ANALYSIS OF HCR 1066 CORNERSTONE PRINCIPLES BY THE KIAMICHI RIVER BASIN WORKING GROUP

Assisted and enabled by OWRB staff through the agency's Geographic Information System (GIS), the Kiamichi River Basin Working Group has conducted extensive study and discussion of issues related to identifying the most economically and environmentally beneficial uses of Kiamichi River Basin water resources, including the paramount question posed to the group through HCR 1066 -- "What are the basin's current and future water needs and is there sufficient water available for transfer out of the basin?"

From specific language stated in the legislation (Figure 5), the Kiamichi Group determined that the plan's over-riding goal should be to consider economic development objectives that protect Basin water resources, provide opportunities to address local and state water needs, and address resolution of the Sardis Lake water storage contract obligation. Furthermore, HCR 1066 provided specific "cornerstone principles" for use by the Kiamichi Group to address pertinent water use projects and issues, especially those impacting Sardis Lake, and evaluate various water development proposals that could accomplish the bill's objectives. These cornerstone principles, amended slightly by the Kiamichi River Basin Working Group, are:

1. The present and future needs for water by all Oklahomans shall be considered, with the highest priority given to Oklahomans from the Kiamichi River Basin.
2. Future use of water by local citizens and entities shall be protected by setting aside a sufficient amount of water from Sardis Reservoir for users within the Kiamichi River Basin Region.
3. An appropriate lake level management plan, developed by the Oklahoma Department of Wildlife Conservation, shall be implemented for the use of water from Sardis Reservoir.
4. Financing opportunities for water and wastewater infrastructure and related economic development projects within the Kiamichi River Basin area shall be optimized.
5. The obligation of the state to the United States for repayment of construction costs of the water supply at Sardis Reservoir shall be addressed.
6. The integrity of the Kiamichi River shall be protected.

Early on, the Kiamichi Group expanded upon those principles, particularly sensitive to the upper basin, to include issues that could influence the lower basin area near Hugo Lake. These additional principles are:

7. Implement an appropriate Hugo Lake level management plan that includes flexibility for adjustments due to future sedimentation.
8. Protect Hugo Lake's wildlife management and waterfowl areas, including appropriate mitigation measures.
9. Satisfy the Hugo Municipal Authority's water supply storage contract with the Corps of Engineers.
10. Protect future water supply in the Hugo and Antlers areas, as well as other communities and areas in the Kiamichi River Basin region.

Finally, at the Working Group's last meeting in Hugo, the members added this cornerstone principle:

11. The Kiamichi River Basin Working Group recommends that any proceeds derived from the development of waters in the Basin be returned for use in the Basin.

The following section of this report details the findings of the Kiamichi River Basin Working Group in their investigation of measures to satisfy the 11 specified cornerstone

principles related to the potential use, development and/or transfer of Basin water resources.

Figure 5
House Concurrent Resolution 1066 and Cornerstone Principles

ENROLLED HOUSE CONCURRENT RESOLUTION NO. 1066

A Concurrent Resolution directing the Oklahoma Water Resources Board to conduct meetings with Choctaw and Chickasaw Nations and local representatives; providing guidelines; requiring development and submission of a Kiamichi River Basin Water Resources Development Plan; and directing distribution.

WHEREAS, the water resources of the Kiamichi River in southeastern Oklahoma are critical to the economic development of the Kiamichi River Basin and must be protected; and

WHEREAS, in order to provide protection of such water resources while at the same time providing opportunities to address local water needs, water needs of Oklahomans and to resolve the Sardis Reservoir water supply storage situation, a comprehensive plan based upon cornerstone principles must be developed; and

WHEREAS, the State of Oklahoma and the Choctaw and Chickasaw Nations have expressed interest in formulating such a comprehensive plan so that the issues relating to water resources development in the Kiamichi River Basin and southeastern Oklahoma can be thoroughly examined.

NOW, THEREFORE, BE IT RESOLVED BY THE HOUSE OF REPRESENTATIVES OF THE 1ST SESSION OF THE 47TH OKLAHOMA LEGISLATURE, THE SENATE CONCURRING THEREIN:

SECTION 1. A. The Executive Director of the Oklahoma Water Resources Board shall conduct meetings with designated representatives of the Choctaw and Chickasaw Nations and local citizens and entities to formulate a comprehensive Kiamichi River Basin Water Development Plan to address water resources issues in the Kiamichi River Basin in accordance with the following cornerstone principles:

1. **The lake level management plan, developed by the Oklahoma Department of Wildlife Conservation, shall be implemented for use of water from Sardis Reservoir;**
2. **Future use of water by local citizens and entities shall be protected by setting aside a sufficient amount of water from Sardis Reservoir for users within the Kiamichi River Basin Region;**
3. **Financing opportunities for water and wastewater infrastructure with the Kiamichi River Basin area shall be optimized;**
4. **The obligation of the state to the United States for repayment of construction costs of the water supply at Sardis Reservoir shall be addressed;**
5. **The present and future needs for water by Oklahomans from the Kiamichi River Basin shall be considered the highest priority; and**
6. **The integrity of the Kiamichi River shall be protected.**

B. In developing the comprehensive plan specified by this resolution, input from the Choctaw and Chickasaw Nations, from citizens from the Kiamichi River Basin area, and from other Oklahoma citizens and entities shall be solicited.

C. The Oklahoma Water Resources Board shall submit the Kiamichi River Basin Water Resources Development Plan to the Oklahoma House of Representatives and the Oklahoma State Senate by February 1, 2000.

SECTION 2. Copies of this resolution shall be distributed to the Oklahoma Water Resources Board, and officials of the Choctaw and Chickasaw Nations.

Adopted by the House of Representatives the 28th day of May, 1999.

Adopted by the Senate the 28th day of May, 1999.

Protecting the Present and Future Water Needs of Oklahomans

"The present and future needs for water by all Oklahomans shall be considered, with the highest priority given to Oklahomans from the Kiamichi River Basin."

Although protecting water resources from the Kiamichi River Basin for users within the Basin is of utmost importance prior to the finalization of potential water development projects, HCR 1066 also directs the Kiamichi River Basin Working Group to ensure Kiamichi supply for future growth in other identified areas of the state. In addition to the relative abundance of existing water supplies throughout both the upper and lower Basin regions, four federal reservoir projects remain authorized for construction in southeast Oklahoma. At this time, however, Congress has not appropriated any funds for the construction of these projects. In addition, the Kiamichi River Basin Working Group does not necessarily recommend their construction.

Tuskahoma (Table 7, Figure 12), the only major project which would reside within the Kiamichi River Basin, has been in deferred status since 1981. The reservoir is proposed for construction on the Kiamichi River in Pushmataha and LeFlore Counties for the purposes of flood control, water supply, recreation, and fish and wildlife conservation. The reservoir would provide flood control storage of 138,600 ac-ft and conservation storage of 231,000 ac-ft. The estimated yield is 224,000 ac-ft/yr (200 mgd). The project was re-evaluated by the Corps of Engineers in 1989 with hydropower as a proposed use. The recommended configuration would have no flood control storage and only 49,100 ac-ft of conservation storage yielding 63,850 ac-ft/yr (57 mgd) of water supply. While hydropower benefits indicate that the project may be economically justified, hydropower is not an authorized use and the project does not meet federal criteria for participation. Potential construction of this project would be difficult due to the abundant existence of numerous endangered species, especially the Ouachita Rock Pocketbook Mussel, in the lake's watershed.

Parker Lake (Table 7, Figure 13), authorized by the Water Resources Development Act of 1986, is a proposed impoundment on Muddy Boggy Creek in Coal County. The lake is authorized for flood control, water supply, recreation, and fish and wildlife mitigation uses. It is estimated to have a drainage area of 164 square miles and would provide 110,300 ac-ft of flood control storage and 109,940 ac-ft of conservation storage yielding 45,900 ac-ft/yr (41 mgd) of good quality water. Pre-construction engineering and design have been completed for the project, but construction is on hold until a local sponsor for the water supply storage is secured.

Boswell Lake (Table 7, Figure 14) is an authorized project on Boggy Creek in Choctaw County. The reservoir, scaled back from its original much larger size, would provide 294,100 ac-ft of flood control storage and 60,870 ac-ft of conservation storage yielding 56,000 ac-ft/yr (50 mgd) of water supply. The project is not currently economically viable, based solely on flood control benefits. Should a local sponsor emerge for the water supply storage, the project could be reactivated.

Lukfata Lake (Table 7, Figure 15) is an authorized impoundment on Glover Creek in McCurtain County. Authorized uses include flood control and water supply. The project would have 172,000 ac-ft of flood control storage and 31,000 ac-ft of conservation storage yielding 69,450 ac-ft/yr (62 mgd) of excellent quality water supply. Lukfata Lake is the only impoundment in the seven-lake system authorized for the Little River Basin that has not yet been constructed. In 1977, Congressional funding for the project was halted due to the potential adverse effect on the habitat of the area's Leopard Darter, a small fish on the threatened species list.

Table 7
Authorized Federal Project Data, Southeast Oklahoma

Project	*Elevation of Dam (feet)*	*Surface Area (acres)*	*Water Supply*		*Flood Control (ac-ft)*	*Location*	*Estimated Cost*
			Storage (ac-ft)	*Yield (mgd)*			
Tuskahoma	640	11,626	224,000	199	138,600	Kiamichi River Pushmataha County	$108.8 million
Parker	690	6,224	45,900	41	100,300	Muddy Boggy Creek Coal County	$74.4 million
Boswell	435	6,029	56,000	50	294,100	Boggy Creek Choctaw County	$174.6 million
Lukfata	506	730	69,450	62	172,000	Glover River McCurtain County	$81.2 million

Figure 12
Tuskahoma Lake (proposed)

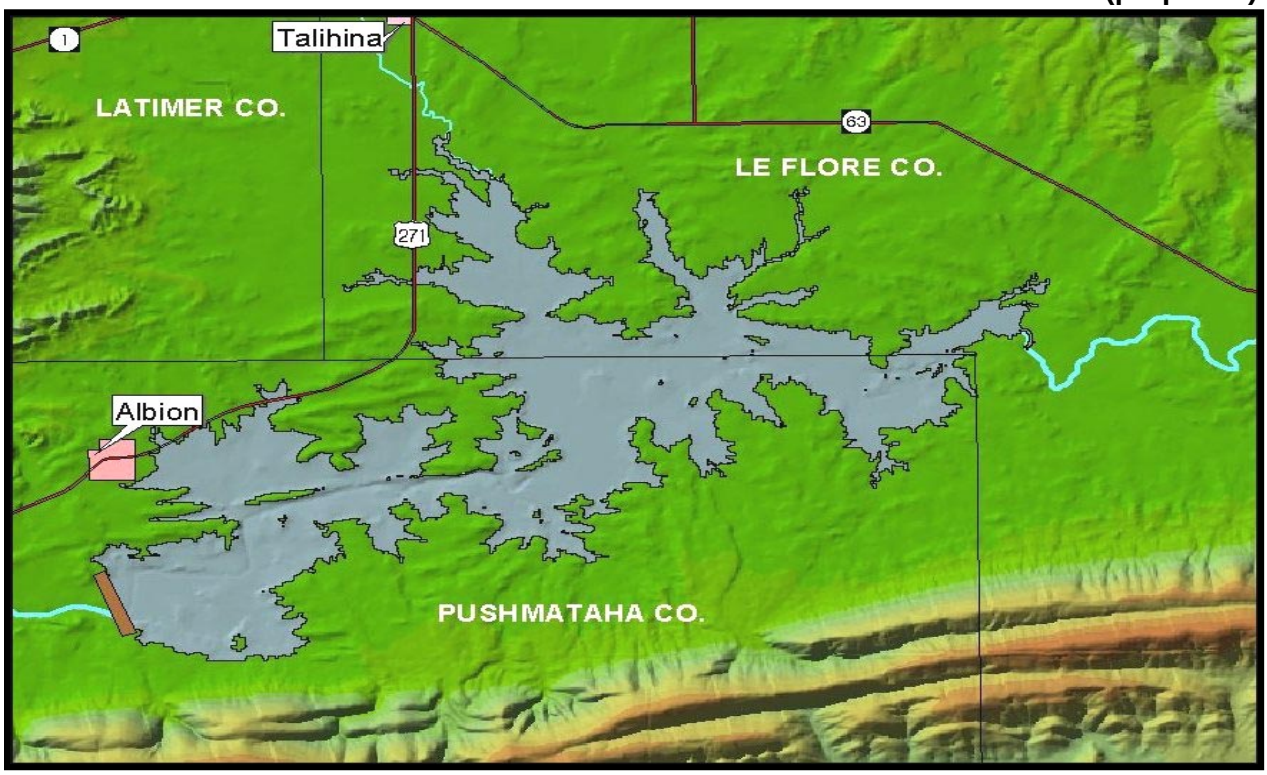


Figure 13
Parker Lake (proposed)

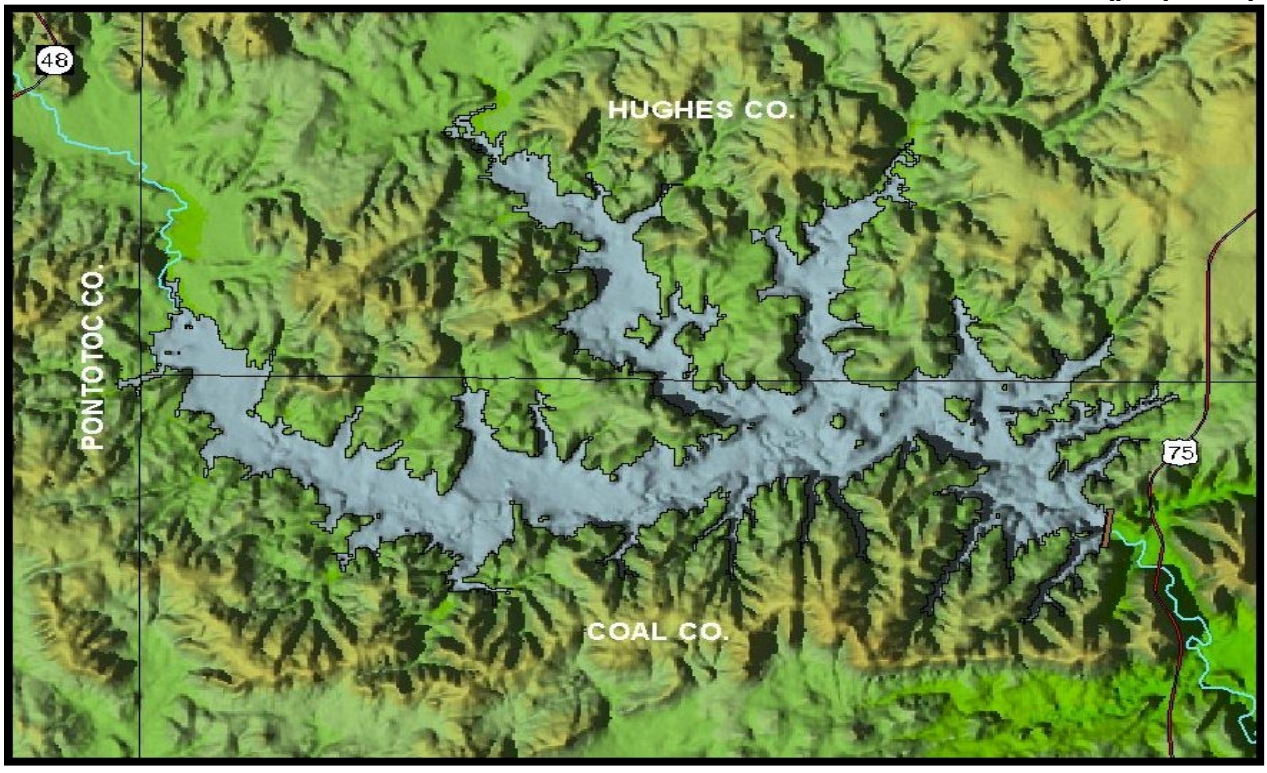


Figure 14
Boswell Lake (proposed)

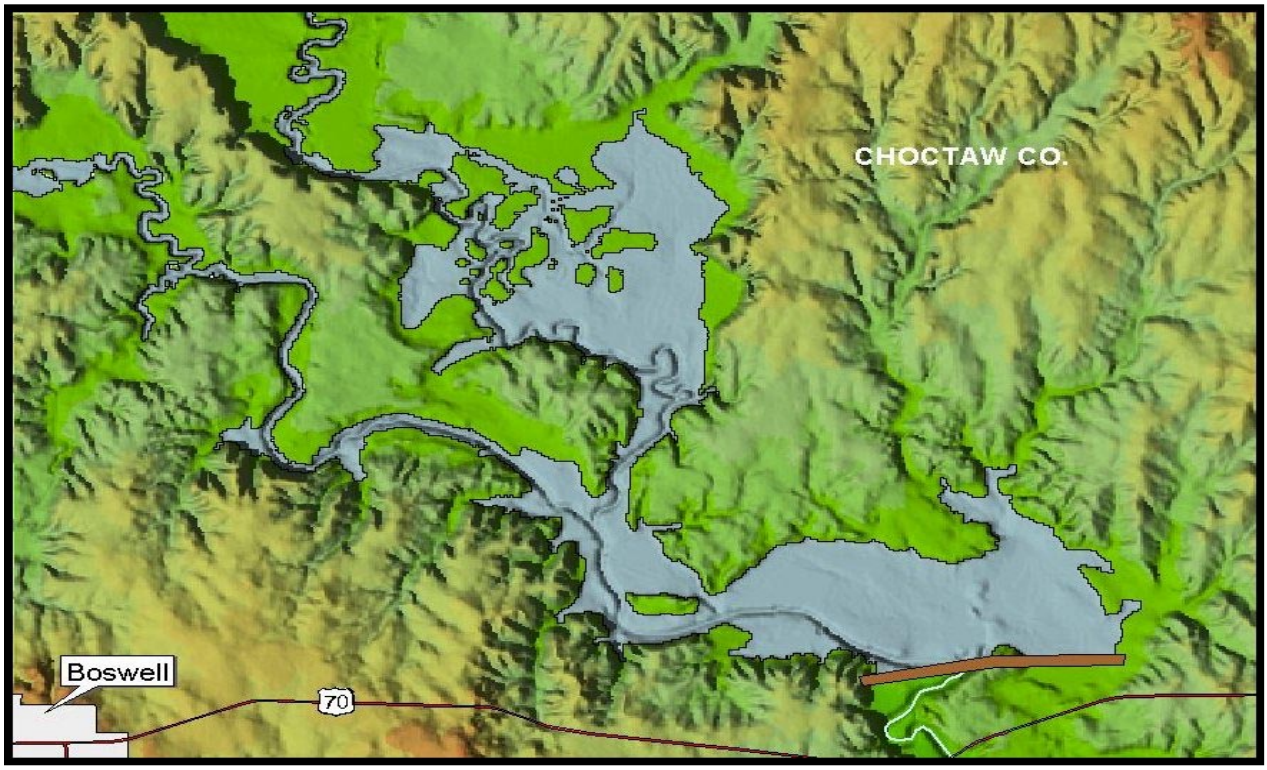
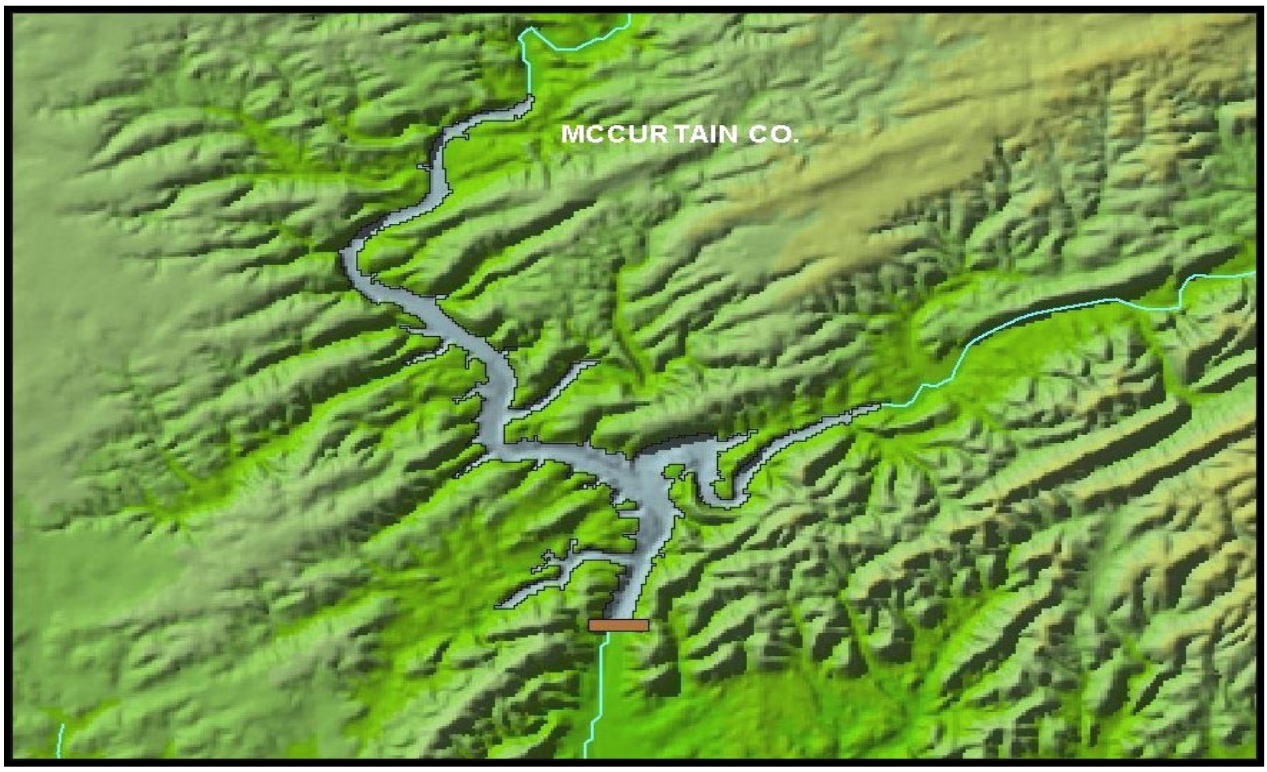


Figure 15
Lukfata Lake (proposed)



Protecting Future Local Water Use Requirements

"Future use of water by local citizens and entities shall be protected by setting aside a sufficient amount of water from Sardis Reservoir for users within the Kiamichi River Basin Region."

"Protect future water supply in the Hugo and Antlers areas, as well as other communities and areas in the Kiamichi River Basin."

Protection and preservation of water supply in the Kiamichi River Basin for future local use, growth and economic development was a primary consideration of the Kiamichi River Basin Working Group which investigated current water usage and general anticipated growth in the Basin.

The OWRB, the state's water use permitting agency, has on file 44 active permits for the use of 84,112 ac-ft/yr of stream water from the Kiamichi River, its tributaries and impoundments (Table 5; figures do not include domestic uses from Sardis and Hugo Lakes, approved by the Corps of Engineers). Stated uses include public water supply, irrigation, agriculture, power, industrial, commercial and recreation (including fish and wildlife purposes). The latest reported surface water use in the basin is 9,751 ac-ft/yr, or 11.6 percent of the total water appropriated from surface sources.

In Sardis, four permits for 7,038 ac-ft -- including 6,000 ac-ft allocated to the Sardis Lake Water Authority, which is under development -- are on file at the OWRB, leaving 149,762 ac-ft of the lake's yield for appropriation. Five additional permits for a total of 486,424 ac-ft -- more than three times the reservoir's dependable yield -- are pending. The applicants are all local entities. Reported water use in 1998 was 3.1 ac-ft.

In Hugo Lake, six permits for 63,723 ac-ft are on file, leaving 1,237 ac-ft of water available for appropriation to other users from the water supply pool. There are no pending applications for the use of water from Hugo Lake. Reported water use in 1998 was 6,150 ac-ft.

Use of groundwater in the Kiamichi River Basin is largely insignificant compared to surface water use. Currently, 10 active permits allocate 3,926 ac-ft/yr of water (Table 6). The last reported groundwater use is only 115 ac-ft/yr (three percent of water appropriated). Stated water uses include irrigation, public water supply, industrial, recreation and agriculture.

Regarding individual water use (Figure 9), more than 88 percent of the Kiamichi River Basin's surface and groundwater rights are allocated to only four users – Western Farmers Electric Cooperative (including both a stream and groundwater use permit), Hugo Municipal Authority (two permits), Sardis Lake Water Authority (one permit) and the Talihina Public Works Authority (three permits). These four entities (including SLWA, which reports no use to date) account for 77 percent of the total water used in the basin. Western Farmers, the largest single user with a 34,420 ac-ft/yr allocation, reports usage of 5,540 ac-ft/yr. The second largest user, Hugo, uses only three percent (943 ac-ft/yr) of its total permitted amount (30,500 ac-ft/yr).

Of the total annual average flow of the Kiamichi River (1,594,248 ac-ft/yr, estimated from total average inflow into Hugo Lake), approximately 5.3 percent (84,112 ac-ft/yr) is appropriated to local users in the basin. Of the estimated 472,320 ac-ft of groundwater available in the basin (from OWRB groundwater basin studies), only 0.8 percent is appropriated. In all, less than 4.3 percent (88,038 ac-ft/yr) of the Kiamichi River Basin's total estimated available surface and groundwater resources have been appropriated, leaving almost 96 percent of the area's total water currently available for future use.

Comparing water use and population in the basin with similar figures from southeast Oklahoma municipalities (Figure 10), the City of McAlester, with a population of approximately 17,000, uses slightly more than 5,000 ac-ft/yr of its allocated water. The entire Kiamichi River

Basin, with a little more than double McAlester's population, uses less than 10,000 ac-ft/yr. When compared to the 20,000 ac-ft/yr of water set aside specifically for future use in the Kiamichi River Basin area through the OWRB's recent rulemaking, these and the other water usage figures specified above appear to more than substantiate adequate protection for future local supply. The Kiamichi Group agrees, however, that similar measures – such as negotiating with Western Farmers or other water rights holders to free-up currently appropriated water at Hugo Lake -- should be taken to ensure future supply for the Hugo area.

Table 5
Surface Water Use Permits, Kiamichi River Basin

Permit #	*County*	*Name*	*Amount (ac-ft/yr)*	*Used (ac-ft/yr)*	*Purpose*
19520394	Choctaw	Leslie	600	100	Irrigation
19540795**	Choctaw	Hugo Municipal Authority	1700	943	Industrial
19540874	Pushmataha	City of Antlers	235	235	Public Water Supply
19560158	Pushmataha	Dept. Tourism & Recreation	10	10	Recreation
19560472	Choctaw	Dept. Wildlife Conservation	200	200	Recreation
19560642	Pushmataha	Evans	8	6	Irrigation
19570121	Pushmataha	Dept. Wildlife Conservation	100	100	Recreation
19570376	Pushmataha	Dept. Wildlife Conservation	130	130	Recreation
19610143	Pushmataha	Miller	25	11	Irrigation
19620079	Latimer	Talihina PWA	300	300	Public Water Supply
19620087	Pushmataha	Clayton PWA	50	50	Industrial
19640593	Pushmataha	Debolt, MD	30	5	Irrigation
19640844	Pushmataha	Talihina PWA	5000	0	Public Water Supply
19660510	LeFlore	Kelley	4	4	Irrigation
19660677	Choctaw	Dept. Wildlife Conservation	90	90	Recreation
19680415	LeFlore	Talihina PWA	1500	815	Industrial
19710003	Pushmataha	Gilbert	84	17	Irrigation
19710567	Choctaw	Leslie	1000	50	Irrigation
19720048**	Choctaw	Hugo Municipal Authority	28800	0	Public Water Supply
19720060**	Pushmataha	Antlers, City of	523	232	Industrial
19760079	Choctaw	Critchlow	60	14	Irrigation
19770160**	Choctaw	Western Farmers Elec. Coop.	32000	5454	Power
19780141	Choctaw	Easterwood	40	80	Irrigation
19800075	Pushmataha	Clayton PWA	400	284	Public Water Supply
19820018*	Pushmataha	U S Army Corps of Engineer	8	4	Recreation
19820134	Pushmataha	Redman	262	9	Irrigation
19830049	Pushmataha	Emery	636	97	Irrigation
19850010	Pushmataha	Corbin	100	5	Irrigation
19860023	Pushmataha	Redman	82	9	Irrigation
19880016	Choctaw	Foster Land & Cattle Co	180	11	Irrigation
19880022*	Pushmataha	Latimer Co RWD #2	1000	0	Public Water Supply
19910037*	Latimer	Addington	30	15	Commercial
19910054*	Latimer	Sardis Lake Water Authority	6000	0	Public Water Supply
19920022**	Pushmataha	Pushmataha Co RWD #3	400	464	Public Water Supply
19930017**	Pushmataha	Pushmataha Co RWD #3	300	0	Public Water Supply
19930039	Pushmataha	Decker Revocable Trust	428	0	Agriculture
19960001	LeFlore	Weatherford	10	5	Agriculture
19960028	Latimer	Kennedy	10	2	Agriculture
19970022	Pittsburg	Wilson	98	0	Irrigation
19980004	Pittsburg	Wilson	300	0	Irrigation
19980005	Pushmataha	Jackson	310	0	Irrigation
19980031	Latimer	Lockhart	295	0	Irrigation
19980032	Pushmataha	Ralston	228	0	Irrigation
19980044	Choctaw	Heddlesten	546	0	Irrigation
Total			**84112**	**9751**	

***Sardis Lake (7,038 ac-ft allocated; 149,762 available; pending applications = 486,424 ac-ft)**
****Hugo Lake (63,723 ac-ft allocated; 1,237 ac-ft available)**

Table 6
Groundwater Use Permits, Kiamichi River Basin

Permit #	County	Name	Amount (ac-ft/yr)	Used (ac-ft/yr)	Purpose
19690402	Pushmataha	Brents	100	0	Irrigation
19710047	Choctaw	Town of Fort Towson	40	2	Public Water Supply
19740127	Choctaw	Ouachita Mountains RC&D	680	25	Irrigation
19770876	Choctaw	Western Farmers Elec. Coop.	2420	86	Industrial
19810544	Pushmataha	Hutson	159	0	Irrigation
19820520	Pushmataha	Sardis Project Office	6	1	Recreation
19880535	Choctaw	American Rock Products Inc	351	0	Industrial
19890504	Pushmataha	Boykin	2	0	Industrial
19910563	Latimer	Addington	68	1	Public Water Supply
19950634	Latimer	Price	100	0	Agriculture
Total			**3926**	**115**	

Figure 9
Water Use, Kiamichi River Basin

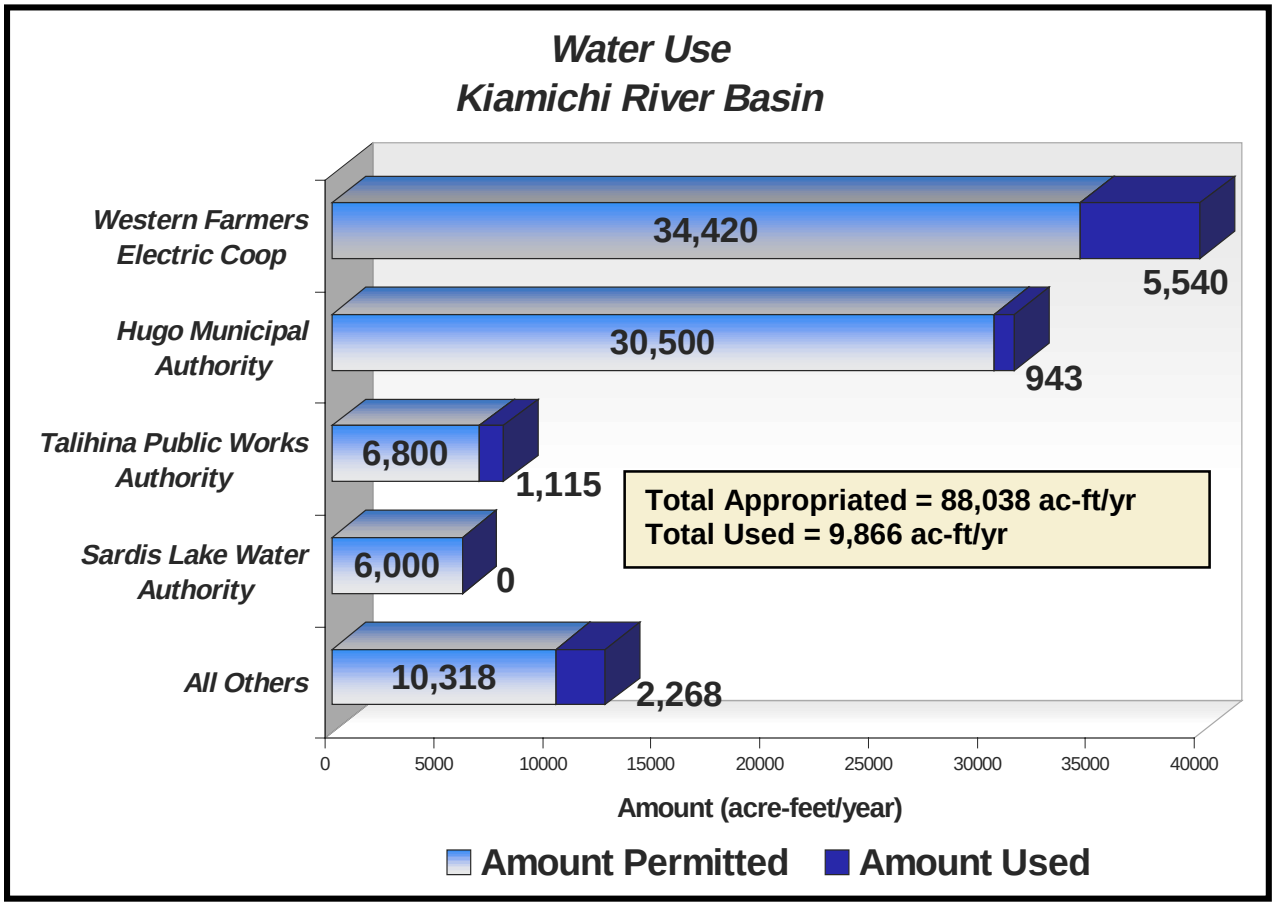
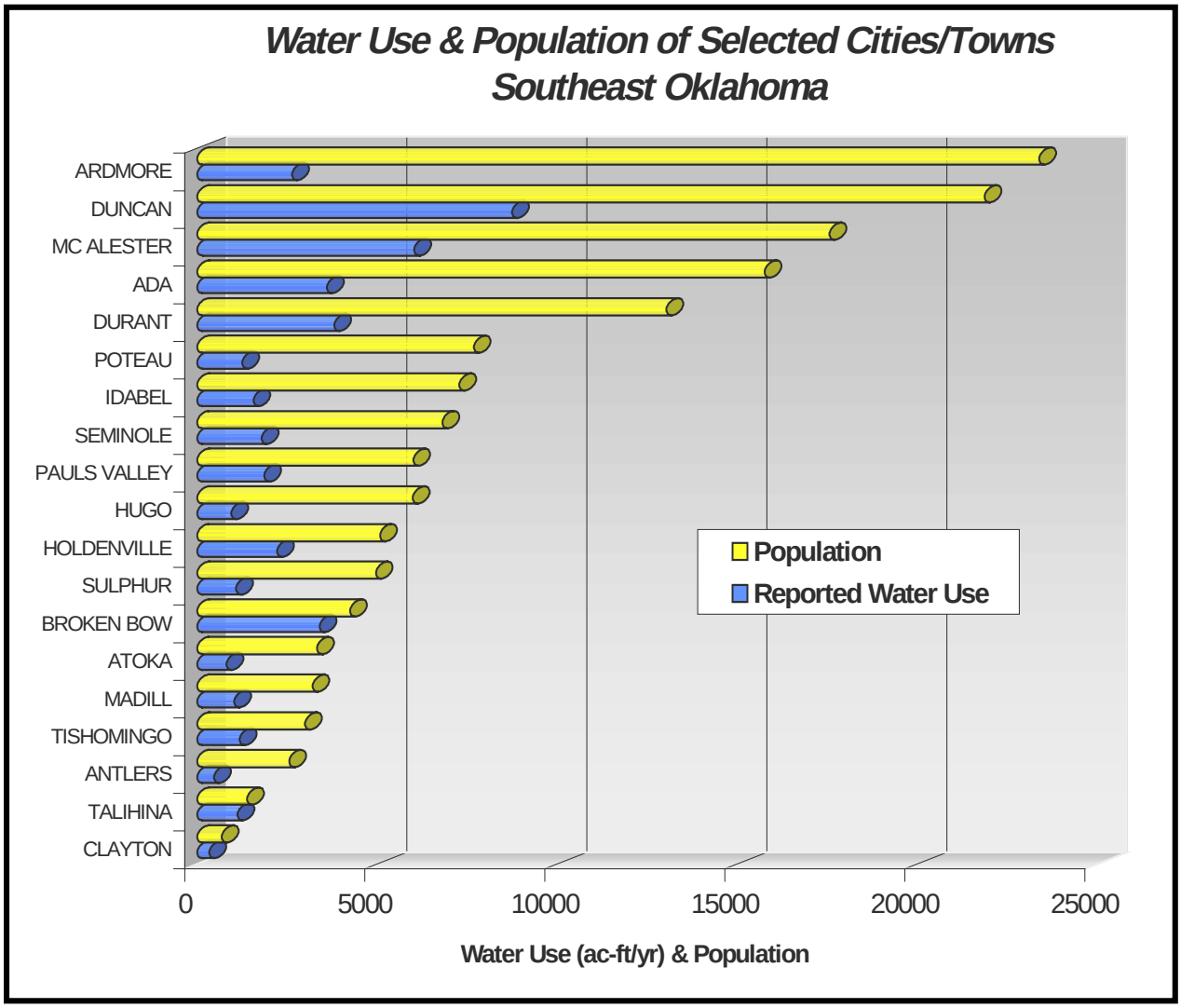


Figure 10
Water Use and Population of Selected Cities and Towns in Southeast Oklahoma



Implementing a Sardis Lake Level Management Plan

"An appropriate lake level management plan, developed by the Oklahoma Department of Wildlife Conservation, shall be implemented for the use of water from Sardis Reservoir."

To protect critically important fishery, wildlife and recreational interests within the Kiamichi River Basin, HCR 1066 directs that appropriate Iake level management plans be implemented at both Sardis and Hugo Lakes. Utilizing the OWRB's Geographic Information System (GIS) and analyses conducted by the Corps of Engineers, the Kiamichi Group investigated the potential implementation of lake level management plans at each lake as well as related impacts of lake level fluctuations resulting from increased local water usage and/or water transfer.

Proposed Sardis Lake Operational Plan

Initially, the group discussed an informal Sardis Lake level management plan drafted by the Oklahoma Department of Wildlife Conservation (ODWC) in 1992. The recently modified plan (Figure 6), originally created in cooperation with the OWRB during water sale negotiations with Texas, was designed to enhance fish habitat and thus improve the economic and environmental benefits of the lake's fishery.

The proposed lake level management plan for Sardis revolves around the establishment of aquatic vegetation that will provide critical habitat during spawning periods as well as eventual protection for fish hatchlings from predators. Specifically, the plan recommends:

1. gradually increasing the lake water level to the approximate normal elevation in early spring (March 1-31);
2. maintaining a stable or slightly increasing level through the summer (April through August); and
3. reducing the level during the fall and winter (September through February) to allow revegetation of shoreline habitat, although limiting the drawdown to less than 4 feet.

Although Sardis Lake is relatively shallow (an average normal depth of less than 17 feet), the lake would experience only minor exposed shoreline as a result of the proposed plan during the fall and winter months when it would be reduced to elevation 595 feet. The exposed land would appear predominantly along the flatter, shallower areas on the northern shore of the lake while the southern and eastern reaches, where the Corps parks exist, would remain relatively stable. According to estimations calculated utilizing the OWRB's GIS, the total surface area lost as a result of the four-foot decrease would be 1,970 acres, from 13,565 (the normal surface area at elevation 599 feet) to 11,595 acres (Table 4, Figure 7).

Table 4 Potential Lake Level Variations, Sardis Lake			
Lake Level Elevation (feet)	***GIS Estimation of Surface Area (acres)***	***GIS Estimation of Total Storage (ac-ft/yr)***	***GIS Estimation of Depth (feet)***
595	11,595	189,985	16.4
599	13,565	238,742	16.8

Figure 6
Sardis Lake ODWC Operational Plan

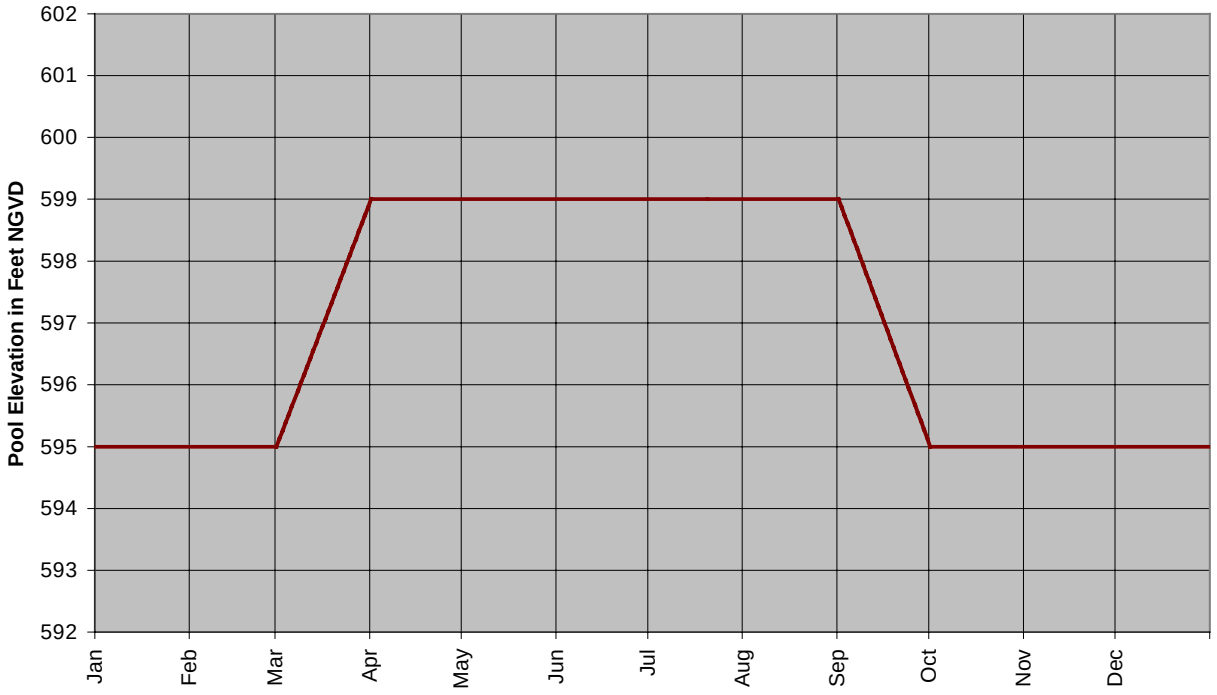
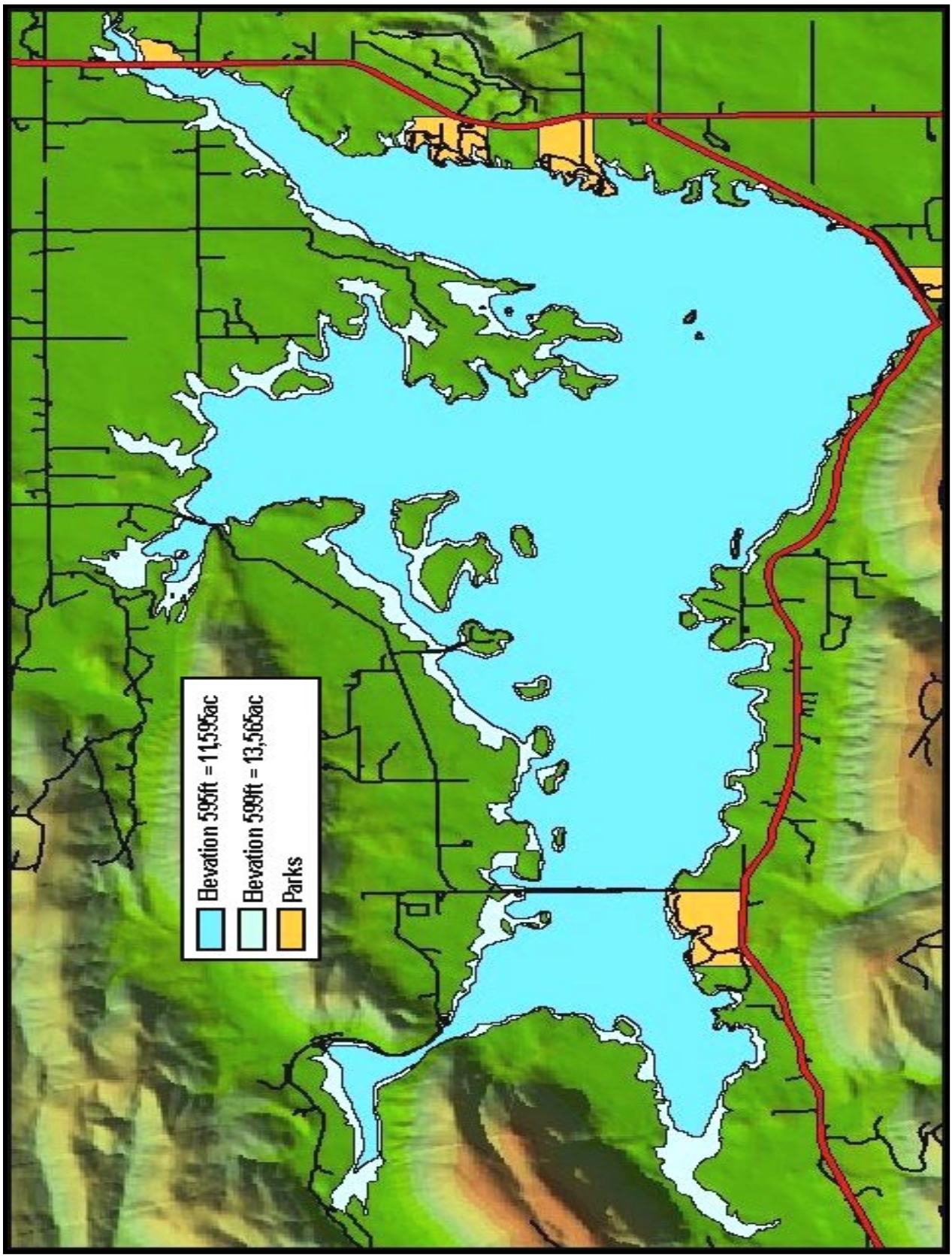


Figure 7
Sardis Lake Level Fluctuations



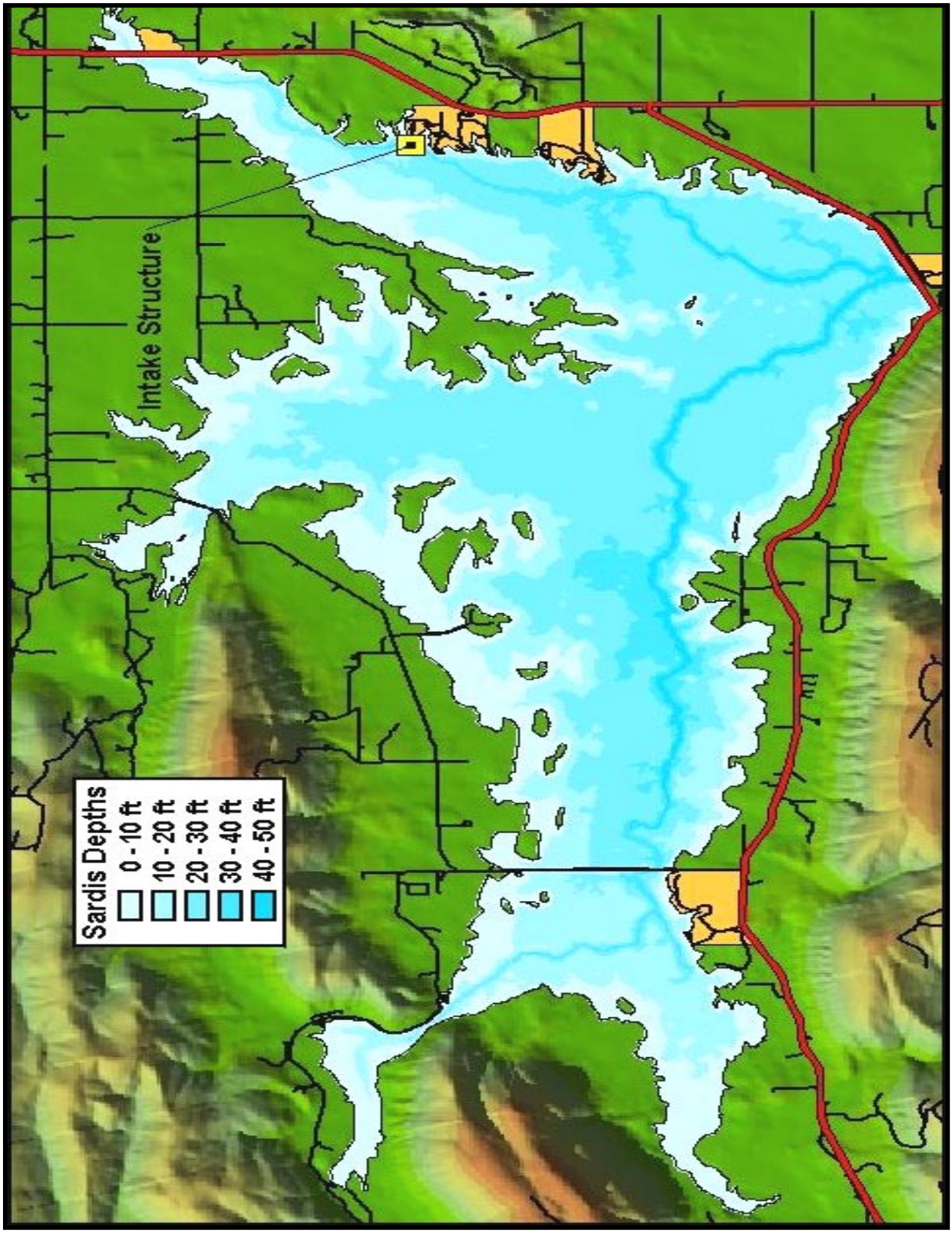
Sardis Lake Bathymetric/Sedimentation Study

As a result of concerns and comments expressed during the Kiamichi Group meetings, the OWRB conducted separate bathymetric mapping studies of Hugo and Sardis Lakes. Utilizing global positioning satellite (GPS) units, agency staff ran hundreds of transects at each lake to determine varying depths at specific geographic locations. Following the field data collection phase, staff verified the information then incorporated it into the OWRB's GIS for comparison with original (or the most recent) topographic maps for each project.

Results of the Sardis Lake study (Figure 8) determined that sedimentation is occurring at the rate anticipated according to the original project plans. Although the bathymetric data will prove more beneficial when compared to future bathymetric studies, the study gathered valuable information about lake depths for more immediate needs, such as in locating or relocating recreational or other facilities.

Members of the Sardis Lake Water Authority and other potential users have expressed much concern regarding placement of the intake structure at the lake's eastern end and that the shallowness of the area could preclude taking of the water in the event of a moderate lake level drop. The OWRB's study determined that lake depth at the structure, which is located in an old stream channel, is approximately 30 feet and would likely present few, if any, problems for potential users in obtaining water supply with the Sardis Lake level management plan in place.

Figure 8
Sardis Lake Bathymetric Study



Maximizing Opportunities for Water and Wastewater Financing

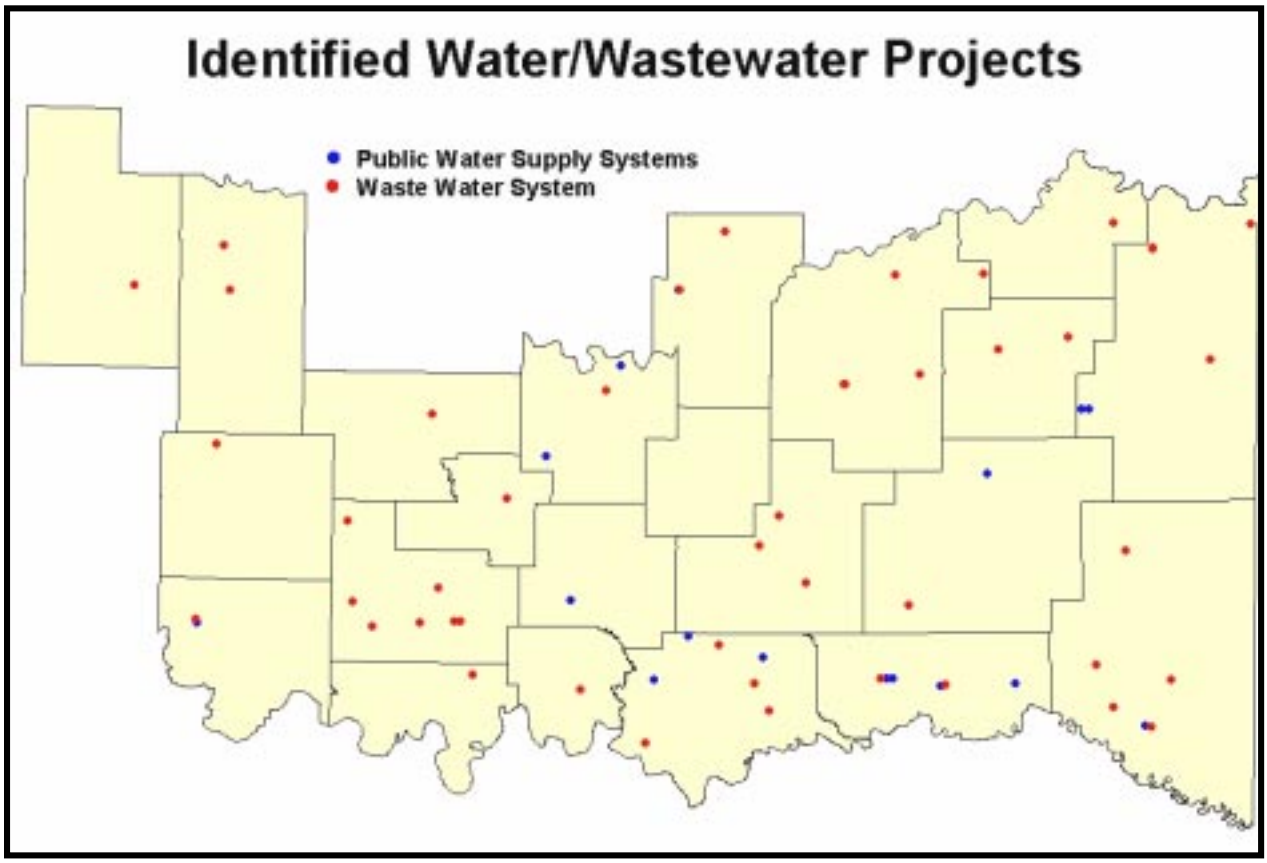
"Financing opportunities for water and wastewater infrastructure and related economic development projects within the Kiamichi River Basin area shall be optimized."

During discussions of plans for potential benefits achieved through large-scale development and/or marketing of Kiamichi River water resources, options to finance water and wastewater infrastructure and establish local regional water supplies were considered a priority issue. According to the Oklahoma Department of Environmental Quality, 22 southeast and southern Oklahoma counties, including the entire Kiamichi River Basin region and lands within the Choctaw/Chickasaw Nation boundaries, require approximately $60 million to upgrade public water supply and wastewater infrastructure (Figure 11). Approximately $33 million dollars more in water/wastewater project improvements, beyond those obligated for funding or already under construction, have been identified by Rural Development.

Those members of the Kiamichi River Basin Working Group representing the southern portion of the Basin strongly believe that allowances for the use of proceeds generated through the development of Basin water resources remain flexible as long as they are used within the Basin for water/wastewater or related economic development projects.

Figure 11

Public Water/Wastewater System Needs, Southeast and Southern Oklahoma (DEQ)



Resolving the Sardis Lake Water Supply Construction Cost Obligation

"The obligation of the state to the United States for repayment of construction costs of the water supply at Sardis Reservoir shall be addressed."

As mentioned, the state is currently in discussion with the federal government to negotiate a settlement of the Sardis Lake Water Storage Contract obligation. Recent federal legislation has directed the Office of Management and Budget to calculate a potential Sardis discount purchase amount.

The Kiamichi Group strongly encourages the state to pursue all options, including a potential discount purchase of Sardis water storage, to resolve the dispute and any potential water supply agreement and/or associated revenues should address repayment of disputed water supply storage costs, currently estimated at $40 million.

Protecting the Integrity of the Kiamichi River

"The integrity of the Kiamichi River shall be protected."

Satisfying endangered species concerns is a fundamental aspect in protecting the integrity of the Kiamichi River and its ecosystem. Any potential water marketing or transfer proposal must address requirements of the Endangered Species Act and related local environmental concerns, including potential impacts to the Kiamichi River.

Twenty species of endangered animals, including 12 mussel species, reside within the Kiamichi River Basin, one of the most environmentally diverse stream systems in the country. Of primary concern, according to the U.S. Fish and Wildlife Service, is the Ouachita Rock Pocketbook Mussel, which is particularly dependent upon river flows. A list of endangered species is presented in Table 8 while occurrences of these species, especially the Rock Pocketbook, is detailed in Figure 16.

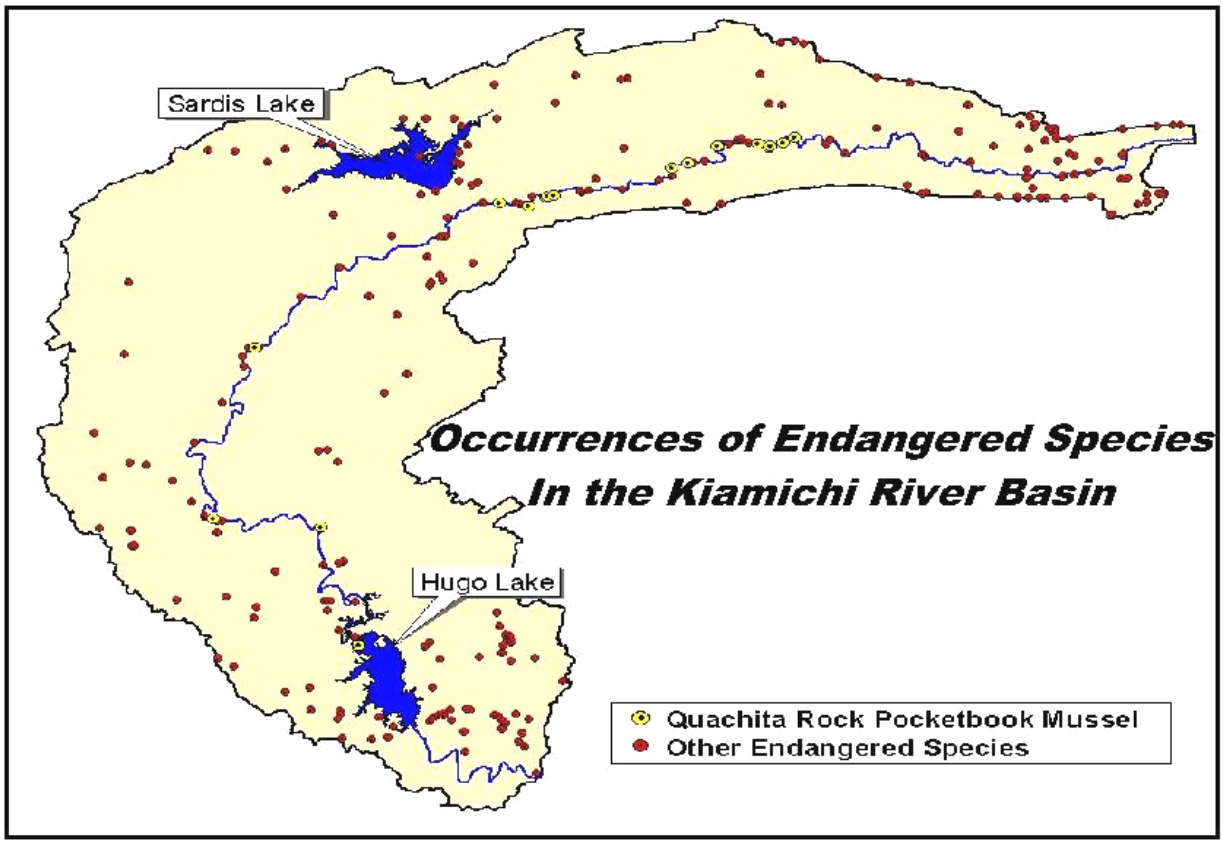
Yet to be determined is the specific impact of reduced Kiamichi River flows or a departure from the river's existing flow regime on the endangered Ouachita Rock-Pocketbook Mussel and other sensitive species downstream of the potential diversion point to central Oklahoma.

Also identified by the Kiamichi River Basin Working Group as a concern are potential impacts of water development projects and/or future lake level management plans on riparian landowners. The Working Group believes that impacts to these individuals should be minimized through mitigation or other appropriate protection measures.

Table 8
Endangered Animal Species, Kiamichi River Basin

Species Type	***Name***	***Common Name***
Fish	Notropis Atrocaudalis	Blackspot Shiner
Mussel	Villosa Iris	Rainbow
Mussel	Villosa Arkansasensis	Ouachita Creekshell
Mussel	Leptodea Leptodon	Scaleshell
Mussel	Ptychobranchus Occidentalis	Ouachita Kidneyshell
Mussel	Villosa Lienosa	Little Spectacle Case
Mussel	Obovaria Jacksoniana	Southern Hickorynut
Mussel	Ellipsaria Lineolata	Butterfly
Fish	Etheostoma Parvipinne	Goldstripe Darter
Reptile	Graptemys Kohnii	Mississippi Map Turtle
Mussel	Lampsilis Hydiana	Louisiana Fatmucket
Fish	Crystallaria Asprella	Crystal Darter
Fish	Notropis Perpallidus	Peppered Shiner
Mussel	Quadrula Metanevra	Monkeyface
Mussel	Strophitus Undulatus	Squawfoot
Mussel	Arkansia Wheeleri	Ouachita Rock Pocketbook
Fish	Hybopsis Amnis	Pallid Shiner
Graminoid	Calamovilfa Arcuata	Sandgrass
Mussel	Obliquaria Reflexa	Three-Horned Wartyback
Fish	Notropis Ortenburgeri	Kiamichi Shiner

Figure 16
Occurrences of Endangered Animal Species, Kiamichi River Basin



Implementing an Appropriate Hugo Lake Level Management Plan

"Implement an appropriate Hugo Lake level management plan that includes flexibility for adjustments due to future sedimentation."

"Protect Hugo Lake's wildlife management and waterfowl areas, including appropriate mitigation measures."

Under consideration by the Kiamichi River Basin Working Group were several lake level management plans proposed for Hugo Lake, which already undergoes major fluctuations due to the enormous inflow received from its 1,434 miles of contributing drainage (Figure 17). Of particular concern to lower basin citizens, especially those in the Hugo Lake area, is the impact and potential benefits that these plans would have on the lake's wildlife management and waterfowl areas, as well as local recreation opportunities.

Proposed Hugo Lake Operational Plans

The often differing requirements of fishery and waterfowl resources/habitat, as well as boating and related recreational uses of Hugo Lake, prompted selection of the lake for a recently concluded management plan study by the Corps of Engineers' Waterways Experiment Station (WES). In addition to discussion of the WES study plan (Figure 18) and the migratory bird plan (Figure 19), the Kiamichi Group conducted cursory investigations of three proposed management plans that remain under consideration at Hugo Lake:

1. The initial operational plan developed by the Oklahoma Department of Wildlife Conservation (Figure 20), as requested by the Kiamichi Group at the Antlers meeting, which seeks to balance benefits afforded to wildlife, migratory birds and the lake's fishery. This plan assumed implementation of a 409-foot lake level to facilitate local interests/benefits.
2. A compromise plan (Figure 21) that seeks to balance benefits for fish/wildlife, migratory birds and recreational boating.
3. A two-year local operational plan (Figure 22) that primarily seeks to enhance recreational and related local economic development benefits.

Both the ODWC plan and the compromise plan build upon a recent cooperative five-year study between the ODWC and Corps of Engineers which investigated the affects of the WES plan on Hugo's fishery. Each plan seeks to strike a balance between improved management of the lake's fishery and preserving habitat in the waterfowl refuge at the lake's shallow northern end and the wildlife management areas which, to a large extent, also occupy the northern reach of Hugo. Waterfowl, migratory birds and habitat at the Hugo wildlife management areas would continue to be impacted by fluctuating lake levels. The local plan, which spans two years, emphasizes management of the lake to benefit local interests.

None of the previously mentioned plans have been sufficiently evaluated. Development of a specific lake level management plan will require additional study and implementation may necessitate potential mitigation measures.

Hugo Lake, like Sardis, is relatively shallow with an average depth of 13.2 feet at elevation 404.5. However, unlike Sardis, the lake experiences frequent and substantial lake fluctuations due to its sizable inflow and, as a result, facilities constructed below 409 feet receive relatively frequent impacts. In addition, increases in the lake's surface area from 404.5 feet to 409 feet are fairly significant, especially in the northern waterfowl and wildlife areas. According to OWRB

estimations, the total land area inundated as a result of a four-and-one-half-foot increase from 404.5 to 409 feet is approximately 1,555 acres (Table 9, Figure 23).

Table 9
Potential Lake Level Variations, Hugo Lake

Lake Level Elevation (feet)	*GIS Estimation of Surface Area (acres)*	*GIS Estimation of Total Storage (ac-ft/yr)*	*GIS Estimation of Depth (feet)*
404.5	11,675	156,777	13.2
409.0	13,230	214,587	16.2

Figure 17
Hugo Lake Annual Inflow

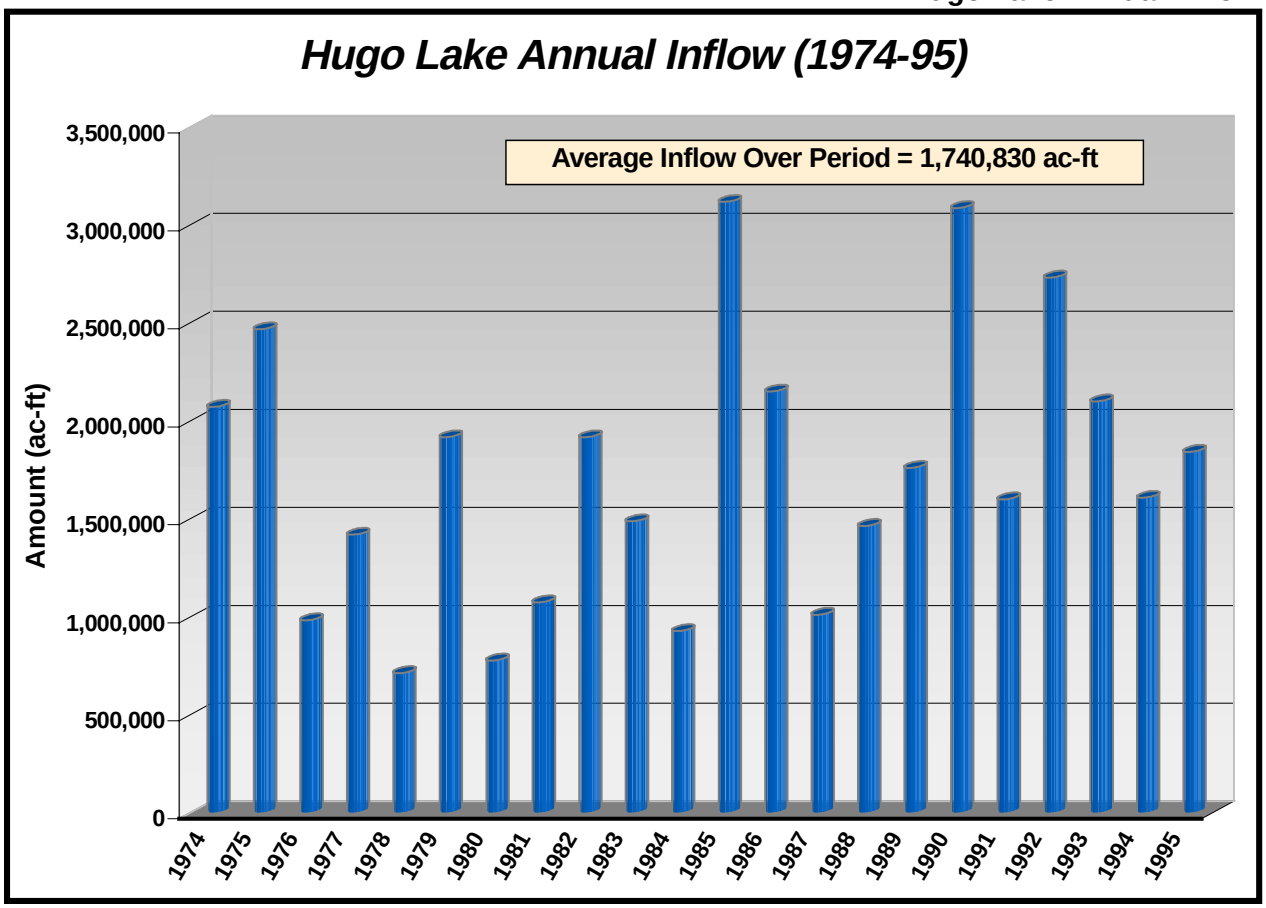


Figure 18
Hugo Lake Waterways Experiment Station (WES) Plan

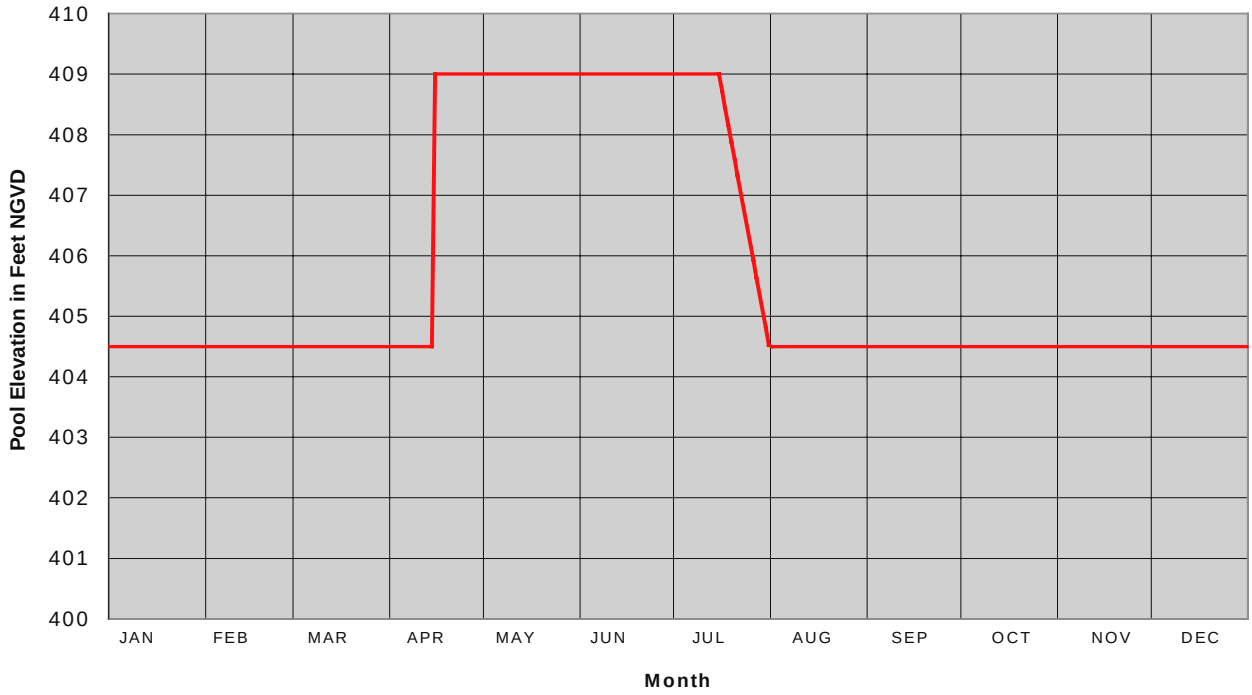


Figure 19
Hugo Lake Migratory Bird Plan (1986-94)

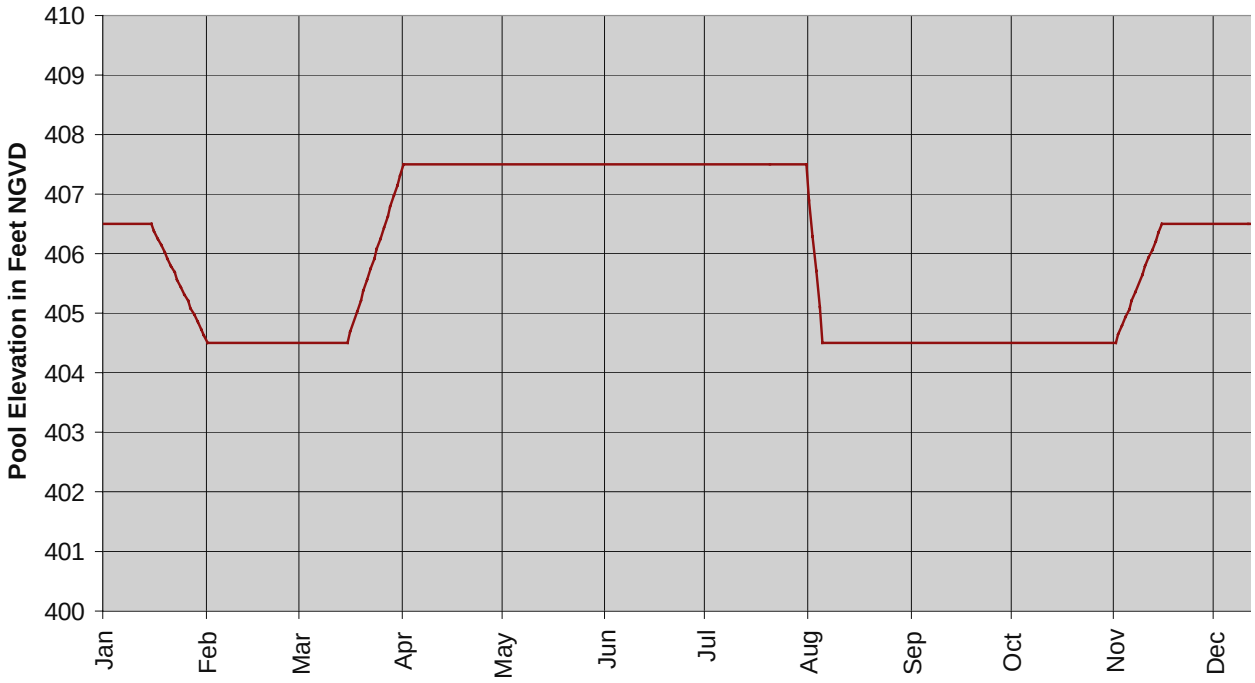


Figure 20
Hugo Lake ODWC Plan (proposed)

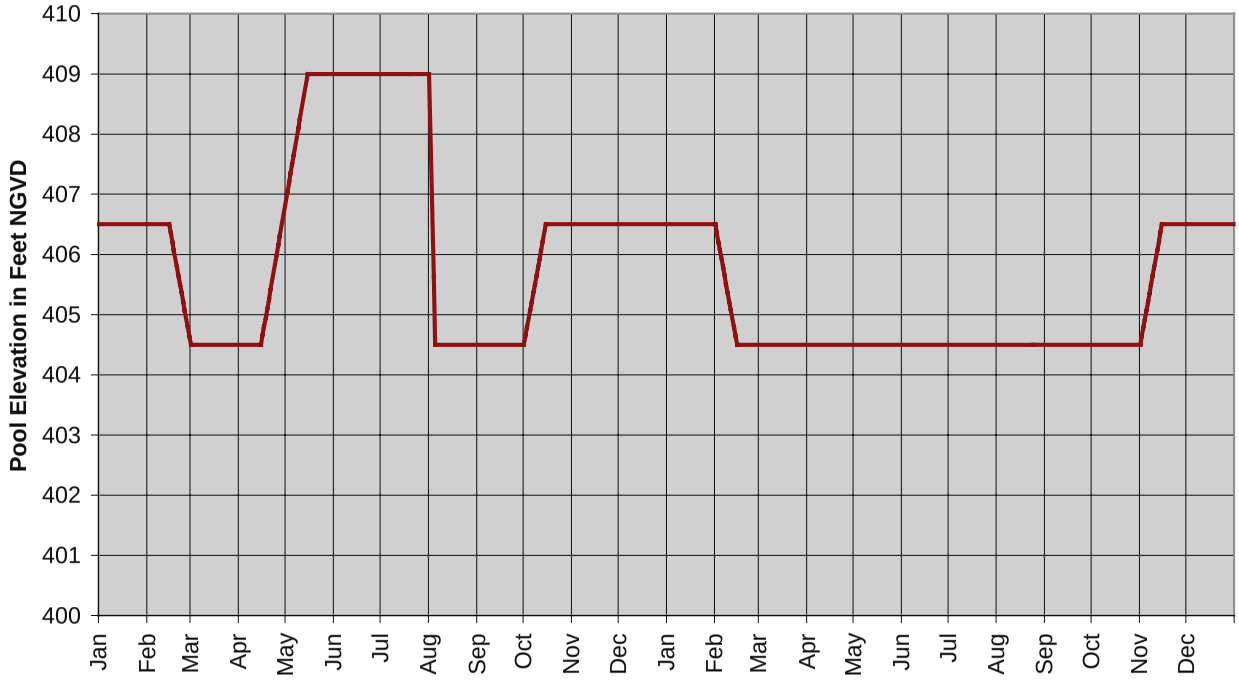


Figure 21
Hugo Lake Compromise Plan (proposed)

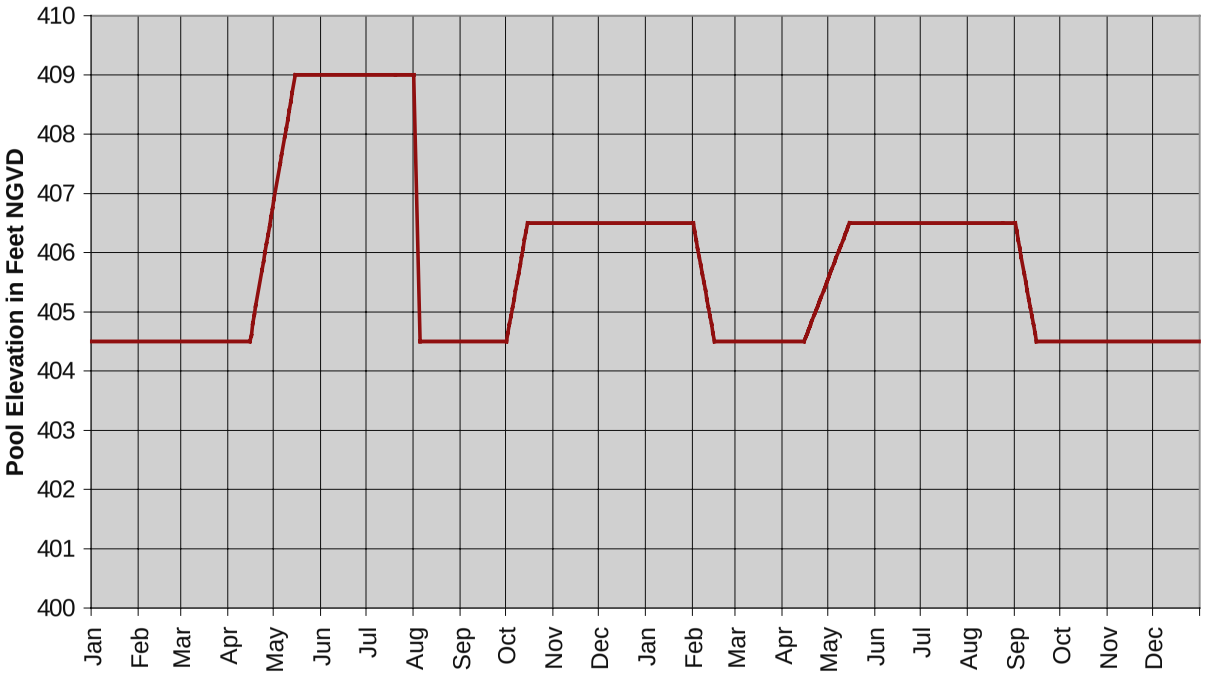


Figure 22
Hugo Lake Local Plan (proposed)

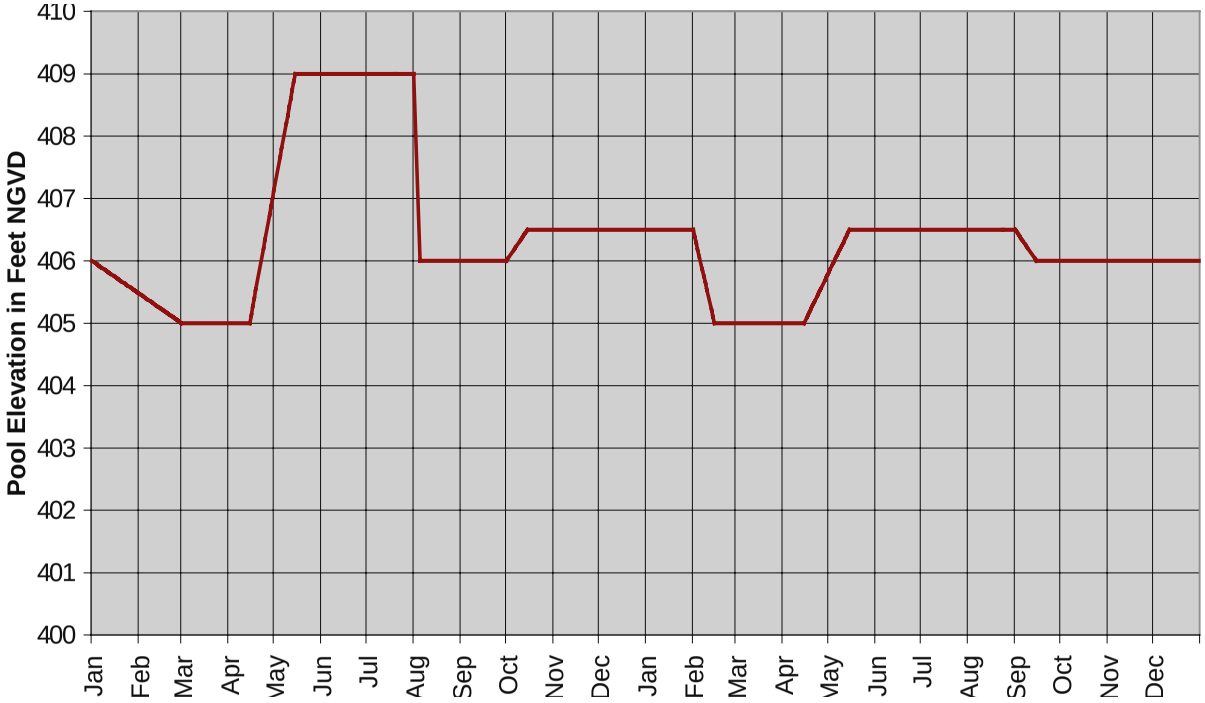
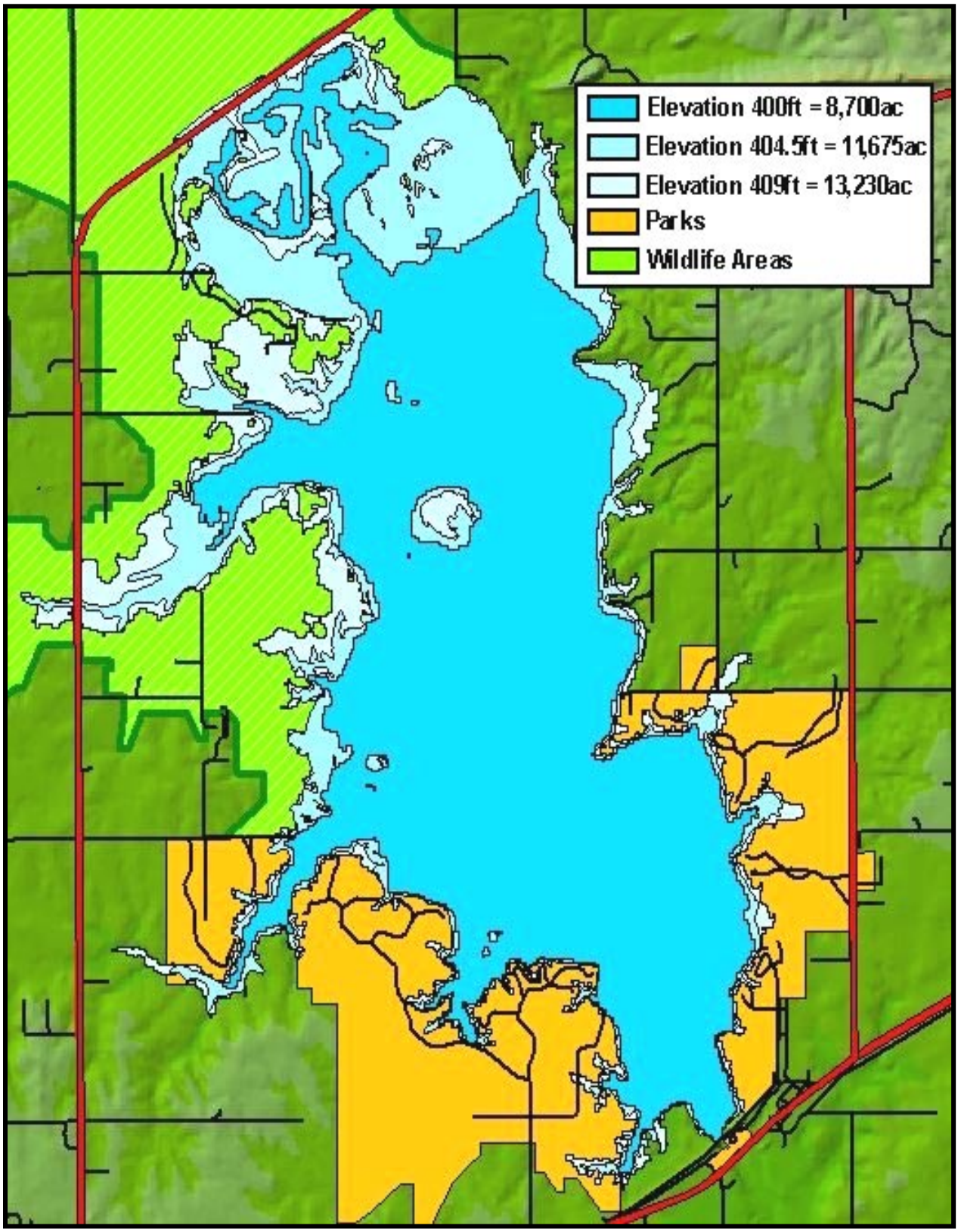


Figure 23
Hugo Lake Level Fluctuations

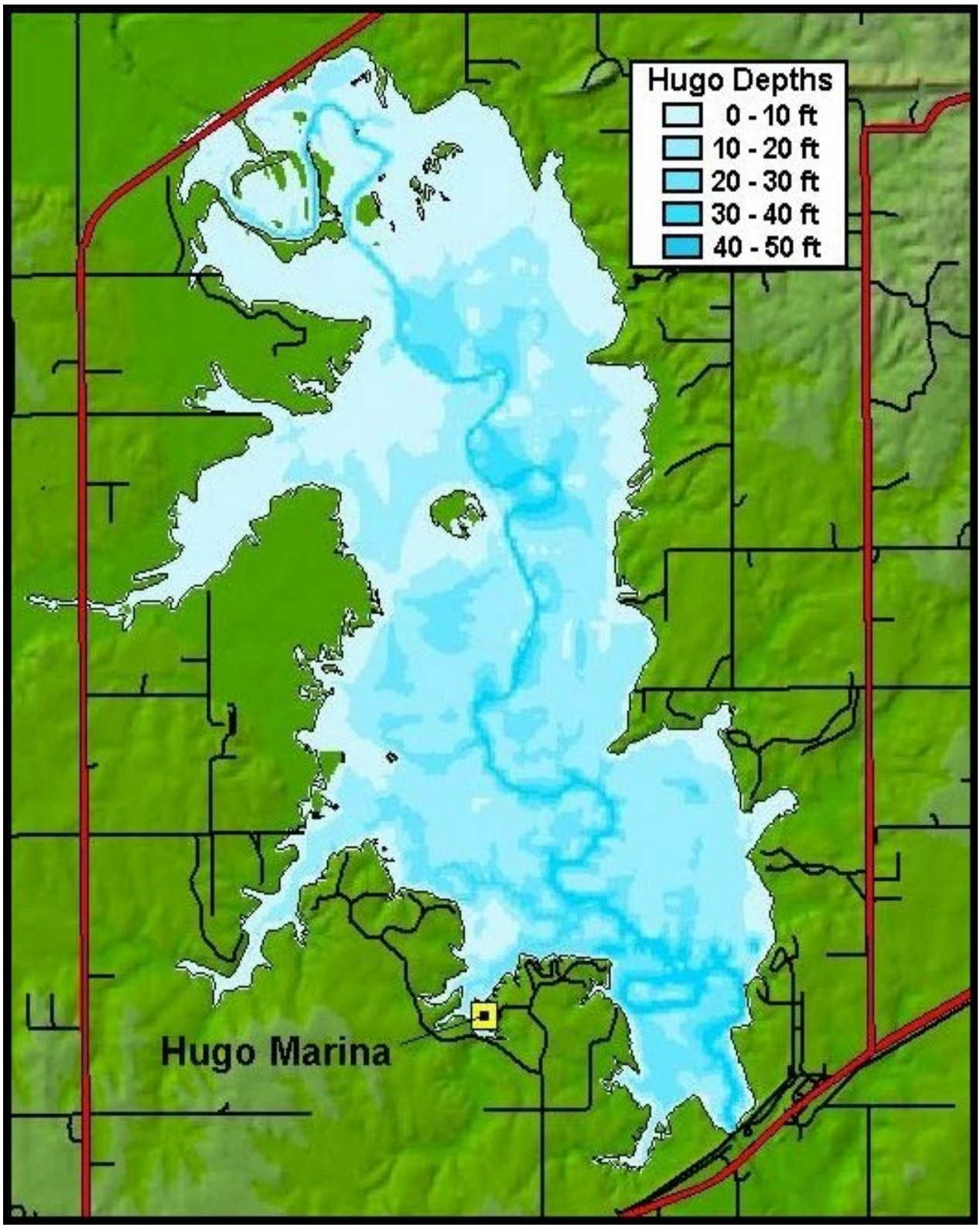


Hugo Lake Bathymetric/Sedimentation Study

As at Sardis, the OWRB conducted a bathymetric mapping study of Hugo Lake and results showed that sedimentation is occurring at the anticipated rate (Figure 24). Similar concerns were expressed about the shallowness of Hugo Lake at the marina, which regularly limits boating and related recreational opportunities in the area. Data resulting from the bathymetric study confirmed that, at the lake's normal level, depths near the marina are only a few feet in many areas.

The Kiamichi River Basin Working Group also agreed that Hugo Lake sedimentation must be considered in all future lake level management plans.

Figure 24
Hugo Lake Bathymetric Study



Impacts of Lake Operational Plans on Potential Water Diversion

Responding to a request from the Kiamichi Group, the Corps of Engineers conducted an exhaustive hydrologic investigation to determine how the potential lake level management plans at Sardis and Hugo would impact the amount and timing of water taken from the Kiamichi River at a point near Antlers, Oklahoma. This location would likely be the most advantageous and economical point to take water for eventual diversion through the Oklahoma City Water Utility Trust's Atoka/McGee Creek Pipeline, approximately 18 miles west, for use in central Oklahoma.

Points of interest assumed by the Corps for the period of record basin simulations were:

1. How would each of the three Hugo lake level management plans (the ODWC plan, compromise plan and the local users plan) affect the lake levels at both Sardis and Hugo and what are the potential downstream impacts of withdrawal of water at Antlers?
2. How would each of the three plans affect the water supply yield at Hugo Lake?
3. How do the three management plans affect the available flow at the Antlers control point and what amount of flow would be available for out-of-basin diversion at that point?

In their analysis, the Corps also included the proposed Sardis ODWC operational plan, the original authorized operational plan at Hugo Lake and the migratory bird plan implemented at Hugo from 1986 through 1994. All simulations utilized period of record (1938 to 1990) flow figures for the Kiamichi River as well as a maximum pumping rate of 200 cfs (almost 130 mgd). Several protection measures, or assumptions, were included in the Corps model scenarios. They were:

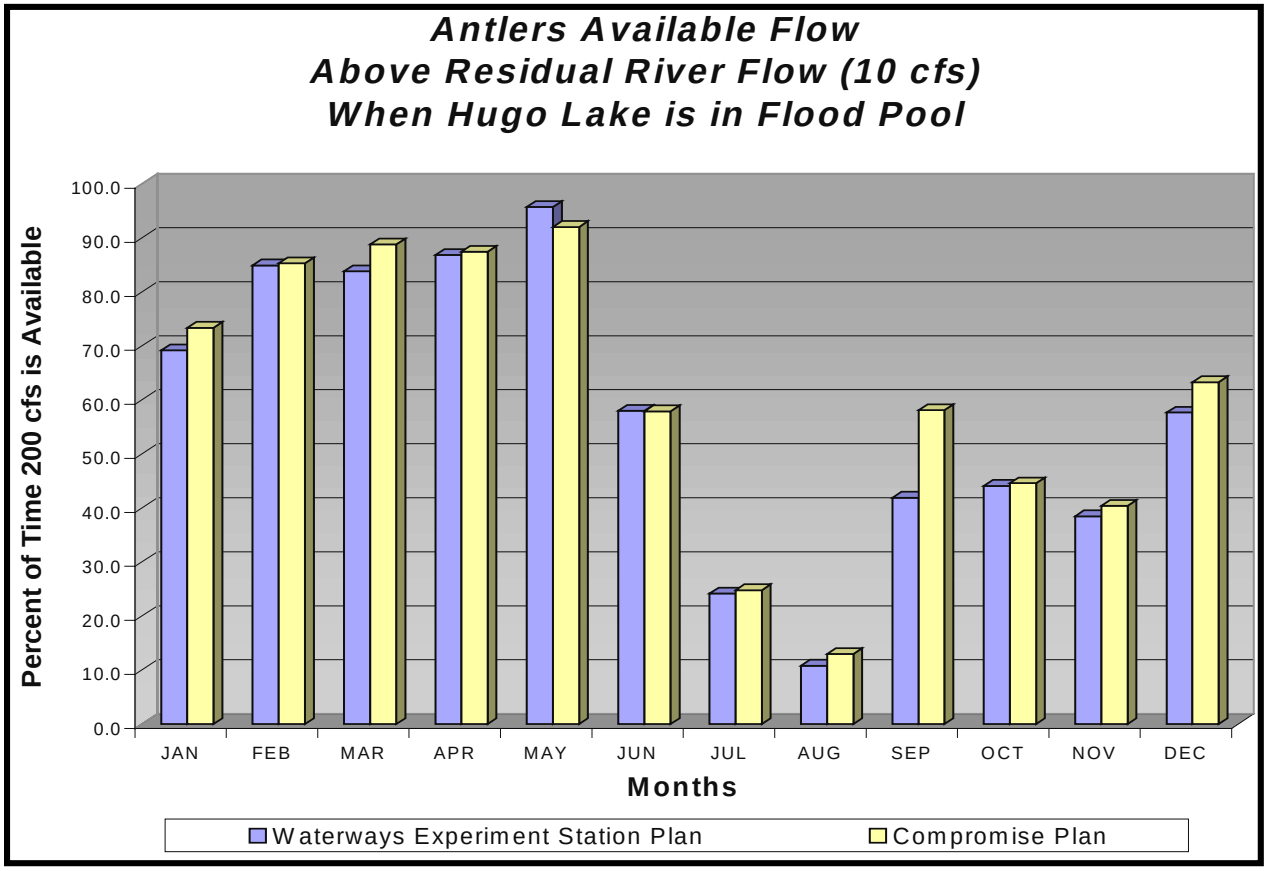
1. a base Kiamichi River flow of 10 cfs;
2. existence of the ODWC's Sardis seasonal pool plan;
3. a Sardis water supply demand of 20,000 ac-ft/yr (27.6 cfs), the amount set aside for future local use, with no additional demands;
4. a Hugo water quality storage demand of 90 mgd (140 cfs); and
5. pumping at Antlers only when the water level at Hugo is above the top of the current conservation pool elevation (404.5 feet), thereby protecting the lake's entire water supply.

Initial results of the study determined that removal of 200 cfs from the river system would have only a nominal impact on the average flow of the Kiamichi River. Regarding the timing of diversions, 200 cfs would be available slightly more often with the Hugo compromise plan than with the WES plan (Figure 25). From February through May, that amount would be available at least 80 percent of the time with either plan in place. In the typically driest summer months (July and August), the water would be available only about 10 to 20 percent of the time.

In summary, the Corps' hydrologic study determined that while this "seasonal" source of water supply directly from the Kiamichi River does not offer the dependability of a reservoir source, it is potentially ideal for entities -- such as Oklahoma City (Oklahoma City Water Utilities Trust) through its central (Hefner, Overholser and Stanley Draper), northwest (Canton) and southeast (Atoka and McGee Creek) water supply systems -- who utilize multiple storage/reservoir sites. These reservoir systems can be balanced and "topped-off" during wet periods or during the winter months, such as December and January when 200 cfs would be available approximately 55 to 70 percent of the time. This allows augmentation of reserve supply for usage during peak, high water demand periods that typically occur during the heat of summer.

Figure 25

Available Flow at Antlers, Corps of Engineers Study



Satisfying the Hugo Municipal Authority's Water Storage Contract

"Satisfy the Hugo Municipal Authority's water supply storage contract with the Corps of Engineers."

Among tasks facing the Kiamichi River Basin Group in its directive under HCR 1066 was investigation of measures to satisfy the Hugo Municipal Authority's (formerly, the Hugo Public Works Authority) water storage contract with the U.S. Army Corps of Engineers, especially future use storage costs concerns. Under terms of the agreement, Hugo has contracted for 20,520 ac-ft/yr of water supply storage in the lake, including the present use of 1,640 ac-ft/yr and future use of 18,880 ac-ft/yr. Currently, the Hugo Municipal Authority uses less than five percent (942 ac-ft/yr) of the total contracted amount.

The Kiamichi Group emphasizes that any potential water development proposal must provide opportunities that allow the Hugo Municipal Authority to resolve these contractual concerns.