigation canals would be above ground, below ground, or partially above ground. Therefore, many canals would require levees to retain the irrigation water. Under the no action alternative, the levees would be constructed using the "balanced cut and fill" approach. At some locations, there would be surplus earthen material from canal excavation that would be available for use in levee construction. At other locations, there would be little or no earthen

material available for levee construction. Therefore, the surplus borrow would be hauled, sometimes long distances, to levee construction sites without sufficient material.

2. **Construct Borrow Pits (Modified Plan)** – The levees would primarily be constructed using the "balanced cut and fill approach." However, it was determined that it would be more cost effective to utilize borrow pits in certain locations to avoid hauling material long distances. The use of borrow pits would not completely eliminate the need to haul borrow, but they would greatly reduce haul distances. It is estimated that 1.5 million cubic yards of earthen material would need to be obtained from nine to 12 borrow pits. The borrow pits would total 113 acres and would range in size from six to 24 acres. These borrow pits would be located in upland agricultural areas to avoid adverse environmental impacts. Features (e.g., islands, sloped bottoms, deeper pools) would be incorporated into the designs of the pits to benefit fish and wildlife.

MODIFICATION 3 – Use Pipelines Instead of Streams to Deliver Water

Alternatives Considered

1. **No Action** – The no action alternative would utilize 291 miles of existing streams in the delivery of project water as stated in the GRR and final EIS. One hundred twenty weirs would be placed in these streams to pool water for withdrawals. During review of both the draft EIS and final EIS, concerns were expressed by several natural resource agencies and conservation organizations over potential environmental impacts associated with the use of existing streams. One primary concern centered on the possible introduction of zebra mussels into the streams. The other major issue was the height of some of the weirs. There was concern that the weirs would pool water too high and, therefore, could saturate the soil along the stream banks, inducing adverse effects on riparian plant communities. The Corps formed an inter-agency team to examine these weir locations and committed to redesigning or relocating any weirs that could cause adverse impacts. It was determined that the pooling effect of the weirs and the supplemental project water would increase the wetted perimeter and improve habitat quality for fish over existing conditions. It was estimated that 4,328 fish habitat units (HUs) per month would be gained through the use of existing streams.

During detailed design, it was found that extending pipelines across property tracts could eliminate the use of natural streams. Moreover, portions of these streams have become integral components of privately owned irrigation systems. Incorporation of these in-stream reservoirs would require extensive modifications to existing irrigation systems. Also, coordination with local farmers revealed that most farmers would prefer to have off-takes (water diversion points) located on the high end of farms to reduce energy costs associated with moving water into storage reservoirs.

2. **Provide More Inlet Points on Natural Streams** – This alternative would incorporate numerous inlet points below existing in-stream reservoirs in order to provide water to downstream farms. This would add additional cost to the project without added benefit.

3. **Divert Water Around Pit Reservoirs** – This would involve pumping water from streams at points above in-stream reservoirs and diverting it around the reservoirs and back into the streams at points below the reservoirs. This plan would also add additional cost without added benefit.

4. **Use Pipelines Instead of Existing Streams (Modified Plan)** – This alternative would allow the project sponsor to accurately regulate (using meters) the amount of water delivered to farms and control the quantity of water going through the system. Also, the use of pipelines is a more efficient means of transporting water. This would translate into energy savings and would allow a greater percentage of the irrigation demand to be met. Farmers would be able to receive water from locations at topographically higher spots on the farms, reducing the energy required to move the water to fields. Moreover, environmental concerns over the use of streams, including concerns over weirs and zebra mussel introduction, should be alleviated. However, the projected fishery benefits (4,328 fish HUs per month) from using the existing streams in the delivery system would be lost. This lost of benefits would not constitute an adverse project impact to existing or future-without project conditions and would not require mitigation.

5. **Use Pipelines Instead of Existing Streams and Continue Providing Water to Existing Streams to Retain Projected Fishery Benefits** – Pipelines would be used instead of existing streams as in Alternative 4. However, water would be delivered to the existing streams and pooled by weirs as presented in the final EIS in order to retain the projected fishery benefits. This would require weirs and acquisitions of rights-of-way along and within the streams. It would also likely require the removal of in-stream reservoirs and associated dams. This alternative is not feasible because of landowner concerns over riparian rights, interference with existing irrigation systems, and high cost associated with providing the fishery benefits. Also, this feature would require pumping additional water from the White River beyond that necessary for irrigation purposes.

6. **Use Pipelines Instead of Existing Streams and Maximize Fishery Habitat in Regulation Reservoir** – This plan would incorporate the use of pipelines instead of existing streams as presented in Alternative 4. In order to replace the fishery benefits projected in the EIS, the size of the regulation reservoir would be increased to approximately 400 surface acres. The reservoir would be designed and managed to provide habitat that would be similar to the habitat provided by pooling water in existing streams--a mixture of deep-water, shallow-water, and wetland habitat. Any basic reservoir design would require relatively high levees and would pool water an average depth of 20-25 feet due to site topography. It would be relatively expensive, compared to fishery benefits gained, to incorporate sufficient shallow water and wetland areas in any reservoir design at this location. See Modification 6, Alternative 3, for a description of the various reservoir sizes examined.

7. **Use Pipelines Instead of Existing Streams, Increase Size of Regulation Reservoir, and Include Fishery Improvements in Borrow Pits** – Pipelines would replace the use of existing streams as described in Alternative 4. Project borrow pits would be improved and managed to provide fishery habitat. The size of the regulation reservoir would be increased, and it would be managed to provide fishery benefits. Fish habitat structures and other features would be incorporated into the reservoir design. Modifying the design, size, and management of the regulation reservoir would replace the remainder of the fishery benefits (as projected in the EIS) that could not be provided in the borrow pits. The borrow pits would be too small to sustain a

public fishery. To make the best use of the pits, local farmers would be allowed to use the borrow pits as part of their on-farm storage system. Therefore, the level of fishery management provided in the borrow pits would be uncertain. The costs of creating adequate shallow water and wetland habitat in the regulation reservoir would be relatively costly compared to the fishery benefits provided.

MODIFICATION 4 – Convert Small Canals to Pipelines

Alternatives Considered

1. **No Action** - The canal sizes decrease as flows decreases in a southerly direction through the project area. Water is carried in pipelines instead of canals at points where flows are small enough and/or topography necessitates. During the general reevaluation, no fixed points were determined as cutoffs where flows could be most efficiently carried in pipelines. In areas without much elevation change, this resulted in relatively small canals. The no-action alternative would maintain the current transitions from canal to pipe.

2. **Transport Flows Up to 25 cubic feet per second (cfs) in Pipelines (Modified Plan)** – Placing the flow in a pipeline would increase project efficiencies, deliver water faster under pressure instead of being strictly gravity flow, and reduce losses due to evaporation and seepage. System maintenance would also be simplified because the small canals would be eliminated. In order to adopt a uniform standard for flow in pipeline verses flow in a canal, an engineering analysis was conducted. This analysis concluded that flows up to 25 cfs should be carried in pipelines based on increased system efficiencies. The right-of-way and permanent impact requirements would be much less with pipelines than canals. Canals carrying 25 cfs or less would be relatively small and shallow. Maintenance costs for these canals would be comparable to larger canals even though they would be incapable of delivering as much water. They would have to be kept free of debris obstructions and would have relatively high system losses. Approximately 29 miles of small canals would be converted to pipelines. The benefits of replacing the small canals with pipelines would outweigh the costs of the pipe. No significant loss of projected fishery benefits would occur as a result of implementing this alternative.

3. **Transport Flows Greater than 25 cfs in Pipelines** – Further increasing the size flow placed in a pipeline could further increase project efficiencies. A value engineering study was performed to evaluate road crossing and small flow conveyance in February 2000. This value engineering study concluded that changes in road crossings would save $7.5 million and reduce head loss, but found that using pipelines for flows greater than 25 cfs would not be cost effective.

MODIFICATION 5 – Eliminate Canal 3200 and Deliver Water with Pipelines

Alternatives Considered

1. **No Action** – Canal 3200 would be built as designed and reported in the GRR and EIS. This would require a 100-cfs pumping station and several large road crossings, including crossing U.S. Highway 70 at a skew to minimize impacts to the Railroad Prairie Natural Area.

2. **Eliminate Canal 3200 and supply the area it served by multiple pipelines fed from the main canal (Modified Plan)** – During coordination of the project with the Irrigation District, it was discovered that the cost of Canal 3200 was comparably higher than that of other canals. There were also concerns with the canal's operating system. Canal 3200 supplied water to the area north of U.S. Highway 70 in the far northwest corner of the project area. At the time of the initial design, open channels were preferred because of their suitability for flat terrain. However, the elevation changes at the northwestern portion of the project area would require an additional lift station to allow for gravity flow. A 100-cfs pumping station was required to lift the water over the drainage divide to where it could gravity flow to the area farms. This was the only other large pumping station required in the project area besides the main pumping station on the White River at DeValls Bluff.

The canal was too large to cost effectively convert to a pipeline. However, the flow had to be carried in large diameter pipes through certain road crossings. When gravity flows have to be funneled into pipelines and then returned to canals, the pipelines required are much larger than if a pump was moving water from a canal into pipeline for final delivery. Several multiple, large-diameter, gravity-flow pipe crossings were required in this item. Over 750 feet of 96-inch diameter reinforced concrete pipe and over 2,400 feet of pipe ranging from 48 inches to 90 inches in diameter would be needed.

When examining the canal and area supplied by the canal as a whole, the project hydraulic engineer developed this alternative plan. The original design consisted of pumping over the high point into a canal running north. The canal would then turn to the west and run parallel to the main canal to the project boundary, supplying farms along the route. By using multiple smaller pipelines, the lift over the high point and run under U.S. Highway 70 and other crossings could be accomplished under pressure in comparatively smaller pipes. Instead of one major lift point, water would be supplied across the divide in four pipelines with flows of 25 cfs or less. The crossings for these smaller pipelines (smaller because flows in them would be under pressure) could be constructed much easier than with the large pipes required for gravity flow. Adoption of this alternative would eliminate the use of the very large diameter pipeline from this item of work, eliminate the construction concerns with the road crossings, and eliminate the 100-cfs pumping station. It was determined that several pump off-takes into this area would be a more efficient alternative without affecting the project costs. It would also simplify the design of the control system by eliminating the effects of an additional lift station working in the open channel system.

Elimination of Canal 3200 would result in the loss of some of the fishery benefits that were projected for canals in the EIS. The EIS reported that new irrigation canals would provide

8,560 fish HUs per month. If Canal 3200 were to be replaced with pipelines, 99 of these projected HUs would be lost. However, 8,461 fish HUs would still be provided by the GPADP, even with the proposed design changes.

MODIFICATION 6 – Construct Regulation Reservoir

Alternatives Considered

1. **No Action –** The delivery system would be constructed as described in the GRR and EIS. The system would operate at full capacity, but flows would likely have to be scheduled to avoid wasting water (i.e., releasing excess water from canals). During detailed design of the project, it was determined that the project as presented in the GRR would be relatively inefficient and costly to operate compared to the modified plan. Alternatives were analyzed that would provide greater control of system flows, improve the flexibility of service, improve system response, conserve power demands, and eliminate wasting water.

2. **Mechanical Control of Flow in Pipeline** – A mechanical device, such as a butterfly valve, would be installed in each of the two 10-foot diameter discharge pipelines that transport water from the pumping station to the main canal (Canal 1000). This device would control flows from the pumps through physical restriction. This would be very inefficient because more energy would be required to operate the pumps. The mechanical control would have to be designed to withstand high pressures and high flows and thus would be very expensive and subject to failure. Therefore, this alternative was eliminated early in the design process.

3. **Construct a Regulation Reservoir (Modified Plan)** - A 235-acre reservoir (175 surface acres and 60 acres of levee) would be constructed so that the pumping system could run continuously until the reservoir is full. This would allow the most flexibility for operating the delivery system to provide water to the farms and for precisely increasing or decreasing flows as necessary. The regulation reservoir would eliminate the wasting of water and would increase delivery system efficiency.

The reservoir would have to be located in Prairie County in the northeast portion of the project area at a site that (1) was near the outlet for the 10-foot diameter discharge pipelines; (2) avoided or minimized impacts to wetlands; and (3) would allow cost-effective construction, operation, and maintenance of the reservoir. The proposed reservoir site is located approximately 1.25 miles northwest of DeValls Bluff in T2N, R5W, Section 12, immediately north of Prairie County Road 705 and immediately west of Prairie County Road 123 (Figure 2). Wattensaw Wildlife Management Area (WMA) is located adjacent to the outlet, and a reservoir for public recreation was considered on the Wattensaw property several years ago. However, unacceptable impacts would occur to upland hardwoods if the reservoir were constructed on the WMA. Reservoir construction on the property on the south side of Prairie County Road 705 would impact a 33-acre lake and 44 acres of upland hardwood forest surrounding the lake. This site also has several deep wells that would be expensive to relocate.

The selected site at the outlet on the north side of the road consists of 173 acres of cleared land and 62 acres of upland hardwood forest. No wetlands are located on this tract. This

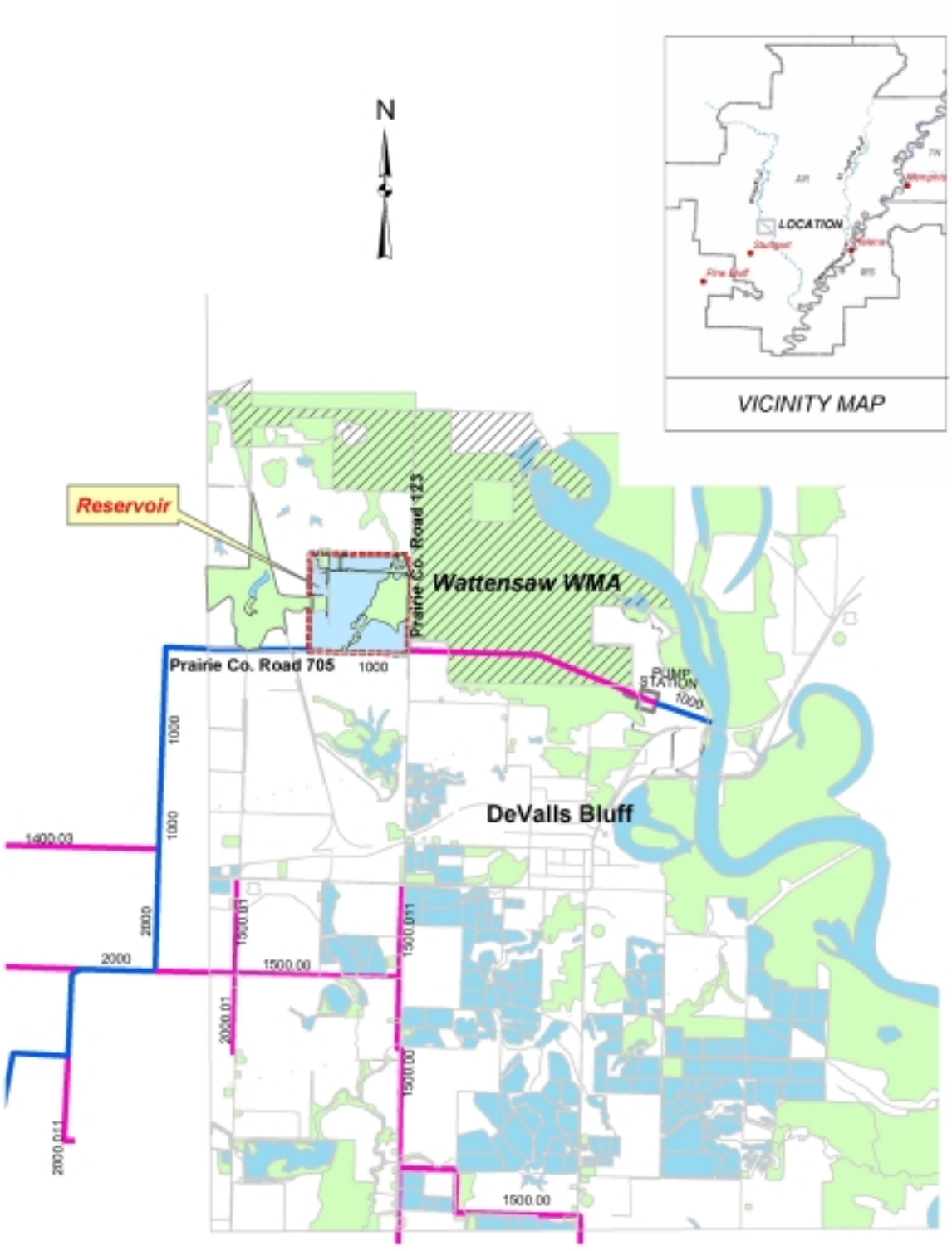

Figure 2. Proposed Reservoir Location

relatively large, flat area appears to offer the best site on which to construct the regulation reservoir.

In an effort to replace the projected fishery benefits lost as a result of Modifications 3 and 5, two larger reservoir designs were examined as possible alternatives. Four hundred fifty-acre and 315-acre reservoir designs were examined along with the selected 235-acre reservoir. Due to site topography, however, all three reservoir alternatives would be deep (average depth of 20 to 25 feet) with little shallow-water habitat. Deep-water reservoirs would not provide in-kind replacement of the fishery habitat gains projected in the EIS because the receiving streams (4,328 HUs/month) and Canal 3200 (99 HUs/month) would have provided habitat primarily for fish species associated with shallow water and wetlands. The amount of earthwork involved to create sufficient shallow-water habitat would be cost prohibitive. Even without this additional earthwork, the estimated costs for the 450-acre, 315-acre, and 235-acre reservoirs would be $13.8 million, $9.7 million, and $7.5 million, respectively. Therefore, the optimum size reservoir (235 acres) for efficient operation of the delivery system was selected as the preferred alternative. The selected reservoir design would provide habitat for pelagic (open-water) and demersal (bottom) fishes (see Aquatic Resources, pp. 19 - 20) and should still provide recreational fishing opportunities. However, no credit has been taken for these benefits.

MODIFICATION 7 – Alignment Changes in Canals and Pipelines

Alternatives Considered

1. **No Action** – The project would be built as designed and reported in the GRR and EIS.

2. **Incorporate Alignment Changes in Detailed Design (Modified Plan)** – As detailed design work continues, small alignment changes become necessary. Optimizations of project features were made to decrease costs of the project as detailed surveys and soil borings were obtained. Changing some locations could balance the cut and fill requirements for canals and levees in certain areas and thus reduce costs. During final design, the locations of features were further developed; and some alignments were changed to avoid woodlands and county infrastructure that is expensive to move. Some changes were made to accommodate the sponsor or landowners who desired to minimize impacts to farming operations or to accommodate landowners' desires whenever possible. Alignment changes were made only if there were no net adverse effects on the environment.

MODIFICATION 8 – Rehabilitation/Alteration of Existing Irrigation Reservoirs

Alternatives

1. **No Action** – The project would be constructed as disclosed in the EIS; 8,849 acres of new on-farm irrigation reservoirs would be constructed in the project area.

2. **Rehabilitate/Alter Some Existing Farm Reservoirs (Modified Plan)** – The rehabilitation and alteration of existing irrigation reservoirs to increase on-farm water storage was not discussed in the EIS. The modification of existing reservoirs was considered and discussed during project planning, and project planners assumed that this would be incorporated into on-farm plans. However, to simplify the assumptions in project planning, it was assumed that all required on-farm storage would be accomplished with 8,849 acres of new reservoirs. This maximized the costs and economic losses. Rehabilitation/alteration of existing reservoirs would be less expensive than construction of new reservoirs, and the on-farm environmental team has also determined that modifications to existing reservoirs can be done in an environmentally sensitive manner. The impacts were fully considered in the environmental assessment for the Section 404 general permit for on-farm work. Construction plans have been completed for 105 new reservoirs, and 87 of these reservoirs have been built. Thirty-two reservoirs have been rehabilitated of altered, and an additional 14 reservoirs are slated for modification. No wetlands or upland hardwoods have been impacted by reservoir rehabilitation/alteration to date. Any future impacts would be fully mitigated, and it is important to note that wetland impacts associated with work on existing irrigation reservoirs would count toward the total on-farm wetland impact limit of 200 acres reported in the EIS.

NAVIGATIONAL RAMIFICATIONS

Project modifications would not have any additional impact on navigation above what was originally disclosed in the EIS. Impacts of the GPADP on navigation would remain the same as disclosed in the GRR and EIS; an average annual loss of $127,000 would result from project-induced diversions and delays of commodity movements and increases in light-loaded barges. The impacts to navigation on the White River were extensively analyzed under a scenario of continuing the operation and maintenance of the existing project and with implementation of the authorized navigation improvements to Newport, Arkansas. If the navigation improvements currently under study were constructed, the GPADP would have no effect on navigation because the river would have to be navigable at 7,720 cfs and the minimum GPADP pump cutoff for any month is 9,650.

Some concerns have been expressed that the maintenance of the river will not continue because it was not included in the President's budget requests for fiscal years 2002, 2003, 2004, and 2005. However, appropriation acts provided funding for maintenance dredging during fiscal years 2002 – 2004. If maintenance dredging were discontinued for a long period of time, sediment would first build up at crossings and other critical areas in the river. As the bottom elevation in these critical locations would increase, higher water levels would be necessary to ship fully loaded barges. The GPADP withdrawals would have less impact to water depths at these higher stages than with the current maintenance. Therefore, the GPADP would have fewer impacts on navigation in critical areas if maintenance were ceased than if continued.

FLOODPLAIN MANAGEMENT

Portions of modified project features would be constructed in floodplains. All non-floodplain alternatives were eliminated during screening because they were not economically justified or practical. All modifications were designed to avoid adverse impacts to floodplains to the extent practical according to Executive Order 11988.

ENVIRONMENTAL JUSTICE IN MINORITY AND LOW-INCOME POPULATIONS

The EIS evaluated potential project impacts to minority and low-income populations according to Executive Order 12898. It was concluded that the project should have no adverse environmental or health effects on low-income or minority populations and that the project should provide slight economic benefits to low-income residents and minorities. The proposed project modifications would not significantly affect minority or low-income populations.

INVASIVE SPECIES

The primary purpose of Executive Order 13112 is to prevent the introduction and spread of invasive species. A federal agency must evaluate a proposed action and determine if the benefits of the action "clearly outweigh" the potential impacts caused by invasive species. During the GPADP general reevaluation, it was determined that the exotic zebra mussel could be introduced from the White River into the receiving streams that would be used as part of the water delivery system. There was concern that zebra mussels could adversely impact native mussels within these streams by competing with native mussels for food and space. Zebra mussels also attach to native mussels and often kill them by impairing their movement and damaging their shell edges. The FWS conducted a mussel survey of LaGrue Bayou, which was thought to be one of the receiving streams most likely to contain a viable mussel population, during the general reevaluation. The FWS concluded that native mussels were scarce in LaGrue Bayou and informed the Memphis District that no additional surveys were necessary. Also, the EIS concluded that, if zebra mussels proliferated in the White River, their introduction into the receiving streams was likely inevitable even without the GPADP. Recent information received from the U.S. Army Engineer Research and Development Center indicates that excessive water temperatures in receiving streams would likely prevent zebra mussels from reaching population levels that would threaten native mussels. However, one of the proposed project modifications (Modification 3) is to eliminate the use of existing streams for water delivery; this change would significantly reduce the likelihood of introducing zebra mussel into the streams.

HAZARDOUS, TOXIC, AND RADIOACTIVE WASTE (HTRW)

During the general reevaluation, a Phase I HTRW assessment was conducted. It was concluded that it was unlikely that any HTRW exists within the project impact zone or that any HTRW would be encountered during project construction or operation. However, a Phase I

assessment would have to be conducted on any new rights-of-way prior to construction. If potential HTRW were to be discovered, the site would either be avoided or a Phase II assessment (testing) would be conducted to determine if HTRW actually exists at the site. The results of the Phase II assessment would be used to determine the appropriate action (avoidance or cleanup).

CLEAN WATER ACT COMPLIANCE

A Section 404(b)(1) evaluation was completed during the general reevaluation and presented in an appendix to the EIS. The result of the proposed project modifications presented in this environmental assessment is a net decrease in the amount of fill material placed in waters and wetlands of the United States. This is due primarily to eliminating the use of existing streams, and associated weirs, as part of the water delivery system. All proposed design changes have been coordinated with the ADEQ. ADEQ has no concerns with the preliminary design for the regulation reservoir, but they will wait until the final design is completed before making a final decision as to whether separate Section 401 water quality certification is needed for this item. ADEQ has issued water quality certification for the general permit covering construction of on-farm project features.

ENVIRONMENTAL SETTING

The project area boundaries have not changed since completion of the EIS. In 1995, over 300 landowners petitioned the Prairie County Circuit Court to be excluded from the project area. However, all but fewer than 20 landowners have withdrawn their petitions; and only one has requested a court date. State law requires landowners to prove that they would not benefit from the project in order to be excluded. A group of farmers south of the project area has indicated that they will form a separate irrigation district. If formed, this district could overlap the Irrigation District by approximately 5,000 acres according to preliminary maps. This boundary issue might have to be resolved by litigation. However, as of February 2004, the ASWCC had not been informed of the required filings necessary to form an additional irrigation district. An analysis was performed and included in the economic appendix of the general reevaluation to determine the participation rate necessary for the GPADP to remain feasible. This rate was between 60% and 65% of the land area. Currently, landowners have requested on-farm plans for over 80% of the project area. Minor boundary changes would not affect the project feasibility or the ability of the project to meet its stated goals.

The project area comprises 362,662 acres and includes significant portions of Arkansas and Prairie counties and small sections of Monroe and Lonoke counties. Approximately 70% (254,406 acres) of the project area consists of agricultural land with wetlands (28,288 acres) and upland forests (14,940 acres) collectively comprising only about 12% of the total project area. A vast (300,000 - 400,000 acres) tall-grass prairie historically occupied the Grand Prairie terrace. This grassland has been reduced to 10 widely scattered remnants totaling about 650 acres. All of these remnants are located in the project area.

The Mississippi Alluvial Aquifer is being severely impacted by groundwater withdrawals for agricultural use. The Grand Prairie is extensively farmed, and rice and soybeans are the primary crops grown. Groundwater from the alluvial aquifer is the primary source of irrigation water and a major source of water for local catfish and bait fish farms. An impermeable clay hardpan restricts recharge in the project area. The deeper Sparta Aquifer is now being increasingly mined for irrigation water. The Sparta Aquifer lacks the recharge capabilities of the alluvial aquifer and is in threat of being depleted. The GPADP is designed to protect the aquifers and thus protect the agricultural-based economy.

Approximately 5,500 acres of the southern portion of the state-owned Wattensaw Wildlife Management Area (WMA) are located in the northern section of the project area. Two 10-foot diameter discharge pipelines would be constructed from the White River pump station at DeValls Bluff across the extreme southern boundary of the WMA as part of the GPADP. The impacts associated with construction of these pipelines have been disclosed in the EIS. Project modifications would not adversely impact the WMA. However, the regulation reservoir would be located immediately west of the WMA. Public fishing at the reservoir would provide additional recreational opportunities and should enhance the overall recreational experience for those visiting the area.

Although not located in the 362,662-acre project area, two national wildlife refuges are located in the project study area that was defined for purposes of environmental impact analyses. The majority of land comprising both the 160,000-acre White River National Wildlife Refuge and the 42,000-acre Cache River National Wildlife Refuge is contained within the project study area. Project modifications would not adversely affect these refuges.

SIGNIFICANT RESOURCES AND IMPACTS

AQUATIC RESOURCES

The study area portion (river mile 57.0 to 126.6) of the White River is a large, turbid, warm-water stream. During the general reevaluation, 47 species of fish were collected from this section of river. Sport and commercial fishing are popular on the river. However, the most productive sport fisheries are contained within the numerous oxbow lakes that are located adjacent to the river. At least thirty-four species of mussels are known to inhabit the lower White River. The exotic zebra mussel, considered an aquatic pest, occurs in the river in limited numbers. Twenty-eight smaller tributary streams and numerous unnamed channels are located within the project area. LaGrue Bayou, Little LaGrue Bayou, Barnes Creek, Honey Creek, Sherril Creek, Stuttgart King Bayou, Mill Bayou, Elm Prong Mill Bayou, and South Mill Bayou are among the largest streams. Mill Bayou and Stuttgart King Bayou are the only project area streams that are not tributaries of the White River; these bayous are tributaries of the Arkansas River. Fisheries in the tributary streams are limited due primarily to excessive withdrawals of irrigation water. A mussel survey conducted by the FWS during the general reevaluation indicated that mussel populations within the tributary streams have been severely impacted by channel modifications, agricultural runoff, and water withdrawals. Studies conducted during the general reevaluation concluded that no significant impacts would occur to the fisheries, mussels,

other aquatic resources, or endangered species. Proposed changes would have no adverse effects on these resources.

The 235-acre reservoir would be constructed near the White River at DeValls Bluff and would be used to store water pumped from the river. Water would then be distributed throughout the project area by a series of canals and pipelines. The depth of the reservoir would range from 20 to 38 feet with an average depth of 20 to 25 feet. Minimal fluctuation (<2 feet) in water levels would occur, providing a more stable habitat for fishes.

Due to the water depth, this reservoir could not be considered to replace the habitat gains that were projected in the EIS. The receiving streams (4,328 HUs/month) and Canal 3200 (99 HUs/month) would have provided habitat for fish assemblages associated with shallow water and wetlands. However, the reservoir would be inhabited by pelagic (open-water) and demersal (bottom) fishes, and some species could probably establish reproductive populations. Based on fish collections in the White River from 1996 to 2000, there are at least 24 species that are pelagic or demersal during the majority of their life (Table 3). This group includes species of special concern (paddlefish), exploitable fishes (buffalo, crappie, catfish, white bass), and important forage fishes (shad, minnows, shiners). Some of these species quickly colonize new water bodies, are adaptable to a wide range of habitat conditions, and can potentially achieve relatively high densities in a deep reservoir: shortnose gar, gizzard shad, blacktail shiner, golden shiner, bullhead minnow, common carp, smallmouth buffalo, white crappie, white bass, yellow bass, channel catfish, and freshwater drum. Long-term abundance of these and other pelagic/demersal fishes may be constrained by reproductive or foraging habitat. However, a variety of fishes would become established in the reservoir, stable water levels would contribute to longer survival, and some species would likely provide a recreational fishery. It must be noted that it is not necessary to replace the fishery benefits that would have been furnished through the use of existing streams in the delivery system. The fishery habitat that would have been provided was supplemental to existing and future-without project conditions and was not mitigation for adverse impacts.

TABLE 3
Pelagic or Demersal Fishes Collected in the White River Between 1996-2000

Paddlefish, *Polyodon spathula*	Common carp, *Cyprinus carpio*
Spotted gar, *Lepisosteus oculatus*	River carpsucker, *Carpiodes carpio*
Longnose gar, *L. osseus*	Smallmouth buffalo, *Ictiobus bubalus*
Shortnose gar, *L. platostomus*	Bigmouth buffalo, *I. cyprinellus*
Bowfin, *Amia calva*	Black buffalo, *I. niger*
Threadfin shad, *D. petenense*	Spotted sucker, *Minytrema melanops*
Gizzard shad, *Dorosoma cepedianum*	White crappie, *Pomoxis annularis*
Blacktail shiner, *Cyprinella venusta*	Black crappie, *Pomoxis nigromaculatus*
Miss. silvery minnow, *Hybognathus nuchalis*	White bass, *Morone chrysops*
Silver chub, *Macrhybopsis storeriana*	Yellow bass, *M. mississippiensis*
Golden shiner, *Notemigonus crysoleucas*	Channel catfish, *Ictalurus punctatus*
Bullhead minnow, *Pimephales vigilax*	Freshwater drum, *Aplodinotus grunniens*

WETLANDS

Approximately 28,387 acres of "natural" or non-agricultural wetlands exist within the project area. Five categories of wetlands were defined during the general reevaluation. Bottomland hardwood forest, forested swamp, scrub/shrub swamp, marsh, and dead timber occupy 15,860 acres, 4,071 acres, 6,987 acres, 1,307 acres, and 99 acres, respectively, of the project area.

Proposed modifications to the delivery system would result in a 29-acre reduction in temporary wetland impacts and an 11-acre reduction in permanent wetland impacts. During detailed design of the pump station, the area of farm wetlands impacted was lessened from 64 acres to 48 acres; this provided an additional 15-acre reduction in permanent wetland impacts. Table 4 provides a comparison between delivery system impacts presented in the EIS and those associated with proposed design changes. As compared to mitigation requirements presented in the EIS, the proposed delivery system modifications would require 61 fewer acres of wetland mitigation. Project impacts would be offset by the acquisition and restoration of 182 acres of farmed or prior-converted wetlands.

UPLAND HABITATS

The Grand Prairie was the largest (300,000 – 400,000 acres) in a series of discontinuous tall-grass prairies that occurred in Louisiana and eastern Arkansas. Today, only about 650 acres remain in 10 widely scattered remnants. The predominant grasses associated with these prairies are big bluestem, little bluestem, Indian grass, and switch grass. Common forbs (i.e., herbs other

TABLE 4
Comparison of Delivery System Impacts

Habitat Impacts (Acres) Presented in EIS						
	Upland Hardwoods	Bottomland Hardwoods	Forested Swamp	Scrub/Shrub Swamp	Marsh	Farmed Wetland
Pumping Stn./ Inlet Channel	5 (P)	0	1 (P)	0	0	64 (P)
Pipelines	55 (T) 8 (P)	15 (T)	3 (T)	8 (T)	0	0
Canals	41 (P)	10 (P)	4 (P)	23 (P)	1 (P)	0
Weirs	10 (T) 5 (P)	20 (T) 14 (P)	2 (T) 2 (P)	9 (T) 7 (P)	2 (P)	0
Total Impacts	65 (T) 59 (P)	35 (T) 24 (P)	5 (T) 7 (P)	17 (T) 30 (P)	3 (P)	64 (P)
Habitat Impacts (Acres) Associated with Proposed Design Changes						
	Upland Hardwoods	Bottomland Hardwoods	Forested Swamp	Scrub/Shrub Swamp	Marsh	Farmed Wetland
Pumping Stn./ Inlet Channel	5 (P)	0	1 (P)	0	0	48 (P)
Pipelines	43 (T) 8 (P)	14 (T)	3 (T)	11 (T)	0	0
Canals	38 (P)	17 (P)	4 (P)	30 (P)	1 (P)	1 (P)
Weirs	0	0	0	0	0	0
Regulation Reservoir	62 (P)	0	0	0	0	0
Total Impacts	43 (T) 113 (P)	14 (T) 17 (P)	3 (T) 5 (P)	11 (T) 30 (P)	1 (P)	49 (P)
Net Change in Impacts						
	Upland Hardwoods	Bottomland Hardwoods	Forested Swamp	Scrub/Shrub Swamp	Marsh	Farmed Wetland
	-22 (T) +54 (P)	-21 (T) -7 (P)	-2 (T) -2 (P)	-6 (T) 0 (P)	-2 (P)	-15 (P)

T = temporary impacts **P = permanent impacts**

than grasses) include Indian paintbrush, sunflower, rough blazing star, goldenrod, compass plant, and pale purple coneflower.

Historically, upland hardwood forests were common throughout the Grand Prairie region. Approximately 14,940 acres of these upland forests remain today. Upland hardwood forests are oak and oak-hickory associations. Common tree species include post oak, white oak, southern

red oak, northern red oak, water oak, mockernut hickory, shagbark hickory, and bitternut hickory.

In comparison to impacts presented in the EIS, delivery design changes would result in a 54-acre increase in permanent impacts to upland hardwoods and a 22-acre reduction in temporary impacts (Table 4). The proposed project modifications would require 373 acres of mitigation compared to the 193 acres of mitigation disclosed in the EIS. This increase in mitigation is due primarily to construction of the regulation reservoir (62 acres of upland hardwoods lost). However, it is also, in part, due to eliminating the use of existing streams and associated weirs as part of the delivery system. Spoil disposal areas that were associated with weir construction would have converted wetland sites into upland habitat. Although the spoil placement would have impacted wetlands, the regenerating upland hardwood habitat would have partially offset overall project impacts to upland hardwoods, thereby reducing upland hardwood forest mitigation. The proposed design changes would require that 180 additional acres of cleared upland be acquired and planted in upland hardwood tree species to offset project losses. The proposed design changes would not result in an increase in prairie impacts.

WILDLIFE RESOURCES

Eastern Arkansas contains the most important waterfowl habitat in the state. The White River bottoms and Grand Prairie region form the most important wintering area for mallards in North America. Flooded rice and soybean fields as well as wetlands provide critical feeding and resting areas for mallards and numerous other waterfowl. The mourning dove is another important game bird. Non-game birds include numerous raptors, wading birds, shorebirds, and songbirds.

White-tailed deer, eastern cottontail and swamp rabbits, and gray and fox squirrels are important game mammals found in the project area. Other mammals inhabiting the project area are gray and red foxes, beaver, mink, muskrat, spotted and striped skunks, bobcat, and coyote.

The Habitat Evaluation System was used to evaluate project-related impacts to wildlife and determine compensatory mitigation requirements. The project as designed and presented in the GRR and EIS would result in a total loss of 104.45 annualized habitat unit values (AHUVs); 436 acres of cleared land would have to be acquired and restored to offset impacts to wetlands (243 acres to mitigate losses) and upland hardwoods (193 acres to mitigate losses). The proposed modifications to the delivery system would increase adverse impacts to wildlife habitat by approximately 28%. A total loss of 133.21 AHUVs would occur if the project were constructed as currently proposed. Five hundred fifty-five acres of cleared land would now have to be acquired and restored to mitigate impacts to wetlands (182 acres of mitigation) and upland hardwoods (373 acres of mitigation).

ENDANGERED AND THREATENED SPECIES

The bald eagle (*Haliaeetus leucocephalus*) is a federally listed threatened species that is found within the project area. Following release of the final EIS, it was discovered that two other endangered mussels inhabit the White River in addition to the pink mucket (*Lampsilis abrupta*). The scaleshell mussel (*Leptodia leptodon*) was found over 100 miles upstream of the project area in September 1999. At that time, the scaleshell was proposed for listing as an endangered species. It was listed as endangered in 2001. A live specimen of the fat pocketbook mussel (*Potamilus capax*) was collected from the White during a survey near the Arkansas Post Canal (river mile 10) in October 2003. The fat pocketbook mussel had not been collected in the White River since the mid-1960s. Quantitative and qualitative mussel surveys were conducted on the portion of the river within the construction impact zone of the pump station inlet channel in October 2001. No endangered mussels were found during these surveys. However, due to the passage of time, an additional survey will be conducted prior to construction of the inlet channel. If endangered mussels are encountered, they will be relocated to suitable habitat outside of the potential impact zone. The endangered pallid sturgeon (*Scaphirhynchus albus*) could possibly occur within the White River; however, no specimens were caught during the general reevaluation. No impacts should occur to these species as a result of any of the proposed project modifications. All project design changes have been thoroughly coordinated with the FWS.

CULTURAL RESOURCES

The cultural resources survey previously conducted for the project's original GRR and EIS largely covers the area of potential effects for the present EA. The NRCS has assumed responsibility for cultural resources identification and treatment on lands associated with on-farm features. All project design changes (i.e. potential modifications) associated with this EA will be coordinated for cultural resources inventory, evaluation, and protection (as applicable) under provisions of the National Historic Preservation Act (NHPA). Such coordination includes communication to the State Historic Preservation Officer of the State of Arkansas and federally recognized tribes, including the Quapaw and the Tunica-Biloxi. Post-review discoveries, if any, associated with construction or operation activities pertinent to this EA will be resolved under 36 CFR 800.13.

RECREATION

Hunting and fishing are the primary recreational activities in the project area. However, bird watching and boating are popular non-consumptive recreational activities, particularly along and on the White River. No adverse impacts to recreation would occur as a result of proposed project design changes. In fact, additional fishing opportunities would be provided by the regulation reservoir that would be constructed adjacent to Wattensaw WMA.

GROUNDWATER

The Mississippi Alluvial Aquifer is declining drastically. This shallow (50 to 120 feet deep) aquifer has been the primary source of irrigation water in the Grand Prairie for over 80 years. Many wells that tap the alluvial aquifer have been abandoned as the saturated thickness of this aquifer decreases to a point where a well cannot be operated satisfactorily. As the alluvial aquifer is depleted, agriculture is turning to the deeper Sparta Aquifer as a source of irrigation water. This aquifer varies in depth throughout the Grand Prairie but is generally located at depths between 500 and 1,000 feet below the ground surface; it has a strata thickness of approximately 300 feet. The Sparta is now being threatened as water pressure, measured as head, is rapidly dropping in the project area. Both the alluvial and Sparta aquifers in the project area have now been declared critical by the State of Arkansas. The recent rapid declines in the Sparta Aquifer are especially troubling. As water pressure in the Sparta drops, it is becoming endangered by compaction as well as infiltration and contamination from deeper salt-water aquifers. The GPADP would protect and sustain both aquifers into the future. It would provide water to eliminate the agricultural use of the Sparta Aquifer and would reduce the use of the alluvial aquifer to the safe yield. The proposed modifications would increase the efficiency of the delivery system and reduce the unmet need without withdrawing any additional water from the river. This reduction of the unmet need would provide additional aquifer protection benefits.

WATER QUALITY

Water quality was addressed in detail in the GRR and EIS. The greatest water quality problem is non-point source pollution from agricultural activities. Utilization of project area streams to deliver irrigation water would have improved water quality in those streams. Minimum pool levels would have been maintained and flow would have been increased during summer months. This would have reduced stagnation and increased dissolve oxygen levels in the streams. These benefits would no longer be realized if the streams were removed from the delivery system; however, this proposed modification would have no adverse impact above existing or future-without project conditions. None of the other proposed design changes would significantly affect water quality in project area streams.

AIR QUALITY

Air quality in the project area is good to above average due to its rural setting. However, temporary exceptions to this occur when crop stubble is burned. The EIS reported that any impacts associated with project construction would be minor and of short duration. Project modifications would not affect air quality.

COSTS AND BENEFITS

The costs of the changes have been examined and fall within the project contingencies. As design and construction proceed, the contingencies will be managed and assigned as needed

until the project is completed. Table 5 presents the estimated costs of the changes and the assignment of contingencies in the project. The costs are presented only for comparison purposes with the original designs in the project. The same unit costs in the project baseline cost estimate were used to ensure that the costs could be compared with the original estimate.

TABLE 5
Comparisons of Costs to Project Baseline Costs Estimate

Total Project Costs	$319 million, including $24.5 million in contingencies
Minor change or modification	**Cost comparison with original estimate**
Relocation of administration offices/control room to center of the project area	$ 2.8 million increase
Construction of regulation reservoir	$ 9.7 million increase
Value engineering study of road crossings	$ 7.5 million decrease
Use of pipelines instead of natural streams	$ 0.9 million increase
Conversion of small canals to pipelines	$13.5 million increase
Alignment changes and small adjustments in canals and pipelines, replacement of canal 3200 and 100cfs pumping station with 4 smaller pipelines from main canal, use of borrow pits to obtain material, and other minor design changes	No significant changes, all changes were coordinated with the project hydraulic engineer to compare features and potential cost savings and increases. No significant cost changes are expected from these modifications.
Rehabilitation of existing irrigation reservoirs	$3 million decrease
Total Project Costs including proposed modifications	$319 million, including $8.1 million in contingencies

The cost of the relocation of the administrative offices and control room to the center of the project area is $2.8 million. This would allow for easy public access to the entire project area for payment of bills and resolution of control issues. It would also provide an alternate site for maintenance equipment that would be needed in the entire project area for operating and maintaining the control structures, pumps, canals, and pipelines. The costs to construct the regulation reservoir include additional levee and an additional control structure. This would allow more precise control of the flow for added flexibility and efficiency and remove the need for mechanical flow controls at the pumping station or pipeline. Project formulation included "balancing" the cut and fill during canal and levee construction. The use of borrow pits would reduce haul distances, but these savings are considered minor. The costs of using borrow pits is considered insignificant. The costs of using pipelines instead of natural streams to deliver water

were calculated by removing the construction costs of weirs and adding costs for additional pipeline. This greatly reduces system length because the pipelines are relatively straight extensions of planned pipelines from larger canals or pipelines located on higher ground. This change would eliminate concerns over riparian rights, eliminate the necessity of carrying water through pit reservoirs and across dams, and eliminate maintenance of existing natural streams. An engineering study estimated an additional cost of $13.5 million to convert small canals to pipelines. All alignment changes and minor design modifications were thoroughly examined by project hydraulic engineers. For each minor change, they examined the length of the new route and the drainage crossings. Originally, the drainage crossings were designed to pass the 100-year flows regardless of the channel capacity. Since the pumps were not used to pass these flows, significant pipe sizes and costs were associated with the drainage crossings, especially in the secondary canals. Changes were made only if the hydraulic engineer, based on his analyses and judgment, verified that the changes would not add to project costs. Rehabilitation of existing irrigation reservoirs would result in a savings of $3 million in construction costs. The costs of project modifications fall within the contingencies included in the total project cost estimates. Therefore, no increase in total project costs is necessary.

REAL ESTATE COSTS

The total rights-of-way for the project have decreased as a result of analyzing the various components of the delivery system. No rights-of-way would be required for use of natural streams since natural streams would not be used as part of the delivery system. This is a large decrease in total acres required. Canal rights-of-way would decrease but the pipeline rights-of-way would increase. Total system length would decrease by over 160 miles with a corresponding decrease in rights-of-way. Real estate costs would not be greatly affected by the project changes except for the reservoir site. The estimated real estate costs for the rights-of-way for the reservoir are included in the cost estimate for the regulation reservoir.

EFFECT ON PROJECT RELIABILITY

The overall effect of the design modifications is that project reliability would increase from 87.5% to 90.9%. The future without project shortfall in water would be 372,400 acre-feet. The average annual future with project shortfall would be reduced from 59,400 acre-feet to 43,600 acre-feet due to more efficient transport of water pumped from the river without additional water withdrawals. This would be a shortfall of 2.2 inches from the optimum amount of irrigation over the project area. The reliability would increase because with the same amount of water withdrawn, less water would be lost in transport to the farms because pipelines would be much more efficient than using natural streams.

EFFECT ON PROJECT BENEFITS

The minor project changes would increase project efficiency and would result in better utilization of the water withdrawn from the White River. No additional water would be withdrawn. However, higher efficiencies for the water would increase project benefits for both

agriculture and waterfowl, and slightly decrease annual operating costs. Eliminating the use of natural streams would prevent the possibility of minor flood damages. Project excess benefits would be increased by over $1.8 million and the benefit-to-cost ratio would increase from 1:1.22 to 1:1.3 with the minor changes.

CUMULATIVE EFFECTS

The Council on Environmental Quality's regulations that provide implementation guidance for NEPA define cumulative impact in 40 CFR 1508.7 as the "…the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable actions regardless of what agency (Federal or non-Federal) or person undertakes such actions." Additional information is now available concerning some of the projects that were described in the EIS and projects that were not covered in the EIS. Below is an update of potential cumulative effects of these actions.

PAST ACTIONS

The Grand Prairie region was historically a diverse ecosystem comprised of prairie grasslands, wetlands, and bottomland and upland hardwood forests. Today, the Grand Prairie is considered one of the most highly degraded regions in North America. Most of the habitat destruction occurred following the introduction of rice cultivation in the early 1900s. Most of the forests and almost the entire prairie were cleared and converted to cropland. Rice and other crops were irrigated with both surface water and groundwater. Surface water was pumped and diverted from area streams and collected in tail-water pits for agricultural purposes. Lower water levels in streams limited fish populations, and water quality was degraded by decreased stream flows and pollution from agricultural runoff. Groundwater was pumped from numerous well scattered all over the Grand Prairie. By 1916, more groundwater was being mined from the shallow alluvial aquifer than could be recharged; and the productivity of many wells was declining as early as 1930. For a thorough description of the historic conditions on the Grand Prairie, see *An Evaluation of Ecosystem Restoration Options for the Grand Prairie Region of Arkansas* on the project web site (http://www.mvm.usace.army.mil/grandprairie).

The White River is one of the most ecologically significant river systems in the United States. However, it has been highly modified by man, especially in the last 50 years. The Corps operates and maintains three reservoirs on the White River: Beaver, Table Rock, and Bull Shoals lakes. There are three other Corps reservoirs on major tributaries of the White: Norfork Lake on the North Fork of the White River, Clearwater Lake on the Black River, and Greers Ferry Lake on the Little Red River. With the exception of Clearwater Lake, these reservoirs are operated to provide hydropower, flood control, and recreation. Clearwater Lake is utilized for flood control and recreation, but has no hydropower capability. Higher flows are occurring on the lower White River during summer than occurred historically. These higher flows are flooding certain wetland zones along the river more frequently and for longer durations than historic flows (prior to reservoir construction on upper White River). The higher flows apparently result from gradual water releases from reservoirs during wet years. In addition, the

lower White River floodplain has been restricted by levees; these levees provided flood-control and allowed forested wetlands to be cleared and converted to cropland.

The GPADP should not induce significant conversions of forest to cropland because most farmable areas with the Grand Prairie region have already been cleared for agricultural purposes. Also, the GPADP cannot meet 100% of the irrigation demand; therefore, irrigated agriculture cannot be expanded within the project area. Project withdrawals would slightly reduce river stages, but this should be a cumulative benefit because major irrigation demands occur during summer when the river was historically lower than present conditions. The GPADP would not affect White River flood flows.

PRESENT ACTIONS

Mid-Arkansas Water Resource Study

A planning study was initiated in June of 2002 and culminated in November 2002, under the Corps' Planning Assistance to States Program (Section 22, Water Resources Development Act of 1974). The Corps, Little Rock District, in partnership with Mid-Arkansas Region Water Discussion Group, Ouachita River Water District, and the ASWCC conducted the study. It assesses the future residential and industrial water needs of central Arkansas (8 counties) through the year 2050 and identifies potential sources that could satisfy those needs. It also identifies the infrastructure required for implementation. The report recommends that the group pursue obtaining water from Greers Ferry Lake and Lake Ouachita. The Chief of Engineers has discretionary authority to reallocate as much as 15% of the total storage capacity or 50,000 acre-feet, whichever is less, if the reallocation has no significant impact on other authorized purposes and does not require major operational or structural changes.

Even if all of the discretionary storage is reallocated, there should be no major adverse impacts to the GPADP study area portion of the White River. Lake Ouachita is located in the Red River Basin; therefore, water reallocations on Lake Ouachita would have no effect on the White River. Greers Ferry Lake is located on the Little Red River. The confluence of the Little Red and White rivers is approximately 60 miles upstream of the GPADP pump station site at DeValls Bluff, Arkansas. Greers Ferry Lake is about 75 miles from the mouth of the Little Red River. Storage reallocation could actually increase maximum river flows if water is reallocated from the flood-control pool. This would reduce the amount of flood storage available to control downstream flooding. During low flow months, this storage might decrease fluctuations in releases. The main concern would be potential reductions in river connectivity with oxbow lakes, sloughs, and wetlands.

A reallocation study to evaluate the remaining storage under the discretionary authority of the Corps for Greers Ferry Lake and Lake Ouachita was initiated in August 2003. An EA and/or EIS will be prepared during this study. Hydraulic models will be utilized to examine the potential effects of water reallocations on the White River; the models will consider the cumulative impacts of water reallocations in conjunction with the GPADP and other projects along the White River. Contact Michael Biggs, project manager, at (501) 324-5842, ext. 171, for more information related to this study.

Batesville Wastewater Treatment Plant

The aeration ponds at the Batesville Wastewater Treatment Plant are threatened by erosion along the north bank of the White River. Under the authority of Section 14 (Emergency Stream Bank Protection), Flood Control Act of 1946, as amended, the Little Rock District is currently examining alternatives to stabilize the eroding bank and protect the aeration ponds. Potential alternatives include dikes (stone or geotubes) and stone revetment. The current schedule for completing the project report and NEPA document is September 2004. This project is located approximately 120 miles upstream of the GPADP pump station site at DeValls Bluff. No significant adverse effects on downstream sedimentation or stages would occur as a result of the bank stabilization; therefore, it would not have an adverse cumulative affect in relation to the GPADP. For more information regarding this project, contact Dana Needham-Kirby, project study manager at (501) 324-7343.

Minimum Flow Study

The White River Minimum Flow Study, underway by the Little Rock District, is examining the impacts that could result in reallocating 1.5 feet of storage in Beaver, 2 feet in Table Rock, 5 feet in Bull Shoals, 3.5 feet in Norfork, and 3 feet in Greers Ferry lakes to maintain minimum flows to improve cold-water habitat on the White, Norfork and Little Red rivers. Section 374 of WRDA of 1999 and Section 304 of WRDA 2000 direct the Corps to reallocate the specified storage and to initiate a study and provide a report that identifies impacts to all existing authorized purposes and to determine possible federal costs. The proposed minimum flows operation will not be implemented unless the report finds it to be economically justified, environmentally acceptable, and technically sound. The main issues considered were flood control, hydropower, water supply, fish and wildlife, and recreation in each lake and each river downstream. The study has been 100% federally funded, and a report and draft EIS are scheduled to be released during the summer 2004. The study has experienced previous delays and the schedule remains subject to change.

It appears that a minimum flow of 1,300 cfs could be released into the White River from Bull Shoals, Norfork, and Greers Ferry lakes without any significant impact on downstream stages. The draft EIS will address all potential impacts and alternatives of the proposed action. For more information, contact Michael Biggs, project manager, at (501) 324-5842, ext. 171, or visit the project web site at http://www.swl.usace.army.mil/planning/wrminflows.html.

Hydropower Facilities

The Little Rock District has issued Section 404, Clean Water Act, permits to construct three hydropower facilities on the White River in Independence County, Arkansas. These hydropower plants will be constructed at Lock and Dam 1, Lock and Dam 2, and Lock and Dam 3. Operation of these facilities would have no cumulative impact because it would not affect downstream river stages. Contact Elaine Edwards at (501) 324-5296 for additional information related to these hydropower permits.

Sand and Gravel Dredging

There are several existing sand and gravel operations at scattered locations on the White River from near Crockett's Bluff (river mile 70) upstream to the vicinity of Batesville (river mile 300). On November 28, 2003, the Little Rock District and State of Arkansas issued a Section 10 and Section 404 public notice of a proposed sand and gravel operation on the White River just downstream of the dam at Batesville. Public comments regarding this notice are currently being considered, and a decision regarding permit issuance will be made by spring 2004; contact Elaine Edwards at (501) 324-5296 for more information concerning this proposed action. Sand and gravel operations remove substrate, destroy aquatic habitat, and increase turbidity in the vicinity of the dredging. The GPADP would result in minor stage reductions downstream of DeValls Bluff, but would have no significant cumulative impacts in association with sand and gravel mining.

Channel Erosion on Lower White River

Severe bank and bed erosion are occurring along the lower 40 miles of the White River, with some additional erosion occurring approximately 200 miles upstream of this reach. The Montgomery Point Lock and Dam, located at the mouth of the White River, should act as a grade-control structure and help stabilize the lower White River channel once construction of the lock and dam is complete. The minor stage reductions associated with the GPADP during low-flow periods would not have any significant affect on channel erosion.

Lone Star Project

In September 2000, the Little Rock District completed a reconnaissance-level flood control appraisal of the Lone Star Area, Russell, Arkansas, under Section 205 of the 1948 Flood Control Act (P.L. 80-858), as amended. The study investigates concerns from the White County Judge that flooding was causing damages to crops and homes in the drainage basin of Glaise Creek in the vicinity of Russell, Arkansas. Glaise Creek is a tributary of Cutoff Creek, which is a tributary of the White River. The alternatives considered are a detention basin on Glaise Creek and channel improvements in the creek. The study concludes that benefits did not exceed costs of damages and therefore are not recommended for continued analysis.

The Lone Star Irrigation District, along with the Little Red River Irrigation District, requested a Planning Assistance to States (PAS) study of agricultural water supply needs in October 2000. The planning analysis identifies current needs and resources available for agricultural water supply in the two Districts' areas. The study concludes that there is a greater need for agricultural water than available through existing wells and on-farm storage. Potential solutions for Little Red River Irrigation District include increased on-farm efficiencies and pumping surface water from the Little Red River. Alternatives examined to potentially solve Lone Star's irrigation shortfall include a reservoir on Glaise Creek, pumping surface water from the Little Red River (utilizing pumps proposed for Little River Irrigation District), and pumping surface water from the White River using separate pumps. This planning study was completed in 2002. It does not result in feasibility-level analysis or recommendations by the Little Rock District. After completion of the PAS study, Little Red River Irrigation District determined that

further investigation was needed and initiated a study with NRCS (see below). The Lone Star Irrigation District did not continue studies or analysis to our knowledge.

NRCS Irrigation Studies

The NRCS is conducting studies for several potential water resources projects, which are briefly described below. To date, only planning funds have been provided to the NRCS. No authority or funding has been given for construction. For more information concerning these projects contact David Weeks, NRCS, Arkansas Technical Service Center, at (501) 301-3139.

North Prairie County Irrigation Project

The NRCS completed a reconnaissance-level study for the North Prairie County Regional Irrigation Water District in January 2002. Alternatives examined include (1) no action, (2) on-farm conservation and storage, (3) water supply from the White River and Bayou Des Arc, and (4) on-farm conservation and storage with water supply from the White River and Bayou Des Arc. The study concludes that Alternative 4 appears to be the most feasible plan. Alternative 4 would involve the construction of two pumping stations: one on the White River less than one mile downstream of the City of Des Arc and a pumping station on Bayou Des Arc about four miles northwest of Des Arc. Maximum pumping capacities at the White River and Bayou Des Arc pumping stations are expected to be 445 cfs and 112 cfs, respectively. No funding has been provided to conduct detailed planning or prepare a NEPA document (EA or EIS).

Little Red Irrigation Project

A plan is being developed to provide sustainable irrigation to the Little Red Irrigation District. The project area is located in White County and comprises 35,000 acres. Three alternatives are currently being evaluated: (1) no action, (2) on-farm conservation and storage, and (3) on-farm conservation and storage and water supply from the Little Red River (maximum pumping capacity of 235 cfs). An additional objective of the study is to formulate a plan to provide surface water for waterfowl flooding on the AGFC's Raft Creek Wildlife Management Area. A notice of intent to prepare a draft EIS was published in the *Federal Register* on July 26, 2002; and a public scoping meeting was held on August 15, 2002. The draft EIS is expected to be released for public review and comment in late winter or early spring of 2004.

Bayou DeView and Upper L'Anguille River Irrigation Projects

Both of these projects are located in Poinsett and Craighead counties and are in the early planning stages. The NRCS is currently obtaining data on existing project area conditions. No extensive plan formulation has been conducted to date. In addition to no action, alternatives to be considered will likely include on-farm conservation, storage and on-farm conservation, and storage and on-farm conservation with water supply. In addition, the Bayou DeView Irrigation Project (BDIP) will examine the feasibility of providing flood control in the vicinity of Jonesboro, Arkansas. The Upper L'Anguille River Irrigation Project area is 162,000 acres. The L'Anguille River is a tributary of the St. Francis River. However, Bayou DeView, a tributary of the Cache River, is located in the White River basin. The BDIP comprises 196,000 acres.

Among the issues to be addressed in the BDIP study are potential effects on the bottomland hardwood ecosystem in the southern portion of the study area, including the Cache River National Wildlife Refuge. Draft plans and EIS's for these two projects should be completed in fiscal year (October – September) 2005.

Potential Effects

The Upper L'Anguille River Irrigation Project is located in the St. Francis River Basin and would have no impact on the White River. Potential effects of the other irrigation projects on the White River and associated oxbow lakes and wetlands would have to be analyzed assuming that all other authorized projects, including the GPADP, are in operation. Studies associated with these irrigation projects should, in part, focus on assessing potential impacts to river connectivity with oxbow lakes and other backwater areas. There would be slight reductions in river stages that could temporarily impact connectivity with oxbow lakes, sloughs, and wetlands. Also, water availability would have to be evaluated to ensure that the GPADP federal investments were protected. The GPADP would adhere to the pump operation criteria contained in the GRR and EIS (Figure 3); these criteria were established by the 1986 draft State Water Management Plan. The GPADP could not change the pump operation criteria without additional analyses and public disclosure through the NEPA process.

FUTURE ACTIONS

Assuming that the need for increased use of surface water continues, it is possible that other irrigation projects will be studied. The ASWCC permits non-riparian water withdrawals. Water withdrawals are limited by state definitions of excess water. Excess water is defined by the state as water levels above the level necessary for fish and wildlife, water quality, and navigation in any given month. Non-riparian withdrawals must stop when these levels are reached. A further limit is that in any given year only 25% of the excess water may be permitted for withdrawal by non-riparian users. If additional non-riparian projects are constructed and the full amount of water that could be permitted was withdrawn, river water levels would likely be closer to the minimum levels necessary for protection of fish and wildlife, water quality, and navigation during a greater portion of the year. However, river stages would still fluctuate because only 25% of the excess water would be permitted for withdrawal in any given year. The practical sizing of pumps to withdraw water up to the maximum level probably would not affect flood stages on the river. The main concern would be potential reductions in river connectivity with oxbow lakes, sloughs, and wetlands during low stages. Oxbow lake connectivity would be monitored with the Grand Prairie project.

SUMMARY OF CUMULATIVE EFFECTS

There are limited construction impacts to bottomland and upland hardwood forests associated with the GPADP, but these impacts will be fully mitigated. Also, the GPADP would induce slight stage reductions on the White River; but these changes in river stages would not have significant adverse impacts on the White River fishery, floodplain wetlands, or waterfowl. A multi-agency team, led by the ANHC and NRCS, conducted a wetlands study to analyze the

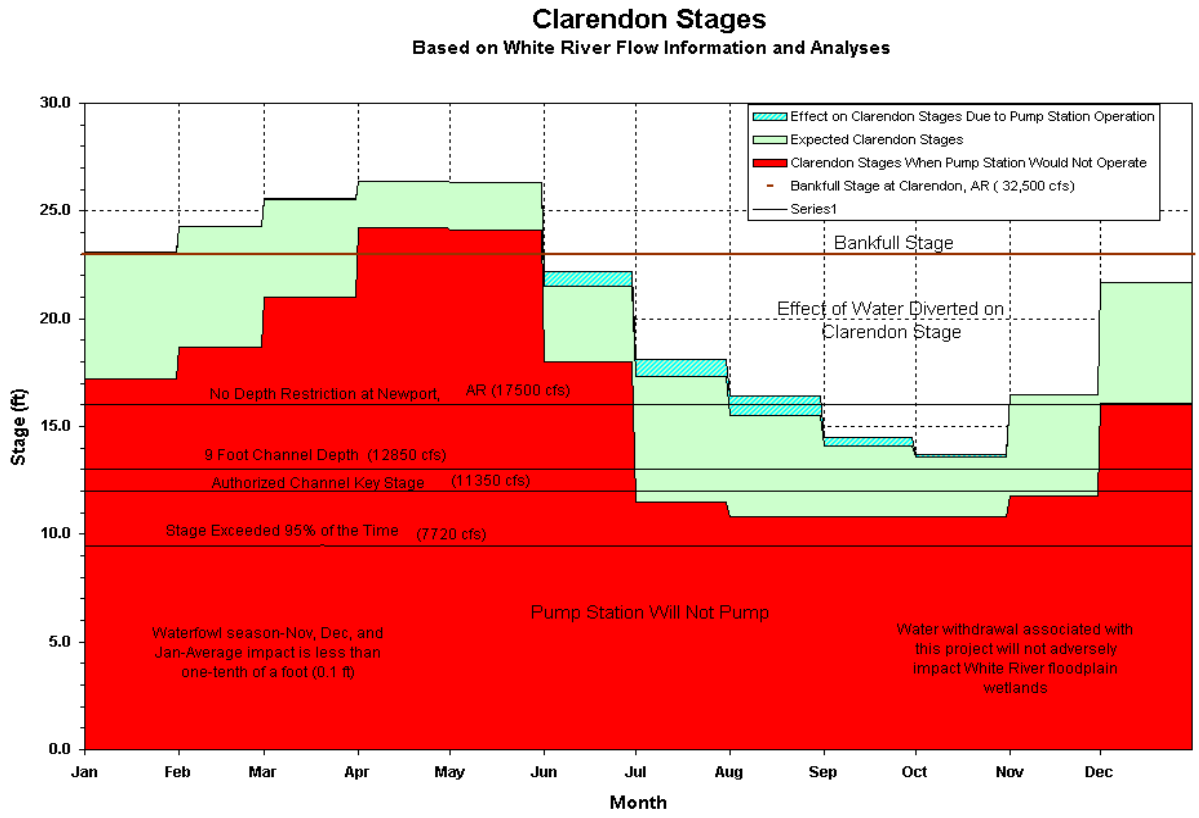

Figure 3. Pump Station Operation Criteria and Project Effects on River Stages

effects of project water withdrawals on wetlands and bottomland hardwood forest communities within the White River floodplain. This study revealed that post-project river stages during summer would more closely mimic the historic or pre-dam hydrograph and would likely benefit some wetlands along the river as a result. However, other projects that could further affect river stages must be studied and planned carefully in order not to adversely affect river connectivity with oxbow lakes, sloughs, and wetlands. The GPADP would allow the alluvial aquifer to recharge over time; this would at least partially restore historic interactions among the aquifer, river, and associated wetlands.

COORDINATION

Project modifications have been coordinated with an inter-agency environmental team. This team is comprised of representatives from the Corps, NRCS, FWS, U.S. Environmental Protection Agency, ASWCC, AGFC, ADEQ, ANHC, and Irrigation District. Also, this draft environmental assessment is being coordinated with these agencies and other interested parties.

CONCLUSION

During detailed design of GPADP items of work, it became obvious that modifications were needed to increase project efficiency and flexibility, resolve landowner disputes, and address cost issues. The changes that have been identified would result in increased delivery system efficiency. This would allow the project to meet its stated purposes better/easier. The efficiency of the delivery system would be higher with the minor changes in place due to reduced losses from natural channels and small canals. This would enable the sponsor to have less operational costs and meet a larger percentage of the area's irrigation demands. The estimated project efficiency would increase 10%, thus increasing project benefits. While the project would provide enough water to protect, sustain, and restore the Mississippi Valley Alluvial Aquifer and the Sparta Aquifer, the changes would make more surface water available to provide additional aquifer protection without taking additional water from the river. A comparison of the effects of the minor design changes is given in Table 2. The miles of canal have changed (decrease of 82 miles) due to the conversion of small canals to pipelines, the elimination of Canal 3200, alignment changes, refinements to canal and pipeline designs, and restriction of service only to irrigated tracts. During development of the project, the delivery system was designed to supply all tracts within the project area regardless of whether it was irrigated cropland or pastureland. The length of pipeline has increased by 113 miles due to the elimination of Canal 3200, conversion of small canals to pipelines, elimination of streams from the delivery system, and refinements in design. The use of 291 miles of natural streams has been avoided, and the need to construct 120 weirs has been eliminated.

The proposed changes would result in a net decrease in wetland impacts. There would be an overall increase in impacts to upland hardwood forest; however, these impacts would be fully mitigated. Eliminating the use of natural streams should alleviate concerns expressed by some environmental organizations and natural resource agencies that the project would introduce zebra mussels into tributary streams and cause possible adverse impacts to riparian plant communities. Detailed design for construction items is at various stages of development. No other significant project modifications, in addition to the changes disclosed in this EA, are anticipated. However, the Memphis District and inter-agency team will continually review the project to ensure NEPA compliance. The proposed design changes do not constitute a major federal action that would significantly affect the human environment. Therefore, a supplemental EIS is not required.