DRAFT
ENVIRONMENTAL ASSESSMENT

WATER REALLOCATION PROJECT
AT HULAH LAKE
AND COPAN LAKE, OKLAHOMA

US Army Corps
Of Engineers
Tulsa District

DECEMBER 2005

ENVIRONMENTAL ASSESSMENT ORGANIZATION

This Environmental Assessment (EA) evaluates the environmental effects of the U.S. Army Corps of Engineers, Tulsa District's Proposed Action to reallocate water supply storage at Hulah Lake and Copan Lake, Oklahoma. This EA will facilitate the decision process regarding the Proposed Action and alternatives.

SECTION 1 *PURPOSE, NEED, AND SCOPE* summarizes the purpose of and need for the Proposed Action, provides relevant background information, and describes the scope of the EA.

SECTION 2 *ALTERNATIVES* examines the alternatives for implementing the Proposed Action.

SECTION 3 *PROPOSED ACTION* describes the recommended action.

SECTION 4 *AFFECTED ENVIRONMENT* describes the existing environmental and socioeconomic setting.

SECTION 5 *ENVIRONMENTAL IMPACTS OF THE PROPOSED ACTION* identifies the potential environmental and socioeconomic effects of implementing the Proposed Action and alternatives.

SECTION 6 *MITIGATION PLAN* summarizes mitigation actions required to enable a Finding of No Significant Impact for the proposed alternative.

SECTION 7 *FEDERAL, STATE, AND LOCAL AGENCY COORDINATION* provides a listing of individuals and agencies consulted during preparation of the EA.

SECTION 8 *REFERENCES* provides bibliographical information for cited sources.

SECTION 9 *APPLICABLE ENVIRONMENTAL LAWS AND REGULATIONS* provides a listing of environmental protection statutes and other environmental requests.

SECTION 10 *LIST OF PREPARERS* identifies persons who prepared the document and their areas of expertise.

APPENDICES

A Scoping Coordination/Correspondence

B SUPER Model Outputs

C Report of the Water Supply Storage Reallocation Study at Hulah and Copan Lakes, Oklahoma

D Section 404 Permit Correspondence

E Fish and Wildlife Coordination

F Cultural Resources Coordination

G Public Review of the Draft EA

DRAFT FINDING OF NO SIGNIFICANT IMPACT

In accordance with the National Environmental Policy Act of 1969, including guidelines in 33 Code of Federal Regulations, Part 230, the Tulsa District has assessed the environmental impacts of the reallocation of all available water quality storage above what is currently being used and allocating all water supply not currently under contract at Hulah and Copan lakes to the City of Bartlesville, Oklahoma. The Proposed Action will require reallocating 2,122 acre-feet from water quality storage at Hulah Lake, and 11,790 acre-feet from water quality storage to water supply storage at Copan Lake. The Proposed Action would ensure a dependable supply of at least 12 million gallons per day for the City of Bartlesville through the year 2035. This assessment was prepared in accordance with U.S. Army Corps of Engineers regulations, 33 Code of Federal Regulations, Part 230, *Policy and Procedures for Implementing the National Environmental Policy Act*. It has been determined from the enclosed Environmental Assessment that the reallocation of water in Hulah and Copan lakes will have no significant adverse effects on the natural or human environment. Therefore, an Environmental Impact Statement will not be prepared.

Date	MIROSLAV P. KURKA Colonel, U.S. Army District Engineer

Enclosure: Environmental Assessment

DRAFT

ENVIRONMENTAL ASSESSMENT OF THE WATER REALLOCATION PROJECT AT HULAH LAKE AND COPAN LAKE, OKLAHOMA

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ABBREVIATIONS AND ACRONYMS

°F	degrees Fahrenheit
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
cfs	cubic feet per second
DEQ	Oklahoma Department of Environmental Quality
EA	Environmental Assessment
EIS	Environmental Impact Statement
EO	Executive Order
ER	Engineering Regulation
FONSI	Finding of No Significant Impact
mgd	million gallons per day
MSL	mean sea level
NEPA	National Environmental Policy Act
NRCS	Natural Resources Conservation Service
ODWC	Oklahoma Department of Wildlife Conservation
SUPER model	Southwestern Division Modeling System for the Simulation of the Regulation of a Multipurpose Reservoir System
U.S.C.	United States Code
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service

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1. Purpose, Need, and Scope

1.1 Introduction

This Environmental Assessment (EA) presents potential impacts associated with reallocating water supply in Hulah and Copan lakes in northern Oklahoma. Hulah Lake is on the Caney River, a tributary of the Verdigris River, about 15 miles northwest of the City of Bartlesville in Osage County, Oklahoma. Hulah Lake receives water from the approximately 732-square mile drainage area of the Caney River (USACE 1983, 1996a, 1996b, 1999). Hulah Lake has a flood control storage capacity of 257,900 acre-feet and a conservation storage capacity of 22,553 acre-feet, including 16,600 acre-feet for water supply, 5,953 acre-feet for water quality, and 12 acre-feet for sediment reserve (USACE 1999, USACE 2005c).

Copan Lake is on the Little Caney River, a tributary of the Caney River, about 2 miles west of the town of Copan and about 9 miles north of the City of Bartlesville, in Washington County, Oklahoma (Figure 1). Copan Lake receives drainage from approximately 505 square miles of the drainage area of the Little Caney River (USACE 1983, 1996a, 1996b, 1999). Copan Lake has a flood control storage capacity of 184,300 acre-feet and a conservation storage capacity of 33,887 acre-feet, including 7,500 acre-feet for water supply, 26,100 acre-feet for water quality, and 287 acre-feet for sediment reserve (based on a 2002 survey by the USACE).

1.2 Purpose of and Need for the Proposed Action

The U.S. Army Corps of Engineers (USACE) is proposing to reallocate water quality storage in Hulah and Copan Lakes to provide an adequate water supply for the City of Bartlesville, Oklahoma to meet future demands. The City of Bartlesville has estimated average future water demands to be 10 to 12 million gallons per day (mgd), and has constructed a new 26-mgd water treatment plant designed to handle a rate about double the anticipated average water demand. The City of Bartlesville currently has combined water supply contracts with Hulah Lake for 12.34 mgd. Hulah Lake has a current yield of 9.9 mgd; however, by 2035, it is predicted that siltation will reduce the available yield to 6.58 mgd. The City of Bartlesville will have a shortfall of 5.5 mgd of water through 2035. Subsequently, the city requested that the Tulsa District investigate alternatives for increasing water supply. The Proposed Action is needed to meet future water supply demand for the City of Bartlesville.

1.3 Regulatory Compliance

1.3.1 National Environmental Policy Act of 1969

The National Environmental Policy Act of 1969, commonly known as NEPA, is a federal statute requiring the identification and analysis of potential environmental impacts of proposed federal actions before those actions are taken. NEPA also established the Council on Environmental Quality (CEQ) that is charged with the development of implementing regulations and ensuring agency compliance with NEPA. CEQ regulations mandate that all federal agencies use a systematic interdisciplinary approach to environmental planning and the evaluation of actions that might affect the environment. This process evaluates potential environmental consequences associated with a proposed action and considers alternative courses of action. The intent of NEPA is to protect, restore, or enhance the environment through well-informed federal decisions.

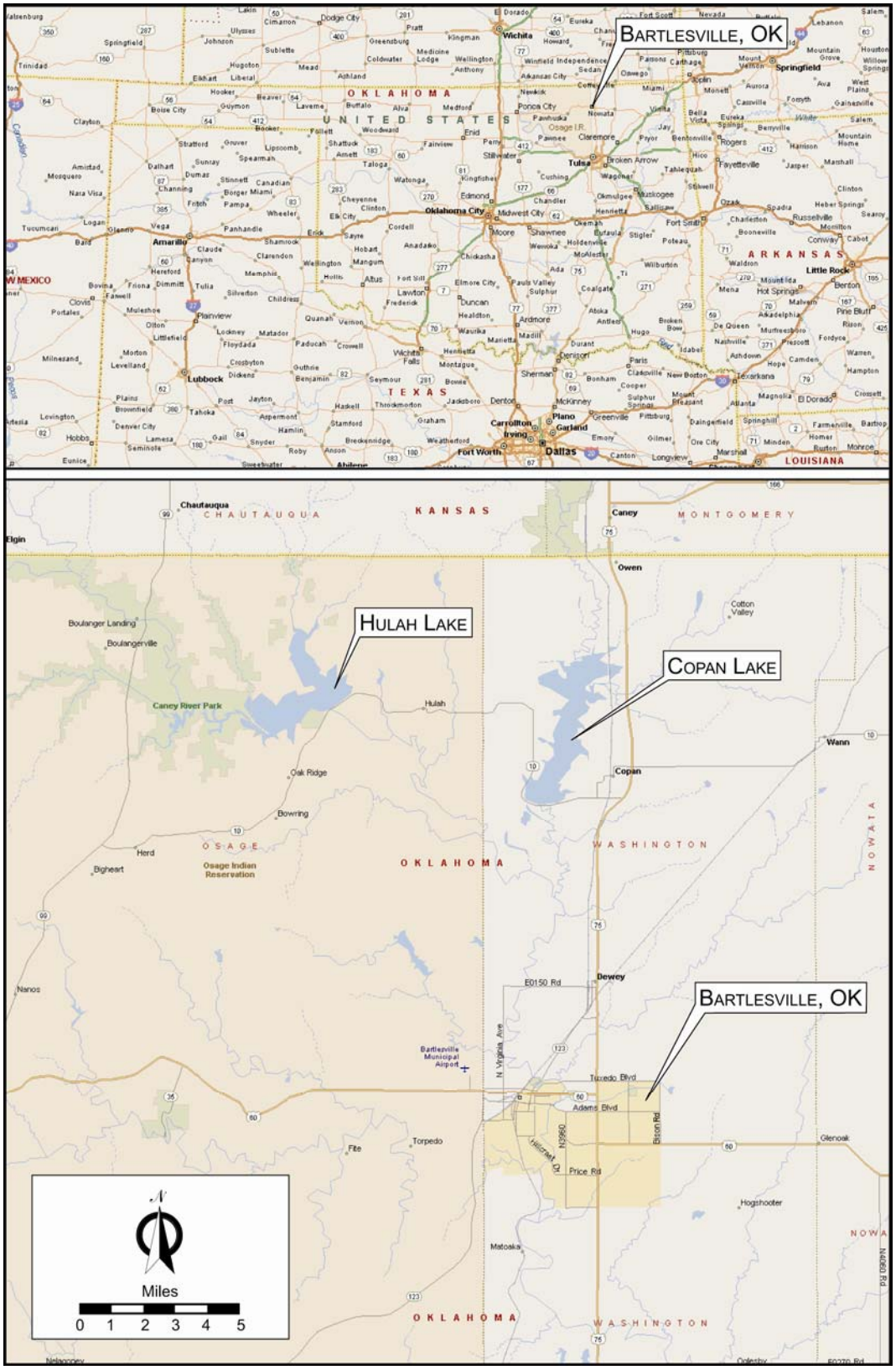

Figure 1. Vicinity Map, Hulah Lake and Copan Lake Water Reallocation Project

The process for implementing NEPA is codified in Title 40 of the Code of Federal Regulations (CFR) Parts 1500–1508, *Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act*. The CEQ was established under NEPA to implement and oversee federal policy in this process. CEQ regulations specify that the following must be accomplished when preparing an EA:

- Briefly provide evidence and analysis for determining whether to prepare an Environmental Impact Statement (EIS) or a Finding of No Significant Impact (FONSI).
- Aid in an agency's compliance with NEPA when an EIS is unnecessary.
- Facilitate preparation of an EIS when one is necessary.

This document has been prepared to comply with NEPA requirements, the CEQ regulations for implementing NEPA and Engineering Regulation (ER) 200-2-2, *Procedures for Implementing NEPA.*

1.3.2 Integration of Other Environmental Statutes and Regulations

To comply with NEPA, the planning and decisionmaking process for actions proposed by federal agencies involves a study of other relevant environmental statutes and regulations. The NEPA process, however, does not replace procedural or substantive requirements of other environmental statutes and regulations. It addresses them collectively in the form of an EA or EIS, which enables the decisionmaker to have a comprehensive view of major environmental issues and requirements associated with the Proposed Action. According to CEQ regulations, the requirements of NEPA must be integrated "with other planning and environmental review procedures required by law or by agency so that all such procedures run concurrently rather than consecutively." Resources that will be analyzed in the EA are those identified as being potentially affected by the Proposed Action, and include applicable critical elements of the human environment whose review is mandated by Executive Order (EO), regulation, or policy (see Section 9).

1.4 Project Scoping

The Tulsa District issued a news release on August 4, 2003, announcing public information workshops for the Hulah Lake and Copan Lake water reallocation project. Paid display advertisements were published in the August 5, 17, and 19, 2003, editions of the *Bartlesville Examiner Enterprise*. The Tulsa District sent scoping and workshop announcements to state and federal resource agencies. Both the advertisement and the announcements initiated the NEPA scoping process by soliciting public input (Appendix A).

The Tulsa District held a workshop on August 19, 2003 (5:00 p.m.–8:00 p.m.), at the Bartlesville Community Center. Twenty-three persons attended the workshop, including representatives from local and state agencies, Native American tribes, and private citizens. Several attendees suggested that not enough was being done about sedimentation in Hulah Lake, and that they were concerned about conservation storage and future dependable yield from the lake. Several attendees suggested that sediment should be dredged from Hulah Lake and transported off-site, including some that suggested it should have been dredged when it was dry. It was questioned whether or not it would be cheaper to just build a new lake. One attendee suggested that a combination of dredging and reallocation of flood control storage at Hulah Lake, coupled with the negotiation of a reasonably priced water supply storage agreement for Copan Lake (between the City of Bartlesville and the Tulsa District), could be an option. Another attendee suggested that sedimentation could be reduced by building a detention catch-pond close to Hulah Lake. The detention pond would capture floodwaters long enough for the sediment to settle out, and then the water could be discharged back to the lake.

As mentioned previously, several attendees suggested that building a new lake might be more reasonable than dredging, and some suggested that plans for constructing Sand Lake in Osage County be implemented. Other attendees suggested that an off-site storage facility be constructed to provide a 30- to 60-day water supply for the City of Bartlesville. A couple of attendees also suggested that Bardew Lake be retained and not sold because it holds a 30-day supply of water and could probably be enlarged. Finally, one attendee suggested increasing the height of the dam at Hulah Lake; several attendees suggested that the City of Bartlesville should receive more water from Copan Lake; and several attendees suggested that the City of Bartlesville should seek alternative water sources (besides Hulah Lake and Copan Lake), such as water available in the Verdigris River.

2. Alternatives

2.1 No Action Alternative

CEQ regulations implementing the provisions of NEPA require federal agencies to consider a No Action Alternative. These regulations define the No Action Alternative as the continuation of existing conditions and their effects on the environment, without implementation of, or in lieu of, a proposed action. This alternative represents the existing condition and serves as the baseline against which to compare the effects of the other alternatives.

Under the No Action Alternative, water reallocation in Hulah Lake and Copan Lake would not occur. With no action, existing water supply sources for the City of Bartlesville would be insufficient for meeting existing 2035 needs. The existing water supply yield for Hulah Lake is currently 9.9 mgd; however, the dependable yield for year 2035 is 6.58 mgd due to sedimentation. Hulah Lake currently has no additional water supply above what is under contract. With a 2035 water supply demand of 12 mgd, the City of Bartlesville needs additional contracts totaling approximately 5.5 mgd. The No Action Alternative would be insufficient to meet future water supply demands of the city.

2.2 Action Alternatives

The USACE evaluated a number of possible scenarios to meet the purpose and needs of the proposed project while maintaining acceptable water quality and flood control storage levels (see Appendix B). Requirements for the selected plan included technical soundness, economic feasibility, and environmental acceptance. The following alternatives were considered early in the planning process; however, all but one, were determined not to be viable and eliminated from further consideration.

2.2.1 Local Small Reservoir Water Sources Considered

Multiple available federal- and state-owned lakes in north-central and northeastern Oklahoma were reviewed to determine if the lakes had the capacity to meet the projected 2035 water demand. The following smaller lakes were considered to have insufficient potential for water supply yield:

- Birch Lake
- Shidler Lake
- Hudson Lake
- Big Creek Lake
- Chelsea Lake

Lakes in the Kansas region were not considered due to past difficulty in transferring water rights from one state to another.

2.2.2 Dredging Alternative

Hulah Lake has lost approximately 13,845 acre-feet of storage to sedimentation, based on 2002 storage data and is projected to lose 28,000 acre-feet of conservation storage by 2035. One option considered in the reallocation study was dredging Hulah Lake to recover storage lost to sedimentation during the life of the project.

A cost estimate for dredging Hulah Lake was prepared assuming 13,845 acre-feet of sediment would be dredged, the storage lost to date based on the 2002 sediment survey. This volume of storage equates to 22,336,600 cubic yards of material. At a cost of $4/cubic yard for dredging and transportation, dredging costs would total over $89 million dollars. Total costs could exceed this estimate if an offsite disposal option is chosen.

Dredging costs exceed the cost of constructing a reservoir with similar conservation storage. As a result, dredging was not considered as a viable alternative.

2.2.3 System Operation Alternatives

In many instances, lakes within the same drainage basin can be operated to optimize the storage and yield of downstream lakes. Hulah and Copan lakes are within the Caney River drainage basin but Hulah Lake is on the main stem of the Caney River while Copan Lake is on the Little Caney River. Since the two lakes are on separate stems of the drainage basin, system operation to maximize storage and yield is not possible. Therefore, system operation was not considered a viable alternative.

2.2.4 Groundwater Alternative

There are no adequate groundwater sources in the Bartlesville area that could meet future water supply demands of the city. Therefore, groundwater sources were not considered a viable alternative.

2.2.5 Construction of a New Reservoir

The proposed Sand Lake reservoir was also eliminated from further consideration. The proposed Sand Lake reservoir was deauthorized in 1999 and would need new congressional approval to be considered again. The cost and time required to reauthorize the Sand Lake reservoir under the current U.S. Environmental Protection Agency (USEPA) regulations is a significant constraint. Selection of this option would require a long term federal and local initiative to reauthorize the reservoir. There is no certainty that the reservoir would eventually be completed.

If Sand Lake was reauthorized, it would likely be a water supply lake with 100 percent of the costs reimbursable from the local sponsor. Reauthorization would also incur significant additional costs for ensuring adequate water quality. Other federal lake projects built in Osage County have encountered significant mineral rights mitigation requirements. It would also have to be redesigned to meet new 2005 federal environmental regulations. Existing environmental laws and Indian sovereign land rights issues would increase the cost of construction of Sand Lake. Because of these issues, the Sand Lake reservoir option was not considered a viable alternative.

2.2.6 Alternative Reservoir Water Sources

The USACE also considered five reservoirs as potential water sources. These reservoirs include

- Skiatook Lake, Osage County, Oklahoma (50 miles to reservoir)
- Grand Lake, Delaware County, Oklahoma (90 miles to reservoir)
- Kaw Lake, Kay County, Oklahoma (55 miles to reservoir)
- Oologah Lake, Rogers County, Oklahoma (50 miles to reservoir)
- Copan Lake, Washington County, Oklahoma (10 miles to reservoir)

Grand Lake was the furthest water supply source option considered. It has no water supply allocation in the conservation pool and has no provisions designed into its dam for the withdrawal of water. Using Grand Lake as a water supply source would require the construction of a water intake structure and reallocation of storage to water supply. Grand Lake was eliminated from further consideration.

Annual water costs were estimated for each of the five reservoirs. Pipeline construction cost estimates were made based on 5-mgd flow rates. The construction and annual costs for each new reservoir and pipeline were estimated and amortized over a 50-year period at 5.375 percent. An annual storage cost was also calculated for available water supply as well as potential reallocated water from water quality. The costs factored into developing the pipeline construction and annual costs for each reservoir alternative include

- Land
- Dams/Intake Structure
- Pumping Plants
- Planning Engineering and Design
- Construction Management
- Estimated Contingencies (35 percent)
- Available Water Supply
- Reallocated Water Supply if available

Oologah and Kaw lakes are not viable options because of high pipeline construction costs. These costs are estimated to be 4 and 5 times higher than construction pipeline costs to Copan Lake.

Skiatook Lake does not have sufficient water rights available to justify further consideration as a potential water supply source. It only has 1 mgd available for water supply and would be cost-prohibitive in addition to being insufficient to satisfy future water supply needs of the City of Bartlesville.

A pipeline from Copan Lake to Hulah Lake, if done with a reallocation of available water quality, is the most cost-effective option. Assuming the same water quality reallocation, a pipeline from Copan Lake to Lake Hudson also ranked high in the list of alternatives. Copan Lake water was not a viable option without a reallocation of the conservation pool. With only 1 mgd of available water supply, there would be insufficient water volume to justify the pipeline construction cost. Therefore, reallocation of available water in Copan and Hulah lakes was determined to be the only viable option and is the preferred action presented in Sections 2.2.7 and 3.

2.2.7 Reallocation Scenarios for Hulah and Copan Lakes

Multiple reallocation scenarios for Hulah and Copan Lakes were evaluated using the Southwestern Division Modeling System for the Simulation of the Regulation of a Multipurpose Reservoir System (SUPER model) (see Appendix B). Various scenarios were considered. The Report of the Water Supply Storage Reallocation Project at Hulah and Copan Lakes, Oklahoma, provides additional information on the reallocation and is included as Appendix C.

Seasonal pool plan reallocations of the flood control pool in conjunction with water quality reallocations are considered in some of the alternatives below. Seasonal pool elevation changes were raised such that flood control reductions of 2.5, 5.0, and 7.5 percent would occur during the seasonal pool time period. Different seasonal pool plan time periods were selected to be analyzed. The time periods that were examined are

- June 1st to October 31st
- May 1st to October 31st
- June 1st to November 30th
- May 1st to November 30th

Reallocation Scenario 1

Alternative 1 would consist of reallocating all available water quality storage at Hulah and Copan lakes. This option would provide 7.23 mgd from Hulah Lake and an additional 5.5 after reallocation from Copan Lake. Total available yield for this alternative would provide 12.71 mgd of water supply.

Reallocation Scenario 2

Alternative 2 would provide for reallocation of all available water quality storage at Hulah Lake with seasonal pool raises from 733.0 feet to 734.75 feet during the May 1st to November 30th time period. This option would make no changes to the existing operation of Copan Lake. Under this alternative, 7.81 mgd would be available from Hulah Lake and an additional 1.03 mgd would be available from Copan Lake. Total available yield for this alternative would provide 8.84 mgd of water supply, which is slightly below the desired rate.

Reallocation Scenario 3

Alternative 3 would provide for reallocation of all available water quality storage at Copan Lake with seasonal pool increases of 710.0 feet to 711.0 feet from June 1st to November 30th. This alternative would continue regular operation at Hulah Lake but would provide a 2.5 percent reduction of flood control from Copan Lake during the seasonal pool time period. This alternative would provide 6.58 mgd from Hulah Lake and 7.1 mgd from Copan Lake. This alternative would provide 13.68 mgd of water supply.

Reallocation Scenario 4

Alternative 4 would provide for reallocation of all available water quality storage plus 5 percent flood control reallocation from elevation 733.0 feet to 736.15 feet at Hulah Lake. There would be no changes to the Copan Lake operation. This alternative would provide 12.19 mgd from Hulah Lake and 1.03 mgd

from Copan Lake. Total yield from both reservoirs from this alternative would be 13.22 mgd of water supply.

Reallocation Scenario 5

Alternative 5 would provide for reallocation of all available water quality storage at Hulah Lake with seasonal pool raises during the May 1st to November 30th time period. The conservation pool at Hulah Lake will be raised to 736.15 feet with a seasonal pool of 737.0. Hulah Lake would incur a 5 percent flood pool loss with the potential for an additional reduction of 1.5 percent during the seasonal pool time period. No reallocation is considered at Copan Lake under this alternative. This alternative would provide a combined total of 14.43 mgd of water supply.

3. Proposed Action

Reallocation of water supply in Copan and Hulah lakes under Reallocation Scenario 1 above is the most cost-effective plan. Reallocation Scenario 1 is the Preferred Alternative to best meet the purpose of and need for the Proposed Action. Therefore, the Proposed Action would consist of reallocating all available water quality storage at Hulah and Copan lakes. This option would provide 7.23 mgd from Hulah Lake and an additional 5.5 mgd after reallocation from Copan Lake. This option would provide 12.71 mgd of available yield and would provide sufficient water quality to continue to meet published Oklahoma Department of Environmental Quality (DEQ) guidelines, and satisfy published water quality release standards. This alternative would not alter pool management or pool elevations, both of which would increase the probability of flooding.

4. Affected Environment

Location

The Hulah Lake and Copan Lake project study area consists of the main body of the lakes as well as the lake and downstream shorelines that could be affected by the water reallocation. Hulah Lake is located on the Caney River, a tributary of the Verdigris River, about 15 miles northwest of the City of Bartlesville in Osage County, Oklahoma. Copan Lake is on the Little Caney River, a tributary of the Caney River, about 2 miles west of the town of Copan and about 9 miles north of the City of Bartlesville, in Washington County, Oklahoma (see Figure 1). Hulah Lake receives runoff from the approximately 732-square-mile drainage area of the upper Caney River, while Copan Lake receives drainage from approximately 505 square miles of the drainage area of the upper Little Caney River (USACE 1983, 1996a, 1996b, 1999).

Climate

Climate data for Osage and Washington counties indicate that the climate in the project area is typified by long, hot summers and relatively moderate winters. The average summer temperature (June, July, and August) is 79.9 degrees Fahrenheit (°F). The average winter temperature (December, January, and February) is 38.1 °F. Average annual precipitation in these counties is about 39.4 inches, with an average of 27.6 inches usually falling during the period of April through October. Rainfall is usually the result of high intensity, short duration, local thunderstorms that occur in the late spring and early fall. Average seasonal snowfall is 9 to 12 inches (OCS 2002). The prevailing winds are from the south, with the greatest wind movements occurring in the spring months (USACE 1999).

4.1 Socioeconomics

4.1.1 Study Area

Hulah Lake and Copan Lake lie within Osage and Washington counties, respectively, and the Proposed Action would have the most direct impact on persons living in the City of Bartlesville. Therefore, these counties and the City of Bartlesville are considered the social area where project-related impacts could occur.

4.1.2 Population

The following table summarizes population data from the Census 2000 for the social area that could be affected by the proposed water reallocation project at Hulah and Copan lakes.

Table 1. Area Population of the Social Area

Locality	Census 1990 Population	Census 2000 Population	Estimated 2004 Population	Percent Growth (2000–2004)
City of Bartlesville	34,256	34,748	34,638	-0.3%
Osage County	41,645	44,437	45,181	1.7%
Washington County	48,066	48,996	49,027	0.1%
State of Oklahoma	3,145,585	3,450,654	3,523,553	2.1%

Sources: U.S. Census Bureau 2005

4.1.3 Employment and Income

In 2000, there were 128,181 people in the social area for the Hulah Lake and Copan Lake water reallocation project. The majority of the workers in the social area are employed in the educational, health and social services, manufacturing, and retail trade sectors (U.S. Census Bureau 2004). Table 2 presents employment and income information for the social area.

Table 2. Employment and Income of the Social Area

Locality	Census 2000 Per Capita Income [1]	Census 2000 Median Household Income [1]	February 2005 Unemployment Rate [2]
City of Bartlesville	$21,195	$35,827	5.1%
Osage County	$17,014	$34,477	5.6%
Washington County	$20,250	$35,816	4.8%
State of Oklahoma	$17,646	$33,400	4.8%

Sources: [1] U.S. Census Bureau 2004, [2] ORIGINS 2005

4.1.4 Environmental Justice

EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, requires that no groups of people, including racial, ethnic, or socioeconomic groups, should bear a disproportionate share of the adverse environmental consequences as a result of federal, state, and

local programs and policies. Consideration of environmental justice concerns includes race and poverty status where a proposed action would occur. Race and poverty status of the area surrounding the Proposed Action is given in the following table. Oklahoma has a large population of Native Americans consisting of dozens of tribes. Osage County has the largest population of Native Americans in the social area and nearly 20 times the population of Native Americans as the United States as a whole (Table 3). It also has the largest population of African Americans in the social area and Oklahoma. Poverty levels in the social area are less than the reported state level (Table 3).

Table 3. Race and Poverty Characteristics of the Social Area

	City of Bartlesville	Osage County	Washington County	Oklahoma	United States
Percent White, 2000	87.4	73.4	87.1	80.3	77.1
Percent African American, 2000	3.8	11.6	3.0	8.3	12.9
Percent Native American, Alaskan Native, 2000	11.8	20.7	13.9	11.4	1.5
Percent Asian, 2000	1.3	0.4	1.0	1.7	4.2
Percent Hawaiian or other Pacific Islander, 2000	0.1	0.1	0.0	0.1	0.3
Percent Other, 2000	1.5	0.9	1.3	3.0	6.6
Percent Living in Poverty, 1999	12.7	13.2	11.9	14.7	12.4

Source: U.S. Census Bureau 2005

4.1.5 Social Ecology

The social ecology of Osage and Washington counties and the City of Bartlesville is primarily rural, with large areas in agricultural production and scattered residences. There are several small communities with a mix of residential, industrial, commercial, and agricultural operations, the largest being the City of Bartlesville. This city of just under 35,000 people is a center for retail and service businesses in this part of northeast Oklahoma.

4.2 Natural Resources

4.2.1 Hulah Lake

4.2.1.1 Terrestrial

Hulah Lake is on the Caney River, a tributary of the Verdigris River, about 15 miles northwest of the City of Bartlesville in Osage County, Oklahoma. The project area, consisting of the lake and its immediately adjacent natural resources, was formed by impoundment of the Caney River. The topography surrounding Hulah Lake varies from hilly to relatively flat bottomlands. The terrain in the vicinity of the lake varies in elevation from about 700 feet above mean sea level (MSL) on the hilltops to about 850 feet above MSL near the base of the dam. The formation of the lake has influenced vegetation and habitat, creating shoreline environments that did not exist prior to filling the reservoir, and eliminating floodplain/riparian habitat that was supported along the Caney River in this area.

The project area is in the Prairie Parkland (Temperate) Province of the Prairie Division. Upland vegetation communities surrounding Hulah Lake include cross-timber forests and tallgrass prairie. A history of grazing at Hulah Lake is also evidenced by abandoned fields and active pasture (USACE 2004); in many places, the tallgrass prairie community is being invaded by grasses and forbs characteristic of overgrazed or disturbed sites.

The cross-timber forests are dominated by various oak (*Quercus* spp.) and hickory (*Carya* spp.) species, including post oak (*Q. stellata*), blackjack oak (*Q. marilandica*), bur oak (*Q. macrocarpa*), bitternut hickory (*C. canescens*), mockernut hickory (*C. tomentosa*), shagbark hickory (*C. cordiformis*), and pecan (*C. illinoensis*). The canopy of these wooded areas is mostly closed and understory vegetation is limited (USACE 2004).

Species commonly found in the tallgrass prairie of Hulah Lake include big bluestem (*Andropogon gerardii*), switchgrass (*Panicum virgatum*), and indiangrass (*Sorghastrum nutans*) (USACE 2004). Much of the grazing that occurs at Hulah Lake occurs in these prairie grasslands, and overgrazing has resulted in the establishment of more short-grass prairie species, including native grasses such as grama (*Bouteloua* spp.), sheep fescue (*Festuca ovina*), and tall dropseed (*Sporobolus asper*). Introduced grasses such as Japanese brome (*Bromus japonicus*) are also found in areas of tallgrass prairie that have been overgrazed or used for pasture, as well as in abandoned fields. Other grasses and forbs indicative of overgrazed conditions found at Hulah Lake include johnsongrass (*Sorghum halepense*), three-awn (*Aristida* spp.), ironweed (*Vernonia* sp.), goldenrod (*Solidago* spp.), and false boneset (*Kuhnia eupatoriodes*) (USACE 2004).

In addition to these upland plant communities, bottomland forests and wetlands also occur in the project area. Bottomland forests border the lakeshore and are found in the riparian areas of the Caney River, as well as some of the other surface waters that feed Hulah Lake. These forests are dominated by eastern cottonwood (*Populus deltoides*) in the canopy and also support swamp oak (*Quercus bicolor*) and pecan (*Carya illinoensis*). The canopy of these forests are mostly closed and the understory vegetation is limited (USACE 2004).

4.2.1.2 Soils and Prime Farmland

Soils surrounding Hulah Lake are of the Verdigris-Mason-Wynona, Steedman-Coweta-Bates, and Darnell-Stephenville associations. Soils in the Verdigris-Mason-Wynona association are deep, nearly level and very gently sloping, well-drained to somewhat poorly drained, loamy soils found on wooded floodplains. Soils in the Steedman-Coweta-Bates association are deep and shallow, very gently sloping to steep, loamy soils over shale and sandstone. These soils are found on ridge crests and side slopes of prairie uplands. Soils of the Darnell-Stephenville association are shallow and moderately deep, very gently sloping to sloping, loamy soils over sandstone that are found on prairie uplands (USDA 1979).

Approximately 21 soil types occur in the project area associated with water reallocation at Hulah Lake. Table 4 provides a summary of the soil properties for each of these types.

Table 4. Soil Associations in the Vicinity of Hulah Lake

Soil Type	Description
Barnsdall very fine sandy loam	Barnsdall very fine sandy loam soils consist of deep, nearly level soils on floodplains. These soils formed in loamy sediments under a cover of trees and grasses, and are subject to flooding. In a representative profile, the surface layer is brown and dark brown, very fine sandy loam about 11 inches thick. The subsoil is approximately 40 to 60 inches deep. The upper 34 inches is a reddish brown silty clay loam. The next 13 inches is reddish brown clay loam, and the lower 14 inches is a brown fine sandy loam. Barnsdall soils are well-drained and have moderate permeability. Available water capacity is high.
Dennis silt loam, 3 to 5 percent slopes	Dennis silt loam soils consist of deep, very gently sloping to gently sloping soils on uplands. These soils formed in material weathered from shales interbedded with thin layers of sandstone under a cover of grasses. In a representative profile, the surface layer is very dark brown silt loam about 11 inches thick.. The upper part of the subsoil is very dark grayish brown and brown silty clay loam to a depth of 31 inches. The lower part of the subsoil is silty clay mottled in shades of red and brown to a depth of about 62 inches. Dennis soils are moderately well-drained and have slow permeability.
Dennis-Carytown complex, 1 to 5 percent slopes	This complex consists of small areas of Dennis and Carytown soils that are so intermingled they could not be separated at the scale selected for mapping. • Dennis soils make up about 30 percent of the mapped acreage. They consist of very gently sloping through gently sloping soils found on slightly higher, convex parts of the landscape. The surface layer is very dark grayish brown silt loam about 9 inches thick. The upper part of the subsoil is very dark grayish brown silty clay loam about 18 inches thick. The middle part is dark brown and brown silty clay about 38 inches thick. The lower part is silty clay mottled in shades of gray and brown about 72 inches thick. Dennis soils are moderately well-drained, have slow permeability, and available water capacity is high. • Carytown soils make up about 20 percent of the mapped acreage. These soils consist of deep soils on very gently sloping slopes on slightly lower, concave parts of the landscape. Typically the surface layer is very dark grayish brown silt loam about 9 inches thick. The upper part of the subsoil is very dark grayish brown, dark grayish brown, and dark brown silty clay about 38 inches thick. The lower parts is silty slay coarsely mottled in shades of gray and brown about 72 inches thick. • 25 percent of this mapping unit consists of soils that are similar to Dennis soils except that the bedrock is less than 60 inches thick. • 10 percent of this mapping unit consists of soils that are similar to Carytown soils except that the bedrock is less than 60 inches thick. • 10 percent of this mapping unit consists of Bates soils. • 5 percent of this mapping unit consists of Okemah soils.
Mason silt loam, 0 to 1 percent slopes	Mason silt loam soils are deep, nearly level soils on floodplains. These soils formed in loamy sediments under a cover of trees with an understory of grasses. Typically, the surface layer and next layer are very dark grayish brown silt loam about 13 inches deep. The upper part of the subsoil is dark brown silty clay loam about 8 inches deep. The lower part of the subsoil is brown silty clay loam about 75 inches deep. Mason soils are well-drained to moderately well drained and have moderate permeability. Available water capacity is high.

Table 4. Soil Associations in the Vicinity of Hulah Lake (continued)

Soil Type	Description
Norge silt loam, 1 to 3 percent slopes	Norge silt loam soils are deep, very gently sloping soils found on uplands. These soils formed in loamy sediments under a cover of grasses. Typically, the surface layer is dark brown silt loam about 10 inches deep. The subsoil is about 64 inches thick. The upper part of the subsoil is dark reddish brown silty clay loam about 7 inches thick. The next layer is reddish brown silty clay loam about 32 inches thick, and the lower part of the subsoil is yellowish red silty clay about 25 inches thick. Norge soils are well-drained and have moderately slow permeability. Available water capacity is high.
Osage silty clay	Osage silty clay soils are deep, nearly level soils on floodplains. These soils formed in clayey sediments under a cover of trees with an understory of grasses, and are subject to flooding. In a representative soil profile, the surface layer is very dark gray silty clay about 8 inches thick. The next layer is black silty clay also about 8 inches thick. The upper part of the subsoil is dark gray silty clay about 22 inches thick. The lower part is dark grayish brown silty clay to about 34 inches deep. Osage soils are poorly drained and have very slow permeability. Available water capacity is medium.
Parsons silt loam, 1 to 3 percent slopes	Parsons silt loam soils consist of deep, nearly level through very gently sloping soils on uplands. These soils formed in material weathered from shales or clayey sediments under a cover of grasses. In a representative profile, the surface layer is a dark grayish brown and very dark grayish brown silt loam about 12 inches thick. The subsoil is approximately 58 inches thick. The upper 20 inches is a dark to very dark grayish brown silty clay. The next 8 inches is a coarsely mottled, dark brown, very dark gray, yellowish brown, and light brownish gray silty clay. The lower 30 inches is coarsely mottled light gray, yellowish brown, light brownish gray, very dark gray, and brown silty clay. Parsons soils are somewhat poorly drained and have very slow permeability. Available water capacity is medium.
Prue loam, 3 to 5 percent slopes	Prue loam soils consist of deep, gently sloping soils on uplands. These soils formed in material weathered from sandstones and shales under a cover of grass. In a representative profile, the surface layer is a very dark brown loam about 12 inches thick. The subsoil is more than 60 inches thick. The upper 6 inches is a very dark grayish brown loam. The next 12 inches is a yellowish brown, sandy clay loam. Underlying this layer is yellowish brown clay loam about 9 inches thick. The next 11 inches is a coarsely mottled, strong brown, grayish brown, and yellowish red silty clay loam, and the lower 22 inches is coarsely mottled strong brown, grayish brown, and very dark gray silty clay. Prue soils are moderately well-drained and have moderately slow permeability. Available water capacity is high.
Steedman silt loam, 1 to 3 and 3 to 5 percent slopes	Steedman silt loam soils consist of moderately deep, very gently sloping to steep soils on uplands. These soils formed from shales interbedded with thin layers of sandstone under a cover of grasses. The soils are generally 20 to 40 inches thick. The surface layer is a very dark grayish brown silt loam that is about 8 inches thick. The subsoil is about 20 inches thick. The upper 9 inches are a brown silty clay. The next 3 inches are a dark grayish brown silty clay, and the lower 5 inches are a coarsely mottled, dark gray, grayish brown, and yellowish brown silty clay. Steedman soils are well-drained to moderately well-drained and have slow permeability. Available water capacity is medium.

Table 4. Soil Associations in the Vicinity of Hulah Lake (continued)

Soil Type	Description
Stephenville-Darnell complex, 1 to 5 percent slopes	This complex consists of small areas of Stephenville and Darnell soils that are so intermingled they could not be separated at the scale selected for mapping. • Stephenville soil makes up about 45 percent of the mapped acreage. This soil consists of deep, very gently sloping through gently sloping soil. The surface layer is very dark brown fine sandy loam about 5 inches thick. The subsurface layer is dark grayish brown fine sandy loam about 14 inches thick. The subsoil is strong brown sandy clay loam about 30 inches thick. Stephenville soils are well drained and have moderate permeability. Available water capacity is medium. • Darnell soil makes up about 30 percent of the mapped acreage. This soil consists of shallow, very gently sloping through gently sloping soil. The surface layer is very dark grayish brown fine sandy loam about 4 inches thick. The subsoil is brown fine sandy loam about 15 inches thick. Darnell soil is well drained to somewhat excessively drained and has moderately rapid permeability. • 15 percent of this mapping unit consists of Niotaze soils. • 5 percent of this mapping unit consists of Gasil soils. • 5 percent of this mapping unit consists of Steedman soils.
Verdigris silt loam	Verdigris silt loam soils consist of deep, nearly level to very gently sloping soils on floodplains. These soils formed in loamy sediments under a cover of trees with an understory of grasses. In a representative profile, the surface layer is very dark grayish brown silt loam about 7 inches thick. The subsoil is about 65 inches deep. The upper 14 inches is very dark grayish brown silt loam. The next 21 inches is a very dark grayish brown silty clay loam, and the lower 30 inches is very dark grayish brown clay loam. Verdigris soils are moderately well-drained and have moderate permeability. Available water capacity is high.
Verdigris soils[1]	Verdigris soils are deep, nearly level to gently sloping soils found on floodplains. As with Verdigris silt loam soils, these soils formed in loamy sediments under a cover of trees with an understory of grasses. Typically, the surface layer is black silt loam about 12 inches deep. The next layer is very dark brown silt loam about 6 inches deep. The subsoil is about 42 inches thick and is dark grayish brown silty clay loam. Verdigris soils are moderately well-drained and have moderate permeability. Available water capacity is high.
Wynona silty clay loam	Wynona silty clay loam soils consist of deep, nearly level soils on floodplains. These soils formed in loamy sediments under a cover of trees with an understory of grasses. They are subject to flooding. These soils are more than 72 inches thick. The surface layer is a very dark gray silty clay loam that is about 8 inches thick. The next 15 inches is black silty clay loam. Below that is a layer of very dark gray silty clay loam about 24 inches thick. The lower 16 inches is dark gray silty clay. Wynona soils are somewhat poorly drained and have slow permeability. Available water capacity is high.
Coweta-Bates complex, 1 to 8 percent slopes	This complex consists of small areas of Coweta and Bates soils that are so intermingled they could not be separated at the scale selected for mapping. • Cowetta soils make up about 45 percent of the mapped acreage in this complex. They consist of shallow, gently sloping through steep soils on uplands. These soils formed in material weathered from sandstone under a cover of grasses. In a representative profile, the surface layer is very dark grayish brown loam about 9 inches thick. The subsoil is dark brown loam and is about 7 inches thick. Cowetta soils are well-drained to somewhat excessively drained and have moderate permeability. Available water capacity is low. • Bates soils make up about 20 percent of the mapped acreage in this complex. Please see previous entry for Bates soil description. • The remaining 35 percent of the mapped acreage in the Coweta-Bates complex includes minor soil types and exposed bedrock.

Table 4. Soil Associations in the Vicinity of Hulah Lake (continued)

Soil Type	Description
Darnell-Stephenville complex, 1 to 8 percent slopes	This complex consists of small areas of Darnell and Stephenville soils that are so intermingled they could not be separated at the scale selected for mapping. • Darnell soils make up about 50 percent of the acreage mapped in this complex. They are shallow, very gently sloping to sloping soils on uplands. Typically, the surface layer is very dark grayish brown fine sandy loam about 4 inches thick. The subsoil is dark brown fine sandy loam about 8 inches thick. Darnell soils are well-drained to somewhat excessively well-drained and have moderately rapid permeability. Available water capacity is low. • Stephenville soils make up about 20 percent of the acreage mapped in this complex. They are moderately deep, very gently sloping to sloping soils on uplands. Typically, the surface layer is very dark brown fine sandy loam about 3 inches thick. The next layer is brown fine sandy loam about 5 inches thick. The subsoil is approximately 18 inches thick. The upper part of the subsoil is strong brown sandy clay loam about 13 inches deep. The lower part is mottled in shades of brown and red sandy clay loam about 5 inches thick. Stephenville soils are well-drained and have moderate permeability. Available water capacity is medium. • The remaining 30 percent of the mapped acreage in the Darnell-Stephenville complex includes minor soil types.
Parsons-Carytown complex, 0 to 3 percent slopes	This complex consists of small areas of Parsons and Carytown soils that are so intermingled they could not be separated at the scale selected for mapping. • Parsons soils make up about 45 percent of the mapped acreage in this complex. Please see previous entry for Parsons soil description. • Carytown soils make up about 35 percent of mapped acreage in this complex. These are deep, nearly level or very gently sloping soils that formed on uplands. Typically, the surface layer is very dark grayish brown silt loam about 6 inches deep. The subsoil is approximately 40 inches thick. The upper part of the subsoil is very dark grayish brown about 21 inches thick. The lower part of the subsoil is silty clay coarsely mottled in shades of gray and brown and is about 19 inches thick. Carytown soils are poorly drained and have very slow permeability. Available water capacity is low. • The remaining 20 percent of the mapped acreage in the Parsons-Carytown complex includes minor soil types.
Niotaze-Darnell complex, 15 to 25 percent slopes	This complex consists of small areas of Niotaze and Darnell soils that are so intermingled they could not be separated at the scale selected for mapping. • Niotaze soils make up about 60 percent of the mapped acreage in this complex. These are moderately deep, moderately steep to steep soils. They formed in material weathered from shale interbedded with thin layers of sandstone and under a cover of trees with an understory of grasses. Typically, the surface layer is ver dark grayish brown loam about 2 inches thick. The subsurface layer is brown loam about 5 inches thick. The upper part of the subsoil is light olive brown silty clay about 11 inches thick, while the lower part of the subsoil is silty clay mottled in shades of olive, brown, and gray about 10 inches thick. Niotaze soils are somewhat poorly drained and have slow permeability. Available water capacity is low. • Darnell soils make up about 15 percent of the mapped acreage in this complex. Please see previous Darnell-Stephenville complex entry for a description of Darnell soils. • The remaining 25 percent of the mapped acreage in the Niotaze-Darnell complex are similar to Niotaze and Darnell soils, except in their depth to bedrock.

Table 4. Soil Associations in the Vicinity of Hulah Lake (continued)

Soil Type	Description
Norge, Dennis, and Prue soils, gullied [1]	This soil type consists of very gently sloping to sloping, gullied soils on uplands. It consists of primarily Norge (20 percent), Dennis (20 percent), and Prue (15 percent) soils in an irregular pattern between gullies. Please see the previous entries above for Norge, Dennis, and Prue soil descriptions. Ten percent of the acreage mapped in this soil type consist of gullies and soils that are similar to Norge, Dennis, or Prue soils except that the surface layer has been removed and the subsoil is exposed. The remaining 35 percent of the acreage mapped in the Norge, Dennis, and Prue soils include minor soil types.
Steedman-Coweta Complex, 3 to 15 percent slopes	This complex consists of small areas of Steedman and Coweta soils that are so intermingled they could not be separated at the scale selected for mapping. • Steedman soils make up about 65 percent of the mapped acreage in this complex. Please see previous entry for Steedman soil description. An additional 10 percent is included in areas of soil that are similar to Steedman soils except that the surface layer is thicker. • Coweta soils make up about 20 percent of the mapped acreage in this complex. Please see previous entry for Coweta-Bates complex for a description of Coweta soils. • The remaining 5 percent of mapped acreage in this complex consist of Bates soils. Please see previous entry for Bates soils description.
Steedman-Coweta Complex, 15 to 25 percent slopes	This complex consists of small areas of Steedman and Coweta soils that are so intermingled they could not be separated at the scale selected for mapping. • Steedman soils make up about 55 percent of the mapped acreage in this complex. Please see previous entry for Steedman soil description. An additional 10 percent is included in areas of soil that are similar to Steedman soils except that the surface layer is thicker. Another 5 percent consists of soils also similar to Steedman soils except the depth to bedrock is shallower. • Coweta soils make up about 20 percent of the mapped acreage in this complex. Please see previous entry for Coweta-Bates complex for a description of Coweta soils. • The remaining 10 percent of mapped acreage in this complex consist of Bates soils. Please see previous entry for Bates soils description.
Stephenville-Darnell complex, 1 to 5 percent slopes	This complex consists of small areas of Stephenville and Darnell soils that are so intermingled they could not be separated at the scale selected for mapping. • Stephenville soils make up about 45 percent of the mapped acreage in this complex. Darnell soils make up about 30 percent of the mapped acreage in this complex. Please see the previous entry for the Darnell-Stephenville complex for a description of these soils. • The remaining 25 percent of the mapped acreage in the Stephenville-Darnell complex includes minor soil types.

Source: USDA 1979

Note [1] Broadly defined types: the composition of these types is more variable than that of the others in the survey area, but has been controlled well enough to be interpreted for the expected use of the soils.

Soil that is prime or unique farmland as defined in the Farmland Protection Policy Act (7 United States Code [U.S.C.] 4201–4209) is classified as prime farmland. According to the U.S. Department of Agriculture, prime farmland soil is soil that is best suited for producing food, feed, forage, fiber, and oilseed crops. Soils in the vicinity of Hulah Lake that are classified as prime farmland include the following (USDA 2000):

- Barnsdall very fine sandy loam
- Norge silt loam, 1 to 3 percent slopes

- Osage silty clay
- Parsons silt loam, 1 to 3 percent slopes
- Prue loam, 3 to 5 percent slopes
- Steedman silt loam, 1 to 3 and 3 to 5 percent slopes
- Verdigris silt loam
- Wynona silty clay loam

4.2.1.3 Hydrology

Hulah Lake lies on the Caney River upstream of the town of Bartlesville, Oklahoma. The drainage area above Hulah Dam is approximately 732 square miles. The gradient of the river varies from as much as 20 feet per mile in the headwaters to 2.6 feet per mile through the reservoir area. The Caney River consists of one major channel with several major tributaries on both the left and right banks. The river is characterized by a well-defined channel with heavily vegetated overbanks that allow for very little bank erosion and result in relatively low sediment inflows into Hulah Lake. In addition, several Natural Resources Conservation Service (NRCS) sediment control structures are upstream of Hulah Lake, further reducing sediment inflows. The average annual sediment deposit is 281 acre-feet (USACE 1999).

At normal pool, Hulah Lake covers less than 3,200 surface acres, but increases to 13,000 acres at the top of the flood pool. The shoreline is approximately 54 miles (USACE 1999, 2004).

The channel capacity of the Caney River below Hulah Dam is approximately 12,600 cubic feet per second (cfs). The nondamaging flow on the Caney River downstream of the confluence with the Little Caney River is approximately 7,000 cfs. The channel capacity at Bartlesville is approximately 10,500 cfs.

Discharges from Hulah Lake are regulated primarily for flood control on the Caney River in conjunction with Copan Lake. When the flood control storage in the two lakes is unbalanced, the lake with the highest flood control storage would be given priority for discharge to the Caney River. In addition, Hulah Lake discharges are regulated for water supply and water quality. Hulah Lake has water supply storage of 16,600 acre-feet with a dependable yield of 9.9 mgd under current conditions. This yield is expected to decrease to 6.8 mgd by the year 2035 due to sedimentation (USACE 1999).

Water quality in the Caney River is considered generally good and requires minimal treatment to be suitable for municipal, agricultural, and industrial use. Hulah Lake has 5,953 acre-feet of storage allocated to water quality and yields an average of 2.1 mgd (3.9 cfs). Water quality discharges are regulated to maintain low flow requirements at Bartlesville. Table 5 shows the monthly water quality requirements for Bartlesville. The discharges are regulated from both Hulah and Copan lakes to provide the required flow to maintain water quality in the Caney River. Table 5 shows the monthly discharges required from both Hulah and Copan lakes to maintain the water quality requirements (USACE 1999).

There are no hydroelectric power units using Hulah Lake.

The U.S. Fish and Wildlife Service (USFWS) has not mapped wetlands in Osage County, Oklahoma, as part of the National Wetlands Inventory as of September 2005. Correspondence with the USACE Regulatory Branch has indicated that a Section 404 Permit under the Clean Water Act would not be required (Appendix D).

Table 5. Minimum Low-Flow Releases for Hulah and Copan Lakes and Bartlesville Minimum Water Quality Requirements

Month	Hulah Release Rates (cfs)	Copan Release Rates (cfs)	Bartlesville Minimum Water Quality Requirements (cfs)
January–May	2	5	10
June	4	8	11
July–August	4	8	13
September–December	2	5	10
Annual Average	**2.50**	**5.75**	**10.58**

Source: USACE 1999

4.2.1.4 Wild and Scenic Rivers

The Caney River and its tributaries are not classified as wild and scenic pursuant to the Federal Wild and Scenic Rivers Act, Public Law 90-542.

4.2.1.5 Fish and Wildlife

The aquatic, wetland, and upland habitats at Hulah Lake support a diversity of fish and wildlife. The Oklahoma Department of Wildlife Conservation (ODWC) has the responsibility to manage, regulate, and control fish and wildlife resources. Approximately 8,900 acres of project lands have been made available to the ODWC for wildlife management purposes. Two thousand acres of this have been set aside as a state waterfowl refuge; the remainder is managed for upland game and whitetail deer and is open to the public as a hunting area (USACE 2005a). The following sections describe the fish and wildlife resources at Hulah Lake.

Fish

Management of the fishery resources at Hulah Lake is the responsibility of the ODWC. Hulah Lake provides habitat for several species of fish. Those species popular for recreational fishing include channel catfish (*Ictalurus punctatus*), flathead catfish (*Pylodictis olivaris*), white crappie (*Pomoxis annularis*), spotted bass (*Micropterus punctulatus*), bluegill sunfish (*Lepomis macrochirus*), gizzard shad (*Dorosoma cepedianum*), thread fin shad (*Dorosoma petenense*), and shiners (*Notropis* sp.). Gizzard shad and threadfin shad are considered important forage species in the lake (USACE 2004).

Amphibians and Reptiles

Numerous amphibians and reptiles are known to occur at Hulah Lake. Species of amphibians and reptiles include tiger salamander (*Ambystoma tigrinus*), bullfrog (*Rana catesbeiana*), green frog (*Rana clamitans*), Woodhouse's toad (*Bufo woodhousei*), northern cricket frog (*Acris crepitans*), snapping turtle (*Chelydra serpentine*), painted turtle (*Chrysemys picta*), eastern box turtle (*Terrapene carolina*), corn snake (*Elaphe guttata*), eastern hognose snake (*Heterodon platyrhinos*), prairie kingsnake (*Lampropeltis calligaster*), copperhead (*Agkistrodon contortrix*), cottonmouth (*Agkistrodon piscivorus*), and western diamondback rattlesnake (*Crotalus atrox*) (USACE 2004).

Birds

The variety of habitats at Hulah Lake supports numerous species of migratory waterfowl and wading birds, upland game birds, raptors, and songbirds. These include belted kingfisher (*Ceryle alcyon*), common golden eye (*Bucephala clangula*), bufflehead (*Bucephala albeola*), great egret (*Casmerodius albus*), black-crowned heron (*Nycticorax nycticorax*), American bittern (*Botaurus lentiginosus*), green-winged teal (*Anas crecca*), ruddy duck (*Oxyura jamaicensis*), pintail (*Anas acuta*), American coot (*Fulica americana*), gadwall (*Anas strepera*), blue-winged teal (*Anas discors*), pied-billed grebe (*Podilymbus-podiceps*), common gallinule (*Gallinula chloropus*), common snipe (*Capella gallinago*), killdeer (*Charadrius vociferous*), mourning dove (*Zenaida macroura*), bobwhite quail (*Colinus virginianus*), great blue heron (*Ardea herodias*), mallard (*Anas platyrhynchos*), Canada goose (*Branta canadensis*), American kestrel (*Falco sparverius*), short-eared owl (*Asio flameus*), northern harrier (*Circus cyaneus*), common nighthawk (*Chordeiles minor*), barn owl (*Tyto alba*), long-eared owl (*Asio otus*), great horned owl (*Bubo virginianus*), screech owl (*Otus asio*), barred owl (*Strix varia*), Cooper's hawk (*Accipiter cooperil*), redtailed hawk (*Buteo jamaicensis*), turkey vulture (*Cathartes aura*), barn swallow (*Hirundo rustica*), rough-winged swallow (*Stelidopteryx ruficollis*), bank swallow (*Riparia riparia*), chimney swift (*Chaetura pelagica*), western meadowlark (*Sturnell neglecta*), flycatcher (*Muscivora forficate*), loggerhead shrike (*Lanius ludovicianus*), lark sparrow (*Chondestes grammacus*), field sparrow (*Spizela pusilla*), horned lark (*Eremophila alpestris*), common flicker (*Colaptes auratus*), American robin (*Turdus migratorius*), mockingbird (*Mimus polyglottos*), eastern bluebird (*Sialia sialis*), bluejay (*Cyanocitta cristata*), cardinal (*Cardinalis cardinalis*), house wren (*Troglodytes aedon*), brown thrasher (*Toxostome rufum*), house sparrow (*Passer domesticus*), song sparrow (*Melopiza melodia*), starling (*Sturnus vulgaris*), common grackle, (*Quiscalus quiscula*), red-winged blackbird (*Agelaius phoeniceus*), common crow (*Corvus brachyrhynchos*), whip-poor-will (*Caprimulgus vociferous*), downy woodpecker (*Picoides pubescens*), red-headed woodpecker (*Melanerpes erythrocephalus*), hairy woodpecker (*Picoides villosus*), brown creeper (*Certhia familiaris*), and red-eyed vireo (*Vireo olivaceus*) (USACE 2004).

Mammals

A variety of mammals occur at Hulah Lake including least shrew (*Cryptotis parva)*, eastern mole (*Scalopus aquaticus*), big brown bat (*Eptesicus fuscus*), Hoary bat (*Lasiurus cinereus*), woodchuck (*Marmota monax*), nine-banded armadillo (*Dasypus novemcinctus*), gray squirrel (*Sciurus carolinensis*), fox squirrel (*Sciurus niger*), southern flying squirrel (*Glaucomys volans*), thirteen-lined ground squirrel (*Spermophilus tridecemlineatus*), plains pocket gopher (*Geomys bursarius*), Texas mouse (*Peromyscus attwateri*), white-footed mouse (*Peromyscus leucopus*), deer mouse (*Peromyscus maniculatus*), Hispid cotton rat (*Sigmodon hispidus*), eastern woodrat (*Neotoma floridana*), prairie vole (*Microtus ochrogaster*), woodland vole (*Microtus pinetorum*), eastern cottontail rabbit (*Sylvilagus floidanus*), white-tailed deer (*Odocoileus virginianus*), American beaver (*Castor canadensis*), muskrat (*Ondatra zibethicus*), raccoon (*Procyon lotor*), bobcat (*Lynx rufus*), coyote (*Canis latrans*), American mink (*Mustela vison*), striped skunk (*Mephitis mephitis*), and eastern spotted skunk (*Spilogale putorius*) (ODWC 2005).

4.2.1.6 Threatened and Endangered Species

The USFWS has not performed an actual field survey of the proposed site due to time and personnel constraints. However, the USFWS provided a list of five species with the potential to occur in the project area for the water reallocation at Hulah Lake (see Appendix E). A sixth species, American burying beetle (*Nicrophorus americanus*), was added to the endangered list for Osage County after the USFWS letter was received.

The interior least tern (*Sterna antillarum*), bald eagle (*Haliaeetus leucocephalus*), whooping crane (*Grus americana*), piping plover (*Charadrius melodus*), and Arkansas River shiner (*Notropis girardi*), and American burying beetle (*Nicrophorus americanus*), are federally listed species that are known to occur in Osage County. The interior least tern (*Sterna antillarum*) and bald eagle (*Haliaeetus leucocephalus*) are endangered and threatened species, respectively, that are known to occur in the project area. Downstream of Hulah Lake, interior least terns may use sandbar habitats for nesting and loafing and the adjacent shallow water habitat for feeding on minnows. Bald eagles are common winter residents along the shores of Hulah Lake and are also known to nest in this area. They use tall trees near water for foraging, roosting, and nesting, and are also known to nest in cliffs. The whooping crane and piping plover are considered migrants in the vicinity of Hulah Lake. Whooping cranes, which are considered rare spring and fall migrants in this area, use emergent vegetation along the edges of marshes, prairie pothole wetlands, or lakes for resting sites; croplands for foraging; and riverine wetlands for roosting (ODWC 2004). The Arkansas River shiner inhabits the main channels of wide, shallow, sand-bottomed rivers. Adults are uncommon in quiet pools or backwaters, and almost never occur in tributaries having deep water and bottoms of mud or stone. Juvenile Arkansas River shiner is associated most strongly with current, conductivity and backwater and island habitat (USFWS 2005). The Neosho mucket (*Lampsilis rafinesqueana*) is a candidate species that has been recorded in Osage County (ODWC 2004). In Oklahoma, the American burying beetle has been found in habitats ranging from deciduous and coniferous forests to open pasture.

4.2.2 Copan Lake

4.2.2.1 Terrestrial

Copan Lake is located on Little Caney River in Washington County, Oklahoma, in the Claremore Cuesta Plains subdivision of the interior low lands physiographic province. Washington County lies on the western flank of the Ozark Plateau, a mountain range prominent in northern Arkansas, southern Missouri, and extending into northeastern Oklahoma. From the western boundary of the Ozark Plateau (which coincides with the position of the Neosho River in Oklahoma), Pennsylvanian rocks dip gently westward, thickening from a feather edge along the Neosho River to about 2,000 feet in Washington County. These beds are predominantly shale interspersed at comparatively large intervals with thin, hard, more resistant beds of sandstone and limestone. Erosion has produced a topography characterized by low east-facing escarpments separated by broad valleys, gently rolling hills, and isolated buttes. Major drainage is by the Caney River which flows in a south to southeast direction across the county. All of the larger tributaries except one enter the river from the east and follow a south to southwest course across dip slopes developed on the harder layers of rock.

Of the 21,305-acre watershed for Copan Lake, approximately 6,750 acres are cultivated, 2,300 acres are improved pasture, 3,200 acres are open pasture, 2,750 acres are upland woodland, 6,200 acres are bottomland woods, and 105 acres are commercial and home sites. The area's flora represent a transition zone of the oak-hickory forest, cross timbers forest, bluestem prairie, and bottomland communities.

The oak-hickory forest is characterized primarily by sandy soils and sandstone capped hills whose tops and upper slopes are forested with post oak (*Quercus stellata*), blackjack oak (*Quercus marilandica*), black oak (*Quercus velutina*), chinquapin oak (*Quercus prinoides),* burr oak (*Quercus macrocarpa),* bitternut hickory (*Carya cordiformis),* shagbark hickory (*Carya ovata),* American elm (*Ulmus americana*), slippery elm (*Ulmus rubra*), and hackberry (*Celtis occidentalis*).

The cross timber forests exist in continuous to scattered stands on sandstone throughout the area. The forests are situated over low, rolling uplands and prairie hilltops. In such areas, post oak, blackjack oak, and others grow on rocky land where water is received from sandstone surfaces and where snow lodges

during the winter. These trees are situated well above the water table and withstand varying degrees of drought. In the understory of the upland woods, shrubs such as coral berry (*Symphoricarpos orbiculatus*), dwarf sumac (*Rhus coppallina*), smooth sumac, (*Rhus glabra),* blackberry (*Rhus allegheniensis)*, black raspberry (*Rhus occidentalis*), and dewberry (*Rhus flagellaris*) grow beneath the trees along the margins of the woods.

The bottomland forests around Copan Lake are composed of a variety of large mature trees, including pecan (*Carya illinoensis*), black walnut (*Juglans nigra*), hackberry, American elm, red oak (*Quercus rubra*), and black oak.

Characteristic native species of the prairie/pasture areas include little bluestem (*Schizachyrium scoparium*), big bluestem (*Andropogon gerardi)*, indiangrass (*Sorghastrum nutans*), and switchgrass (*Panicum virgatum),* along with more palatable herbaceous plants on the ungrazed or very lightly grazed areas. Other species characteristic of disturbed areas are sideoats grama (*Boteloua curtipendula*), fall panicum (*Panicum dichotomiflorum*), plains lovegrass (*Eragrostis intermedia*), chess (*Bromus scalinus*), Japanese chess (*Bromus japonicus*), flowering spurge (*Euphorbia corollata*), woolly verbena (*Verbena stricta*), tall goldenrod (*Solidago altissima*), blue sage (*Salvia azurea*), wild petunia (*Ruellia humilis*), lace grass (*Eragrostis capillaris*), stink grass (*Eragrostis cilianensis*), and windmill grass (*Chloris verticillata*).

4.2.2.2 Soils and Prime Farmland

According to a soil survey conducted in 1968, prior to the construction of Copan Lake, soils in the vicinity of Copan Lake are of the Dennis-Okemah-Parsons, Collinsville-Talihina-Bates, and Osage-Verdigris associations (USDA 1968). Soils of the Dennis-Okemah-Parsons association are nearly level and gently sloping, deep soils found on prairie uplands. Soils of the Collinsville-Talihina-Bates association are gently sloping to hilly, very shallow to deep soils also found on prairie uplands. Soils in the Osage-Verdigris association are nearly level, deep soils found in bottomlands (USDA 1968).

Soil type data for Washington County was recently updated by the U.S. Department of Agriculture, NRCS (NRCS 2004). Table 6 summarizes the properties of the approximately 15 soil types found in the vicinity of Copan Lake.

Table 6. Soil Associations in the Vicinity of Copan Lake

Soil Type	Description
Darnell stony sandy loam, 5 to 30 percent slopes	Darnell stony sandy loam soils are very shallow and shallow, gently sloping to steep soils on uplands. These soils developed in material weathered from coarse-grained sandstone, under a cover of tall native grasses. The surface layer is grayish brown, stony sandy loam about 5 inches thick. The subsurface layer is light yellowish brown fine sandy loam about 4 to 14 inches thick. Darnell soils are somewhat excessively drained and have moderately rapid permeability. Available water capacity is medium.
Dennis silt loam, 1 to 3 percent	Dennis silt loam soils are deep, very gently sloping to gently sloping soils on uplands. These soils developed under tall prairie grasses, largely from calcareous silty or sandy shale. Typically, the surface layer is dark grayish brown silt loam about 10 inches thick. The subsoil is approximately 42 inches thick The upper part is a dark grayish brown light clay loam about 5 inches thick. The lower part of the subsoil is a yellowish brown clay loam and heavy clay loam about 37 inches thick. Dennis soils are well-drained and have slow permeability. Available water capacity is low.

Table 6. Soil Associations in the Vicinity of Copan Lake (continued)

Soil Type	Description
Dennis silt loam, 3 to 5 percent	Dennis silt loam soils are deep, very gently sloping to gently sloping soils on uplands. These soils developed under tall prairie grasses, largely from calcareous silty or sandy shale. Typically, the surface layer is dark grayish brown silt loam about 10 inches thick. The subsoil is approximately 42 inches thick The upper part is a dark grayish brown light clay loam about 5 inches thick. The lower part of the subsoil is a yellowish brown clay loam and heavy clay loam about 37 inches thick. Dennis soils are well-drained and have slow permeability. Available water capacity is low.
Dennis silt loam, 3 to 5 percent slopes, eroded	This soil has a similar profile and characteristics of the Dennis silt loam soils, however, erosion has removed between 25 and 75 percent of the surface layer, and the surface layer is now about 6 inches thick. The subsoil is exposed in many rills, small gullies, and thin spots.
Eram clay loam, 3 to 5 percent slopes	Eram clay loam soils are moderately deep, gently sloping to moderately steep soils on uplands. These soils developed under tall prairie grasses, in material weathered from noncalcareous shale. In a representative profile, the surface layer is grayish brown clay loam about 9 inches deep. The subsoil is a grayish brown clay mottled with yellowish brown and pale brown about 13 inches thick. Eram clay loam soils with 3 to 5 percent slopes have thinner soil layers than the representative profile, and 1 to 5 percent of the surface is covered with stones and cobbles. Eram soils are well-drained and have slow permeability. Available water capacity is low.
Osage Clay	Osage clays are deep, dark-colored, clayey, nearly level soils on bottom lands. In a representative profile, the surface layer is slightly acidic clay about 22 inches thick. The subsoil is dark-gray, neutral clay mottled with strong brown about 28 inches thick. Osage clays are somewhat poorly drained and have slow permeability.
Okemah silt loam, 0 to 1 percent slopes	Okemah silt loam soils are deep, nearly level and very gently sloping soils on uplands. They developed in material weathered from noncalcareous shale, under a cover of tall prairie grasses. In a representative profile, the surface layer is about 16 inches thick. The upper 12 inches is dark gray silt loam, and the remaining 4 inches is gray heavy silt loam. The subsoil is approximately 44 inches thick. The upper part is dark, grayish brown silty clay loam with a few yellowish brown mottles. The lower part of the subsoil is grayish brown to light yellowish brown silty clay with dark grayish brown mottles. Okemah soils are moderately well-drained and have slow permeability. Available water capacity is low.
Parsons silt loam, 0 to 1 percent slopes	Parsons silt loam soils are deep, nearly level soils on uplands. These soils developed in material weathered from shale, under tall prairie grasses. In a representative profile, the surface layer is about 11 inches thick. The upper 9 inches of the surface layer is grayish brown silt loam, while the remaining surface layer is light brownish gray silt loam. The subsoil is about 39 inches thick. The top 13 inches are grayish brown clay and the next 14 inches are brown clay. The last 12 inches of the subsoil are mottled brown, yellowish brown, and gray clay. Parsons soils are somewhat poorly drained and have very slow permeability. Available water capacity is low.
Verdigris silt loam	Verdigris silt loam soils consist of deep, nearly level soils on floodplains. These soils developed in recent alluvium washed mainly from prairie soils. In a representative profile, the surface layer is dark grayish brown silt loam that is about 22 inches thick. The subsoil is 38 inches or more of dark grayish brown and grayish brown silt loam with a few yellowish brown mottles. Verdigris soils are moderately well-drained and have moderately slow permeability. Available water capacity is low.
Verdigris clay loam	These soils are similar to the Verdigris silt loam with the exception that the 22-inch surface layer is clay loam and the subsoil is 50 inches or more of clay loam.
Verdigris soils, broken	These soils are similar to the Verdigris silt loam. However, they occur only as narrow areas along major streams in Washington County and are frequently flooded.

Table 6. Soil Associations in the Vicinity of Copan Lake (continued)

Soil Type	Description
Bates-Collinsville complex, 2 to 6 percent slopes	This complex is made up of 70 to 80 percent Bates fine sandy loam, 15 to 25 percent of Collinsville sandy loam, and 5 percent Dennis silt loam. • Bates fine sandy loam soils are moderately deep and deep, gently sloping soils found on uplands. These soils developed in material weathered from noncalcareous sandstone under tall prairie grasses. The surface layer is dark grayish brown fine sandy loam about 12 inches thick. The subsoil is about 22 inches thick and the upper part is brown sandy clay loam. The lower part of the subsoil is yellowish brown to light yellowish brown and yellow mottles. Bates soils are well-drained and have moderate permeability. Available water capacity is low. • Collinsville soils are very shallow and shallow, gently sloping to moderately steep soils on uplands. These soils formed in material weathered from noncalcareous sandstone. The surface layer is dark grayish brown light loam about 6 inches deep. Below this is about 4 inches of brown sandy loam over sandstone. Collinsville soils are well-drained and somewhat excessively drained and have moderately rapid permeability. Available water capacity is low. • Please see previous entry for Dennis silt loam for a description of this soil type.
Breaks-Alluvial Land complex	This complex is found on the floors and sides of small valleys, along the upper reaches of intermittent streams, and is frequently flooded. The soils on the valley sides are grayish brown, dark brown, and reddish brown and have a loamy surface layer and a loamy to clayey subsoil. Soils on the valley floors are brown to grayish brown and loamy. Drainage is somewhat poor to somewhat excessive.
Collinsville-Talihina complex, 5 to 20 percent slopes	This complex is made up of 50 to 70 percent Collinsville soils, 20 to 30 percent of Talihina soils, and 5 to 10 percent Bates soils. • Please see the entry for the Bates-Collinsville complex for a description of Collinsville soils. • Talihina soils are very shallow and shallow, gently sloping to moderately steep soils found on uplands. These soils developed in material weathered from noncalacareous olive and gray shale, under a cover of tall grasses. In a representative profile, the surface layer is brown clay loam about 6 inches thick. The next layer is about 4 inches thick and about 50 percent consists of fragments of weathered shale. The soil in this layer is a light olive brown, light clay. Talihina soils are somewhat excessively drained and have slow permeability. Available water capacity is low. • Please see the entry for the Bates-Collinsville complex for a description of Bates soils.
Dwight-Parsons silt loam, 0 to 1 percent slopes	This complex consists of 50 to 70 percent Dwight silt loam, 20 to 40 percent Parsons silt loam, and 5 to 10 percent Okemah silt loam. • Dwight silt loam soils are deep, nearly level soils found on uplands. These soils developed under mixed prairie grasses in material weathered from shaley clay. The surface layer is gray silt loam about 5 inches thick. There is a claypan subsoil about 45 inches thick. The upper part is very dark grayish brown clay, while the lower part is dark grayish brown massive clay mottled with yellowish brown. Dwight soils are somewhat poorly drained and have very slow permeability. Available water capacity is low. • Please see the previous entry for Parsons silt loam for a description of this soil type. • Please see the previous entry for Okemah silt loam for a description of this soil type.

Sources: USDA 1968; NRCS 2004

Soils in the vicinity of Copan Lake that are classified as prime farmland include the following (NRCS 2004):

- Bates fine sandy loam, 3 to 5 percent slopes
- Dennis silt loam, 1 to 3 percent slopes
- Dennis silt loam, 3 to 5 percent slopes
- Eram clay loam, 3 to 5 percent slopes
- Okemah silt loam, 0 to 1 percent slopes
- Osage Clay (only considered prime farmland if drained)
- Parsons silt loam, 0 to 1 percent slopes (only considered prime farmland if drained)
- Verdigris clay loam
- Verdigris silt loam

4.2.2.3 Hydrology

Copan Lake is on the Little Caney River. The Little Caney River discharges into the Caney River downstream of Hulah Lake but upstream of the City of Bartlesville. The drainage area above Copan Dam is approximately 505 square miles. The gradient of the river and its tributaries range from approximately 2 feet per mile to approximately 150 feet per mile. The Little Caney River consists of one main channel and several major left bank tributaries. The drainage basin above Copan Lake contributes very little sediment because of good ground cover and a clay type soil. In addition, the sediment inflow is further reduced by the 38 NRCS dams upstream (USACE 1983).

At normal pool, Copan Lake covers approximately 4,449 acres, which increases to approximately 13,380 acres at the top of the flood pool (USACE 2002).

The capacity of the Little Caney River channel below Copan Dam is approximately 3,000 cfs. Because the dam is near the confluence with the Caney River, backwater from large releases from Hulah Dam could reduce the channel capacity of the Little Caney River. As previously discussed, the channel capacity on the Caney River at Bartlesville, below the confluence with the Little Caney River, is approximately 12,600 cfs.

Discharges from Copan Lake are primarily for flood control in the Little Caney River and in conjunction with Hulah Lake for the Caney River. In addition, discharges also occur for water quality and water supply. As previously discussed, flood discharges are regulated in conjunction with Hulah Lake to maintain a balanced amount of flood control storage in each lake while ensuring that the capacity of the river channel at Bartlesville is not exceeded.

Copan Lake has water supply storage of 7,500 acre-feet with a dependable yield of 3 mgd (based on a 1973 survey by the USACE). The water in the Little Caney River is considered of excellent quality and requires minimal treatment to be suitable for municipal and industrial uses. In addition to the 3 mgd for water supply, the remaining conservation storage of 26,100 acre-feet supplies a maximum dependable yield of 16 mgd toward meeting the water quality needs of the area (based on a 1982 survey by the USACE). Required releases water quality from Copan Lake, as shown in Table 5, are much less than the maximum dependable yield of 16 mgd.

The USFWS has not mapped wetlands in Washington County, Oklahoma, as part of the National Wetlands Inventory as of September 2005. Correspondence with the USACE Regulatory Branch has indicated that a Section 404 Permit under the Clean Water Act would not be required (Appendix D).

4.2.2.4 Wild and Scenic Rivers

The Little Caney River and its tributaries are not classified as wild and scenic pursuant to the federal Wild and Scenic Rivers Act, Public Law 90-542.

4.2.2.5 Fish and Wildlife

The aquatic, wetland, and upland habitats at Copan Lake support a diversity of fish and wildlife. The ODWC has the responsibility to manage, regulate, and control fish and wildlife resources for Copan Lake. As the result of cooperative arrangements between the ODWC and the Tulsa District, several tracts (totaling 1,195 acres) adjacent to Copan Lake have been made available to Oklahoma sportsmen for restricted hunting (USACE 2005b). The following four subsections provide a brief overview of fish and wildlife species that could occur at Copan Lake.

Fish

The affected environment for fish at Copan Lake is essentially the same as that described under Section 4.2.1.5 for Hulah Lake.

Amphibians and Reptiles

The affected environment for amphibians and reptiles at Copan Lake is essentially the same as that described under Section 4.2.1.5 for Hulah Lake.

Birds

The affected environment for birds at Copan Lake is essentially the same as that described under Section 4.2.1.5 for Hulah Lake.

Mammals

The affected environment for mammals at Copan Lake is essentially the same as that described under Section 4.2.1.5 for Hulah Lake.

4.2.2.6 Threatened and Endangered Species

The USFWS has not performed an actual field survey of the proposed site due to time and personnel constraints. However, the USFWS has listed three species with the potential to occur in the project area for the water reallocation at Copan Lake (see Appendix E).

The bald eagle (*Haliaeetus leucocephalus*), whooping crane (*Grus americana*), and American burying beetle (*Nicrophorus americanus*) are federally listed species that are known to occur in Washington County. The bald eagle (*Haliaeetus leucocephalus*) is an endangered and threatened species that is known to occur in the project area. Bald eagles are common winter residents along the shores of Copan Lake and are also known to nest in this area. They use tall trees near water for foraging, roosting, and nesting, and are also known to nest in cliffs. Whooping cranes, which are considered rare spring and fall migrants in this area, use emergent vegetation along the edges of marshes, prairie pothole wetlands, or

lakes for resting sites; croplands for foraging; and riverine wetlands for roosting. The American burying beetle is known to occur in several counties along or near Copan Lake. In Oklahoma, it has been found in habitats ranging from deciduous and coniferous forests to open pasture. Surveys for the American burying beetle have not been conducted on Copan Lake. Since it is known to occur in the vicinity of the lake, and because it is a highly mobile species, it could occur in suitable habitat at Copan Lake. The Neosho mucket (*Lampsilis rafinesqueana*) is a federal candidate species that has been recorded in Washington County (ODWC 2004).

4.3 Cultural Resources

In accordance with Section 106 of the National Historic Preservation Act of 1966 (as amended), the appropriate agencies and Native American tribes were contacted via written correspondence (dated September 23, 2005) to discuss potential impacts on cultural resources. The Tulsa District mailed letters to the Oklahoma Historical Society State Historic Preservation Office and the Oklahoma Archeological Survey, as well as the Osage Nation of Oklahoma, Wichita and Affiliated Tribes of Oklahoma, and the Cherokee Nation of Oklahoma (Appendix F). In these letters, the Tulsa District established the position that there would be "no effect" on cultural resources as a result of the Hulah and Copan lakes water reallocation project.

The Oklahoma Historical Society responded (October 13, 2005) with a determination of "no historic properties affected." The Oklahoma Archeological Society responded (September 27, 2005) with no objection to the proposed plan. Agency responses are included in Appendix F. None of the tribes contacted have provided comments on the project. Section 106 coordination is therefore complete for this project.

4.4 Air Quality

USEPA published the Conformity Rule on November 30, 1993, requiring all federal actions to conform to appropriate State Implementation Plans that were established to improve ambient air quality. National Ambient Air Quality Standards exist for six pollutants: carbon monoxide, ozone, particulate matter smaller than 10 microns, sulfur dioxide, nitrogen oxides, and lead. These "criteria pollutants" are the only ones for which standards have been established. USEPA assigns designations, based on an area's meeting or "attaining" these standards. At this time, the Conformity Rule only applies to federal actions in nonattainment areas. A nonattainment area is an area that does not meet one or more of the National Ambient Air Quality Standards for the criteria pollutants designated in the Clean Air Act.

The project area is within the Oklahoma counties of Washington and Osage. According to maps in USEPA's "Green Book" (for criteria pollutant nonattainment areas), all counties within Oklahoma have been designated as attainment areas for criteria pollutants and air toxins (USEPA 2004). Since the geographical region potentially affected by the Hulah and Copan lakes water reallocation project is in attainment and meets the National Ambient Air Quality Standards for the criteria pollutants designated in the Clean Air Act, a conformity determination is not required.

4.5 Hazardous, Toxic, and Radiological Wastes

Potential pollution sources in the vicinity of Hulah and Copan lakes include agricultural practices, sewage disposal/treatment systems (septic tanks and other subsurface disposal systems, as well as municipal sewage treatment plants), private cabins and concession operations, boats, sanitary landfills, open dumps, water treatment plants, animal production facilities, and oil production facilities.

Concentrations of chlorides, sulfates, and the major cations are low in Hulah Lake. The pesticides chlordane and DDE (dichlorodiphenyldichloroethylene) have been identified in the water and fish tissue, but concentrations were below 1988 USEPA and State of Oklahoma alert levels. Toxic metals have not been detected. Iron and manganese occasionally exceed USEPA criteria for raw water sources but these metals are generally associated with the suspended solids and can be removed by conventional water treatment processes (USACE 1999).

A study conducted prior to Copan Lake becoming operational in 1983 determined that Copan Lake could have high values of calcium carbonate, chloride, iron, and manganese from the local soils. Nutrients such as phosphates and nitrogen could support algae blooms. Historical data revealed that some water quality criteria might be exceeded; however, with the exception of iron and manganese, all parameters would be below established criteria (USACE 1983).

4.6 Noise

Noise quality and natural sound exist in the absence of human-caused sound. The natural ambient sound is the aggregate of all the natural sounds that occur in area, together with the physical capacity for transmitting natural sounds. The frequencies, magnitudes, and duration of human-caused noise considered acceptable varies, being generally greater in developed areas and less in undeveloped areas. Noise sources at Hulah and Copan lakes are primarily affiliated with recreation activities and include motor boats, motor vehicles, hunting, and people at the marinas, campgrounds, and other recreational facilities surrounding the lakes.

4.7 Land and Recreational Use

Hulah Lake

Hulah Lake was constructed for flood control, water supply and recreation. Primary land use around Hulah Lake is for farming and ranching. Recreational opportunities include fishing and hunting. The principal species of fish in the lake include largemouth bass, white bass, crappie, channel catfish, flathead catfish, and bullhead catfish. Approximately 8,900 acres of project lands have been made available to the ODWC for wildlife management purposes. Two thousand acres of this have been set aside as a state waterfowl refuge; the remainder is managed for upland game and whitetail deer and is open to the public as a hunting area. Game species prevalent are deer (abundant), mourning dove (good), waterfowl (good), prairie chicken (low), wild turkey (fair), cottontail rabbit (good), and squirrel (good). Camping and picnicking facilities are also available at Hulah Lake and include boat launching ramps, camping and picnicking sites, beaches, and sanitary facilities in the developed park areas around the lake. Overnight accommodations, services, and supplies are also available on the lake.

Copan Lake

Copan Lake was constructed for flood control, water supply, and recreation. Primary land use around Copan Lake is for farming and ranching. Recreational opportunities include fishing and hunting. The principal species of fish in the lake include largemouth bass, white crappie, channel and flathead catfish, and various species of sunfish. The lake has also received an experimental stocking of the hybrid cross between the white bass and the striped bass, more commonly called the “Wiper.” Approximately 1,200 acres of land managed by the ODWC or Tulsa District are open for hunting. There are also day use areas beach areas, picnic sites, camping, and boat launching ramps.

5. Environmental Impacts of the Proposed Action

A summary of environmental impacts is presented in Table 7.

Table 7. Impact Assessment Matrix

Name of Parameter	Magnitude of Probable Impact						
	Increasing Beneficial Impact			No Appreciable Effect	Increasing Adverse Impact		
	Significant	Substantial	Minor		Minor	Substantial	Significant
A. Social Effects							
1. Noise Levels				X			
2. Aesthetic Values				X			
3. Recreational Opportunities				X			
5. Public Health and Safety				X			
6. Community Cohesion (Sense of Unity)				X			
7. Community Growth and Development			X				
8. Business and Home Relocations			X				
9. Existing/Potential Land Use				X			
10. Controversy				X			
B. Economic Effects							
1. Property Values				X			
2. Tax Revenues				X			
3. Public Facilities and Services			X				
4. Regional Growth			X				
5. Employment			X				
6. Business Activity			X				
7. Farmland/Food Supply				X			
8. Flooding Effects				X			

Table 7. Impact Assessment Matrix (continued)

Name of Parameter	Magnitude of Probable Impact						
	Increasing Beneficial Impact			No Appreciable Effect	Increasing Adverse Impact		
	Significant	Substantial	Minor		Minor	Substantial	Significant
C. Natural Resource Effects							
1. Air Quality				X			
2. Terrestrial Habitat				X			
3. Wetlands				X			
4. Aquatic Habitat					X		
5. Habitat Diversity and Interspersion				X			
6. Biological Productivity					X		
7. Surface Water Quality				X			
8. Water Supply		X					
9. Groundwater				X			
10. Soils				X			
11. Threatened and Endangered Species				X			
12. Hazardous, Toxic, Radioactive Materials				X			
D. Cultural Resources							
1. Historic Architectural Values				X			
2. Pre-Historic and Historic Archeological Values				X			

5.1 Socioeconomics

5.1.1 No Action Alternative

Under the No Action Alternative, water reallocation in Hulah Lake and Copan Lake would not occur. With no action, existing water supply sources for the City of Bartlesville would be insufficient for meeting projected 2035 needs. The existing water supply yield for Hulah Lake is currently 9.9 mgd; however, the dependable yield for year 2035 is 6.58 mgd due to sedimentation. The city's future demand of approximately 12 mgd would not be met by Hulah Lake's insufficient yield of roughly 6.6 mgd. If allowed to remain status quo, an insufficient yield of water would have indirect adverse impacts on the socioeconomic characteristics in the project area. Because the demand for water would remain the same, but with a smaller supply, it is not unreasonable to expect that the cost for water would rise in the social area. Following the rise in cost, industries and consumers could take one or more options. Industries could reduce their capacity of manufacturing (i.e., supplying their product), which would result in the loss of employment, or they could implement water conservation practices and technologies in order to sustain their productivity. Consumers could also implement water conserving practices and technologies in their homes.

5.1.1.1 Population

Under the No Action Alternative, there would be long-term minor indirect adverse impacts on the population of the City of Bartlesville and surrounding area. Population trends of the past decade would continue. Population dynamics are influenced by economic and recreational opportunities in the counties of Osage and Washington, and the City of Bartlesville. However, economic opportunities (e.g., employment) would be hampered by the limited supply of water available to promote business growth in the social area which could result in stagnant to decreased population levels.

5.1.1.2 Employment and Income

Under the No Action Alternative, there would long-term minor direct adverse impacts on the employment capabilities of Osage and Washington counties and the City of Bartlesville. Historically bodies of water have been a center for commerce and communities. If conditions were allowed to persist, the available dependable yield would be nearly half (6.58 mgd) of the anticipated demand by 2035. This would likely result in the displacement of jobs, especially in the manufacturing and retail industries and agriculture, which normally have large demands for water. This, of course, is dependent on whether water conservation practices and technologies were put in place. Conversely, employment levels could remain the same but employment growth could be encumbered by limited water supply. Under the No Action Alternative, there would be long-term minor indirect adverse impacts on the income level of the counties and city. The income of the area would decrease as the number of employment opportunities decreased. Impacts on median household income could sharply decline if one or more household providers become unemployed.

5.1.1.3 Environmental Justice

Although the social area has a population with a very high percentage of Native Americans, it is not expected that they would bear any disproportionate impacts. Minority populations would share adverse impacts equally with the rest of the social area.

5.1.1.4 Social Ecology

Under the No Action Alternative, there would both long- and short-term direct and indirect adverse impacts on the social ecology in Osage and Washington counties and the City of Bartlesville. All areas of lifestyle would be disadvantaged. Manufacturing, commercial, industrial, and agriculture trades and industries that make up the area would be largely impacted, thereby damaging the population, employment, and income growth and sustainability of the area. The result would be a less diverse social ecology, as employment opportunities ceased or became fewer. On the other hand, industries and other consumers could invest in water-conserving technologies and implement practices to save water. This could be beneficial to companies supplying water conservation equipment.

5.1.2 Proposed Action

Under the Proposed Action, the future dependable water supply of at least 12 mgd would be secured and the water demands of Osage and Washington counties and the City of Bartlesville would be met through 2035.

5.1.2.1 Population

The Proposed Action would have a long-term minor indirect beneficial impact on the population of the social area. Population trends would continue as is, resulting in an added demand for water. Although it would not have an impact on overall population growth trends in Oklahoma, this water supply would ensure that the water would be available for new industrial, agricultural, and municipal users in this area. This could promote growth of business-related opportunities or residential development in the social area, which could cause small, local changes in population.

5.1.2.2 Employment and Income

The Proposed Action would have long-term minor direct beneficial impacts on the employment of the social area. Current employment trades and industries could continue to operate nominally or would have the availability for expansion as there would not be a limited supply of water. The growth in employment would perpetuate population and income growth and sustainability through at least 2035. The educational, health and social services, manufacturing, and retail trade sectors are expected to continue being an important part of the economy in this area. Under the Proposed Action, there would be long-term minor beneficial impacts on the income in the employment area. There would not likely be a surge in income level; however, per capita and median household incomes would be sustained through the employment opportunities present in the social area.

5.1.2.3 Environmental Justice

The Proposed Action would have no disproportional impacts on minority or low-income populations in the social area. These populations would continue to share the same privileges and opportunities as others.

5.1.2.4 Social Ecology

The Proposed Action would have no impacts on the area's social ecology. The Proposed Action would allow for the continued way of life of the social area, including agriculture and manufacturing (a large employer). The reallocation of water would reinforce the social ecology of this area as primarily a mix of residential, agricultural, and business.

5.2 Natural Resources

5.2.1 No Action Alternative

Under the No Action Alternative, conditions at Hulah Lake and Copan Lake would remain status quo. There would be no impacts on natural resources.

5.2.2 Proposed Action

5.2.2.1 Terrestrial

The Proposed Action would have no impact on terrestrial resources. Construction and earth-moving activities would not be associated with the water reallocation project at Hulah Lake and Copan Lake. Reductions in elevation duration, elevation frequency, discharge duration, and discharge frequency would not be expected to have effects on terrestrial resources such as upland plant communities. Because the Proposed Action does not involve raising lake levels, additional flooding or backwater effects would not occur on terrestrial resources upstream of Hulah Lake or Copan Lake.

5.2.2.2 Soils and Prime Farmland

The Proposed Action would have no impact on soils or prime farmland. Although soils classified as prime farmland do exist in the project area, there would be no effects from the water reallocation at Hulah and Copan Lakes. None of these soils would be converted to different uses (i.e., taken out of agricultural production), nor would they be affected by the reductions in elevation duration, elevation frequency, discharge duration, or discharge frequency.

5.2.2.3 Hydrology

Reallocation of the available water quality storage in Hulah and Copan lakes would result in no changes to the flood control pool at either lake, and no changes to the flood control protection for the downstream reaches including the City of Bartlesville. As shown in the SUPER model analysis (see Appendix B), the elevation duration, elevation frequency, discharge duration, and discharge frequency at Hulah and Copan lakes experience negligible change as a result of the implementation of the Proposed Action. The proposed action will require reallocating 2,122 ac-ft from water quality storage at Hulah Lake, and 11,790 ac-ft from water quality storage to water supply storage at Copan Lake. Tables 8 and 9 provide the pertinent data with and without the water supply reallocation.

The SUPER model calculated information for both reservoirs under the No Action Alternative and the Proposed Action using the data available (1940 to 2000). The elevation frequency, or the percent of years in which a given lake elevation is equaled or exceeded, would not change perceptibly for either lake with implementation of the Proposed Action (see Figures 1 and 3 in Appendix B). The SUPER model also indicated that the elevation duration, or the percent of time for which a given lake elevation is exceeded, would not change when lake elevations are approximately 733 feet above MSL or higher for Hulah Lake (see Figure 2 in Appendix B) or approximately 710 feet above MSL or higher for Copan Lake (see Figure 4 in Appendix B). Elevation duration would decrease by approximately 2 to 5 percent under the Proposed Action. For example, under current conditions, elevations of approximately 707 feet at Copan Lake are exceeded approximately 95 percent of the time; under the Proposed Action, this elevation would be exceeded approximately 90 percent of the time.

Table 8. Hulah Lake Pertinent Data

Feature	Seasonal Pool (ft)	1973 Survey (ac-ft)	Yield based on usable storage (mgd)	2002 Survey (ac-ft)	Yield based on 2035 storage (mgd)	2035 Conditions (ac-ft)	Yield based on 2035 storage (mgd)	2002 Survey– After Water Supply Reallocation (ac-ft)	Yield based on 2035 storage (mgd)
Top of Dam	779.5	--	--	--	--	--	--	--	--
Top of Flood Control Pool	765.0	289,000	--	289,000	--	--	--	--	--
Flood Control Storage	733.0 to 765.0	257,900	--	257,900	--	--	--	--	--
Spillway Crest	740.0	61,400	--	61,400	--	--	--	--	--
Top of Conservation Pool	733.0	31,160	--	22,565	--	13,074	--	--	--
Active Conservation Storage	710.0 to 733.0	31,100	--	22,553	--	13,074	--	--	--
Water Supply	--	19,800	12.4	16,600	6.4 [a]	9,622	6.4	18,722 [b]	7.23
Water Quality	--	7,100	4.5	5,953	2.3	3,452	2.3	3831 [b]	1.48
Sediment Storage	--	4,200	--	0	--	0	--	--	--
Inactive Storage	710.0	0	--	12	--	0	--	--	--

Notes:

[a] Hulah Lake will currently yield 9.9 mgd.

[b] Water Supply Reallocation of 2,122 ac-ft based on 2002 data.

Table 9. Copan Lake Pertinent Data

Feature	Seasonal Pool (ft)	1983 Survey (ac-ft)	Yield based on usable storage (mgd)	2002 Survey (ac-ft)	Yield based on 2035 storage (mgd)	2035 Conditions (ac-ft)	Yield based on 2035 storage (mgd)	2002 Survey– After Water Supply Reallocation (ac-ft)	Yield based on 2035 storage (mgd)
Top of Dam	745.0	--	--	--	--	--	--	--	--
Top of Flood Control Pool	732.0	227,700	--	227,700	--	--	--	--	--
Flood Control Storage	710.0 to 732.0	184,300	--	184,300	--	--	--	--	--
Top of Conservation Pool	710.0	43,400	--	34,634	--	30,060	--		--
Active Conservation Storage	687.5 to 710.0	42800	--	33,887	--	29,369	--	--	--
Water Supply	--	7,500	3.0	7,500	2.9 [a]	6555	2.9	19,290 [b]	7.48
Water Quality	--	26,100	16.0	26,100	10.1	22814	10.1	14,310 [b]	5.55
Sediment Storage	--	9,200	--	287	--	0	--	--	--
Inactive Storage	687.5	600	--	747	--	0	--	--	--

Notes

[a] Copan Lake will currently yield 3.3 mgd.

[b] Water Supply Reallocation of 11,790 ac-ft based on 2002 data.

Based on the results of the modeling discharge frequency, or the percent of years in which a given discharge would be equaled or exceeded, reservoir outflows would not change perceptibly for either lake (see Figures 5 and 7 in Appendix B). The model results also show that discharge duration, or the percent of time for which a given discharge would be equaled or exceeded, would also be only slightly reduced. This change would be the most pronounced, but still only slightly reduced for lower flow discharges between approximately 10 and 150 cfs for both reservoirs. For example, under current conditions, discharges of 60 cfs at Copan Lake are equaled or exceeded approximately 34 percent of the time. Under the Proposed Action, these discharges would be equaled or exceeded approximately 31 percent of the time. In addition, modeling of discharge duration and frequency at Bartlesville and Ramona, on the Caney River downstream of both lakes, indicate that the effects of the Proposed Action are reduced the further one travels below the lake (see Figures 9 through 12 in Appendix B).

The slight reduction in elevation duration and frequency at Hulah and Copan lakes is not expected to affect aquatic or wetland habitat adversely. Although lake levels might be reduced slightly, this could result in the creation of wetlands in areas that were previously flooded. Backwater effects (e.g., flooding) on aquatic and wetland habitat at and upstream of the lake are not anticipated.

The reduction in discharge duration and frequency would have negligible effects on aquatic and wetland habitat downstream of both lakes since such reductions are negligible. The model results for Bartlesville and Ramona indicate the effects would be reduced as one travels further downstream from the lake. Additionally, regulation of water quality on the Caney and Little Caney rivers is an authorized project purpose for both lakes. Low-flow releases, as outlined in Table 5, generally ensure the water quality of both rivers downstream of the lakes. Finally, during drought conditions, drought contingency plans would be implemented (see Section 6, Mitigation Plan) to ensure that adequate water is available for conservation purposes.

Because the Proposed Action does not involve raising lake levels, additional flooding or backwater effects would not occur on aquatic and wetland habitat upstream of Hulah Lake or Copan Lake. No wetland or water quality permits under the Clean Water Act would be required for implementation of the Proposed Action (see Appendix D).

5.2.2.4 Fish and Wildlife

Construction and earth-moving activities are not necessary to implement the water reallocation project at Hulah and Copan lakes; therefore, upland wildlife habitat and species would be unaffected. Reductions in elevation duration, elevation frequency, discharge duration, and discharge frequency (as discussed in Section 5.2.2.3, Hydrology) could have impacts on wildlife that use the aquatic and wetland habitat available in the lakes and Caney and Little Caney rivers. A reduction in elevation duration and frequency could result in the formation of new wetlands, which would provide important wildlife habitat in areas that were previously inundated. Although this could result in the loss of shoreline aquatic habitat for wading birds and waterfowl and amphibians, the effects would be imperceptible given the extent of this habitat at Hulah and Copan lakes. In addition, the implementation of seasonal pool plans that benefit wildlife would continue to cause periodic inundation of these areas, temporarily restoring such habitat. Therefore, the Proposed Action is not anticipated to significantly affect wildlife or their habitat at Hulah or Copan lakes.

Under the Proposed Action, slight reductions in discharge duration and frequency from Hulah or Copan lakes are not expected to significantly affect wildlife or their habitat downstream. These reductions could, at times, cause pools that provide habitat for fish along the Caney or Little Caney rivers to be shallower; however, impacts would be negligible.

Because the Proposed Action does not involve raising lake levels, additional flooding or backwater effects would not occur on aquatic and wetland habitat upstream of Hulah Lake or Copan Lake.

5.2.2.5 Threatened and Endangered Species

Overall, the Proposed Action is not likely to adversely affect any of the federally listed species that occur at Hulah or Copan lakes.

American Burying Beetle

Although the American burying beetle has the potential to occur at Hulah Lake or Copan Lake, the Proposed Action would not affect the terrestrial environment in which this species is supported (upland plant communities). Therefore, the Proposed Action is not anticipated to have significant effects on this species.

Arkansas River Shiner

Impacts on the Arkansas River shiner are not anticipated under the Proposed Action because this species is not likely to occur in the project area. In addition, changes in discharge or elevation duration and frequency at Hulah Lake are not anticipated to alter the potential habitat for this species. There would be no changes in water quality that could affect the prey base of this species under this alternative. Therefore, the Proposed Action would have no effect on the Arkansas River shiner.

Bald Eagle

Reductions in elevation duration and frequency at Hulah and Copan lakes would not result in the loss of shoreline habitat (e.g., large trees near the water) that supports bald eagles. In addition, there would be no construction-related activities that could impact bald eagles (e.g., noise from heavy-equipment or tree removal). There would be no changes in water quality that could affect the prey base of the bald eagle under this alternative. Therefore, the Proposed Action would have no effect on bald eagles at Hulah or Copan lakes.

Interior Least Tern

Reductions in discharge duration and frequency are not anticipated to affect the hydrologic conditions that could create sandbar habitats potentially used by interior least terns downstream of Hulah Lake. Because there would be no construction-related activities that could impact interior least terns (e.g., heavy equipment noise or habitat loss) and because potential changes to downstream discharges would have no impacts, the Proposed Action would have no effect on potential interior least terns downstream of Hulah Lake.

Piping Plover

Although habitat for the piping plover is supported in the Hulah Lake project area, historical records indicate that it occurs primarily as migrants in the vicinity of the lakes. Regardless, reductions in discharge duration and frequency are not anticipated to affect the hydrologic conditions that create the wetland and mudflat areas downstream of the lake that might be used by this species. Because there would be no construction-related activities that could impact piping plovers (e.g., heavy equipment noise or habitat loss), because potential changes to discharge or elevation duration and frequency would have no impact on their habitat, and because there would be no changes in water quality that could affect the prey base, the Proposed Action would have no effect on this species.

Whooping Crane

Although habitat for the whooping crane is supported in the Hulah and Copan lakes project areas, historical records indicate that it occurs primarily as migrants in the vicinity of the lakes. Regardless, reductions in discharge duration and frequency are not anticipated to affect the hydrologic conditions that create the wetland and mudflat areas downstream of the lake that might be used by this species. Reductions in elevation duration and frequency at Hulah or Copan lakes would not significantly affect the shoreline habitat that might be used by whooping cranes. In fact, a reduction in elevation duration and frequency at the lake could result in the formation of new wetlands, which could provide additional rest areas for whooping cranes. Because there would be no construction-related activities that could impact whooping cranes (e.g., heavy equipment noise or habitat loss), because potential changes to discharge or elevation duration and frequency would have no impact on their habitat, and because there would be no changes in water quality that could affect the prey base, the Proposed Action would have no effect on this species.

5.3 Cultural Resources

5.3.1 No Action Alternative

Under the No Action Alternative, conditions at Hulah Lake and Copan Lake would remain status quo. There would be no impact on cultural resources.

5.3.2 Proposed Action

The Proposed Action does not involve construction or earth-moving activities or changes in pool elevation activities. Therefore, it is expected that the Proposed Action would have no effect on cultural resources. As discussed in Section 4.3, Section 106 coordination under the National Historic Preservation Act has been initiated (Appendix F). No responses have been received to date.

5.4 Air Quality

5.4.1 No Action Alternative

Under the No Action Alternative, conditions at Hulah Lake and Copan Lake would remain status quo. There would be no impact on air quality.

5.4.2 Proposed Action

The Proposed Action would have no effect on air quality. No earth-moving, ground-disturbing, or other activities that emit air pollutants would occur.

5.5 Hazardous, Toxic, and Radiological Wastes

5.5.1 No Action Alternative

Under the No Action Alternative, conditions at Hulah Lake and Copan Lake would remain status quo. There would be no impact on hazardous, toxic, or radiological wastes.

5.5.2 Proposed Action

The Proposed Action would have no effect on hazardous, toxic, or radiological wastes. Reallocation of water supply at Hulah and Copan lakes would not change storage pool elevation levels, surface water runoff into the lakes, or disturb sediments on the lake bottoms.

5.6 Noise

5.6.1 No Action Alternative

Under the No Action Alternative, conditions at Hulah Lake and Copan Lake would remain status quo. There would be no impact on noise in the project area.

5.6.2 Proposed Action

The Proposed Action would have no effect on the noise environment. Reallocation of water supply would not result in or increase any activities that would produce noise.

5.7 Land and Recreational Use

5.7.1 No Action Alternative

Under the No Action Alternative, conditions at Hulah Lake and Copan Lake would remain status quo. There would be no impact on land and recreational use in the project area.

5.7.2 Proposed Action

The Proposed Action would have negligible effect on land use or recreational activities. Reallocation of water supply would not change storage pool elevation levels or current land use in or around the lakes. Over the long term, reallocation could allow for adequate water supply to encourage additional agricultural or industrial users, but these would most likely be closer to the City of Bartlesville.

5.8 Cumulative Impacts

No cumulative impacts are anticipated to occur as a result of the proposed project. However, if any future construction such as pipelines for water conveyance is found to be necessary, separate NEPA documents would be prepared to study the effects of the necessary construction and its impacts.

6. Mitigation Plan

Additional mitigation measures would not be necessary to implement the Proposed Action. However, existing measures are in place to reduce potentially adverse effects. Regulation of flows on the Caney and Little Caney rivers is an authorized project purpose for both lakes. During drought conditions, a Drought Contingency Plan is implemented at both lakes (USACE 1972, 1999). The Drought Contingency Plan establishes a USACE Drought Management Committee and an Interagency Drought Management Committee to conserve stored water and to identify surplus water available during drought conditions.

7. Federal, State, and Local Agency Coordination

The Draft EA will be coordinated with agencies having legislative and administrative responsibilities for environmental protection. Copies of the correspondence from those agencies that provided comments and planning assistance for preparation of the draft EA are in the appendices. Following is a list of officials from federal, state and local agencies, and tribes that were consulted as part of the EA process. The detailed mailing list, including federal, state, and local agencies; tribes; elected officials; and private citizens, is included in Appendix G.

U.S. Environmental Protection Agency
U.S. Fish and Wildlife Service
U.S. Department of Agriculture, Natural Resources Conservation Service
Oklahoma Water Resources Board
Oklahoma Department of Environmental Quality
Oklahoma Department of Wildlife Conservation
Oklahoma Historical Society State Historic Preservation Office
Oklahoma Archeological Survey
Wichita and Affiliated Tribes of Oklahoma
Cherokee Nation of Oklahoma
Osage Nation of Oklahoma
Kaw Indian Tribe of Oklahoma
Delaware Tribe of Indians, Oklahoma
Delaware Nation of Oklahoma
Bartlesville Water Utilities
Bartlesville City Manager

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9. Applicable Environmental Laws and Regulations

Table 10 contains a list of environmental laws and regulations that might apply to the Proposed Action.

Table 10. Relationship of Plans to Environmental Protection Statutes and Other Environmental Requirements

Federal Policies	Compliance
Archeological and Historic Preservation Act, 1974, as amended, 16 U.S.C. 469, et seq.	All plans in full compliance
Clean Air Act, as amended, 42 U.S.C. 7609, et seq.	All plans in full compliance
Clean Water Act, 1977, as amended, Federal Water Pollution Control Act, 33 U.S.C. 1251, et seq.	All plans in full compliance
Endangered Species Act, 1973, as amended, 16 U.S.C. 1531, et seq.	All plans in full compliance
Farmland Protection Policy Act, 7 U.S.C. 4201, et seq.	All plans in full compliance
Federal Water Project Recreation Act, as amended, 16 U.S.C. 460-1-12, et seq.	All plans in full compliance
Fish and Wildlife Coordination Act, as amended, 16 U.S.C. 661, et seq.	All plans in full compliance
Land and Water Conservation Fund Act, 1965, as amended, 16 U.S.C. 4601, et seq.	All plans in full compliance
National Environmental Policy Act, as amended, 42 U.S.C. 4321, et seq.	All plans in full compliance
National Historic Preservation Act, 1966, as amended, 16 U.S.C. 470a, et seq.	All plans in full compliance
Native American Graves Protection and Repatriation Act, 1990, 25 U.S.C. 3001–13, et seq.	All plans in full compliance
Rivers and Harbors Act, 33 U.S.C. 401, et seq.	N/A
Water Resources Development Act of 1986, Public Law 99-662	All plans in full compliance
Water Resources Planning Act, 1965	N/A
Watershed Protection and Flood Prevention Act, 16 U.S.C. 1001, et seq.	N/A
Wild and Scenic Rivers Act, as amended, 16 U.S.C. 1271, et seq.	N/A
Floodplain Management (EO 11988)	All plans in full compliance
Protection of Wetlands (EO 11990)	All plans in full compliance
Environmental Justice (EO 12898)	All plans in full compliance
Protection of Children From Environmental Health Risks and Safety Risks (EO 13045)	All plans in full compliance

Note: Full compliance means all requirements of the statutes, EOs, or other environmental requirements for the current stage of planning have been met.

10. List of Preparers

This EA has been prepared under the direction of Mr. Jerry Sturdy and Ms. Jan Hottubbee of USACE Tulsa District. Individuals from engineering-environmental Management, Inc. (e^2M) who contributed to the preparation of this document are listed below.

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