CHAPTER 3
AFFECTED ENVIRONMENT

3.1 ANALYSIS APPROACH

The National Environmental Policy Act (NEPA) and its federal regulations require focused analyses of the areas and resources potentially affected by an action or alternative. They also indicate that an environmental document should consider, but not analyze in detail, those areas or resources not potentially affected by the alternatives. Therefore, a document should not be encyclopedic; rather, it should try to be "to the point." NEPA also requires a comparative analysis that allows decisionmakers and the public to differentiate among the alternatives. Combined, the affected areas and affected resources defined through scoping and analyses comprise the affected environment for each of the alternatives.

The affected area for the proposed action is presented in Table 3.1-1. As discussed in Chapter 1, the proposed action and no-action alternative only differ in mitigation measures, not in the operation or pool levels of the Wister Lake project. The general affected areas are subdivided into the area around Wister Lake and areas adjacent to the Poteau River downstream to its confluence with the Arkansas River (Figure 3.1-1). Within the area around the lake, it was further divided into elevations based on the magnitude of the flood event and the potential loss of property. Since downstream areas flood frequently, regardless of water releases from the Wister Lake project, impacts to the 100-year floodplain will be analyzed only for those periods when the flood level at Wister Lake exceeds the height of the spillway, more than 7,200 cubic feet per second are released at the dam, or the duration of the flood event exceeds 31 days.

Table 3.1-1 Affected Areas

Proposed Action	*Flood Event*	*Reason for subdividing*
Lake		
471.6 - 478.0	low	Difference in conservation pool elevations
478.0 - 485.0	low	Recreation road flooded
485.1 - 495.8	low	Spillway road (495+)/boat docks flooded
495.9 - 502.5	moderate	Flooded to top of spillway
502.5 - 508	extreme	Over spillway
Downstream		
100-year floodplain	extreme	Consider events only when water goes over spillway or more than 7,200 cfs are released

These affected areas provide the focus for data collection and analysis. Some resources, such as socioeconomics, have a different affected area (the county) because of how economic data are collected. For other resources, such as water quality, the upstream areas greatly affect the water contents at the lake and further downstream. For this resource and hydrology, the study area is the Poteau River watershed, although the affected area is Wister Lake and downstream to the Arkansas River confluence.

Once the affected environment was defined, detailed and current data were collected by

- Reviewing previous studies, such as technical publications, agency databases, management plans, and other NEPA documents.
- Talking to agencies and others with information on specific resources, such as the Oklahoma Department of Wildlife Conservation (ODWC), U.S. Fish and Wildlife Service (USFWS), and county planners.
- Reviewing public input during the scoping process.

3.2 HYDROLOGY AND WATER QUALITY

The hydrology and water quality section of this Supplemental FES addresses the topics of flooding and inundation/pool level fluctuations, as well as low water conditions at Wister Lake. The affected environment potentially impacted by changes in hydrology and water quality is concentrated at Wister Lake and the Poteau River, downstream from the Wister Dam. However, factors such as soils composition and pollution sources, which influence the hydrology and water quality at Wister Lake, are located throughout the watershed. Therefore, the study area for some resources within this section includes the entire watershed region.

The water quality of Wister Lake and the Poteau River is regulated through the Clean Water Act. This law regulates point source pollution and discharge or disturbance to any waters of the United States. In addition, the state of Oklahoma has targeted the watershed through Section 319 of the *Oklahoma Watershed Management Plan*. This action looks at ways to improve water quality through implementing Best Management Practices and lowering the Total Maximum Daily Load (TMDL) of sediment. Baseline water quality conditions reflect current methods of ongoing recommendations of regulators to improve water quality conditions. Data used to evaluate the current conditions of Wister Lake and the Poteau River watershed are concurrent with state and federal water quality standards.

The hydrology analysis has been focused on conservation pool levels and the duration and frequency of discharges potentially occurring within the affected environment. Pool level fluctuations caused by changes in water inflow and discharge provide the basis for impact analysis for all resources around Wister Lake. Downstream duration and frequency of discharges indicate potential for downstream flooding compared with baseline conditions. The Tulsa District USACE has provided hydrological modeling of the potential water flows. Factors affecting the hydrology and water quality discussed in this section include climate and watershed characteristics, Wister Lake structure and water holding capacity, geology and soils composition, surface water and groundwater flows and sources, water use and allocation of Wister Lake and outflows at Wister Lake.

3.2.1 Setting

Wister Lake is located in the northern foothills of the Kiamichi Mountains adjacent to the Ouachita National Forest in Le Flore County in southeastern Oklahoma. The lake is located in a structural basin surrounded by Sans Bois Mountains to the north, the Jackforks to the west, the Kiamichis to the south, and the Ouachitas to the east. The dam site on the Poteau River is at river mile 61, roughly 6 miles downstream of the confluence of the Poteau River and Fourche Maline and approximately 2 miles south of the town of Wister (refer to Figure 1.1-1). The Poteau River begins in Scott County, Arkansas, and flows west to the vicinity of Wister where it forms the eastern arm of Wister Lake. The major tributaries to the Poteau River are Jones Creek, Black Fork, Fourche Maline, Caston Creek, Sugarloaf Creek, Brazil Creek, and James Fork. The Poteau River Basin, extending 85 miles from east to west and 50 miles from north to south, drains 1,888 square miles, of which 993 square miles are above Wister Dam (Figure 3.2-1). The Fourche Maline River originates in the northwest part of Latimer County, Oklahoma, and flows eastward for 37 miles where it forms the western arm of Wister Lake (refer to Figure 1.2-1). Wister Lake has a mean depth of 7.5 feet and a maximum depth of 44 feet.

Annual precipitation averages 44 inches, with about 50 percent of that amount occurring in May, June, July, and October. Average annual runoff is about 12.5 inches. Data from wind reporting stations in the vicinity of the basin indicate that 45 miles per hour is the highest wind velocity that can be reasonably expected for a duration for one hour (USACE 1983). The average annual evaporation of Wister Lake is 62 inches.

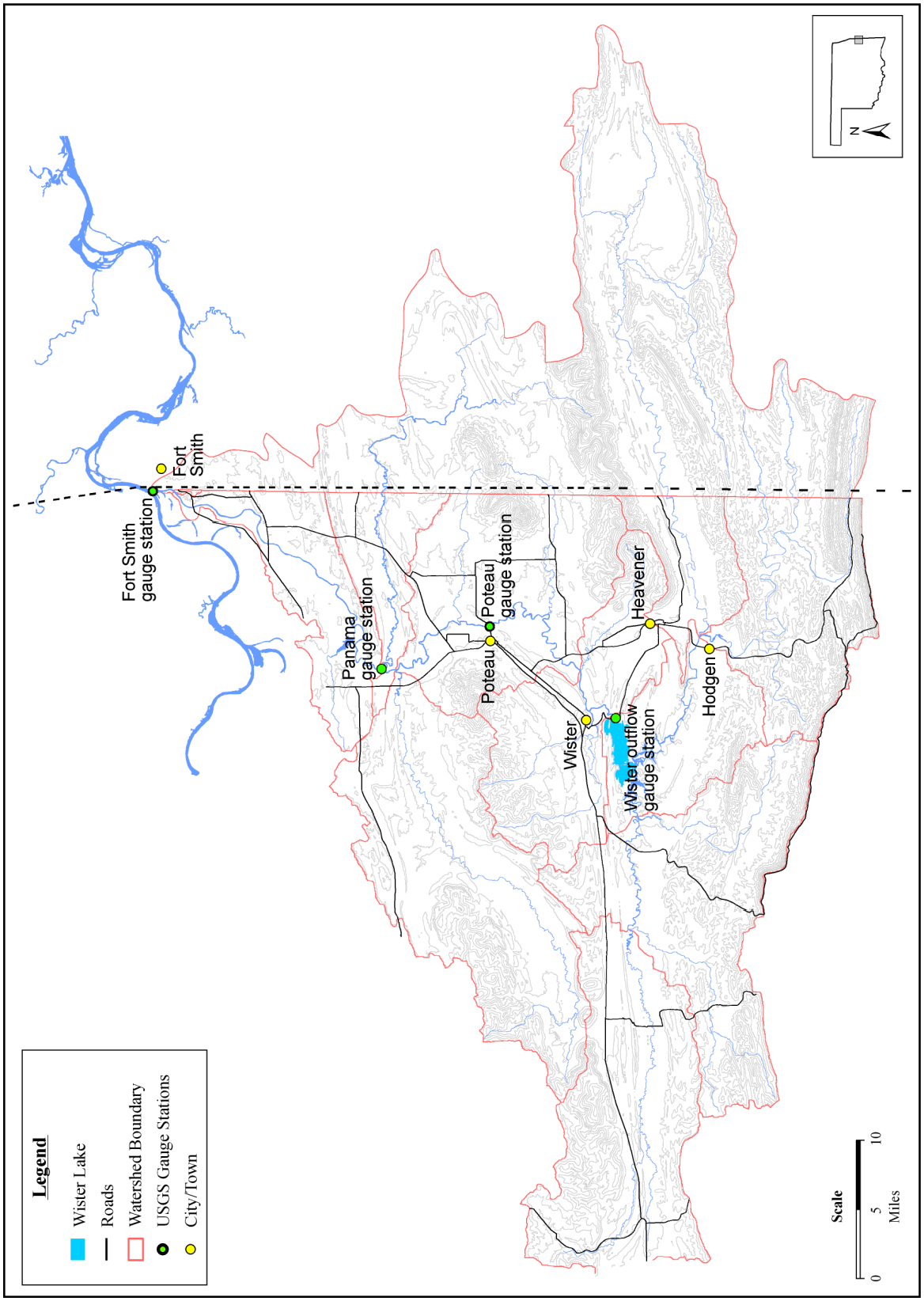

Figure 3.2-1 Watershed and USGS Gauge Stations

Wister Lake project is the primary development project for water resources in the Poteau River Basin. Wister Lake contains a total of 427,389 acre-feet of storage below the top of the flood control pool at 502.5 feet to the bottom of conservation storage at 468.8 feet. The conservation pool includes 61,429 acre-feet of storage from 478.0 feet. This storage is reserved for sediment, water supply, and conservation purposes. Currently 14,000 acre-feet of this storage, with a dependable yield of 20 million gallons per day (mgd), is allocated to municipal and industrial water supply (USACE 1993).

The remaining storage, with a dependable yield of 8 mgd, is reserved for 100-year accumulated sediment (estimated to be about 13,000 acre-feet) and other conservation purposes (USACE 1993). Data for Wister Lake are shown in Table 3.2-1.

Table 3.2-1 Wister Lake Pertinent Data

Feature	*Elevation (feet)*	*Surface Acres (acres)*	*Capacity (acre/feet)*
Top of Dam	527.5	42,050*	-
Spillway Crest and Top of Flood Control Pool	502.5	23,366	-
Flood Control Storage	478.0-502.5	-	365,960*
Top of Conservation Pool	478.0	7,333	-
Conservation Storage	468.8-478.0	-	46,557*

Source USACE 1993
*Personal Communication Duke 2001

Wister Dam is located at mile 60.9 on the Poteau River. It is a 5,700- foot-long earth dam that is 99 feet above the streambed at its maximum height. The outlet works consist of two reinforced concrete conduits through the embankment near the right abutment. Flow is controlled by six vertical lift gates. The 600-foot-wide, uncontrolled, concrete spillway is located between the main embankment and the 2,400 foot-long dike (refer to Figure 2.1-2). Existing spillway capacity is 170,910 cfs at the maximum pool elevation of 523.5 feet. Existing combined conduit discharge capacities are 7,850 cfs and 14,700 cfs with the pool elevations at 471.6 and 502.5 respectively (USACE 1983); however, a discharge of 7,200 cfs will not cause damage downstream. Discharges above 7,200 cfs are made only when the flood control pool is filled and discharges from the spillway exceed this flow. Because discharges over the spillway are always less than inflow to the lake while the lake stage is rising, downstream conditions benefit. After the lake has reached its peak elevation, the downstream discharge will remain higher than the inflow and the lake will return to its normal pool elevation. This process lengthens the time required for the downstream flows to return to normal.

The Wister Lake project was originally planned for maximum flood control releases of 9,000 cfs and operated on that basis until 1954. After aerial observations and ground reconnaissance were conducted, it was determined that 3,600 acres of land downstream of the project were flooded when

9,000 cfs was released. In January 1954, the maximum releases were reduced to 6,600 cfs. Since 1954 minor changes have occurred to the channel of the Poteau River downstream of Wister Lake. The channel capacity is now estimated to be 7,200 cfs (Duke, personal communication 2001). As a result of these reductions, pool levels have been higher and the spillway has functioned more frequently than was anticipated when the project was planned. In 52 years of operation, water has exceeded the spillway three times (May 1957, May 1960, and May 1990). The minimum time to empty the flood control pool, assuming a maximum release of 7,200 cfs, is 31 days. This emptying time is problematic because more than one major flood-producing storm may occur in the basin within 31 days.

Due to the limited channel capacity of 7,200 cfs below Wister Dam, the river downstream is subject to overflow during periods of high water. The overflow area includes both urban and rural land. The urban area subject to flood damages is Poteau, Oklahoma. The overflow area on the Poteau River varies in width from about 1.3 miles in the upper reach to about 3 miles in the middle reach and 1.5 miles in the lower reach (Figure 3.2-1). The reach area subject to flood damages by the maximum flood event from the Wister Dam to the mouth of Brazil Creek is estimated to be 18,710 acres (USACE 1973).

Flood waters are “pooled” in Wister Lake during the rainy seasons to minimize downstream flooding. Once water levels lower, flood waters are released from Wister Lake. Pooling of flood waters causes the nutrient-rich sediments to be deposited. If flood waters were not pooled, more of these sediments would move through the Wister Lake project, rather than being deposited. Pooling of flood waters also decreases the mean depth of the reservoir, increasing the potential for resuspension and resolubilization of sediment-bound nutrients.

3.2.2 Geology And Soils

Low mountains and meandering streams define the landscape of southeastern Oklahoma. The mountains of Oklahoma consist mainly of resistant rock masses that were folded, faulted, and thrust upward in the geologic past. Streams have eroded less resistant rock and lowered the landscape to form broad valleys, hills, and plains throughout most of the remainder of Oklahoma. The Poteau River Basin, with its headwaters in Scott County, Arkansas, is composed of two major geological provinces. These two provinces are the Arkoma Basin and the Ouachita Mountains Uplift (OWRB 1996).

The Arkoma Basin is a trough formed during the early and mid Pennsylvanian periods. Rock formations derived from sediments include Hartshorn, McAlester, Savanna, and Boggy. These

formations have been deformed by strong lateral crustal pressures exerted from the south into numerous long, narrow anticlines and synclines. Several moderate to low-lying mountain ranges are also in the region. They include Sans Bois, Cavanal, Sugar Loaf, Poteau, Beaver, Hi Early, and Rattlesnake Mountains, among others, in parts of Le Flore, Latimer, Pittsburg, Haskell, Sequoyah, Muskogee, and McIntosh Counties. The mountains typically are broad features capped by thick and resistant sandstones. These mountains stand 300 to 2,000 feet above the wide, hilly plains formed on thick shale units. These sandstones and shales were deposited in shallow seas and coastal areas that covered eastern Oklahoma in early and mid Pennsylvanian times (330–310 million years ago [mya]), and this area was broadly uplifted and gently folded during the mid and late Pennsylvanian uplift of the Ouachita Mountains. The largest mountain area is the Sans Bois Mountains, north of Wilburton and Red Oak. The highest summit is Sugar Loaf Mountain, 8 miles east of Poteau; it is 2,568 feet high and rises about 2,000 feet above the surrounding plains. Principal mineral resources of the area are coal, oil and gas, shale, clay, building stone, sand and gravel, and volcanic ash.

The Ouachita Mountains of southeast Oklahoma and western Arkansas make up an arching belt of forested mountain ridges and subparallel valleys. The Ouachitas are the central part of a great chain of mountains that include the Appalachian Mountains of the eastern United States and the Marathon Mountains of West Texas and northern Mexico. Connections between these three exposed mountain systems are buried beneath thousands of feet of younger rock and sediments in the Mississippi embayment (to the east) and Texas (to the south and west). Rocks making up the Ouachitas are mostly thick units of sandstone and shale, with lesser amounts of chert and novaculite (a fine-grained silica rock), deposited in a deep sea that covered the area from late Cambrian through early Pennsylvanian time (515–315 mya). The area was then folded and faulted in such a manner that resistant beds of sandstone, chert, and novaculite now form long, sinuous mountain ridges that rise 500 to 1,500 feet above adjacent valleys formed in easily eroded shales. Rich Mountain has the highest elevation at 2,666 feet. Major prominent ridges within the Ouachita system are Winding Stair, Rich, Kiamichi, Blue, Jackfork, and Blackjack Mountains. Mineral resources that are, or have been, produced in the Ouachitas include limestone, quartzite, sand and gravel, asphaltite, lead, and oil and gas.

Approximately 35,964 acres within the Poteau River Basin are affected by erosion. Sheet erosion rather than gully erosion is the most common and destructive form of erosion. Most of the erosion occurs in areas where the soils have been disturbed or where the productive vegetation has been altered (USACE 1983). Such sites include previously cultivated lands, burned over pasture and woods, and exposed steep mountain slopes. Soil erosion is harmful in lowland areas where the basin's most popular and productive agricultural land is found.

Stream patterns within the Poteau River are a direct reflection of the area's topography and underlying structure. Most streams can be classified as subsequent streams. In other words, they flow in the approximate direction of the orientation of the beds, and over time they have carved valleys out of weak rock strata. The overall basin drainage pattern is classified as trellis pattern. Such patterns are characteristic of areas exhibiting folded topography. Stream density averages two or three small streams per square mile. Stream valleys are approximately 1 mile wide but may increase to 2 or 3 miles wide if gradients are low.

The watershed of the Wister Lake project contains predominately eight soil associations comprised of numerous soils. A detailed discussion of these soils can be found in the Scott County, Arkansas, Latimer County, Oklahoma, and Le Flore County, Oklahoma soil surveys (USDA 1975, 1981, 1983), and Appendix C. The soils groups in Appendix C have been collapsed and grouped based on their infiltration rates and plotted for the affected area (Figure 3.2-2).

The upland soils in the affected area consist of three groups: the yellow, red, and gray groups. The yellow upland soils group is a very fine sandy loam with clay subsoils. Because soil in this group is loose, porous, and moderately friable, they are easily cultivated. The light color of the surface soil indicates a low percentage of organic matter. This soil group is slightly acidic and highly erosive.

The red upland soils group is divided into two subgroups; one subgroup is very fine sandy loam and friable, and the second is much more coarse with shaley, gravelly, or moderately stony subsoils. Both subgroups are light in color and highly erosive. The gray subgroup is very fine sandy loam and clay. It contains a heavily compact subsoil and is very acidic.

In addition to the upland groups, soils have developed from alluviation and occur in the lower levels near the streams that are susceptible to overflow. These soils are broken into two groups by their infiltration rates. Well-drained soils with friable subsoils and poorly drained soils with compact subsoils occur in the river reaches below Wister Dam. Both groups are moderately to highly acidic and low in organic matter.

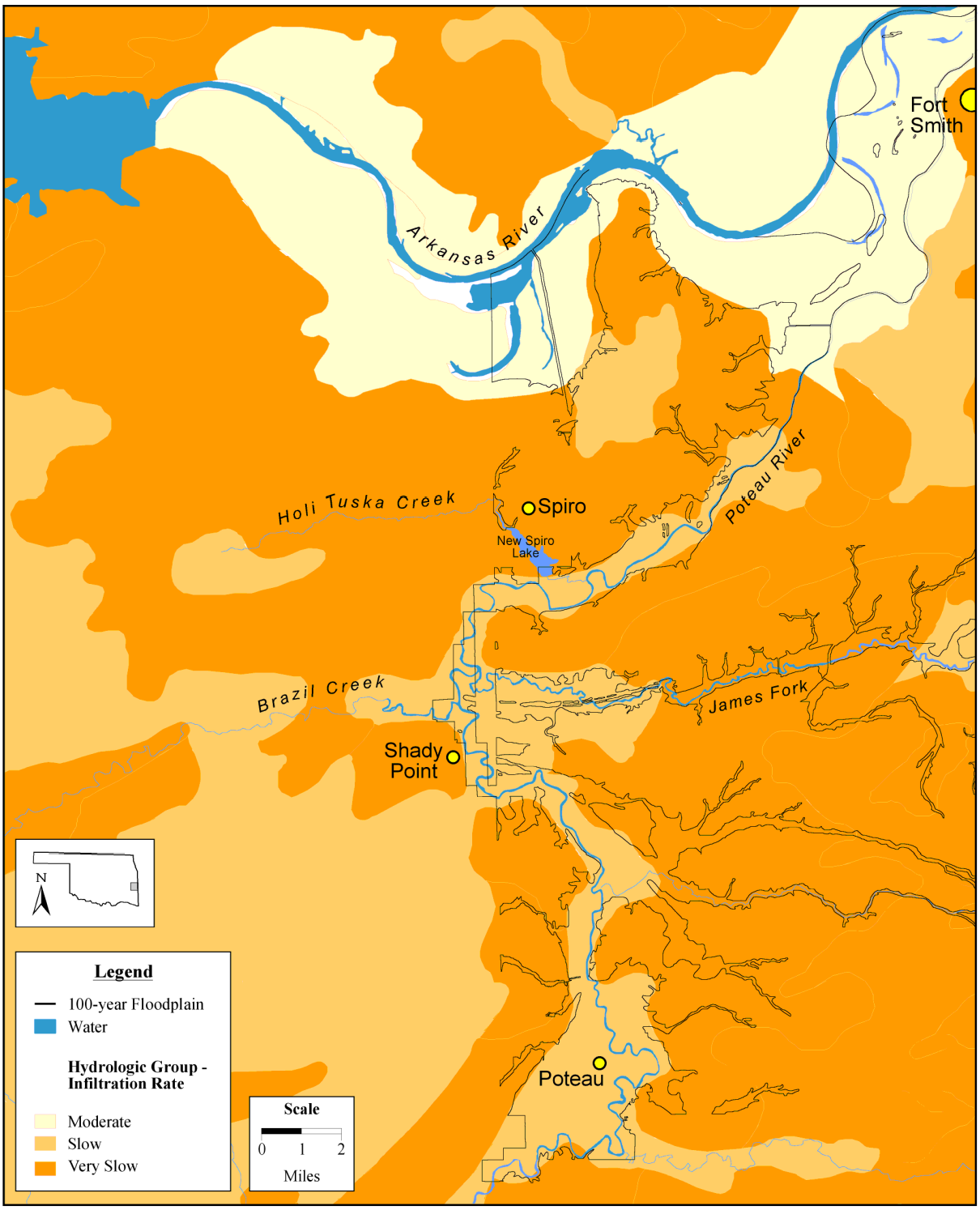

Figure 3.2-2 Soils

3.2.3 Surface Water and Groundwater

The 1,888 square mile Poteau River Basin lies in southeast Oklahoma and in west-central Arkansas, including 993 square miles above Wister Dam (Figure 3.2-1). Water flows into the Poteau River above Wister Dam are well controlled; however, large amounts of flow are contributed below the dam. The principal stream in the basin rises about 10 miles east of Waldron, Arkansas, flows westward to its confluence with Fourche Maline near Wister, and then flows northeastward into the Arkansas River at Fort Smith, Arkansas. Table 3.2-2 summarizes information for the major tributaries of the Poteau River.

Table 3.2-2. Major Tributaries to the Poteau River

Tributary	*Confluence (River Mile)*	*Drainage Area (Square Miles)*
James Fork	27	201
Brazil Creek	29	234
Sugarloaf Creek	47	66
Caston Creek	59	70
Fourche Maline	61[1]	411
Black Fork	78	195
Jones Creek	109	91

[1] Within Wister Reservoir

Flooding is common in the Poteau River, especially along the tributary streams. Most flooding occurs during the spring when rainfall and runoff are at a maximum. Downstream from Wister Dam and Reservoir, floods are much less frequent since the dam controls maximum flows.

Average annual runoff in the basin is approximately 14 inches, and the annual yield is estimated to be 1,410,000 acre-feet or 1,260 mgd. Despite the large runoff, most basin streams do not flow during the summer months or droughts. At such times, only the large streams contain isolated chains of waterholes, while smaller streams are totally dry. However, the Poteau River below Wister Dam flows continually. The generally mountainous basin terrain descends from about 2,300 feet on the highest peak to 460 feet mean sea level (msl) on the valley floor (USACE 1983). The Poteau River stream slope has values of 6 feet per mile from the source to the Oklahoma—Arkansas state line, 3 feet per mile from the state line to Wister, Oklahoma, and 1 foot per mile from Wister to the mouth. In most reaches, the water is slow moving and shaded, with many shallow riffles and deep pools. The Poteau River meanders through a broad, forested floodplain, with some large backwater areas. The stream bottom is typically composed of bedrock, clay, silt bars, pebbles, and boulders. A wide variety of aquatic conditions exist, as indicated by the diversity of the fish species. Most of the smaller tributaries to the Poteau River have narrow, shallow, and less diverse channels than the mainstem.

Steeper slopes and rapid runoff hamper the formation of extensive pools and riffles. Moderate water quality and heavy bank cover are typical for these streams.

3.2.4 Water Use/Water Rights (Allocation)

A basinwide analysis of the water supply has been done for Haskell, Latimer, Le Flore, and Sequoyah Counties to determine the water supply needs within the Poteau River Basin. Groundwater is limited in the basin and is of little consequence as a source of municipal and industrial water supply. However, there is a dependable yield of 12.35 mgd from surfaces sources in the basin (USACE 1983).

The updated storage yield analysis conducted by the Tulsa District in 1986 (USACE 1986) revealed a difference in the storage yield relationship from the original analysis done in 1959. This difference was in part due to more sophisticated methods in computing yield, and these updated values are used in the analysis and inputs to SUPER Model (Appendix B). The conservation storage at 478.0 feet is 46,557 acre/feet. Of this amount, 14,000 acre-feet, with a dependable yield of 20 mgd has been allocated to water supply. By increasing the permanent pool level to 478.0, it is possible to increase the dependable water supply yield of the reservoir from 20 mgd to approximately 60 mgd (USACE 1987). Nearly all of the current water supply storage is under contract to the Poteau Valley Improvement Authority (PVIA), the Heavener Utility Authority and Applied Energy Services (AES), Shady Point. Table 3.2-3 summarizes the water supply contracts for Wister Lake as of April 4, 2001.

Table 3.2-3 Wister Lake Water Supply Contracts

User Name	*Approval Date*	*Type of Contract*	*Present Storage (acre-feet)*	*Future Storage (acre-feet)*	*Total User Storage (acre-feet)*	*Yield (mgd)*
Not Under Agreement		Storage	0	347	347	0.540
Heavener Utilities Authority	05-17-63	Storage	1,600	0	1,600	2.28
Poteau Valley Improvement Authority	9-25-67	Storage	4,800	0	4,800	6.85
AES Shady Point	5-13-87	Storage	7,253	0	7,253	10.36
Total			13,653	347	14,000	20.030

Source: USACE 2001

The PVIA provides water for the majority of communities in the basin north of Wister Lake. PVIA takes in water at two locations, one in shallow water and the other at the lake bottom. Water is withdrawn from the top part of the lake at the shallow location, when lake levels allow it. During periods of heavy algae blooms, water withdrawn from this site can have an undesirable taste. At the same time, an open intake at the bottom of the lake withdraws water laden with iron and manganese, which stain.

AES, Shady Point operates a coal-fired power generation plant on the Poteau River near Panama, Oklahoma. The plant is estimated to use 10.36 mgd for cooling water, make-up water, and incidental and associated facility operation and maintenance purposes. Permits were issued for this process on January 15, 1985. Water for this process demand is considered to be constant and not expected to increase over time.

3.2.5 Water Quality

Studies conducted by the Tulsa District and the Soil Conservation Service, as well as by Oklahoma State University, indicate the water quality problems at Wister are twofold: heavy nutrient load from poultry wastes and turbidity due to soil erosion within the basin. Although algae blooms associated with the high nutrient levels are a problem for the PVIA treatment plant, no treatment costs have been specifically associated with this problem. Turbidity, however, requires application of alum for flocculation. The cost of alum is a major concern for PVIA. The turbidity of Wister Lake is considered above average for lakes in this region (OWRB 1996).

Historical water quality data indicate that the lake is receiving high levels of nutrients and sediments from various activities occurring in the watershed. Nutrient and sediment pollution are generated from several point and non-point sources, including poultry operations, county and forest roads, forestry practices, abandoned strip coal mines, and natural gas exploration practices.

The Poteau River exhibits low dissolved mineral content due to abundant rainfall, well leached rocks, stratum and soils, and scarcity of readily soluble minerals. During releases from the hypolimnion, or the lower level of Wister Lake, water quality of the Poteau River exhibits low dissolved oxygen and increased carbon dioxide, iron, magnesium, and ammonia. Steady growth of algae and vascular aquatic plants and a high density of benthic, periphytic, planktonic, and other invertebrate organisms characterize the Poteau River.

Previous investigations have indicated that Wister Lake has been eutrophic (having high nutrient levels) for at least twenty years (OWRB 1996). Two trophic classification schemes discussed in this report indicate that the lake is still eutrophic and possibly approaching hypereutrophic. However, the

water is suitable for treatment and subsequent municipal and industrial use. The projected increase of the poultry industry could jeopardize water suitability unless watershed management practices are instituted to minimize runoff of nutrients and suspended materials (USACE 1994).

High concentrations of iron and manganese in the water are the result of the geology in the area. Soils in the watershed are high in these metals. If PVIA were not treating the water with a metal removing process at the plant, clothing and plumbing would continue to stain. Watershed management practices are needed in the basin in order to control point and non-point sources of pollution to the lake.

Water quality in Wister Lake has been a concern since its impoundment in 1949 (Appendix C). Water quality degradation is related, in part, to sedimentation in the lake basin. Nutrient-rich sediment has been deposited in the upper reaches of the lake, decreasing depth and thereby increasing probability of sediment resuspension. The resuspension of sediment would decrease clarity and could increase nutrient concentration in the water column. Too much sediment and other suppressed nutrients may cause algae blooms and reduce dissolved oxygen available for fish and other aquatic organisms. The rate of sedimentation was characterized by the USACE for the years of 1949, 1972, and 1985. In addition, the pattern of sediment deposition also has implications to water quality.

Two constituents used by the Oklahoma Water Resources Board to categorize the overall condition of a lake are the Trophic State Index and Turbidity (Figures 3.2-3 and 3.2-4). The trophic level is the measure of the biological productivity of the lake based on the amount of phosphorous and nitrates available in the water (Appendix C), which may cause algae blooms and reduce oxygen available for aquatic species. In general, the higher trophic state index of a lake, the more nutrient loading into the system is occurring and the more productive the lake. This productivity is usually an indicator of overall poor water quality. Sedimentation decreases lake depth, allowing deposited sediment to be disturbed and release the trapped nutrients, thereby increasing the trophic level of the lake. Increasing eutrophy, or high trophic levels, in Wister Lake has negatively affected its use as a water supply reservoir. Anoxia, which is a low oxygen condition in the water, increases the solubility of metals such as iron and manganese that contribute to taste, odor, and staining in water supplies.

Turbidity is a water quality indicator that quantifies the cloudiness, or the amount of fine particles suspended in the water (Appendix C). Turbidity at Wister Lake tends to vary seasonally due to the condition of the watershed and weather patterns during the spring and summer. In addition, sedimentation decreases lake depth and allows for wave action to resuspend particles and increase turbidity levels.

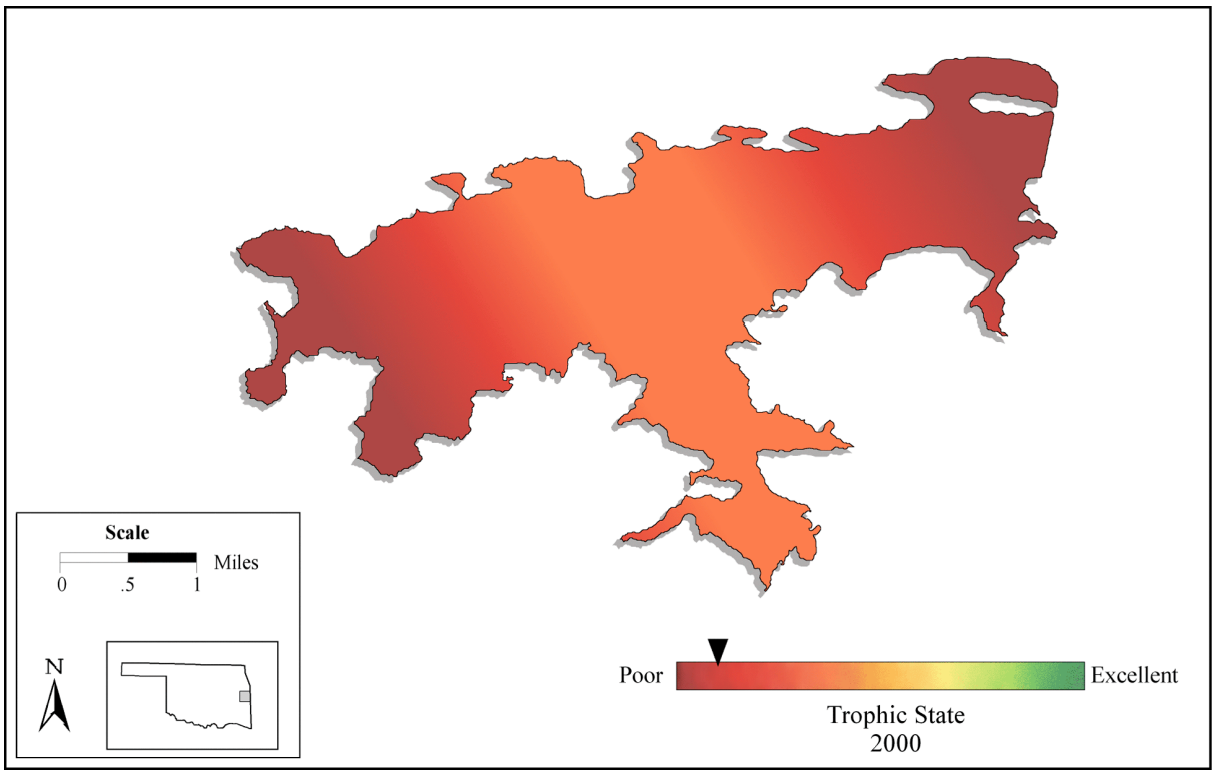

Figure 3.2-3 Trophic Map

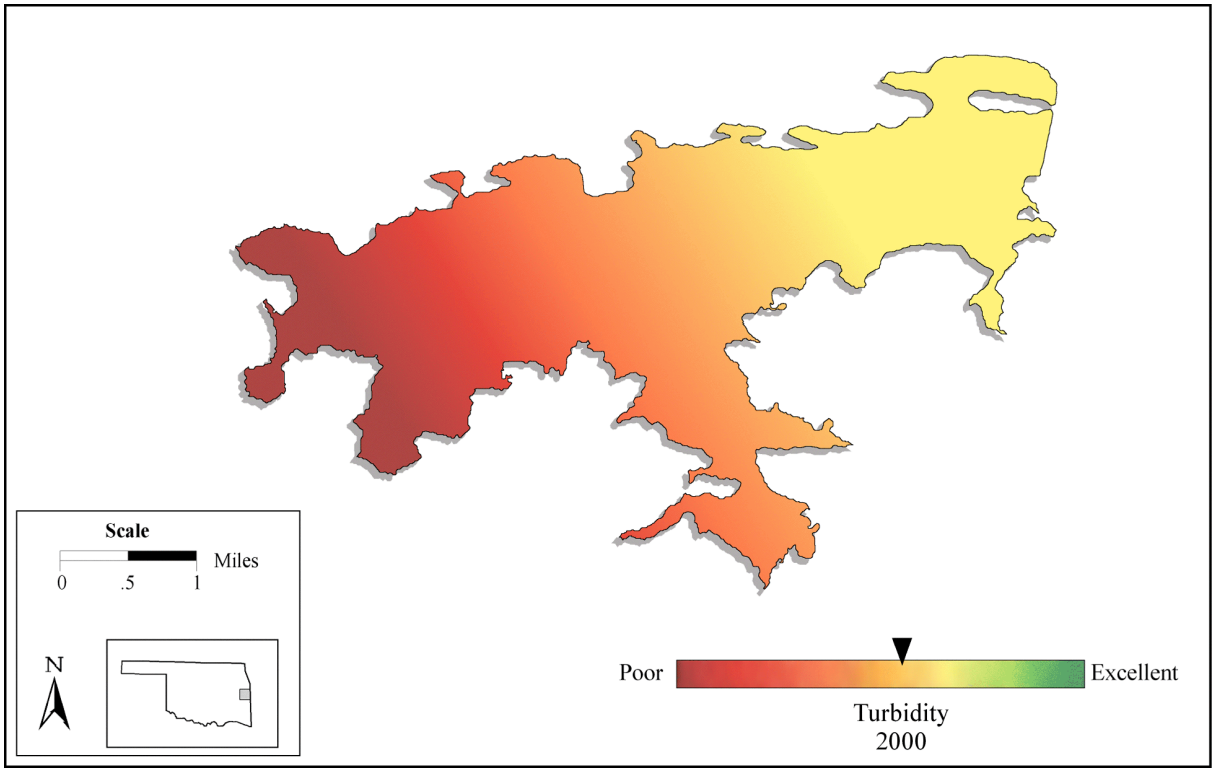

Figure 3.2-4 Turbidity Map

The turbidity problem has not been quantified but has been known to cause aesthetic concerns and increase the cost of treatment.

Wister Lake stratifies during the summer, and water quality problems typically develop. The lower stratum, or hypolimnion, extends from about 10 feet below the water surface to the bottom of the lake. The water in this zone is anoxic, slightly acidic, and high in iron, manganese, and hydrogen sulfide (USACE 1983). The upper stratum, or photic zone, extends from the water surface down about 8 feet. This zone also has water quality problems because most of the microscopic plants (algae) and animals are produced in this zone.

The quality of water below Wister Dam varies seasonally. In the winter the lake is unstratified and water discharged below the dam is well oxygenated and of good quality. However, the water released during the summer is from the lower stratum or hypolimnion. When the water is discharged and contacts the atmosphere, hydrogen sulfide is released, causing noxious odors. The iron and manganese in solution precipitate out and cause red and black staining on rocks and concrete. Aquatic organisms cannot survive until the water is reaerated, a process that may not be completed until the water has flowed several miles downstream (USACE 1983). After reaeration, the released water is of similar quality, although less turbid, than water flowing into Wister Lake.

The current operating pool plan is a flat pool or a steady pool level of 478. This plan has been adhered to since the pool was congressionally raised in 1996.

Data collection methods and materials completed by the Tulsa District are outlined in the *Water Quality Report* (USACE 1994). Background conditions taken from this report are representative of the current water quality conditions.

The Oklahoma 1990 Water Quality Assessment Report for Section 305 (b) of the Federal Clean Water Act (ODEQ 1990) also identifies Wister Lake as being eutrophic and having turbidity problems. The report lists agricultural nonpoint source pollution as the major concern (Figure 3.2-5). In addition, the Poteau River is identified in the *State of Oklahoma Section 319 Nonpoint Source Assessment Report* (OCC 1989) as threatened by nutrients and sediment. It has also been added to the list of targeted watershed projects in the *Oklahoma Section 319 Nonpoint Source Management Plan*. Arkansas' 1990 *Water Quality Assessment Report for Section 305(b)* indicates that the Poteau River does not support

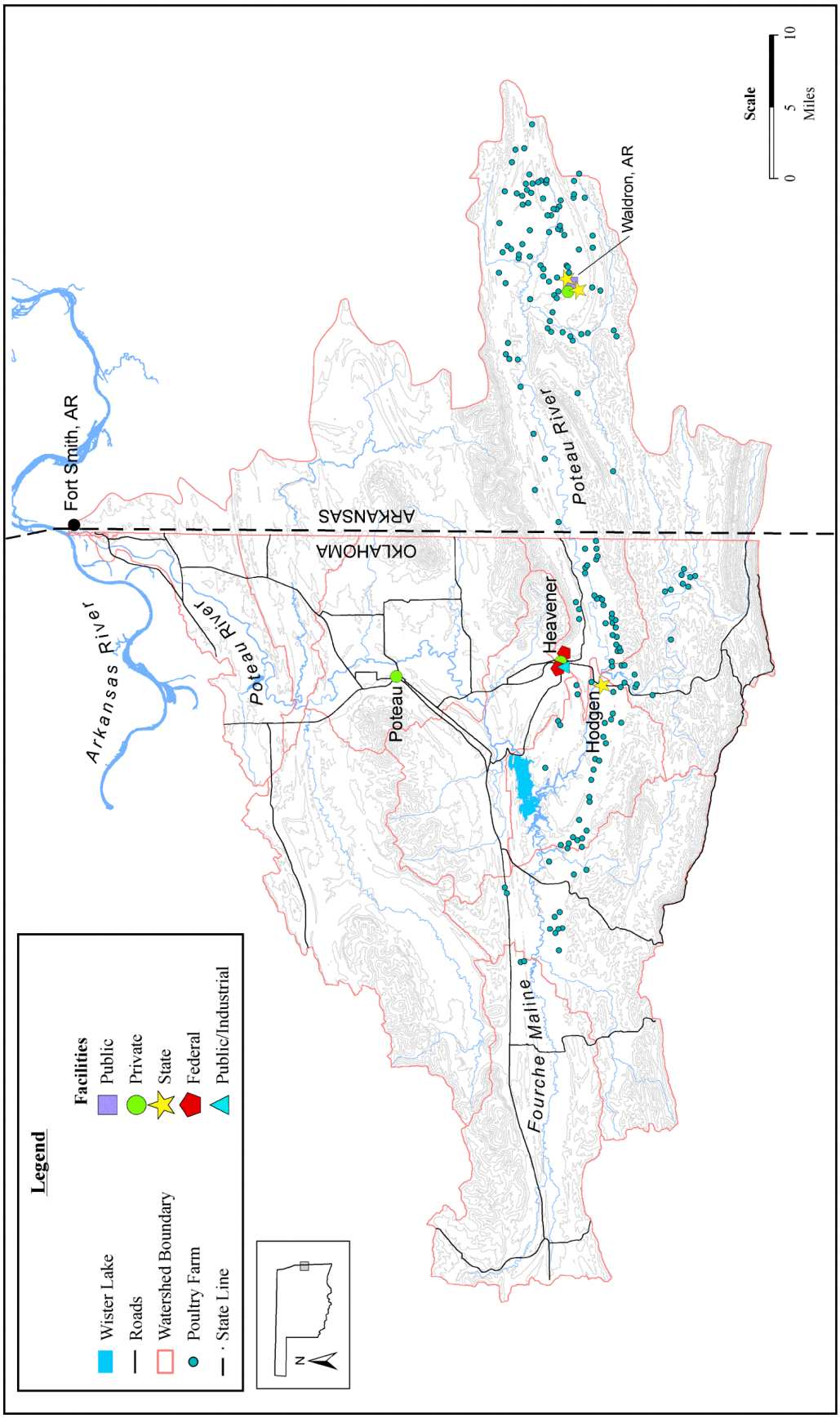

Figure 3.2-5 Point and Non-point Sources of Pollution

recreation upstream and downstream of Hon, Arkansas, due to excess silt, biological oxygen demand, pathogens, ammonia, and nutrients. They indicate the source of these pollutants to be from agriculture and point discharges (OWRB 1996). In addition, Wister Lake is listed on the state's 303 (d) list, which lists water bodies with known water quality concerns.

The Oklahoma Department of Environmental Quality (ODEQ) is developing a Total Maximum Daily Load (TMDL) to protect the Poteau River and Wister Lake. This load is based, in part, on the recommendation of the 1996 *Clean Lakes Phase I Report* (OWRB 1996) on Lake Wister, which suggested that at least a 41 percent load reduction was necessary to prevent increased rate of eutrophication in the lake. The TMDL will set limits on the permissible nutrient load to the lake and help determine the necessary loading reductions to be contributed by point and nonpoint sources (OCC 2000). The TMDL can only be implemented if local citizens and other stakeholders agree to its merit and are willing to take the necessary voluntary and mandatory steps to implement the recommended reductions.

3.3 AIR QUALITY

Air quality in a given location is described by the concentration of various pollutants in the atmosphere. The type and amount of pollutants emitted into the atmosphere, the size and topography of the air basin, and the prevailing weather conditions determine air quality. The 1970 Clean Air Act (CAA) and the 1990 Clean Air Act Amendments regulate air pollution emissions from stationary sources (such as boilers and generators) and mobile sources (such as motor vehicles and aircraft) to protect public health and welfare.

The significance of a pollutant concentration is determined by comparing it to federal (national) and state air quality standards. National Ambient Air Quality Standards (NAAQS) are established by the Environmental Protection Agency (EPA) for criteria pollutants, including ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter equal to or less than ten micrometers in diameter (PM_{10}), and lead (Pb). NAAQS represent the maximum levels of background pollution that are considered safe, with an adequate margin of safety, to protect public health and welfare. Short-term standards (1-, 8-, and 24-hour periods) are established for pollutants contributing to acute health effects, while long-term standards (annual averages) are established for pollutants contributing to chronic health effects. NAAQS are shown in Table 3.3-1.

Table 3.3-1 Federal National and State Ambient Air Quality Standards

Pollutant	*Averaging Time*	*National Standards*[1]
Ozone (O_3)	8-hour	0.08 ppm
	1-hour	0.12 ppm (235 µg/m^3)
Carbon Monoxide (CO)	8-hour	9.00 ppm (10 µg/m^3)
	1-hour	35.00 ppm (40 µg/m^3)
Nitrogen Dioxide (NO_2)	Annual Average	0.053 ppm (100 µg/m^3)
Sulfur Dioxide (SO_2)	Annual Average	0.03 ppm (80 µg/m^3)
Particulate Matter (PM_{10})	Annual Arithmetic Mean	50 µg/m^3
	24-hour	150 µg/m^3
Lead (Pb)	Calendar Quarter	1.50 µg/m^3

Table 3.3-1 also includes the proposed 8-hour standard for ozone. Although the future implementation of the 8-hour standard is uncertain, many states and air districts are considering their status under both standards.

Based on measured ambient criteria pollutant data, the EPA designates all areas of the United States as having air quality better than (attainment) or worse than (nonattainment) the NAAQS. The ODEQ implements the state and federal CAA and maintains or achieves NAAQS attainment through developing a state implementation plan (SIP). The SIP provides a strategy that will result in the attainment and maintenance of the NAAQS.

Wister Lake and the Poteau River are located in the Metropolitan Fort Smith Interstate Air Quality Control Region All NAAQS within the Metropolitan Fort Smith Interstate Air Quality Control Region, as well as all regions within Oklahoma are currently designated as in attainment (DEQ 2001). The Tulsa area may not remain in attainment if the 8-hour standard for ozone is implemented. However, at this time it remains designated as in attainment (DEQ 2001).

3.4 BIOLOGICAL RESOURCES

Biological resources are defined as terrestrial and aquatic vegetation; wildlife; and threatened, endangered and sensitive plant and animal species. For analysis, resources have been divided into vegetation, wildlife, and threatened and endangered species, wetlands, and floodplains. The affected environment for biological resources for the proposed alternative includes lands around Wister Lake that may be impacted by the fluctuations in water levels and the habitat areas immediately adjacent to the lake. On the Poteau River downstream of Wister Dam, potentially impacted areas are located within the 100-year floodplain.

This section describes existing conditions for natural resources. Resources were assessed by compiling information obtained from local, state and federal agencies, including the Oklahoma Department of Wildlife Conservation (ODWC), Oklahoma State University, U.S. Fish and Wildlife Service (USFWS) Oklahoma Natural Heritage Inventory, and National Wetlands Inventory (NWI).

3.4.1 Vegetation

The Wister Lake project lies within the Ouachita Biotic District of the Southern Mixed Forest Ecological Province. This biotic district is characterized by its broad hills, mountains, and hilly plains. Information on vegetation communities such as forests, grasslands, and developed areas within the affected environment were taken from existing Gap Analysis Program (GAP) data and grouped into larger habitat types (Figures 3.4-1 and 3.4-2). Table 3.4-1 shows vegetation acreage and dominant species for forests, woodlands, grasslands, developed areas, and residential areas.

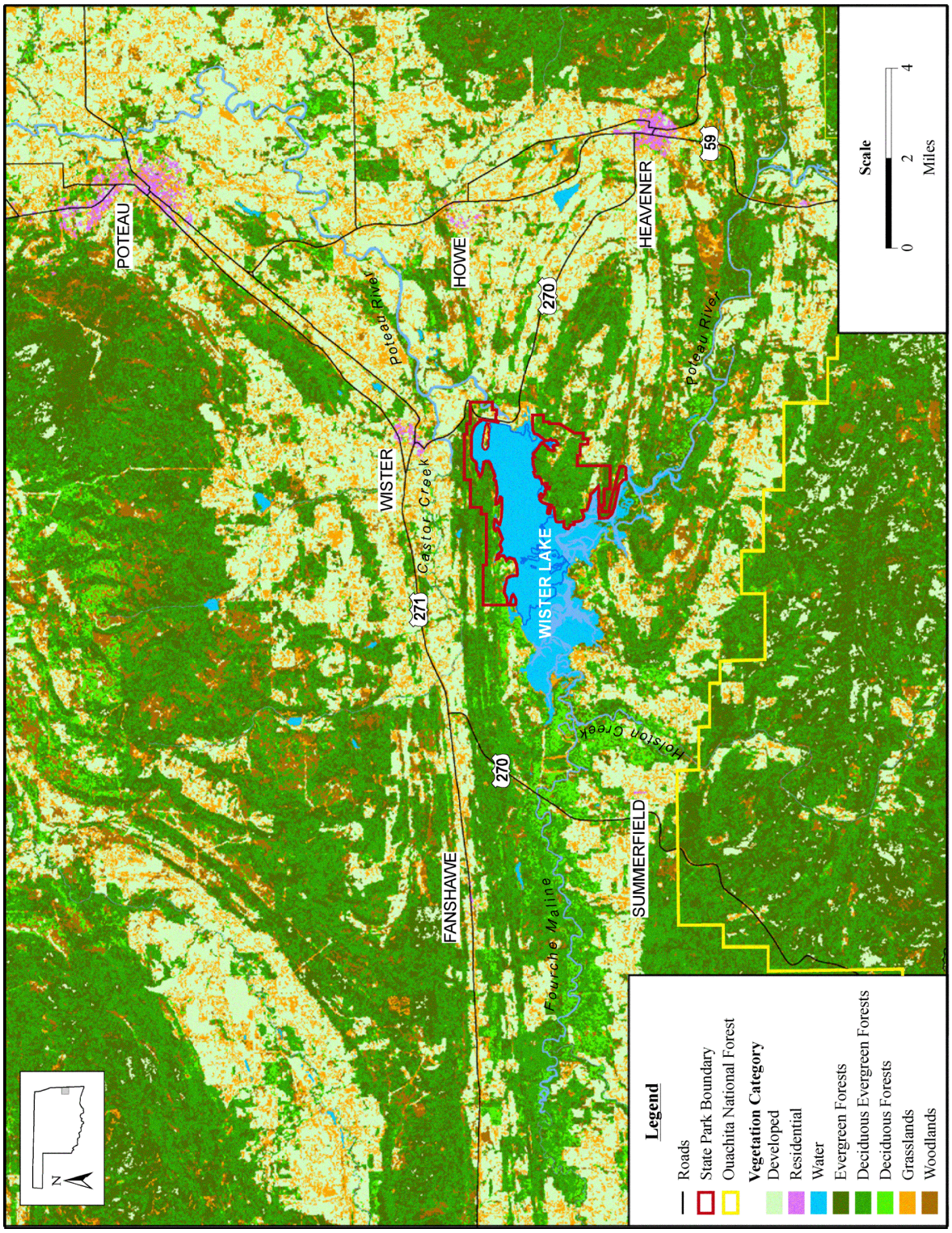

Figure 3.4-1 Vegetation Types around Wister Lake

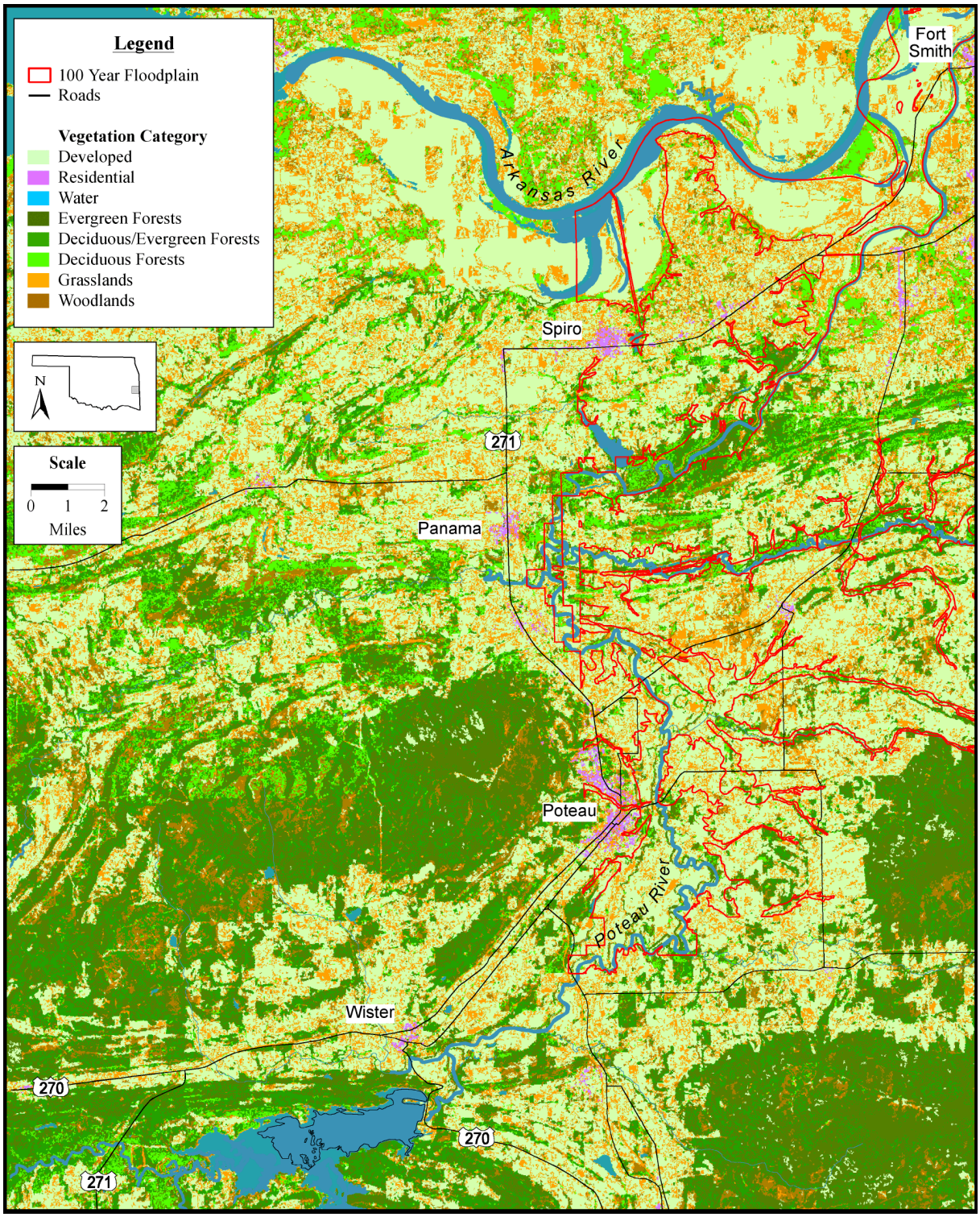

Figure 3.4-2 Vegetation Types Downstream of Wister Lake

Table 3.4-1 Habitat Types and Dominant Vegetation Found within the Study Area

Habitat Type	*Dominant Vegetation*	*Acreage*
Evergreen Forest (Trees over 5 meters tall and 61-100% canopy cover)	Shortleaf Pine (*Pinus echinata*), Oak (*Quercus* ssp.), Loblolly Pine (*P. taeda*)	13,259.2
Deciduous/Evergreen Forest	Oak, Hickory (*Carya* ssp.), Eastern Red Cedar (*Juniperus virginiana*), Shortleaf Pine	21,585.2
Deciduous Forest	Oak, Hickory, Eastern Red Cedar, White Oak (*Quercus albus*), American Elm (*Ulmus americana*), White Ash (*Fraxinus pennsylvannica*), Hackberry (*Celtis laevigata*)	11,139.1
Woodlands (Trees over 5 meters tall and 26-60% canopy cover)	Shortleaf Pine, Oak, Eastern Red Cedar	11,212
Grasslands (Less than 25% canopy cover)	Big Bluestem (*Andropogon gerardii*), Indiangrass (*Sorghastrum nutas*), Little Bluestem (*Schizachyrium scoparium*), Switchgrass (*Panicum virgatum*), Sideoasts grama (*Boueloua curtipendula*), Cedar, Pine	27,057.5
Developed	Crops, Pasture	61,772.2
Residential	None	1,467.8
Water	None	7,106.9
Total		154,600.0

Oklahoma Land Cover Classification Scheme: Dichotomous Key

Evergreen forests in the project area encompass approximately 13,259.2 acres. Of the evergreen forests, approximately 1,469.2 acres are shortleaf pine forest, 11,155.5 acres are shortleaf pine—oak forest, 625.4 acres are loblolly pine forest, and 8.7 acres are loblolly pine—oak forest.

Deciduous/evergreen forests in the project area consist of approximately 21,585.2 acres. Of the deciduous/evergreen forests in the project area, oak—pine forests encompass approximately 20,135 acres, approximately 1,104.6 acres are oak—hickory—pine forests, and 345.4 acres are oak—cedar forests.

The deciduous forest habitat type contains vegetation units known as crosstimbers and bottomland hardwood forests. Crosstimbers included post oak (*Quercus stellata*) and black jack oak

(*Q. marilandica*) associated with sandstone geology and coarse soils. Of the deciduous forests within the project area, eastern crosstimbers are composed of approximately 5,690.4 acres, eastern bottomland forests encompass 3,027.7 acres, east-central bottomland forests encompass 1,452.5 acres, and 968.5 acres are white oak-hickory forests. This vegetation unit is generally lower in biodiversity, and accounts for as much as 70 percent of the woody area in Oklahoma (Hoagland 2000). Species such as pin oak *(Q. palustris),* water oak *(Q. nigra),* willow oak *(Q. phellos)*, white ash, and sweet gum *(Liquidambar styraciflua)* account for the dominant overstory species of the deciduous bottomland hardwood forests. The understory is comprised of black willow *(Salix nigra),* buttonbush *(Cephalanthus occidentalis),* American elm, and blackgum *(Nyssa sylvatica).* Upland forest habitats are dominated by pine, red oak *(Quercus* sp.*),* post oak, and hickory.

Grasslands in the affected environment are composed of tall grass prairies (16,274.9 acres) and tallgrass oak savannas (10,782.6 acres). Developed areas are comprised of approximately 55,771.1 acres of improved/introduced warm season pastures, approximately 5,911.5 acres of warm season crops, and 89.6 acres of planted/cultivated loblolly pine forests. The agricultural fields are typically planted in corn and soybeans.

3.4.2 Fish and Wildlife Resources

The region around the Wister Lake project is home to over 300 species of animals, including 13 species of turtles, 11 species of lizards, and 31 species of snakes. Some of the most common reptile species observed are the copperhead *(Agleistrodon contortrix mokason),* ribbon snake *(Thamnopphis sauritus),* five-lined skink *(Eunrecis fasciatus)*, eastern box turtle *(Terrapene carolina carolina),* and pond sliders *(Psedemys scripta).* In addition to these reptilian species, the Wister Lake region also has species of salamanders and 15 species of frogs. The most common frog species in the area are the American toad *(Bufo americanus),* spring peeper *(Pseudacris crucifer),* cricket frog *(Acris gryllus),* gray tree frog *(Hyla versicolor),* American bullfrog *(Rana catesleiana),* and the leopard frog *(Rana sphenocephala)* (USACE 1993).

A total of 293 bird species inhabit Wister Lake during some portion of the year, including wintering waterfowl and resident herons and egrets. Some of the common heron species are the great blue heron *(Ardea herodias),* little blue heron *(Egretta caerulea),* and green heron *(Butorides virescens).* Wintering birds include the gadwall *(Anas strepera),* green-winged teal *(Anas crecca),* blue-winged teal *(Anas dicors),* pintail *(Anas acula),* mallard *(Anas platyrhynchos),* Canadian snow goose *(Anser caerulescens caerulescens),* and lesser scaup *(Aythya affinis).* Many varieties of gulls and terns can also be observed using the lake during the winter and spring months (USACE 1993).

Many mammals also inhabit the lake and its adjacent lands. Some of the most common nongame mammal species found within this area are the beaver *(Castor canadensis)*, striped skunk *(Mephitis mephitis),* coyote *(Canis latrans),* and muskrat *(Ondatra zibethicus)* (USACE 1993). The ODWC introduced river otters into the Wister Wildlife Management Area (WMA) ecosystem in 1988 (ODWC 1988). River otters are now found throughout most of the waterways inside the WMA (Robertson 2001).

The Poteau River has a wide diversity of fish species with approximately 95 species of fish having been recorded within the Poteau River and its tributaries (USACE 1993). Game fish species popular within the river and Wister Lake include channel catfish *(Ictalurus punctatus)*, largemouth bass *(Micropterus salmoides),* white crappie *(Pomoxis annularis),* bluegill *(Lepomis macrochirus),* flathead catfish *(Pilodictus olivaris),* and walleye *(Stizostedion vitreum).*

3.4.3 Unique and Sensitive Areas

The Wister WMA (Figure 3.4-3) is located on the western shores of Wister Lake. Among these 35,500 acres are the 1,000-acre Wister Waterfowl Refuge and 160-acre green tree reservoir (Robertson 2001). The western half of the WMA is designated a game management area, where management activities are designed to maximize game availability. However, the entire WMA is open to hunting during game seasons. 28,300 acres fall within the area of impact. 3,254 acres were inundated when the pool level was raised to 478.0 feet. The ODWC manages and regulates hunting and fishing on the entire WMA.

Although the Ouachita National Forest is located south of the project area, it provides additional habitat for species located around the lake. The Ouachita National Forest encompasses approximately 1,647,000 acres in southeastern Oklahoma and west-central Arkansas. The Ouachita National Forest contains a wide variety of vegetation, terrain, and habitats for diverse wildlife species.

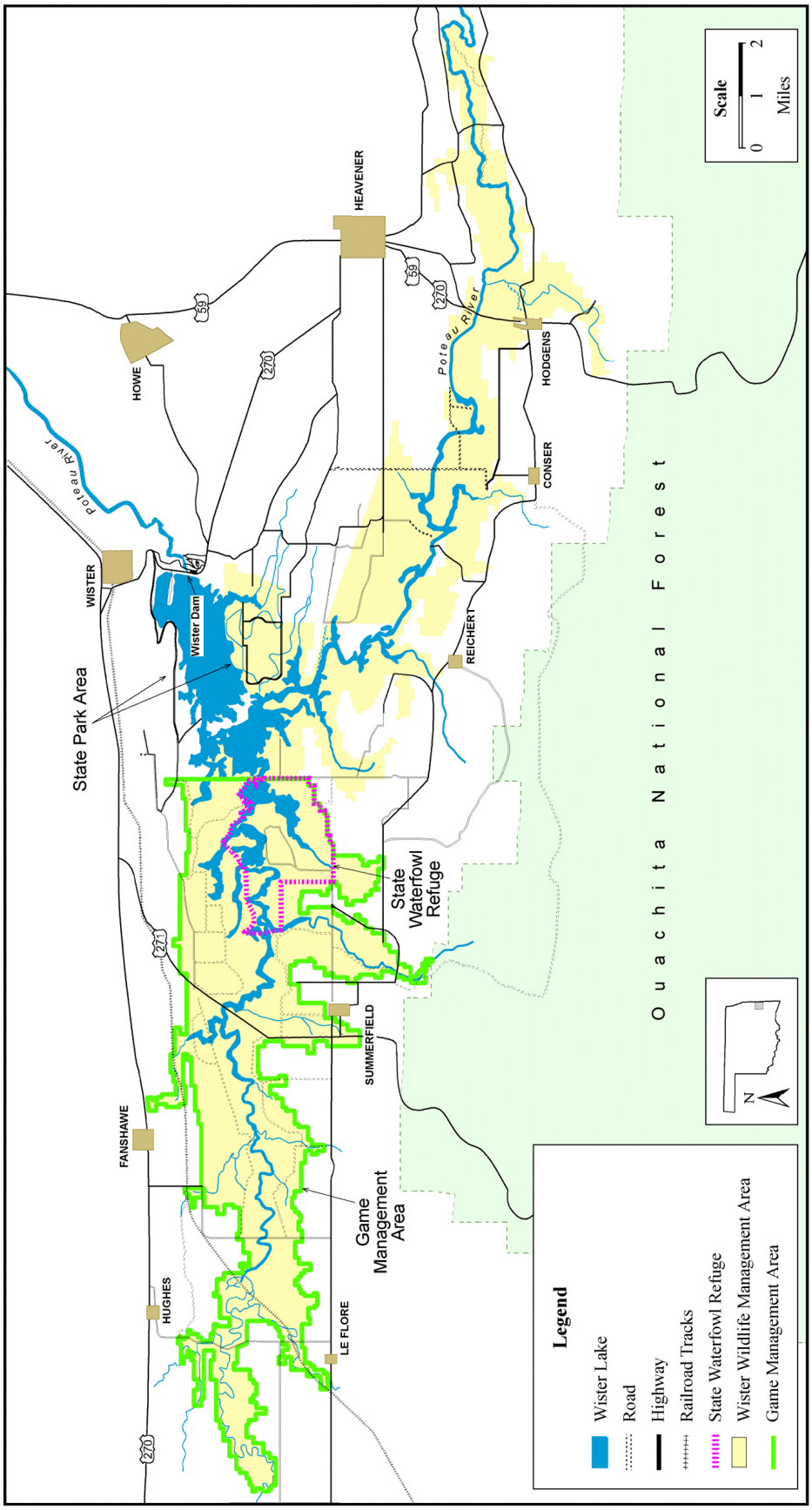

Figure 3.4-3 Unique and Sensitive Areas

3.4.4 Protected Species

The Endangered Species Act (ESA) [16 U.S.C. 1532 et. seq.] of 1973, as amended, was enacted to provide a program for the preservation of endangered and threatened species and to provide protection for the ecosystems upon which these species depend for their survival. All federal agencies are required to implement protection programs for designated species and to use their authorities to further the purposes of the act. Responsibility for identifying threatened or endangered species and developing of any potential recovery plans lies with the Secretary of the Interior and the Secretary of Commerce.

The U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS) are the primary agencies responsible for implementing the ESA. The USFWS is responsible for protected birds, terrestrial species, and freshwater species, while the NMFS is responsible for protected nonbird marine species. The USFWS's responsibilities under the ESA include (1) the identification of threatened and endangered species; (2) the identification of critical habitats for listed species; (3) implementation of research on, and recovery efforts for, these species; and (4) consultation with other federal agencies concerning measures to avoid harming listed species.

An endangered species is a species in danger of extinction throughout all or a significant portion of its range. A threatened species is a species likely to become endangered within the foreseeable future throughout all or a significant portion of its range. Proposed species are those that have been formally submitted to Congress for official listing as threatened or endangered. Species may be considered endangered or threatened when any of the five following criteria are met: (1) the current/imminent destruction, modification, or curtailment of their habitat or range; (2) overuse of the species for commercial, recreational, scientific, or educational purposes; (3) disease or predation; (4) the inadequacy of existing regulatory mechanisms; and (5) other natural or human-induced factors affect continued existence.

In addition, the USFWS has identified species that are candidates for listing as a result of identified threats to their continued existence. The candidate designation includes those species for which the USFWS has sufficient information on hand to support proposals to list them as endangered or threatened under the ESA. However, proposed rules have not yet been issued because such actions are precluded by other listing activity.

The ESA also calls for the conservation of what is termed *critical habitat*, the areas of land, water, and air space that an endangered species needs for survival. Critical habitat also includes such things as food and water, breeding sites, cover or shelter, and sufficient habitat area to provide for normal population

growth and behavior. One of the primary threats to many species is the destruction or modification of essential habitat by uncontrolled land and water development.

Ten federally listed species potentially exist within Le Flore and Latimer Counties, Oklahoma (Appendix D). Four species are listed as endangered and three as threatened. Information pertaining to the distribution, status, and habitat requirements of these federally protected species is included in Table 3.4-2. The only mammal listed is the endangered Indiana bat *(Myotis sodalis).* The remaining three species, which are birds, include the bald eagle *(Haliaeetus leucocephalus),* piping plover *(Charadrius melodus),* and the interior least tern *(Sterna antillarum)*. The other species of concern include one fish, the leopard darter (*Percina pantherina*), and two invertebrates, the American burying beetle *(Nicrophorus amercanus)* and the Ouachita rock-pocketbook mussel *(Arkansia wheeleri).* No candidate species or designated critical habitat are found in Le Flore or Latimer Counties, Oklahoma.

Table 3.4-2 Federal and State Listed Species Potentially Occurring in Le Flore and Latimer Counties, Oklahoma

Species *Common Name* *Scientific Name*	*Federal Status*	*State Status*
Mammals		
Indiana Bat *Myotis sodalis*	E	E
Birds		
American peregrine falcon *Falco peregrinus anatum*	M	E
Arctic peregrine falcon *Falco peregrinus tundrius*	M	
Bald eagle *Haliaeetus leucocephalus*	T	E
Piping plover *Charadrius melodus*	T	T
Interior least tern *Sterna antillarum*	E	

Table 3.4-2 (Continued) Federal and State Listed Species Potentially Occurring in Le Flore and Latimer Counties, Oklahoma

Species *Common Name* *Scientific Name*	*Federal Status*	*State Status*
Fish		
Blackside darter *Percina maculata*	--	E
Longnose darter *Percina nasuta*	--	E
Leopard darter *Percina pantherina*	T	T
Invertebrates		
American burying beetle *Nicrophorus americanus*	E	E
Ouachita rock-pocketbook *Arkansia wheeleri*	E	E
Scaleshell mussel *Leptodea leptodon*	PE	SS2
Anphibians		
Rich Mountain salamander *Plethodon ouachitae*	--	SOC
Rich Mountain slitmouth *Stenotrema pilsbryi*	--	SOC

E Listed Endangered
T Listed Threatened
PE Proposed Endangered
M Monitor Species
SS2 Species of Special Concern possibly threatened or vulnerable to extirpation, but with little documented evidence on population and range.
SOC Species of Concern

State species of concern are the blackside darter (*Percina maculata*) and the longnose darter (*P. nasuta*), which is listed as a state endangered species. Two other species of potential concern are the Rich Mountain salamander *(Plethodon ouachitae)* and the Rich Mountain slitmouth *(Stenotrema pilsbryi).* These two species are state-listed species of special concern (Elam 2001).

3.4.5 Waters of the U.S. and Wetlands

Section 404 of the Clean Water Act (CWA) of 1977 (P.L. 95-217) authorizes the Secretary of the Army, acting through the USACE, to issue permits for the discharge of dredged or fill material into waters of the United States, including wetlands. Waters of the United States (Section 328.3[2] of the CWA) are those waters used in interstate or foreign commerce, subject to ebb and flow of tide, and all interstate waters, including interstate wetlands. Waters of the United States are further defined as all other waters such as intrastate lakes, rivers, streams, mudflats, sandflats, wetlands, sloughs, prairie

potholes, wet meadows, playa lakes, natural ponds or impoundments of waters, tributaries of waters, and territorial seas. Wetlands are those areas inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions (USACE 1987).

Activities that result in the dredging or filling of jurisdictional wetlands are regulated under Section 404 of the CWA. The USACE has established Nationwide Permits (NWPs) to efficiently authorize common activities that do not significantly impact waters of the United States, including wetlands. The USACE is responsible for authorizing permitting under a NWP or requiring an individual permit.

The wetlands classification system used for describing wetlands within the study area is based on the hydrology, geology and vegetation of the area as published by the USFWS (Cowardin *et al*. 1979). This system is used on a national level by the USFWS to locate wetlands for the NWI maps. Wetlands located around Wister Lake and downstream are generally classified as palustrine, riverine, or lacustrine. Because of the amount of precipitation and available water within the study area, wetlands are a common feature. Approximately 13,268 acres of wetlands are found within the study area around Wister Lake (Table 3.4-3). Figure 3.4-4 shows the general locations of the wetlands. Downstream wetlands are similar in type and are found along the entire length of the Poteau River.

Table 3.4-3 General Wetlands Types Located within the Study Area

Wetlands System	*Wetlands Type*	*Class or Descriptor Found within the Study Areas*	*Acres(Within the 511 Corps Boundary)*
Palustrine	Pond or pool of water dominated by trees, shrubs or emergent vegetation or less than 20 acres in size.	1. Constructed dike or impoundment 2. Forested areas 3. Emergent vegetation 4. Shrub-dominated areas	8,630
Riverine	Running water defined within a distinct channel	1. Lower perennial streams 2. Intermittent streams	475
Lacustrine	Lake or deepwater area within a topographic depression or behind a dammed river channel	1. Deepwater lake areas 2. Shoreline areas with emergent vegetation	4,163

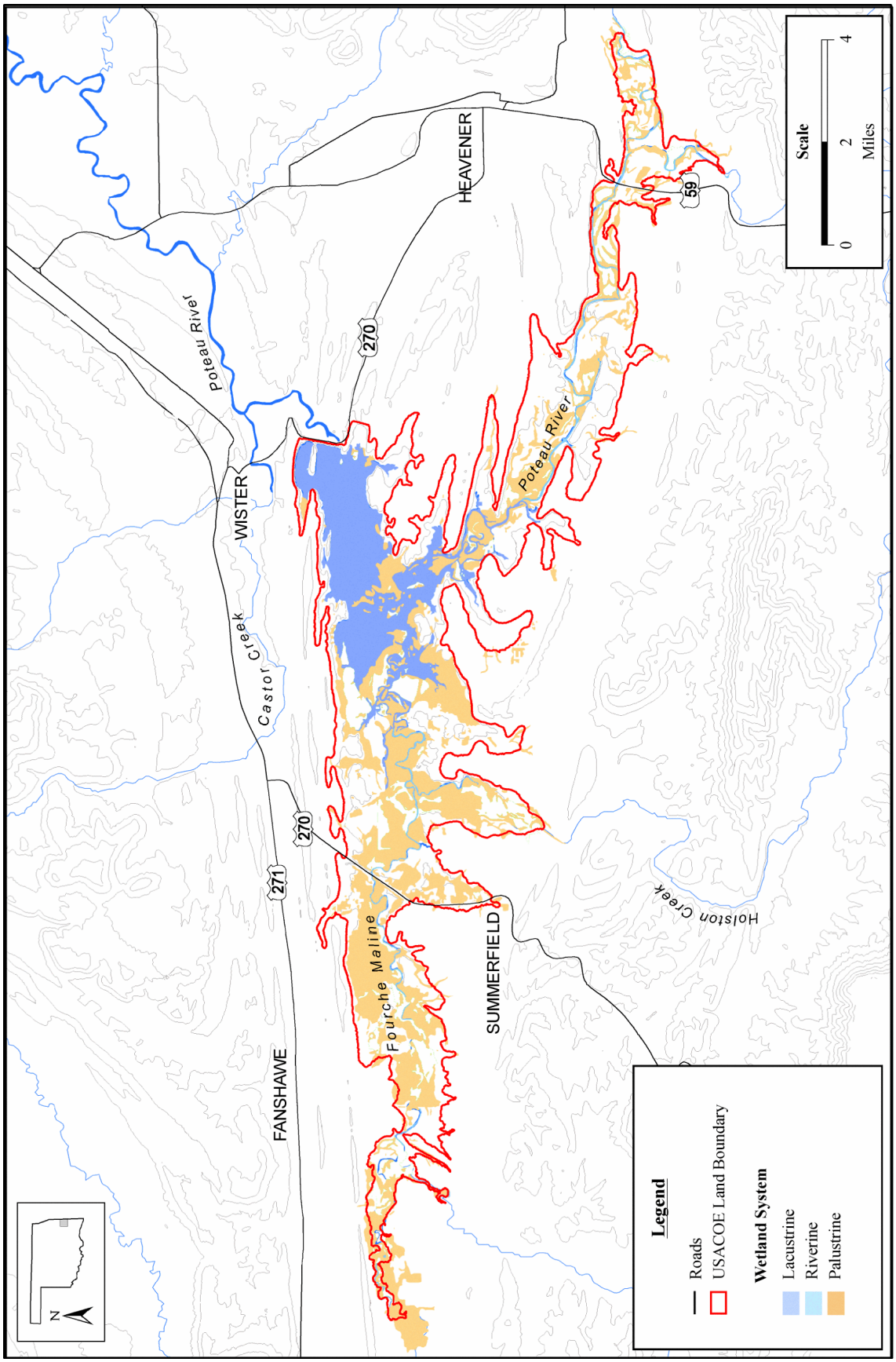

Figure 3.4-4 Wetlands Located around Wister Lake

3.4.6 Floodplains

Floodplains are the areas along rivers or lakes that are inundated during periods of flooding. Flooding is an inevitable event along most rivers, tending to be seasonal and caused by spring rains or melting snow. Other causes include flash floods from sudden thunderstorms and torrential rain. Many areas have 50- and 100-year floodplains identified through the Federal Emergency Management Agency (FEMA) for flood insurance purposes. However, because Le Flore County is not a participant in the FEMA flood insurance program, no current floodplain maps exist.

Floodplains around Wister Lake are generally inundated due to the dam. However, it is known that the larger flood levels reached a height of 480 feet, just above the current level of the conservation pool (Owens *et al.* 2000). These levels are well within the impact area for analysis of the pool levels. The most recent floodplain information available for downstream is from 1983, prior to FEMA discontinuing mapping (Figure 3.4-5). Approximately 45,600 acres are considered within the 100-year floodplain. These areas would have been flooded about once every 100 years.

3.5 LAND MANAGEMENT AND USE

Land use is defined as human modification of land, often for residential or economic purposes. It also refers to use of the land for preservation or protection of natural resources such as wildlife habitat, vegetation, unique features, or recreational pursuits. The attributes of land use include general land use and ownership, special-use land management areas, and land management plans. Land uses are frequently regulated by management plans, policies, ordinances, and regulations that determine the types of uses that are allowable or protect specially designated or environmentally sensitive uses. Special-use land management areas, such as wild and scenic rivers and wilderness areas require greater protection.

The affected environment for land ownership, management, and use consists of the area immediately surrounding Wister Lake and the area within the 100-year floodplain for the Poteau River below the dam.

3.5.1 Land Use

Wister Lake is located within Le Flore County, Oklahoma. The county is characterized by low, rolling, timbered mountains and valley pastures and meadows. The total land area of the county is

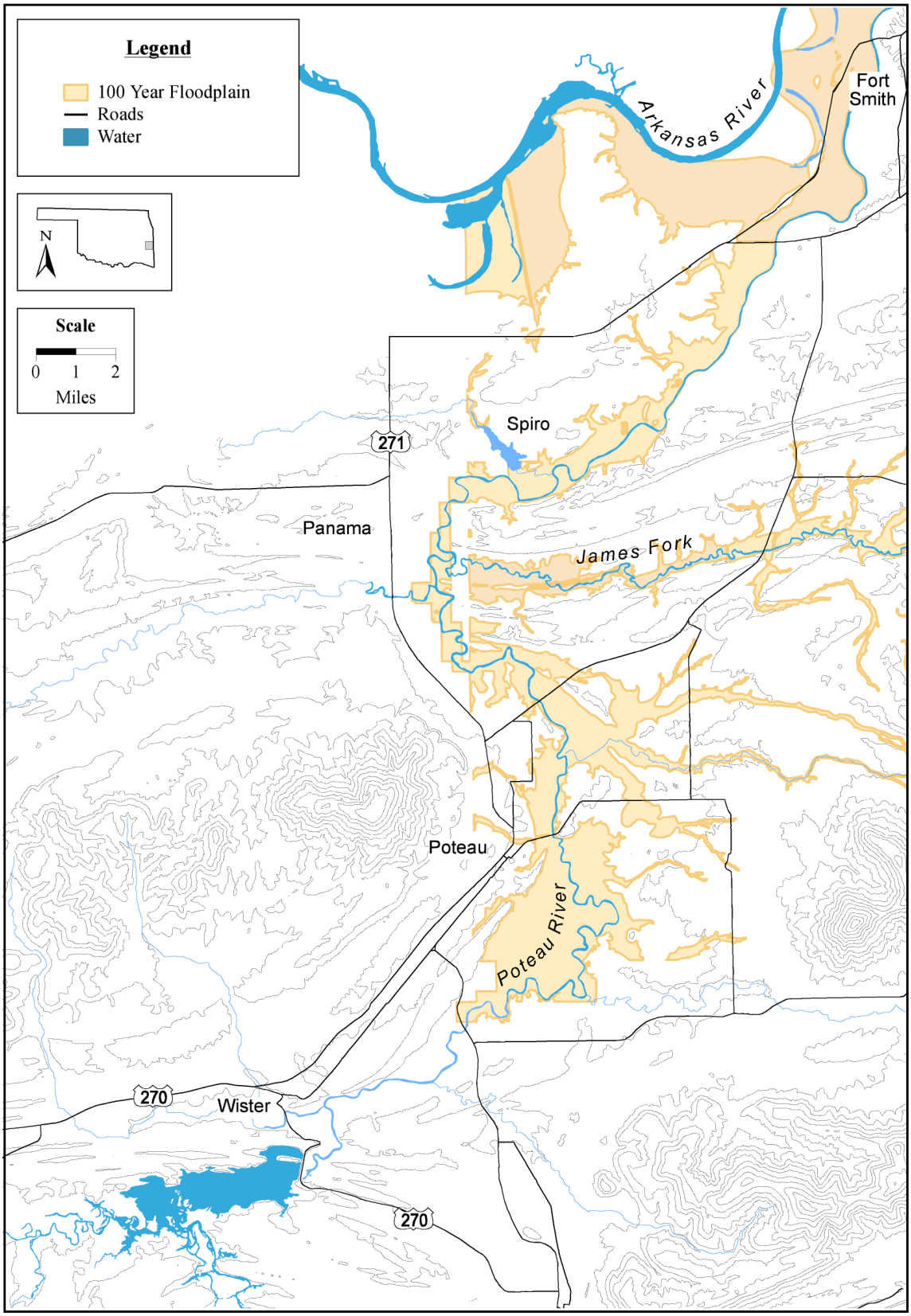

Figure 3.4-5 100-Year Floodplains Downstream of Wister Lake

1,014,300 acres. Timberland comprises 60 percent, while 35 percent is agricultural (of which 3,164 acres are irrigated). The remaining acreage is defined as residential/industrial. Of the approximate 1 million acres in Le Flore County, 118,100 acres are owned by forest industries, 43,500 acres by farmers, and 6,200 acres of timberland by corporations. Individuals own 279,600 acres, and the federal government owns the remaining 205,500 acres. In addition to a successful forest industry, Le Flore County produces poultry and beef.

Land use areas within the affected area of Wister Lake and downstream along the Poteau River are shown in Table 3.5-1.

Table 3.5-1 Land Use Types Around Wister Lake and the Poteau River

Land Use	*Wister Lake Area (Acres)*	*Poteau River Floodplain (Acres)*
Developed (Commercial, Residential, Industrial, Parks, Quarries)	23	338
Agricultural (Pasture, Cropland)	1,223	27,062
Undeveloped (Forest, Grasslands, Wetlands)	27,282	18,208
Total	28,504	45,608

3.5.2 Land Ownership and Management

USACE has direct control over several facilities and lands up to approximately the 511.0-foot elevation mark at the lake (see section 3.6 for further description of these facilities). Currently, the USACE leases lands to the west and south of the lake for grazing (9,122 acres) and agriculture (1,671.4 acres) (USACE 2001a). Also surrounding Wister Lake are 1,170 acres of Oklahoma State Park lands managed by the Department of Tourism and Recreation for recreational, hunting, fishing, and other water sports activities (see Figure 3.6-1). Park rangers currently manage and maintain the lands for a conservation pool level of 478 feet. Facilities, such as cabins, docks, and picnic areas, and roads in the state park are located to accommodate this pool level.

The ODWC has a license with the USACE to manage the 35,500-acre wildlife management area and wildlife refuge. In this region, both waterfowl hunting and conservation activities occur immediately adjacent to the lake. Municipal areas include local communities around Wister lake and downstream of the dam.

The towns of Wister and Poteau are both located within Le Flore County. Wister is located about 1 mile north of the Wister Lake main entrance, and Poteau is about 9 miles northeast of Wister. Fort Smith is about 47 miles downriver and northeast of Wister Lake. Land ownership along the 100-year floodplain consists mainly of private, business, and trust lands.

3.6 RECREATION

Recreation resources consider outdoor recreational activities that take place away from the residences of participants. Attributes used to describe recreational use of an area include the number of users, the activities available, the perceived value or benefit of the area for the users, and the uniqueness of the area as a recreational resource.

The affected environment for recreation resources includes the land immediately adjacent to Wister Lake and the lake itself. The Poteau River extends north from the lake to the Arkansas River. However, recreational activities are mainly restricted to the river itself, as developed recreation facilities are limited by private land ownership along the banks. Therefore, downstream recreation would not be affected by water level changes at Wister, and additional analysis is not needed.

The recreational activities at the lake and on land surrounding the lake are managed by USACE, Tulsa District, the Oklahoma Tourism and Recreations Department (OTRD)/Division of State Parks/Wister Lake State Park, and the ODWC. Visitors to Wister Lake enjoy recreational activities in areas managed by all three entities. These activities include boating, fishing, water skiing, swimming, camping, hunting, and hiking.

Recreational facilities are designed to serve the population demand within a 50-mile radius. Emphasis has been directed at day-use facilities, but overnight opportunities exist as well. Wister Lake offers eight public-use areas for vacationers. Park facilities include cabins, campsites (developed and undeveloped), swimming pool, showers, group campground, picnic pavilions, recreational vehicle hook-ups, convenience facilities (laundry/grocery/gift shop), and a nature center. Below is a listing of these recreational, public-use areas (Oklahoma Parks n.d.; USACE 1979); the managing agency is provided in parentheses.

- *Conser Crossing* (USACE) includes picnic and campground facilities, drinking water, and restrooms.
- *Overlook* (USACE) provides a boat ramp, drinking water, and restrooms.
- *Damsite recreation area* (OTRD) has cabins, a swimming pool, miniature golf, and the Activity Center.
- *Quarry Isle* (OTRD) provides commercial services, cabins, boat ramp, picnic and campgrounds (tent and recreational vehicles), and restrooms.
- *Wister Ridge* (OTRD) is handicapped accessible and includes a boat ramp, picnic and campgrounds (tent and recreational vehicle), and restrooms.
- *Victor Area* (OTRD) includes a boat ramp, group and single campground facilities, picnic grounds, restrooms, and recreational vehicle camping.

- *Fanny Creek* (OTRD) has picnic and parking areas as well as restrooms.
- *Potts Creek* (OTRD) is an undeveloped area with a boat ramp.

Figure 3.6-1 illustrates the locations of these recreational areas and the agencies that manage them.

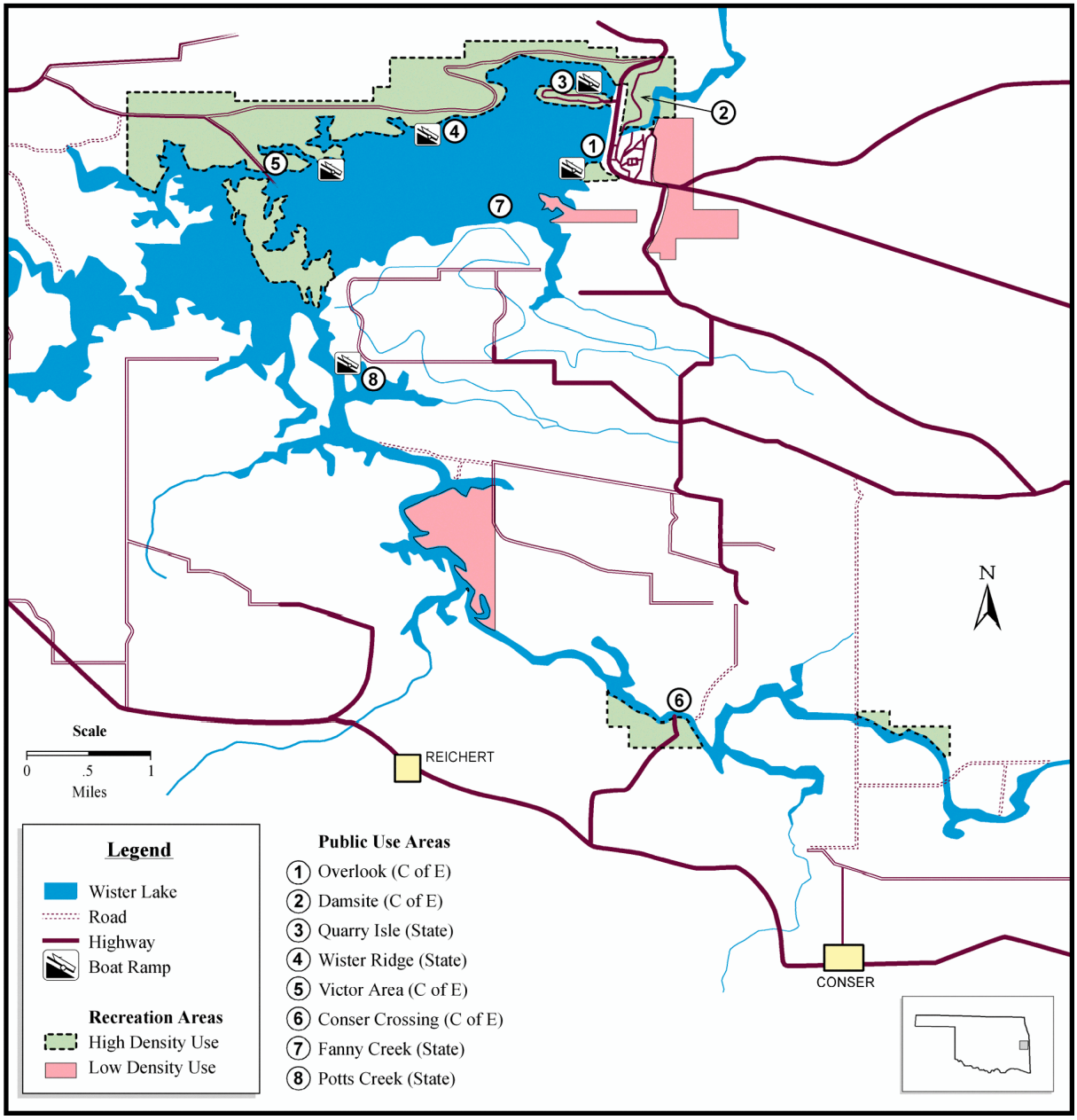

Figure 3.6-1 Recreation Areas and Intensity of Use

A public hunting area, approximately 35,000 acres, with deer, turkey, squirrel, rabbit, and bobwhite quail is located in the upper regions of the lake. A state waterfowl refuge is located on 2,000 acres of the western portion of the lake and surrounding land areas. These areas are managed by ODWC. Figure 3.4-3 provides the location of the game management area and waterfowl refuge.

Wister Lake State Park is one of fourteen state parks with cabins in a 50-park system in Oklahoma (ORTD 2001). Within the southeast region of Oklahoma, where Lake Wister State Park is located, there are 15 state parks—5 with golf courses, 4 others with cabins, and 4 with resorts. Over 280,000 visitors were recorded at Wister Lake in Fiscal Year (FY) 2000. Table 3.6-1 provides the number of visits and visitors since 1996 (personal communication, Stan Spirlock, 2001).

Table 3.6-1 Visitor Statistics at Wister Lake

Year (FY)	*Visits*	*Visitors*	*Visitor Hours*
2000	377,047	282,053	3,391,810
1999	340,099	250,924	3,011,023
1998	391,611	289,284	3,477,806
1997	394,146	315,472	3,785,619
1996	327,111	269,296	3,231,483

3.7 SOCIOECONOMICS

This section describes and analyzes the general features of the local economy including population, employment, and income that could be affected by the alternatives.

Wister Lake is located in Le Flore County (Figure 3.7-1). Primary access to Wister Lake is provided by U.S. Routes 270 and 271 through the communities of Wister, Heavener, and Poteau. Since these primary gateway communities are also located in Le Flore County, the socioeconomic analysis is focused on this county.

Le Flore County is one of 77 counties in Oklahoma and ranked fourteenth in the state by population. The population of Le Flore County was 48,109 in 2000, an increase of 11.2 percent from 1990, the fourteenth highest in the state. Total population in Oklahoma grew by 9.7 percent over the same period (U.S. Census Bureau 2001a).

Total full- and part-time employment in Le Flore County in 1997 was 17,719, about 2 percent greater than in 1996. Approximately 66 percent of total employment was wage and salary employment, 25

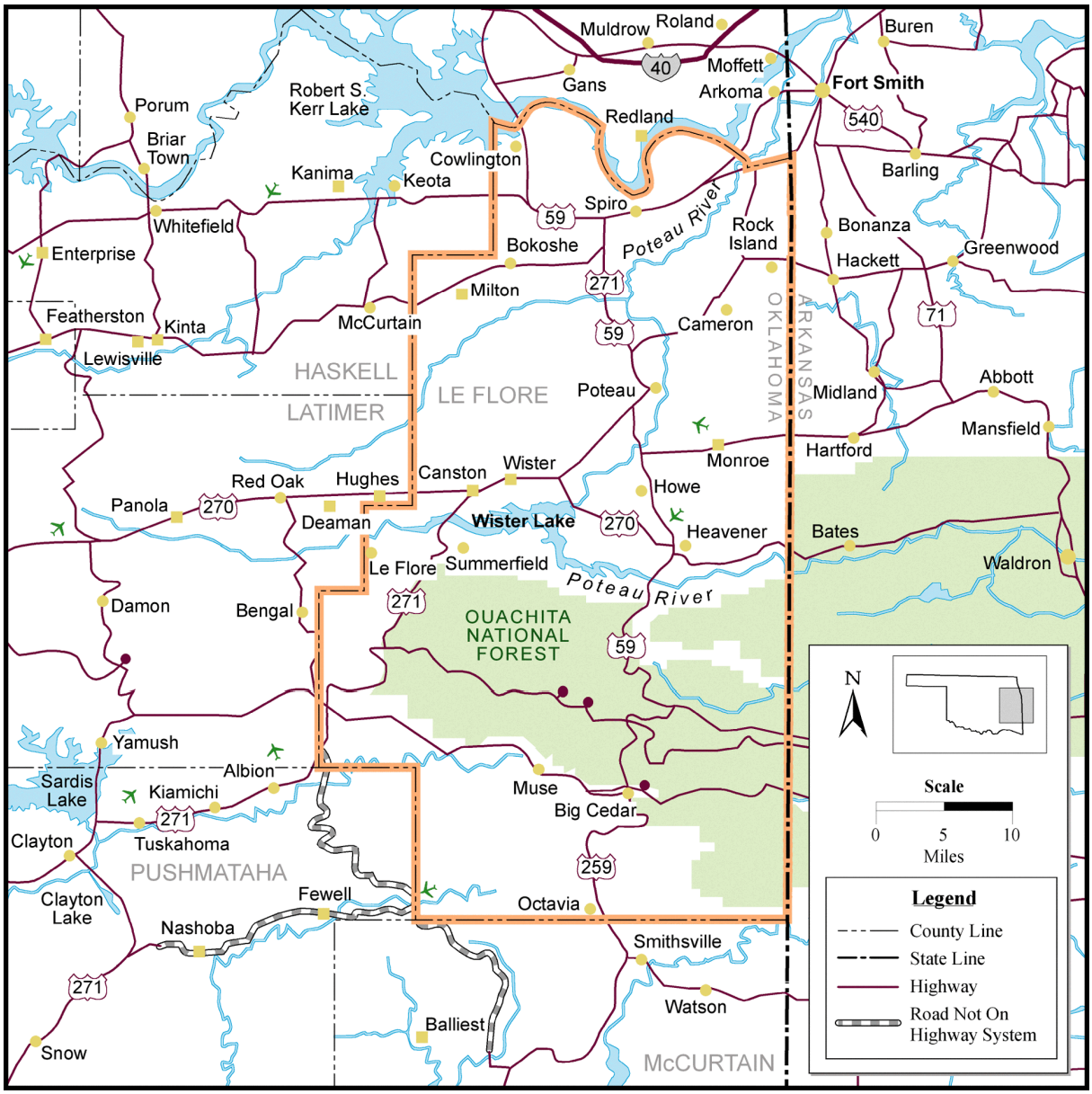

Figure 3.7-1 Socioeconomic Affected Area

percent was nonfarm proprietors' employment, and 9 percent was farm proprietors' employment (U.S. Bureau of Economic Analysis 2001).

The unemployment rate in Le Flore County in June 2001 was 4.8 percent, a decrease of 36 percent from the 1995 unemployment rate of 7.5 percent. The June 2001 unemployment rate for Oklahoma was 3.3 percent, and for the nation 4.7 percent (Oklahoma Employment Security Commission 2001).

The largest industries by employment in the county were *services* (23 percent), *government* (19 percent), *retail trade* (17 percent), *manufacturing* (13 percent), and *farming* (10 percent) (U.S. Bureau of Economic Analysis 2001).

In 1999, Le Flore County had a total personal income of $829,735,000, an increase of 70 percent from 1989. Per capita personal income in the county was $17,741 in 1999, a 56 percent increase from 1989. Le Flore County per capita personal income was 77 percent of the State of Oklahoma average ($22,958) and 62 percent of the national average ($28,546) (U.S. Bureau of Economic Analysis 2000).

Industries that generated the largest earnings in 1999 were *government* (21 percent), *farm* (14 percent), and *services* (13 percent). Of the industries that accounted for at least 5 percent of earnings in 1999, the fastest growing was *nondurable goods manufacturing,* which increased at an average annual rate of 17 percent. The slowest growing was *construction,* which decreased at an average annual rate of 7 percent (U.S. Bureau of Economic Analysis 2000).

Operations and activities associated with the Wister Lake project affect the local economy both directly and indirectly through the generation of revenues from recreation, grazing leases, payment in lieu of taxes (PILT), water sales, and protection from flooding.

The USACE has developed an economic model to estimate the economic impacts of recreation at Corps-managed lakes on regional economies. Using this model, recreation at Wister Lake generated $2.91 million in output, $1.09 million in personal income, and 89 jobs (including part-time positions) in FY 1999. Total impacts, after accounting for the multiplier effect, were $3.77 million in output, $1.37 million in personal income, and 103 jobs (including part-time positions) (USACE 2001b). This represents less than one percent of the Le Flore County economy.

Grazing leases around Wister Lake affect about 10,800 acres of land, divided up among 53 separate parcels. Approximately $27,700 in lease revenue is generated from these parcels each year. About 75 percent of the revenue received from grazing leases is returned to the state through supplemental direct funding or improvements and maintenance for road and schools.

PILT, which totals approximately $14,000 a year, is paid on a quarterly basis and may be routed to the county through school and road funds, as set by law.

Economic revenues from water storage at Wister Lake are approximately $250,000 a year. This fee is for the actual storage of water and is based on the amount of water stored and when the storage contract was initiated. Water storage fees are in effect until the investment cost of the water storage facility is repaid to the Treasury, and then yearly costs are reduced and used to cover the costs of maintenance and operation.

The Wister Lake project has prevented over $117,000,000 in flood damages downstream of the dam. This savings includes replacement costs for lost structures and crops that would have occurred had the dam system not been in place to control water flows (USACE 1993). This number has undoubtedly increased significantly since 1992, when the economic analysis was completed.

3.8 TRANSPORTATION

Transportation refers to the movement of vehicles on roads and highway networks. Primary roads are principal arterials, such as major interstates, designed to move traffic, but not necessarily to provide access to all adjacent areas. Secondary roads are arterials, such as rural routes and major surface streets, which provide access to residential and commercial areas.

For the purposes of this Supplemental FES, the affected environment includes the secondary roads used to access the Wister Lake project and associated park and wildlife refuge. The region of impact includes those roads subject to inundation during a flood event. Such roads include those immediately adjacent to the lake and those accessing the park and wildlife refuge. Because the nearest major interstate, I-40, is more than 50 miles north of the lake, it is not included in this analysis.

Wister Lake is located about a one mile south of Wister, about 7 miles northwest of Heavener, and about 9 miles southwest of Poteau (Figure 3.8-1). Route 270, running east to west, serves as the main access point to the lake and Wister Lake State Park. The state park is responsible for the upkeep and maintenance of roads to the campgrounds and associated facilities (Park Representative 2001). Route 270 (as well as other secondary county roads surrounding the lake) is maintained by the Le Flore County Highway Department.

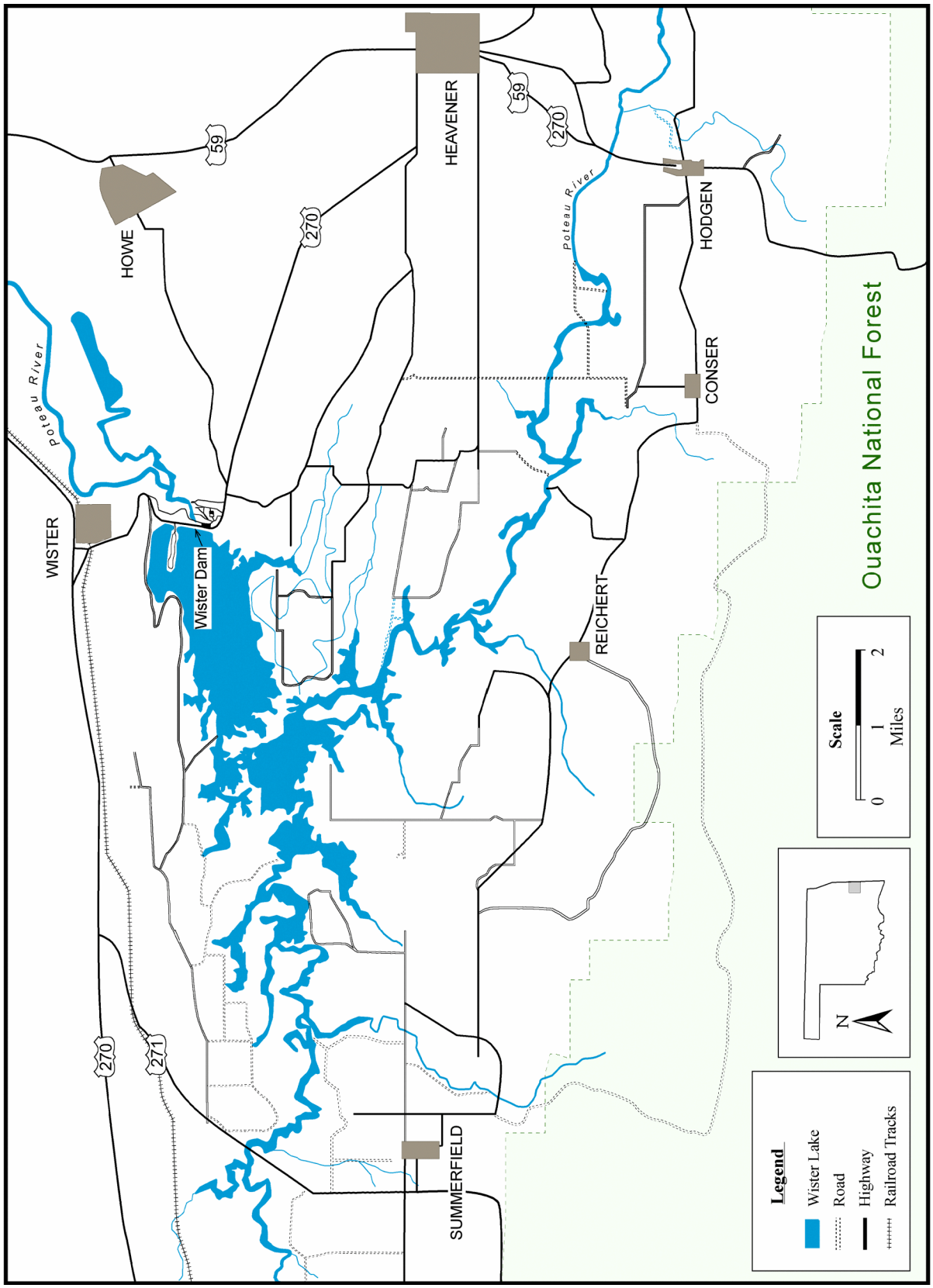

Figure 3.8-1 Transportation.

3.9 CULTURAL RESOURCES

Cultural resources are prehistoric and historic sites, buildings, districts, or objects that are important to a culture or community. Cultural resources are divided into three main categories: archaeological resources, architectural resources, and traditional cultural resources or properties.

- *Archaeological resources* are any material remains of past human life or activities such as pottery, basketry, bottles, and weapons.

- *Architectural resources* are standing buildings, dams, canals, bridges, windmills, oil wells, and other structures.

- *Traditional cultural properties* are resources associated with the cultural practices and beliefs of a living community that link the community to its past and help maintain its cultural identity. Most traditional cultural properties are associated with Native Americans. Traditional cultural properties can include archaeological resources, locations of historic events, sacred areas, sources of raw material for making tools and sacred objects, or traditional hunting and gathering areas.

Under the National Historic Preservation Act and various federal regulations, only significant cultural resources are considered when assessing the possible impacts of a federal action. Significant archaeological resources include those that are eligible or recommended as eligible for inclusion in the National Register of Historic Places (National Register). The significance of archaeological resources is usually determined by using the specific criteria (listed in 36 CFR 60.4), including association with a famous individual, ability to contribute to scientific research, and ability to add to an understanding of history and prehistory. Cultural resources must usually be at least 50 years old to be considered eligible for listing. Even if a traditional cultural resource is determined to be ineligible for the National Register, it may still be significant to a particular tribe and be protected under the Native American Graves Protection and Repatriation Act, the American Indian Religious Freedom Act, or Executive Order 13007, which addresses sacred Indian sites. The significance of a Native American traditional cultural property is determined by consulting with the appropriate Native American tribes.

The affected area for cultural resources includes the area around Wister Lake to the 511.0-foot elevation line and the floodplain of the Poteau River approximately 61 river miles from Wister Dam to the confluence with the Arkansas River. These are the areas most likely to be affected by water fluctuation, submergence, alluviation, or erosion associated with changes in the height of the conservation pool.

Information on archaeological and architectural resources within the affected environment was derived from published sources, USACE reports, and records at the State Historic Preservation Office. Data

collection included background research to identify previously recorded National Register properties and archaeological sites for an area below the 511.0-foot elevation level around Wister Lake, studies on the potential for archaeological sites in unsurveyed area to 511.0-foot level, and studies for the area within one-half mile on either side of the Poteau River from Wister Dam to the Arkansas River. USACE sources included the *Wister Lake Historic Properties Management Plan* (USACE 1996), the Wister Lake Archaeological Database (USACE 2000), and recent testing along Wister Lake (Owens *et. al.* 2000). Studies in other areas in Le Flore County include Mayo (1975), Albert (1987), and Petersen and others (1993).

Past consultation and correspondence with Native American tribes for this project provided information on Native American issues and traditional cultural resources. Groups contacted during the IICEP process include those federally recognized tribes who live in the vicinity of the affected environment or those who lived there in the past, including the Caddo, Cherokee, Choctaw, Muskogee, Chickasaw, and Wichita tribes. Each of these groups was sent information about the proposal, and their concerns were solicited by USACE, Tulsa District.

Archaeological investigations have been conducted in the area around Wister Lake since the 1930s, but more extensive surveys and excavations were performed by the University of Oklahoma in the mid 1940s, before the construction of the dam. In the 1970s, large area, systematic surveys were performed prior to the seasonal increase in the level of the conservation pool to 478.0 feet. In 1975, the Wister Lake Archaeological Project, consisting of federally owned lands at Wister Lake, was listed on the National Register of Historic Places. The 45,000-acre district included 18 prehistoric sites as contributing members. Since 1975, a number of surveys have been conducted to record sites in unsurveyed areas, to relocate previously recorded sites, and to assess the conditions of sites potentially affected by inundation or fluctuating pool levels in order to determine National Register eligibility.

All of the surveys around Wister Lake have recorded 207 sites, including 180 prehistoric sites, 16 historic sites, 4 multicomponent (historic/prehistoric sites,) and 7 sites of unknown age (Owens *et al.* 2000). The cultural history of eastern Oklahoma began during the Pleistocene, approximately 12,000 years ago (Owens *et al*. 2000). The past in this area is generally divided into five major periods: PaleoIndian (12,000–8,000 years ago), Archaic (8,000–2,300 years ago), Woodland (2,300–1,200 years ago), Arkansas Valley Caddoan (1,100–400 years ago), and Historic (400–present). Early periods of prehistory, especially PaleoIndian and Archaic, are poorly understood. Generally, there is a trend toward increasing sedentism, agricultural development, population growth, and social differentiation. Starting in the late Archaic, groups extensively used riparian environments. This practice was particularly true during the Arkansas Valley Caddoan tradition, which had large-mound ceremonial centers, large habitation sites, and farmsteads. All of these kinds of sites tended to be located on or adjacent to

floodplains. The most significant site in the region belonging to the Arkansas Valley Caddoan tradition is the Spiro site, a large, ceremonial mound center approximately 30 miles north of Wister Lake. Spiro phase sites along Wister Lake are considered to be outlying members of this ceremonial-political center.

Historic use of the area consisted of resettled Indian tribes (Cherokee, Creek, Seminole, Choctaw, and Chickasaw) from the southeastern United States in the early 1800s and Euroamerican homesteaders in the late 1800s.

Of 207 archaeological sites, 21 sites are listed on the National Register or are eligible for listing, 170 sites are undetermined, and 16 sites are ineligible. In addition to known sites, there are areas around Wister Lake that have a high potential for containing buried archaeological sites based on geomorphological studies on buried terraces around Wister Lake (Owens *et al.* 2000). Approximately 53 percent of these areas are located at elevations less than 485.0 feet.

Table 3.9-1. Significant Sites around Wister Lake

Elevation around Wister Lake (feet)	*Eligible Sites*	*Unknown Eligibility*	*Not Eligible*	*Total Sites*
471.6-478.0	7	33	11	51
478.1-485.0	9	21	2	32
485.1-495.8	0	19	2	21
495.9-502.5	4	25	0	29
502.5-511.0	1	37	0	39
511.1-519.0	0	17	0	1
520.0-550.0	0	18	1	19
Total Sites	21	170	16	207

The *Wister Lake Historic Properties Management Plan* (USACE 1996) identifies ongoing methods for completing archaeological surveys, relocating and evaluating sites, and assessing site conditions.

To assess potential effects to downstream areas of the Poteau River, a record search was conducted at the Oklahoma State Historic Preservation Office in Oklahoma City. All sites located within one-half mile of the lower Poteau River bank were mapped, and general characteristics such as age and type of site were noted. A total of 47 archaeological sites are recorded in this area. Thirty-nine of the sites are prehistoric in age, three are historic, and five sites have both prehistoric and historic components. The prehistoric sites consist of small hunting camps, Archaic and Woodland base camps, late prehistoric farmsteads, and two possible mound sites. The historic sites are homesteads, a cemetery, and trash dumps. At least 30 of these sites have enough integrity to be considered eligible or possibly eligible to the National Register.

No traditional cultural properties have been identified around Wister Lake or in the downstream areas. However, sites with burials are considered to be particularly important to Native American groups in the area.

3.10 HAZARDOUS, TOXIC, AND RADIOACTIVE WASTE

Hazardous materials are identified and regulated under the Comprehensive Environmental Response, Compensation and Liability Act and include any substances with special characteristics that could harm people, plants, or animals when released. The USACE is responsible for maintaining a plan that addresses storage, proper handling procedures and spill procedures.

Hazardous waste is defined as any solid, liquid, contained gaseous or semisolid waste, or any combination of wastes that could or do pose a substantial hazard to human health or the environment. Waste may be classified as hazardous because of its toxicity, reactivity, radioactivity, ignitiblity, or corrosivity. Generators of hazardous wastes are responsible for properly segregate, storing, and transferring all hazardous waste for disposal to accumulation points.

Daily operations and maintenance of the Wister Lake project include the storage of hazardous materials such as petroleum fuel, oil and lubricants, pesticides, paint, paint thinner, solvents, batteries and compressed gas (acetylene and oxygen). The generation of hazardous waste at the Wister Lake project is minimal but includes used oil or solvents, paint thinner, and solvent-laden rags and batteries.

During 1999, a compliance audit found that the Wister Lake project was in adherence with all required hazardous materials and hazardous waste management regulations, AR 200-1, ER 200-2-3, and district policy. This compliance (or adherence) included procedures for storing, handling, and transporting hazardous materials and disposal of hazardous waste.

3.11 ENVIRONMENTAL JUSTICE

Environmental Justice, as defined in Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority and Low-Income Populations*, looks at whether proposed actions or alternatives disproportionately affect minority or low-income populations. The order mandates that federal actions and policies should avoid, if possible, the disproportionate placement of adverse environmental, economic, social, or health effects on minority or low-income groups.

Wister Lake and areas downstream along the Poteau River are located in Le Flore County. Since all potential impacts would be contained within Le Flore County, it is used as the basis for environmental justice analysis. Information developed by the U.S. Census Bureau was used to identify the percentages of minority and low-income populations within Le Flore County. Minority populations are defined as "persons of Hispanic origin of any race, Blacks, American Indians, Eskimos, Aleuts, Asians or Pacific Islanders." Low-income populations are defined as "persons living below the poverty level, based on a total annual income of $17,463 for a family of four persons including two children" (U.S. Census Bureau 2001b).

The minority population of Le Flore County in 2000 was 9,429, or 19.6 percent of the total population. This number is an increase of approximately 47.6 percent from 1990. The minority population of Oklahoma in 2000 was approximately 23.8 percent. The minority population for the United States is 24.9 percent (U.S. Census Bureau 1990, 2001a).

Approximately 10,440 people, or 21.7 percent of the total county population, are below the poverty level. This number is essentially unchanged from the 1990 rate of 21.8 percent. Approximately 16.3 percent of the population of Oklahoma is below the poverty level (U.S. Census Bureau 1990, 2001a). The percent of people below poverty level within the United States is 13.3 percent. Both the state of Oklahoma and Le Flore County are above this number.

3.12 PROTECTION OF CHILDREN

In 1997, Executive Order 13045, *Protection of Children from Environmental Health Risks and Safety Risks* (*Protection of Children*), was issued to ensure the protection of children. The order requires federal agencies to make it a high priority to identify and assess environmental health and safety risks that may disproportionately affect children. Socioeconomic data specific to the distribution of population by age and proximity of youth-related developments such as daycare centers and schools, that could potentially conflict with the proposed action or alternatives are presented.

The affected environment includes lands immediately adjacent to Wister Lake and those areas within the 100-year floodplain along the Poteau River. As of the 2000 census, the total number of Le Flore County residents under the age of 18 was about 12,500 or 26.1 percent. No youth-related facilities are located within the Wister Lake Study area. Elementary, middle, and high schools that may occur within the Poteau River study area are shown in Table 3.12-1.

Table 3.12-1: Schools Potentially Located within the Affected Area

City	*Schools*
Arkoma	Arkoma Elementary School Arkoma Junior High School Arkoma High School
Heavener	Heavener Junior High School Heavener High School
Poteau	Poteau Primary Elementary School Poteau Upper Elementary School Pansy Kidd Middle School Poteau High School
Shady Point	Shady Point Elementary School
Wister	Wister Elementary School Wister High School