Draft
Environmental Assessment
for
Designation of Critical Habitat
for
Arkansas River Shiner

U.S. Department of the Interior
Fish and Wildlife Service
Region 2

27 July 2005

TABLE OF CONTENTS

1.0 PURPOSE OF AND NEED FOR ACTION 1
1.1 Introduction 1
1.2 Purpose of the Action 2
1.3 Need for the Action 3
1.4 Background 3
1.4.1 Critical Habitat 3
1.4.1.1 Provisions of the ESA 3
1.4.1.2 The Section 7 Consultation Process 5
1.4.1.3 Proposed Primary Constituent Elements 7
1.4.2 Background Information on Arkansas River Shiner 8
1.4.2.1 Description 8
1.4.2.2 Distribution 8
1.4.2.3 Reproduction and Life History 8
1.4.2.4 Habitat 10
1.4.2.5 Food Habits 11
1.4.2.6 Competition 12
1.5 Permits Required for Implementation 12
1.6 Related Laws, Authorizations, and Plans 12
1.7 Issues 13

2.0 ALTERNATIVES, INCLUDING THE NO ACTION ALTERNATIVE 14
2.1 Development of Alternatives 14
2.2 No Action Alternative 14
2.3 Alternative I 14
2.3.1 Unit 1A - Canadian River, New Mexico and Texas 14
2.3.2 Unit 1B - Canadian River, Texas and Oklahoma 16
2.3.3 Unit 2 - Beaver/North Canadian River, Oklahoma 16
2.3.4 Unit 3 - Cimarron River, Kansas and Oklahoma 16
2.4 Alternative II 18
2.5 Option A - Exclusion of Unit 1A 21
2.6 Comparison of Alternatives 21
2.7 Preferred Alternative 21

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES 27
3.1 Assessment of Impacts 27
3.1.1 Nature of Impacts from Critical Habitat Designation for Arkansas River Shiner 27
3.1.2 Impact Assessment Method 30
3.2 Conservation of Arkansas River Shiner 31
3.2.1 Existing Conditions 31

3.2.2 Effects on Conservation of Arkansas River Shiner 32
3.2.2.1 No Action Alternative 32
3.2.2.2 Alternative I 34
3.2.2.3 Alternative II 35
3.2.2.4 Option A 36
3.3 Water Resources 36
3.3.1 Existing Conditions 36
3.3.2 Effects on Water Resources 39
3.3.2.1 No Action Alternative 39
3.3.2.2 Alternative I 41
3.3.2.3 Alternative II 43
3.3.2.4 Option A 43
3.4 Agriculture and Concentrated Animal Feeding Operations 44
3.4.1 Existing Conditions 44
3.4.2 Effects on Agriculture and Concentrated Animal Feeding Operations 46
3.4.2.1 No Action Alternative 46
3.4.2.2 Alternative I 47
3.4.2.3 Alternative II 48
3.4.2.4 Option A 48
3.5 Oil and Gas Resources 48
3.5.1 Existing Conditions 48
3.5.2 Effects on Oil and Gas Resources 50
3.5.2.1 No Action Alternative 50
3.5.2.2 Alternative I 50
3.5.2.3 Alternative II 51
3.5.2.4 Option A 51
3.6 Transportation 51
3.6.1 Existing Conditions 51
3.6.2 Effects on Transportation 52
3.6.2.1 No Action Alternative 52
3.6.2.2 Alternative I 52
3.3.2.3 Alternative II 54
3.3.2.4 Option A 54
3.7 Recreation 55
3.7.1 Existing Conditions 55
3.7.2 Effects on Recreation 55
3.7.2.1 No Action Alternative 55
3.7.2.2 Alternatives I, II and Option A 55
3.8 Socioeconomic Conditions and Environmental Justice 57
3.8.1 Existing Conditions 57
3.8.1.1 Land Use 57
3.8.1.2 Communities 59

3.8.1.3 Economy 59
3.8.1.4 Environmental Justice 60
3.8.2 Environmental Justice and Effects on Socioeconomic Conditions 62
3.8.2.1 No Action Alternative 62
3.8.2.2 Alternative I, II, and Option A 62
3.9 Cumulative Effects 63
3.10 Relationship Between Short-Term and Long-Term Productivity 63
3.11 Irreversible and Irretrievable Commitment of Resources 63

4.0 COUNCIL ON ENVIRONMENTAL QUALITY ANALYSIS OF SIGNIFICANCE 64

5.0 REFERENCES 65

LIST OF TABLES

Table 1. Proposed critical habitat units in Alternative I 17
Table 2. Proposed critical habitat units in Alternative II 19
Table 3. Comparison of potential effects of alternative critical habitat designations 22
Table 4. Formal and informal consultations that included Arkansas River shiner 33
Table 5. Oil and gas production in 2003 in the project area 48
Table 6. Number of road and railroad crossings in each of the proposed critical habitat units 52
Table 7. Counties in the analysis area for critical habitat designation for Arkansas River shiner 57
Table 8. Land ownership in the proposed critical habitat project area 59
Table 9. Population of the four states and their associated counties in the analysis area 60

LIST OF FIGURES

Figure 1. Simplified diagram of the ESA section 7 consultation process 6
Figure 2. Arkansas River shiner 9
Figure 3. Historic range and current distribution of Arkansas River shiner 9
Figure 4. Critical habitat units proposed in Alternative I 15
Figure 5. Critical habitat units proposed in Alternative II 20
Figure 6. Distribution of nesting interior least tern in the Arkansas River basin 30
Figure 7. Water surface elevation of Lake Meredith since construction of Sanford Dam 38
Figure 8. Overview of major agricultural land uses in the project area 45
Figure 9. Highways and railroads in the proposed critical habitat project area 53
Figure 10. Location of ORV areas at Lake Meredith National Recreation Area 56
Figure 11. Land ownership in the analysis area 58
Figure 12. Number of farms in 1997 in the counties encompassing the project area 58
Figure 13. Demographic characteristics of the project area 61

1.0 PURPOSE OF AND NEED FOR ACTION

The U.S. Department of the Interior (USDI), Fish and Wildlife Service (Service) has prepared this Environmental Assessment (EA) to analyze potential effects to physical and biological resources and social and economic conditions that may result from designation of critical habitat for the Arkansas River shiner (*Notropis girardi*), a species listed as threatened under the Endangered Species Act of 1973 (ESA), as amended.

This EA will be used by the Service to decide whether or not critical habitat will be designated as proposed, if the proposed action requires refinement, or if further analyses are needed through preparation of an environmental impact statement. If the proposed action is selected as described or with minimal changes and no further environmental analyses are needed, a Finding of No Significant Impact will be prepared. This EA has been prepared pursuant to the requirements of the National Environmental Policy Act of 1969 (NEPA) as implemented by the Council on Environmental Quality regulations (40 CFR §1500, *et seq.*)[1] and Department of the Interior NEPA procedures.

This Environmental Assessment analyzes the potential effects of re-designation of critical habitat for the Arkansas River shiner, a species listed as threatened under the federal Endangered Species Act

1.1 Introduction

While species extinction can and does occur naturally, the current rate of extinctions is estimated to be many times greater than the natural "background" rate, due to the effects of human actions (*e.g.* Wilson, 1992; Ward, 2004). Recognition that human activities "untempered by adequate concern and conservation" were causing species extinctions was the primary reason for enacting the Endangered Species Act of 1973 (*cf.* ESA §2[a][1]). In developing the law, Congress found that the biological diversity and natural heritage of the United States had "esthetic, ecological, educational, historical, recreational, and scientific value to the Nation and its people" (*cf.* ESA §2[a][3]). The ESA is now the main federal law for protecting and recovering species that are in danger of extinction, thereby conserving the biological diversity and natural heritage of the United States.

The final rule to list the Arkansas River basin population of Arkansas River shiner as threatened under the ESA was published on 23 November 1998 (63 FR 64772). It is estimated that the species has been eliminated from about 80 percent of its historic range (69 FR 59859: 59861). The primary threat to Arkansas River shiner is "destruction and modification of habitat from stream channelization, reservoir construction, stream flow alteration and depletion, and, to a lesser extent, water quality degradation" (63 FR 64772: 64790). Critical habitat was not designated

[1] CFR is the Code of Federal Regulations, which can be accessed via the Internet at http://www.gpoaccess.gov/cfr/index.html

when the species was listed because the Service concluded that it would not benefit the species (63 FR 64772: 64796).

Pursuant to a court settlement order on 16 February 2000 (*Center for Biological Diversity* v. *Bruce Babbitt, et al.* C99-3202 SC), the Service agreed to reconsider critical habitat designation. The Service subsequently found that designation of critical habitat was prudent and could benefit conservation of the species. Accordingly, critical habitat was proposed on 30 June 2000 (65 FR 40576: 40577). Following extended public comment on the proposed rule, the Service published a final rule designating critical habitat for Arkansas River shiner on 4 April 2001 (66 FR 18002). The critical habitat designation included 1,160 miles of river and 300 feet of adjacent riparian habitat along each stream bank. Included in the designation were the Arkansas River in Kansas (363 miles), the Cimarron River in Kansas and Oklahoma (134 miles), the Beaver/North Canadian River in Oklahoma (161 miles), and the South Canadian/Canadian River in New Mexico, Oklahoma, and Texas (502 miles).

Critical habitat for the Arkansas River shiner was previously designated and was in place from May 2001 to September 2003

Critical habitat designation was in place for about two-and-one-half years, from May 2001 to September 2003, when a court decision ordered the Service to re-propose critical habitat for Arkansas River shiner (69 FR 59859: 59861). The Service vacated the designation in September 2003 and re-proposed critical habitat for Arkansas River shiner on 6 October 2004 (69 FR 59859).

This EA analyzes alternatives for re-designation of critical habitat for Arkansas River shiner. The EA is organized in six chapters. Chapter 1 contains introductory information on critical habitat and Arkansas River shiner, and describes the purpose of and need for the action. Chapter 2 describes the alternatives for critical habitat designation, including the No Action alternative, and provides a summary comparison of the effects of the alternatives. Chapter 3 presents the existing conditions and discloses the effects of the alternatives for critical habitat designation on relevant resource areas. Chapter 4 is the analysis of significance of the proposed action. Chapter 5 is the list of preparers of the EA, and Chapter 6 is a list of references cited in the EA.

1.2 Purpose of the Action

Appropriate management of the habitat required by an endangered or threatened species is a crucial component of conservation. A primary purpose of the ESA is to "provide a means whereby the ecosystems upon which endangered species and threatened species may be conserved" (ESA §2[b]). The critical habitat provisions of the ESA are intended to provide protection of habitat that is essential to the conservation of listed species.

In 30 years of implementing the Act, the Service has found that the designation of statutory critical habitat provides little additional protection to most listed species, while consuming significant amounts of available conservation resources. The present system for designating critical habitat has evolved since its original statutory prescription into a process that provides little real conservation benefit, is driven by litigation and the courts rather than biology, limits the Service's ability to fully evaluate the science involved, consumes

enormous agency resources, and imposes huge social and economic costs.

While attention to and protection of habitat is paramount to successful conservation actions, the Service has consistently found that, in most circumstances, the designation of critical habitat is of little additional value for most listed species, yet it consumes large amounts of conservation resources. Sidle (1987) stated, "Because the Act can protect species with and without critical habitat designation, critical habitat designation may be redundant to the other consultation requirements of section 7." Currently, only 470 species or 38 percent of the 1,253 listed species in the U.S. under the jurisdiction of the Service have designated critical habitat.

The Service addresses the habitat needs of all 1,253 listed species through conservation mechanisms such as listing, section 7 consultations, the Section 4 recovery planning process, the Section 9 protective prohibitions of unauthorized take, Section 6 funding to the States, and the Section 10 incidental take permit process. The Service believes that it is these measures that may make the difference between extinction and survival for many species.

The costs resulting from the designation include legal costs, the cost of preparation and publication of the designation, the analysis of the economic effects and the cost of requesting and responding to public comment, and in some cases, such as the present one, the costs of compliance with the National Environmental Policy Act. None of these costs result in any benefit to the species that is not already afforded by the protections of the Act enumerated earlier, and they directly reduce the funds available for direct and tangible conservation actions.

The purpose of this action is to re-designate critical habitat for Arkansas River shiner, which is listed as threatened under the ESA. Critical habitat designation identifies geographic areas that have features that are essential for conservation of the species. It also describes those physical and biological features that constitute critical habitat (*i.e.* primary constituent elements).

1.3 Need for the Action

The ESA requires that critical habitat be designated for listed species unless the Service determines that such a designation is not prudent. The Service has determined that a designation is prudent, and so is required to complete the process.

1.4 Background

1.4.1 Critical Habitat

1.4.1.1 Provisions of the ESA Section 4(a)(3) of the ESA states that critical habitat shall be designated to the maximum extent prudent and determinable and that such designation may be revised periodically, as appropriate. Section 4(b)(2) of the ESA requires that critical habitat designation be based on the best scientific information available and that economic and other impacts must be considered.

Areas may be excluded from critical habitat designation if it is determined that the benefits of excluding them outweigh the benefits of their inclusion, unless failure to include the areas in critical habitat would result in extinction of the species.

Critical habitat is defined in section 3(5)(A) of the ESA as "(I) the specific areas within the geographical area occupied by the species, at the time it is listed in accordance with the provisions of section 4 of this Act, on which are found those physical and biological features (I) essential to the conservation[2] of the species and (II) which may require special management considerations or protection;" and "(ii) specific areas outside the geographical area occupied by the species at the time it is listed in accordance with the provisions of section 4 of this Act, upon a determination by the Secretary that such areas are essential for the conservation of the species."

Section 3(5)(C) also states that critical habitat "shall not include the entire geographical area which can be occupied by the threatened or endangered species" except when the Secretary of the Interior determines that the areas are essential for the conservation of the species.

Section 7(a)(2) of the ESA requires federal agencies to consult with the Service to "insure that any action authorized, funded, or carried out by such agency ... is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species which is determined ... to be critical." This consultation process is typically referred to as section 7 consultation. Section 7 of the ESA does not apply to state, local, or private actions unless there is a federal nexus (*i.e.* federal funding, authorization, permitting).

[2] Conservation is defined in the ESA as the use of "all methods and procedures which are necessary to bring any endangered or threatened species to the point at which the measures provided pursuant to this Act are no longer necessary."

Designation of critical habitat does not change land ownership, nor does it automatically impose restrictions on land uses

Uses of private land that have no federal involvement are not affected by critical habitat designation

Designation of critical habitat can help focus conservation activities by identifying areas that are essential to the conservation of the species, regardless of whether they are currently occupied by the listed species. Designation of critical habitat also serves to alert the public and land management agencies to the importance of an area for conservation of a listed species. As described above, critical habitat receives protection from destruction or adverse modification through required consultation under section 7 of the ESA. Aside from outcomes of consultation with the Service under section 7, the ESA does not automatically impose any restrictions on lands designated as critical habitat.

However, the Service has found that critical habitat designation, or the prospect of designation, often gives rise to strong public opposition. While this may be the result of misunderstandings of the consequences of the designation, the opposition is real. It can in turn generate opposition to needed conservation measures, and cause landowners to not cooperate or engage in voluntary conservation measures on their lands which they other wise might be willing to undertake. Although designation of critical habitat prohibits destruction or adverse modification of that habitat as the result of Federal action, funding or permits, designation of critical habitat does not require, or provide any

direct incentive for conservation measures to improve the quality of or restore the designated habitat.

1.4.1.2 The Section 7 Consultation Process

The section 7 consultation process (Figure 1) begins with a determination of effects on listed species and designated critical habitat by the federal action agency. If the federal action agency determines that there will be no effect on listed species or designated critical habitat, the proposed action is not altered or impacted by ESA considerations. If the federal action agency determines that listed species or designated critical habitat may be affected, then consultation with the Service is initiated.

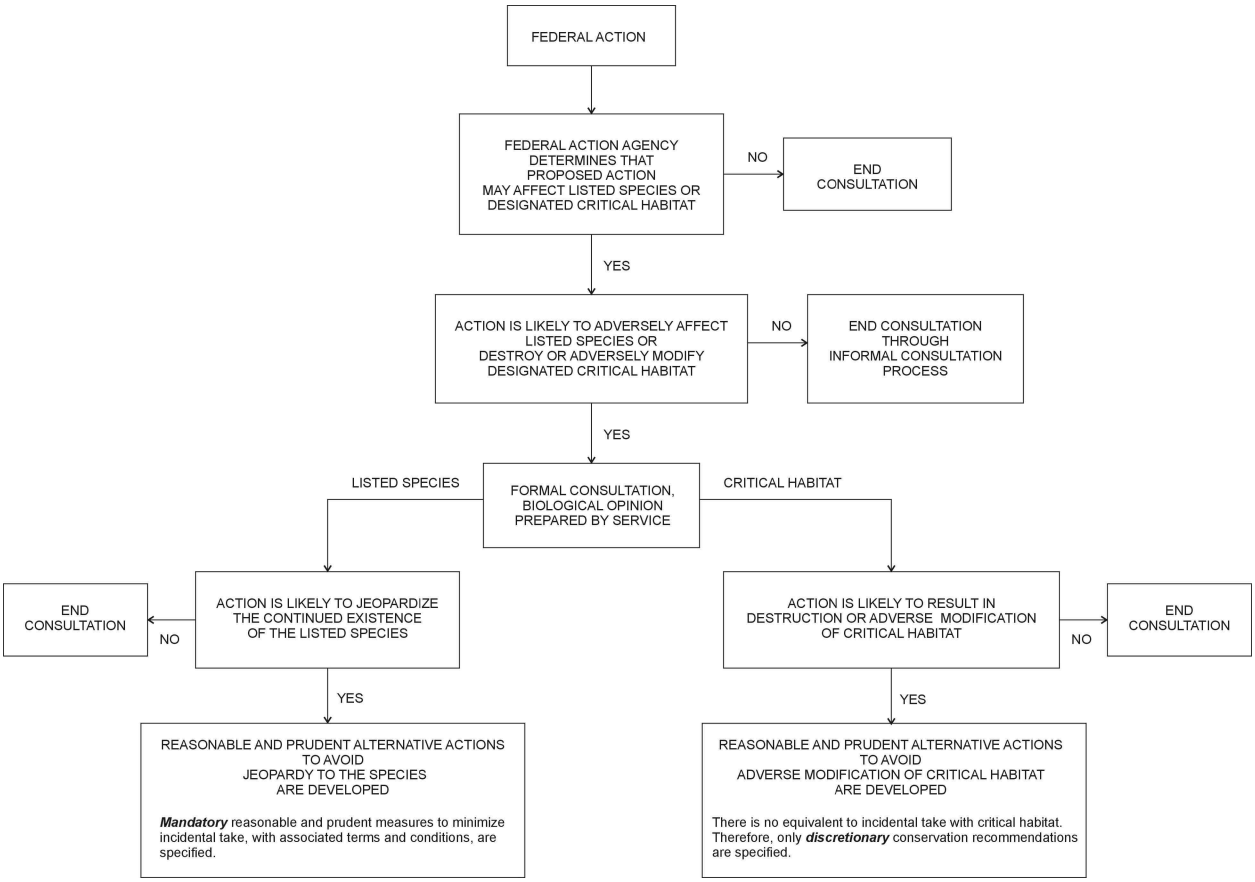
Once it is determined that the proposed federal action may affect a listed species or critical habitat, the federal action agency and the Service typically enter into informal section 7 consultation. Informal consultation is an optional process for identifying affected species and critical habitat, determining potential effects, and exploring ways to modify the action to remove or reduce adverse effects to listed species or critical habitat (50 CFR §402.13). The informal section 7 consultation process concludes in one of two ways: 1) the Service concurs in writing that the proposed action is not likely to adversely affect listed species or critical habitat; or 2) adverse impacts are likely to occur and formal consultation is initiated.

Formal consultation is initiated when it is determined that the proposed federal action is likely to adversely affect a listed species or critical habitat (50 CFR §402.14). Formal consultation concludes with a biological opinion issued by the Service on whether the proposed federal action is likely to jeopardize the continued existence of a listed species or result in destruction or adverse modification of critical habitat (50 CFR §402.14[h]). Independent analyses are made under both the jeopardy and the adverse modification standards.

A "non-jeopardy" or "no adverse modification" opinion concludes consultation and the proposed action may proceed under the ESA. The Service may prepare an incidental take statement with reasonable and prudent measures to minimize take, and associated, mandatory terms and conditions that describe the methods for accomplishing the reasonable and prudent measures. Discretionary conservation recommendations may also be included in a biological opinion based on effects to species. Conservation recommendations, whether they relate to the jeopardy or adverse modification standard, are discretionary actions recommended by the Service. These recommendations may address minimizing adverse effects on listed species or critical habitat, identify studies or monitoring, or suggest how action agencies can assist species under their own authorities and section 7(a)(1) of the ESA.

There are no ESA section 9 prohibitions for critical habitat. Therefore, a biological opinion that concludes no destruction or adverse modification of critical habitat may contain conservation recommendations but would not include an incidental take statement, reasonable and prudent measures, or terms and conditions.

Figure 1. Simplified diagram of the ESA section 7 consultation process showing the parallel track for listed species and designated critical habitat. The informal section 7 consultation process leading to a determination of no adverse effect to listed species or designated critical habitat is not portrayed in detail.



In a biological opinion that results in a jeopardy or adverse modification conclusion, the Service develops mandatory reasonable and prudent alternatives to the proposed action. Reasonable and prudent alternatives are actions that the federal agency can take to avoid jeopardizing the continued existence of the species or adversely modifying critical habitat. The Service may develop reasonable and prudent alternatives that vary from slight project modifications to extensive redesign or relocation of the project, depending on the situations involved.

Reasonable and prudent alternatives must be consistent with the intended purpose of the proposed action and they also must be consistent with the scope of the federal agency's legal authority. Furthermore, the reasonable and prudent alternatives must be economically and technically feasible. A biological opinion that results in a jeopardy finding, based on effects to the species, may also include an incidental take statement, reasonable and prudent measures, terms and conditions, and conservation recommendations. A biological opinion that results in an adverse modification finding may include reasonable and prudent alternatives and conservation recommendations, but no incidental take statement or associated reasonable and prudent measures and terms and conditions.

1.4.1.3 Proposed Primary Constituent Elements In accordance with section 3(5)(A)(I) of the ESA and regulations at 50 CFR §424.12,the Service is required to consider those physical and biological features, called primary constituent elements, that are essential to conservation of the species. Proposed primary constituent elements essential to the conservation of Arkansas River shiner include those habitat components providing for adequate spawning flows over sufficient distances, habitat for food organisms, appropriate water quality, a natural flow regime, rearing and juvenile habitat appropriate for growth and development to adulthood, and suitable habitat (*e.g.* sufficient flows and lack of barriers) sufficient to allow Arkansas River shiner to recolonize upstream habitats (69 FR 59869: 59863). Proposed primary constituent elements of critical habitat for Arkansas River shiner are:

1) a natural, unregulated hydrologic regime complete with episodes of flood and drought or, if flows are modified or regulated, a hydrologic regime characterized by the duration, magnitude, and frequency of flow events capable of forming and maintaining channel and in-stream habitat necessary for particular Arkansas River shiner life stages in appropriate seasons;

2) a complex, braided channel with pool, riffle, (*i.e.* a shallow area in a streambed causing ripples), run, and backwater components that provide suitable variety of depths and current velocities in appropriate seasons;

3) a suitable unimpounded stretch of flowing water of sufficient length to allow hatching and development of the larvae;

4) substrates of predominately sand, with some patches of silt, gravel, and cobble;

5) water quality characterized by low concentrations of contaminants and natural daily and seasonally variable temperature, turbidity, conductivity, dissolved oxygen, and *p*H;

6) suitable reaches of aquatic habitat, as defined by primary constituent elements 1 through 5 above, and adjacent riparian habitat sufficient to support an abundant terrestrial, semiaquatic, and aquatic invertebrate food base, and

7) few or no predatory or competitive nonnative fish species present.

1.4.2 Background Information on Arkansas River Shiner

1.4.2.1 Description Arkansas River shiner was described to science based on a fish collection made in 1926 from the Cimarron River northwest of Kenton, Cimarron County, Oklahoma (Hubbs and Ortenburger, 1929). Arkansas River shiner is a small, robust minnow with a small, dorsally flattened head, rounded snout, and small subterminal mouth. Dorsal coloration tends to be light tan, with silvery sides gradually grading to white on the belly (Figure 2). Adults typically attain a maximum length of about two inches. Dorsal, anal, and pelvic fins all have eight rays, and there is a small, black chevron (v-shaped mark) usually present at the base of the caudal fin (Miller and Robison, 1973; Robison and Buchanan, 1988).

1.4.2.2 Distribution Arkansas River shiner is endemic[3] to the Arkansas River drainage of Oklahoma, western Arkansas, southern Kansas, northern Texas, and northeastern New Mexico (Lee *et al*., 1980: 268). The species is now almost entirely restricted to about 508 miles of the Canadian River in Oklahoma, Texas, and New Mexico (Figure 3). A small aggregation of Arkansas River shiner may still persist in the Cimarron River in Oklahoma and Kansas, based on collection of 24 fish since 1985. Arkansas River shiner was last found in the Cimarron River near Guthrie, Oklahoma in August 2004 (69 FR 59859: 59861). A remnant population also may persist in the Beaver/North Canadian River in Oklahoma, based on collection of four individuals since 1990 (Larson *et al*., 1991; J. Pigg, Oklahoma Department of Environmental Quality, pers. comm., 1993). Arkansas River shiner is believed to be extirpated from the entire Arkansas River. In summary, the Arkansas River shiner has been extirpated from over 80 percent of its historic range within the last 45 years.

1.4.2.3 Reproduction and Life History Flow regime appears to play an important role in determining success of reproduction of Arkansas River shiner. Moore (1944) postulated that Arkansas River shiner spawned in July, usually coinciding with elevated flows following heavy rains associated with summertime thunderstorms. Bestgen and others (1989) found that spawning in the nonnative population of Arkansas River shiner in the Pecos River of New Mexico generally occurred in conjunction with releases from Sumner Reservoir. However, recent studies by Polivka and Matthews (1997) and Wilde and others (2000) neither confirmed nor rejected the hypothesis that elevated stream flow influenced spawning of Arkansas River shiner.

Arkansas River shiner is an open-water, broadcast spawner that releases eggs and sperm over an unprepared substrate (Platania and Altenbach, 1998; Johnston, 1999). Examination of Arkansas River shiner gonadal development between 1996 and 1998 in the Canadian River in New Mexico

[3] "Endemic" means that the Arkansas River shiner is unique to the Arkansas River drainage and historically was not found anywhere else in the world.

Figure 2. Arkansas River shiner. Photo courtesy of Ken Collins, U.S. Fish and Wildlife Service.

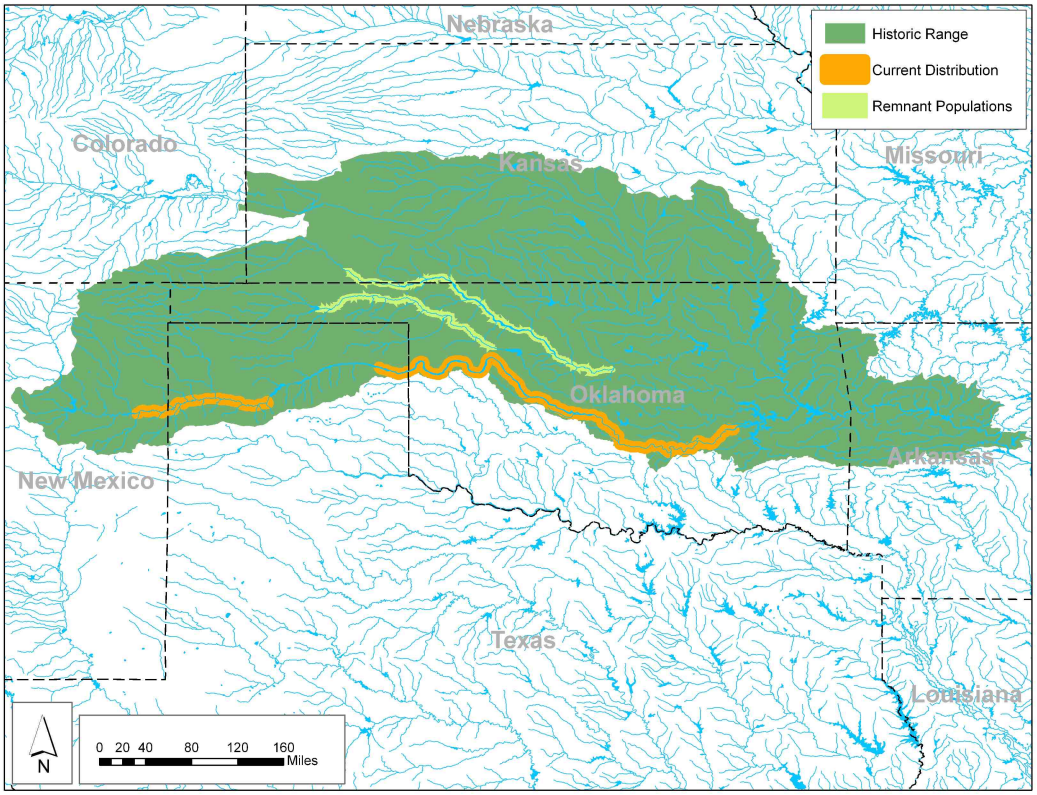


Figure 3. Historic range and current distribution of Arkansas River shiner.

and Texas demonstrated that the species undergoes multiple, asynchronous (*i.e.* not happening at the same time) spawns in a single season (Wilde *et al.*, 2000). Arkansas River shiner appears to be in peak reproductive condition throughout the months of May, June, and July (Wilde *et al.*, 2000; Polivka and Matthews, 1997). However, spawning may occur as early as April and as late as September. Both Moore (1944) and Platania and Altenbach (1998) described development of Arkansas River shiner eggs. The fertilized eggs are nonadhesive and semi-buoyant. Platania and Altenbach (1998) found that spawned eggs settled to the bottom of the aquaria where they quickly absorbed water and expanded. Upon absorbing water, the eggs became more buoyant, rose with the water current, and remained in suspension. The eggs would sink when water current was not maintained in the aquaria. This led Platania and Altenbach (1998) to conclude that the Arkansas River shiner and other plains fishes likely spawn in the upper to mid-water column during elevated flows. Spawning under these conditions would allow the eggs to remain suspended during the 10- to 30-minute period the eggs were non-buoyant. Once eggs became buoyant, they would remain suspended in the water column as long as current was present.

In the absence of sufficient stream flows, eggs would likely settle to the channel bottom where silt and shifting substrates would smother the eggs, hindering oxygen uptake and causing mortality of the embryos. Spawning during elevated flows appears to be an adaptation that likely increases survival of the embryo and facilitates dispersal of young. Assuming a conservative drift rate of about two miles per hour, Platania and Altenbach (1998) estimated that fertilized eggs could be transported 45 to 89 miles before hatching. Developing larvae could then be transported up to an additional 134 miles before they were capable of directed swimming movements. Bonner and Wilde (2000) speculated that about 135 miles may be the minimum length of unimpounded river for successful completion of Arkansas River shiner life history, based on their observations in the Canadian River in New Mexico and Texas.

Rapid hatching and development of young is another adaptation in plains fishes for survival in the harsh environments of plains streams. Arkansas River shiner eggs hatch in 24 to 48 hours after spawning, depending on water temperature (Moore, 1944; Platania and Altenbach, 1998). Larvae are capable of swimming within 34 days. They then seek out low-velocity habitats, such as backwater pools and quiet water at the mouths of tributaries where food is more abundant (Moore, 1944).

Observations by Wilde and others (2000) indirectly support the speculation by Cross and others (1985) that Arkansas River shiner initiates an upstream spawning migration. Whether this represents a true spawning migration or just a general tendency in these fish to orient into the current and move upstream, perhaps in search of more favorable environmental conditions, is unknown (Wilde *et al.*, 2000). Regardless, there is strong evidence supporting a pattern of directed, upstream movement by Arkansas River shiner over the course of a year.

1.4.2.4 Habitat Arkansas River shiner historically inhabited the main channels of wide, shallow, sandy-bottomed rivers and larger streams of the Arkansas River basin (Lee *et al.*, 1980: 268). Adult Arkansas River shiner is uncommon in quiet pools or backwaters lacking stream flow, and almost never occurs in habitats having deep water and bottoms of mud or stone (Cross, 1967).

Cross (1967) contended that adult Arkansas River shiner preferred to orient into the current on the leeward sides of large transverse sand ridges and prey upon food organisms washed downstream with the current.

Most plains streams are highly variable environments. Water temperature, flow regime, and overall physicochemical conditions (*e.g.* quantity of dissolved oxygen) typically fluctuate so drastically that fishes native to these systems often exhibit life-history strategies and microhabitat preferences that enable them to cope with these conditions. Matthews (1987) classified several species of fishes, including Arkansas River shiner, based on their tolerance for adverse conditions and selectivity for physicochemical gradients. Arkansas River shiner was described as having a high thermal and oxygen tolerance, indicating a high capacity to tolerate elevated temperatures and low dissolved oxygen concentrations (Matthews, 1987). Observations from the Canadian River in New Mexico and Texas revealed that dissolved oxygen concentrations, conductivity, and *p*H rarely influenced habitat selection by the Arkansas River Shiner (Wilde *et al.*, 2000). Arkansas River shiner was collected over a wide range of conditions: water temperatures from 32.7°F to 98.2°F, dissolved oxygen from 3.4 to 16.3 parts per million, conductivity (total dissolved solids) from 0.7 to 14.4 mS/cm, and *p*H from 5.6 to 9.0.

In the Canadian River in central Oklahoma, Polivka and Matthews (1997) found only a weak relationship between environmental variables measured and the occurrence of the species within the stream channel. Water depth, current, dissolved oxygen, and sand ridge and mid-channel habitats were the environmental variables most strongly associated with the distribution of adult Arkansas River shiner. Similarly, microhabitat selection by Arkansas River shiner in the Canadian River in New Mexico and Texas was influenced by water depth, current velocity, and, to a lesser extent, water temperature (Wilde *et al.*, 2000). Arkansas River shiner generally occurred at mean water depths between 6.6 and 8.3 inches and current velocities between 11.7 and 16.4 inches per second. The most important habitat variables explaining occurrence of juvenile Arkansas River shiner were current velocity, conductivity, and backwater and island habitat types (Polivka and Matthews, 1997).

Wilde and others (2000) found no obvious selection for or avoidance of any particular habitat type (*i.e.* main channel, side channel, backwaters, and pools) by Arkansas River shiner. The species did tend to select side channels and backwaters slightly more than expected based on the availability of these habitats (Wilde *et al.*, 2000). Likewise, they appeared to make no obvious selection for, or avoidance of, any particular substrate type. Substrates in the Canadian River in New Mexico and Texas were predominantly sand; however, Arkansas River shiner was observed to occur over silt slightly more than expected based on the availability of this substrate (Wilde *et al.*, 2000).

1.4.2.5 Food Habits Arkansas River shiner is a generalist in its food habits and forages both on items suspended in the water column and items lying on the substrate (Jimenez, 1999; Bonner *et al.*, 1997). In the Canadian River of central Oklahoma, Polivka and Matthews (1997) found that gut contents were dominated by sand, sediment, and detritus with invertebrate prey being an incidental component of the diet. In the Canadian River of New Mexico and Texas, stomach contents of Arkansas River shiner were dominated by detritus, invertebrates, grass seeds, sand, and silt (Jimenez, 1999). Invertebrates were

the most important food item, followed by detrital material.

Terrestrial and semiaquatic invertebrates were consumed at higher levels than were aquatic invertebrates (Jimenez, 1999). With the exception of the winter season, when larval flies were consumed much more frequently than other aquatic invertebrates, no particular invertebrate taxa dominated the diet (Bonner *et al.*, 1997). Fly larvae, copepods, immature mayflies, insect eggs, and seeds were the dominant items in the diet of Arkansas River shiner introduced into the Pecos River in New Mexico (K. Gido, University of Oklahoma, *in litt*.).

1.4.2.6 Competition Decline of Arkansas River shiner in the Cimarron River is attributed, in part, to the introduction of the Red River shiner (Cross *et al.*, 1983; Felley and Cothran, 1981). Red River shiner is a small minnow endemic to the Red River. It was first recorded from the Cimarron River in Kansas in 1972 (Cross *et al.*, 1985) and from the Cimarron River in Oklahoma in 1976 (Marshall, 1978). Since its introduction, Red River shiner has replaced Arkansas River shiner throughout much of the Cimarron River. The morphological characteristics, population size, and ecological preferences exhibited by the Red River shiner (*Notropis bairdi*), indicate that it competes with Arkansas River shiner for food and other habitat requirements (Cross *et al.*, 1983; Felley and Cothran, 1981). The intentional or unintentional release of Red River shiner, or other potential competitors, into other reaches of the Arkansas River drainage by anglers or the commercial bait industry is a potentially serious threat that could alter habitat suitability.

1.5 Permits Required for Implementation

No permits are required for critical habitat designation. Designation of critical habitat occurs through a rule-making process under the Administrative Procedures Act and the ESA.

1.6 Related Laws, Authorizations, and Plans

Related provisions of the ESA require federal agencies to consult with the Service when there are potential effects to endangered or threatened species, independent of critical habitat.

Arkansas River shiner is listed as State endangered in Kansas. The Kansas Department of Parks and Wildlife has designated portions of the Cimarron, Arkansas, South Fork Ninnescah, and Ninnescah rivers as critical habitat for the Arkansas River shiner. A permit is required by the State of Kansas for public actions that have the potential to destroy individuals of a listed species or their critical habitat. Subject activities include any publicly funded or State or federally assisted action, or any action requiring a permit from any other State or federal agency.

Arkansas River shiner is also listed as a State endangered species in New Mexico. This listing prohibits taking of the species without a valid scientific collecting permit but does not provide habitat protection. The states of Oklahoma and Texas list Arkansas River shiner as a State threatened species, but these listings do not afford any protection for habitat of the species.

The Kansas legislature can identify a minimum desirable flow for a stream as part of the Kansas

Water Plan. The Chief Engineer is then required to withhold from appropriation the amount of water necessary to establish and maintain the minimum flow. New Mexico and Oklahoma water laws do not include provisions for acquisition of in-stream water rights for protection of fish and wildlife and their habitats. Oklahoma indirectly provides some protection of aquatic habitat, primarily by withholding appropriations for flows available less than 35 percent of the time (63 FR 64772: 64795).

Section 404 of the federal Clean Water Act (33 U.S.C. 1251-1376) regulates dredge and fill activities in waters of the United States. Section 401 of the Clean Water Act regulates water quality. This program is implemented by each state in accordance with their water quality standards. The National Environmental Policy Act requires federal agencies to analyze and disclose to the public the environmental impacts of their actions.

A recovery plan for interior least tern (*Sterna antillarum*) was completed in 1990 (Service, 1990). Interior least tern was listed as endangered under the ESA on 28 May 1985. This species occurs in habitats proposed for critical habitat designation for Arkansas River shiner and has overlapping habitat requirements.

1.7 Issues

The following issues associated with designation of critical habitat were identified from comments received on the previous rule-making process for designation of critical habitat for Arkansas River shiner in 2000 and the current proposed rule to re-designate critical habitat for the species (69 FR 59859).

Public concerns regarding designation of critical habitat include:

- Concerns were expressed that critical habitat designation could have severe economic and social impacts;
- Concerns were expressed that critical habitat designation could restrict withdrawal and uses of groundwater and surface water;
- Concerns were expressed that critical habitat designation could infringe on the rights of private property owners and result in reduced property values;
- Concerns were expressed that critical habitat designation could force landowners to fence riparian areas;
- Concerns were expressed that critical habitat designation could prohibit or restrict farming activities;
- Concerns were expressed that critical habitat designation could result in additional regulation of the oil and gas industry;
- Concerns were expressed that critical habitat designation could result in additional regulation of Concentrated Animal Feeding Operations;
- Concerns were expressed that critical habitat designation could prohibit hunting, fishing, hiking, off-road vehicle use, and other forms of recreation; and
- Concerns were expressed that critical habitat designation could result in control of, or "taking" of private land.

2.0 ALTERNATIVES, INCLUDING THE NO ACTION ALTERNATIVE

2.1 Development of Alternatives

Identification of areas essential for the conservation of Arkansas River shiner is the cornerstone of critical habitat designation. The Service made an assessment of areas needed for the conservation of Arkansas River shiner based on the best scientific and commercial information available concerning the present and historic range of the species, its habitat and biology, and potential recovery requirements (69 FR 59859: 59862-59866). This assessment and issues identified during comment on the proposed rule (*cf.* section 1.7) served as the basis for developing critical habitat designation alternatives.

In addition to this assessment, the Service is conducting an economic analysis of the impacts of proposed critical habitat designation and related factors, which is also available for public review and comment. Based on public comment on that document, on this assessment, and on the proposed designation itself, and the information in the final economic analysis, additional areas beyond those identified in this assessment may be excluded from critical habitat by the Secretary under the provisions of section 4(b)(2) of the ESA. This is provided for in the ESA and the Service's implementing regulations at 50 CFR 242.19.

2.2 No Action Alternative

The No Action alternative is defined as no designation of critical habitat for Arkansas River shiner. Analysis of the No Action alternative is required by NEPA, and it serves as a baseline for analyzing effects of action alternatives.

2.3 Alternative I

Alternative I consists of five proposed critical habitat units comprising about 1,244 river miles (Figure 4 and Table 1). These units were described in the proposed designation of critical habitat for the Arkansas River shiner published on 6 October 2004 (69 FR 59859: 59868-59870).

2.3.1 Unit 1A - Canadian River, New Mexico and Texas Critical habitat Unit 1A consists of approximately 154 miles of the Canadian River from the U.S. Highway 54 bridge near Logan, New Mexico, downstream to the confluence with Coetas Creek in Texas. Seepage from Ute Reservoir, inflow from Revuelto Creek, and several springs help sustain perennial flow in most years. This segment of the Canadian River, despite flows having been modified by Conchas and Ute reservoirs, still supports a largely intact plains river fish fauna. This reach is predominantly in private ownership. The State of New Mexico owns scattered tracts. The reach in Texas is in private ownership, except for some parcels administered by the Bureau of Land Management and a small segment on the extreme lower end that is administered by the National Park Service as part of Lake Meredith National Recreation Area. Unit 1A is located in the following counties: Quay County, New Mexico, and Oldham and Potter counties, Texas.

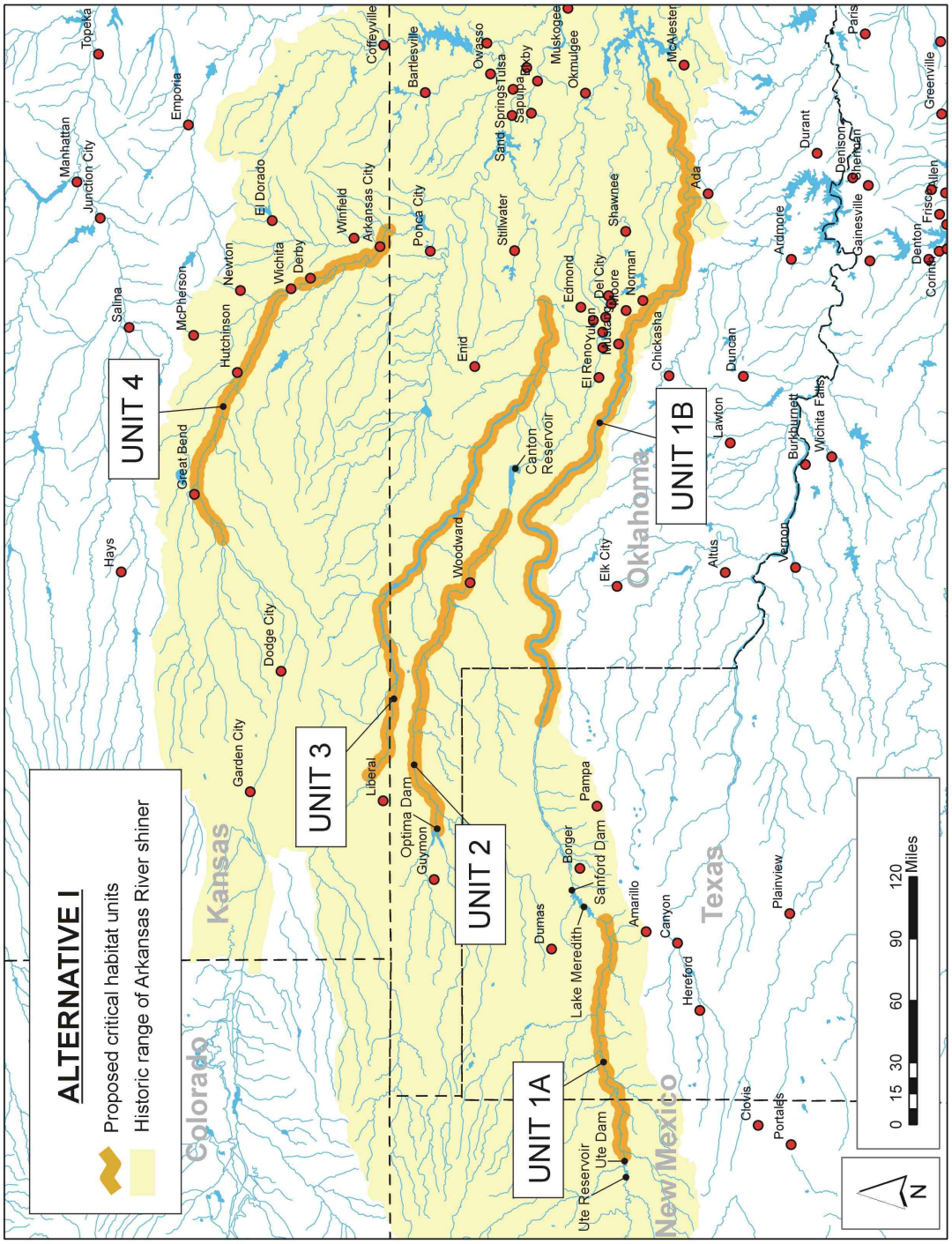


Figure 4. Critical habitat units proposed in Alternative I. The historic range extends east into Arkansas and farther west into New Mexico, and represents the entire geographic area that could be occupied by the species.

2.3.2 Unit 1B - Canadian River, Texas and Oklahoma Critical habitat Unit 1B consists of approximately 399 miles of river extending from the U.S. Highway 60/83 bridge near Canadian, Texas, downstream to the Indian Nation Turnpike bridge northwest of McAlester, Oklahoma. This segment of the Canadian River is the longest continuous reach in the Arkansas River basin that still supports Arkansas River shiner. Arkansas River shiner varies from being rare to common in this unit, with the species generally becoming more abundant in a downstream direction.

This unit consists of mostly private lands, with limited areas of State and tribal ownership. The Texas Parks and Wildlife Department owns a small segment downstream of the town of Canadian, Texas in the Gene Howe Wildlife Management Area. The Oklahoma Department of Wildlife Conservation also owns a small section near Roll, Oklahoma at the Packsaddle Wildlife Management Area. Small tracts of tribal lands are located near Oklahoma City.

Unit 1B is located in the following counties: Hemphill County, Texas, and Blaine, Caddo, Canadian, Cleveland, Custer, Dewey, Ellis, Grady, Hughes, McClain, McIntosh, Pittsburg, Pontotoc, Pottawatomie, Roger Mills, and Seminole counties, Oklahoma.

2.3.3 Unit 2 - Beaver/North Canadian River, Oklahoma Critical habitat Unit 2 consists of approximately 211 miles of river extending from Optima Dam in Texas County, Oklahoma, downstream to the U.S. Highway 60/281 bridge in Major County, Oklahoma. Almost the entire Beaver/North Canadian River main-stem and at least one of the major tributaries, the Deep Fork River, in Oklahoma were historically known to support Arkansas River shiner. A small population may still persist between Optima Dam and the upper reaches of Canton Reservoir, based on the collection of four individuals since 1990. At present, habitat in large areas of the drainage are degraded or unsuitable, either because of reservoirs, reduced stream flow, or water quality impairment. While habitat quality in this reach for Arkansas River shiner appears to be marginal, all of the primary constituent elements are present.

Land ownership in Unit 2 is predominately private, with limited areas of State-owned lands. The Oklahoma Department of Wildlife Conservation owns small sections near Beaver, Oklahoma at the Beaver River Wildlife Management Area and near Fort Supply, Oklahoma at the Cooper Wildlife Management Area. The Oklahoma Department of Parks and Tourism owns a small section near Woodward, Oklahoma at Boiling Springs State Park. Unit 2 is located in the following counties: Beaver, Ellis, Harper, Major, Texas, and Woodward counties, Oklahoma.

2.3.4 Unit 3 - Cimarron River, Kansas and Oklahoma Critical habitat Unit 3 consists of 286 miles of river extending from the U.S. Highway 54 bridge in Seward County, Kansas, downstream to the U.S. Highway 77 bridge in Logan County, Oklahoma. Historically, almost the entire main stem of the Cimarron River and several of the major tributaries were inhabited by Arkansas River shiner. However, between 1985 and 1992, only 16 individual Arkansas River shiner were collected from the Cimarron River. No Arkansas River shiner were collected from the unit between 1992 and 2004, but in August 2004, eight individual Arkansas River shiner were collected near Guthrie, Oklahoma (69 FR 59859: 59869). Although the status of this population is uncertain, it appears to be persistent.

The Cimarron River contains all of the proposed primary constituent elements, except for the presence of a competitive nonnative species, which would be addressed during the recovery planning process. This unit reflects the need for sufficient lengths of stream that provide habitat for successful completion of the life cycle of Arkansas River shiner and to support populations of the species that are large enough to be self-sustaining over time.

Unit 3 consists mostly of private lands that are used mainly for livestock grazing and other forms of agriculture. Unit 3 is located in the following counties: Clark, Comanche, Meade, and Seward counties, Kansas, and Beaver, Blaine, Harper, Kingfisher, Logan, Major, Woods, and Woodward counties, Oklahoma.

2.3.5 Unit 4 - Arkansas River, Kansas

Critical habitat unit 4 consists of 194 miles of the Arkansas River extending from the confluence of the Pawnee River near Larned, Kansas, downstream to Kansas-Oklahoma state line in Cowley County, Kansas. This distance does not include a 12.4-mile long reach of the Arkansas River within the City of Wichita metropolitan area, extending from the westbound lane of the Kansas State Highway 96 crossing downstream to the Interstate 35 crossing.

The Arkansas River in Kansas contains a significant portion of the historic range of Arkansas River shiner. The species historically inhabited the entire main-stem of the Arkansas River, but had begun to decline by 1952 due to the construction of John Martin Reservoir 10 years earlier on the Arkansas River in Bent County, Colorado (Cross *et al.*, 1985). Unit 4 contains one or more of the primary constituent elements and, if designated as critical habitat, would be considered essential for conservation of Arkansas River shiner in the context of recovery of the species.

Lands in Unit 4 are entirely in private ownership except for the Kaw Wildlife Area near the Kansas-Oklahoma state line that is owned by the U.S. Army Corps of Engineers and managed by the Kansas Department of Wildlife and Parks. Unit 4 is located in the following counties: Barton, Cowley, Pawnee Reno, Rice, Sedgwick, and Sumner counties, Kansas.

Table 1. Proposed critical habitat units in Alternative I. Lengths are in river miles (69 FR 59859: 59870).

UNIT		OKLAHOMA	TEXAS	KANSAS	NEW MEXICO	TOTAL
1A	Canadian R.	0	116	0	38	154
1B	Canadian R.	372	27	0	0	399
2	Beaver/North Canadian R.	211	0	0	0	211
3	Cimarron R.	224	0	62	0	286
4	Arkansas R.	0	0	194	0	194
TOTAL		**807**	**143**	**256**	**38**	**1,244**

2.4 Alternative II

Alternative II consists of three proposed critical habitat units (1A, 1B, and 3) comprising about 839 river miles (Figure 5 and Table 2). These units are described above in sections 2.3.1, 2.3.2, and 2.3.4 under Alternative I. Exclusion of units 2 and 4 may be warranted under section 4(b)(2) of the ESA (69 FR 59859: 59870-59872). Under this section of the ESA, the Service may exclude any area if it is determined that "the benefits of such exclusion outweigh the benefits of specifying such area as part of the critical habitat."

Recovery of Arkansas River shiner likely would include augmenting or reestablishing populations of the species in the Beaver/North Canadian River (Unit 2) and/or the Arkansas River (Unit 4). Arkansas River shiner is likely extirpated from Unit 4 (Arkansas River; *cf.* section 1.4.2.2). Currently, the status of Arkansas River shiner in Unit 2 (Beaver/North Canadian River) is uncertain and it is not clear if the species persists in this drainage (69 FR 59859: 59869). If additional survey work and evaluation indicates that Arkansas River shiner no longer exists in the Beaver/North Canadian River, some habitat restoration coupled with reestablishing populations of the species there may contribute to recovery (69 FR 59859: 59869).

Use of the authorities provided to the Service under section 10(j) of the ESA may facilitate repatriation of Arkansas River shiner as experimental populations within areas of its historic range where the species no longer occurs, such as the Arkansas River (Unit 4) and, possibly, the Beaver/North Canadian River (Unit 2). With designation of populations as experimental under section 10(j), certain section 9 prohibitions (*e.g.* harm, harassment, capture) that apply to endangered and threatened species may be removed, and a special rule can be developed that contains specific prohibitions and exceptions necessary and appropriate to conserve the species.

This flexibility may encourage local cooperation in recovery, which is vital given the predominance of private lands in the units and the perceived negative impacts of critical habitat designation. The flexibility gained by establishment of an experimental population through section 10(j) would be of little value if a designation of critical habitat overlaps it. This is because Federal agencies would still be required to consult with the Service on any actions that may adversely modify critical habitat. Public support for habitat modification and rehabilitation, as well as for the reintroduction, might be significantly reduced because of concerns over the impact of the designation. In effect, the flexibility gained from section 10(j) would be rendered useless by the designation of critical habitat. In fact, section 10(j)(2)(C)(ii) of the Act states that critical habitat shall not be designated under the Act for any experimental population determined to be not essential to the continued existence of a species.

Table 2. Proposed critical habitat units in Alternative II. Lengths are in river miles (69 FR 59859: 59870).

UNIT		OKLAHOMA	TEXAS	KANSAS	NEW MEXICO	TOTAL
1A	Canadian R.	0	116	0	38	154
1B	Canadian R.	372	27	0	0	399
3	Cimarron R.	224	0	62	0	286
TOTAL		**596**	**143**	**62**	**38**	**839**

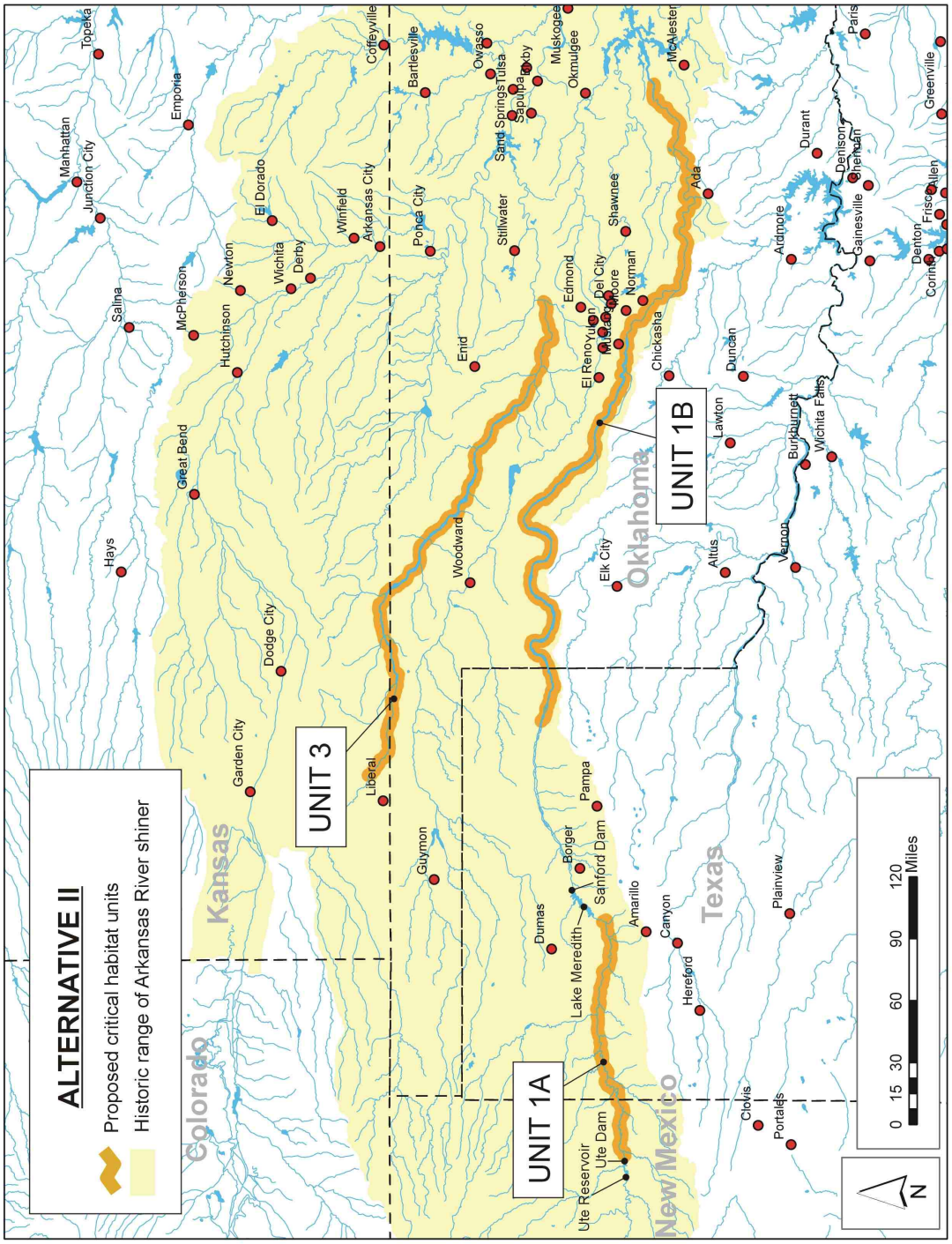


Figure 5. Critical habitat units proposed in Alternative II. The historic range extends east into Arkansas and farther west into New Mexico, and represents the entire geographic area that could be occupied by the species.

2.5 Option A - Exclusion of Unit 1A

Option A was formulated to address the development of a conservation plan for Unit 1A by the Canadian River Municipal Water Authority. This option would exclude Unit 1A (Canadian River in New Mexico and Texas) from critical habitat designation. Exclusion of Unit 1A may be warranted under sections 4(b)(2) and 3(5)(A) of the ESA.

The intent of the proposed conservation plan is to "provide benefits which will aid in conservation and recovery of the species, while avoiding unnecessary and restrictive regulation of activities in the proposed area of critical habitat and upstream areas which could be affected by critical habitat designation" (Canadian River Municipal Water Authority, 2005*a*). The major activity called for in the plan is eradication and control of salt cedar, which is currently being implemented through various programs. Other management actions specified in the plan consist entirely of "voluntary conservation activities and continuation of activities which are already part of the programs of several different agencies" (Canadian River Municipal Water Authority, 2005*a*). Furthermore, no new programs or commitments by landowners are specified in the draft plan (Canadian River Municipal Water Authority, 2005*a*). The anticipated effect of salt cedar control in Unit 1A that is specified in the draft conservation plan is to "result in substantial saving of water in the basin, benefitting the shiner and other species as well as water users" (Canadian River Municipal Water Authority, 2005*a*).

Conservation of Arkansas River shiner will require restoration and maintenance of habitat required by the species (69 FR 59859: 59866). The primary habitat management issue for Arkansas River shiner in Unit 1A is control of salt cedar to restore the river to a more naturally-functioning system (K. Collins, Service, pers. comm.). Proposed critical habitat in Unit 1A consists mostly of private lands. Critical habitat designation in this reach may preclude effective habitat management efforts on private lands because of real or perceived impacts that could result from designation. Therefore, the benefit of excluding Unit 1A is the elimination of these real or perceived impacts and constraints of critical habitat designation on private landowners, thereby encouraging participation and cooperation in recovery among private, local, and state entities and the Service. This could improve the potential for successful recovery and conservation of Arkansas River shiner.

2.6 Comparison of Alternatives

Table 3 summarizes the potential effects or characteristics of the alternative critical habitat designations on the environment. Potential effects on resources are summarized from the analyses presented in Chapter 3.

2.7 Preferred Alternative

Alternative II is the alternative preferred by the Service for designation of critical habitat for Arkansas River shiner.

Table 3. Comparison of potential effects of alternative critical habitat designations, as compared to existing conditions, by resource category.

Resource Category	No Action Alternative	Alternative I	Alternative II
Total River Miles	0	1,244	839
Number of Critical Habitat Units	0	5 (4 with Option A)	3 (2 with Option A)
Conservation of Arkansas River Shiner	- §7 consultation on potential effects of proposed federal actions on Arkansas River shiner under the jeopardy standard - No potential benefits to conservation of Arkansas River shiner from §7 consultation on potential effects to critical habitat under the destruction or adverse modification standard - No potential non-regulatory or educational benefits from critical habitat designation - No possible adverse public reaction and reduced landowner cooperation to conservation measures for the Arkansas River shiner as a result of concerns over the impact of the designation	- §7 consultation on potential effects to critical habitat under the destruction or adverse modification standard in all units - Non-regulatory and educational benefits to conservation of Arkansas River shiner could occur in all five units, including informing the public of areas important for conservation of the species, and focusing attention on and awareness of those areas - Potential benefit to Arkansas River shiner from critical habitat designation may also accrue to other rare or sensitive fish species in all five units - Possible adverse public reaction and reduced landowner cooperation to conservation measures for the Arkansas River shiner as a result of concerns over the impact of the designation might occur in all units **OPTION A** - Potential regulatory and non-regulatory benefits described above would not accrue to Unit 1A - Potential public hostility to conservation measures for the shiner as a result of the designation might not occur in Unit 1A	- §7 consultation on potential effects to critical habitat under the destruction or adverse modification standard in units 1A, 1B, and 3 - Non-regulatory and educational benefits to conservation of Arkansas River shiner could occur in units 1A, 1B, and 3, including informing the public of areas important for conservation of the species, and focusing attention on and awareness of those areas - Potential benefit to Arkansas River shiner from critical habitat designation may also accrue to other rare or sensitive fish species in units 1A, 1B, and 3 - Possible adverse public reaction and reduced landowner cooperation to conservation measures for the Arkansas River shiner as a result of concerns over the impact of the designation might occur in all units 1A, 1B and 3 **OPTION A** - Potential regulatory and non-regulatory benefits described above would not accrue to Unit 1A - Potential public hostility to conservation measures for the shiner as a result of the designation might not occur in Unit 1A

Table 3, continued

Resource Category	No Action Alternative	Alternative I	Alternative II
Water Resources	- §7 consultation on effects to Arkansas River shiner under the jeopardy standard would be required for federally supported water resource management actions - Potential for federal nexus in water management projects is restricted to proposed water supply project at Ute Dam and potential flood control operations at Sanford Dam by U.S. Army Corps of Engineers. Water supply project at Ute Dam is still in the planning stages with no definite date for implementation and no guarantee of federal involvement. Flood control operation conditions at Sanford Dam have not occurred since the dam was built and are unlikely to occur in the future. - No change in existing dam operations at Ute Dam or Sanford Dam due to current non-federal control of releases from both facilities; existing stream flow conditions below both dams unlikely to change due to section 7 consultation involving Arkansas River shiner under the jeopardy standard - No effect on groundwater pumping in project area due to lack of federal nexus, unless this resulted in "take" of the shiner	- §7 consultation on effects to Arkansas River shiner under both the jeopardy and the destruction or adverse modification standards would be required in units 1A, 1B, 2 and 3 - No substantial changes in federally supported water projects through section 7 consultation are likely, compared to the No Action alternative - Interjection of critical habitat considerations in §7 consultations may result in additional discretionary conservation measures to protect long-term function of critical habitat in units 1A and 1B, if there is federal involvement in water resources management - Federal water resource actions in Unit 4 would trigger §7 consultation under the destruction or adverse modification standard, which could result in identification of discretionary conservation measures or, if impacts are severe enough, mandatory reasonable and prudent alternatives **OPTION A** - Critical habitat considerations would not be incorporated in §7 consultations conducted on federal water resource actions in Unit 1A	- §7 consultation on effects to Arkansas River shiner under both the jeopardy and destruction or adverse modification standards would be required in units 1A, 1B, and 3 - No substantial changes in federally supported water projects through section 7 consultation in units 1A, 1B, and 3 are likely, compared to the No Action alternative - Interjection of critical habitat considerations in §7 consultations may result in additional discretionary conservation measures to protect long-term function of critical habitat **OPTION A** - Critical habitat considerations would not be incorporated in §7 consultations conducted on federal water resource actions in Unit 1A

Table 3, continued

Resource Category	No Action Alternative	Alternative I	Alternative II
Agriculture and Concentrated Animal Feeding Operations	- §7 consultation on effects to Arkansas River shiner under the jeopardy standard would be required for federally supported actions - Row-crop production and livestock grazing unlikely to be affected due to scarcity of federal nexus in these activities - Potential for economic impacts to CAFOs in occupied habitat (units 2 and 3 and the Oklahoma portion of Unit 1B) from NPDES permit requirements for protection of Arkansas River shiner under the jeopardy standard	- §7 consultation on effects to Arkansas River shiner under both the jeopardy and adverse modification or destruction of critical habitat standards would be required in units 1A, 1B, 2 and 3 for federally supported activities - No substantial changes in federal agriculture support programs through §7 consultation in units 1A, 1B, 2 and 3 are likely, compared to the No Action alternative. - Measures to protect surface water quality from NPDES-permitted CAFO waste discharge could be required in Unit 4 - Potential for economic impacts to CAFOs in occupied habitat (units 2 and 3 and the Oklahoma portion of Unit 1B) from NPDES permit requirements for protection of Arkansas River shiner under both the jeopardy and adverse modification standards **OPTION A** - Critical habitat considerations would not be incorporated in §7 consultations conducted on federal agriculture-related actions in Unit 1A	- §7 consultation on effects to Arkansas River shiner under both the jeopardy and adverse modification or destruction of critical habitat standards would be required in units 1A, 1B, and 3 for federally supported activities - No substantial changes in federal agriculture support programs through §7 consultation in units 1A, 1B, and 3 are likely, compared to the No Action alternative - Potential for economic impacts to CAFOs in occupied habitat (units 2 and 3 and the Oklahoma portion of Unit 1B) from NPDES permit requirements for protection of Arkansas River shiner under both the jeopardy and adverse modification standards **OPTION A** - Critical habitat considerations would not be incorporated in §7 consultations conducted on federal agriculture-related actions in Unit 1A

Table 3, continued

Resource Category	No Action Alternative	Alternative I	Alternative II
Oil and Gas Resources	- §7 consultation on effects to Arkansas River shiner under the jeopardy standard would be required for federally supported actions - Measures to minimize potential for degradation of water quality from oil and gas activities with federal involvement would continue to be recommended - Directional boring of pipeline crossings in occupied habitat would be recommended; trenching operations in occupied habitat would likely continue to be subject to formal consultation, which could result in project delays	- §7 consultation on effects to Arkansas River shiner under both the jeopardy and adverse modification or destruction of critical habitat standards would be required in units 1A, 1B, 2 and 3 for federally supported activities - Recommendation of additional measures with critical habitat designation are unlikely in occupied habitat because water quality concerns (the major issue associated with oil and gas projects) are already addressed under the jeopardy standard - Measures to minimize potential for water quality degradation may be recommended in Unit 4 for oil and gas activities with federal involvement - Mandatory requirements for protection of water quality and habitat in Unit 4 are unlikely, as potential for adverse modification determination on oil and gas actions is low **OPTION A** - Critical habitat considerations would not be incorporated in §7 consultations conducted on federal oil and gas-related actions in Unit 1A - Measures to minimize potential for degradation of water quality from oil and gas activities would continue to be recommended	- §7 consultation on effects to Arkansas River shiner under both the jeopardy and adverse modification or destruction of critical habitat standards would be required in units 1A, 1B, and 3 for federally supported activities - Oil and gas activities with federal involvement in Unit 4 would not be subject to section 7 consultation under the adverse modification standard - Measures to minimize potential for degradation of water quality from oil and gas activities would continue to be recommended **OPTION A** - Critical habitat considerations would not be incorporated in §7 consultations conducted on federal oil and gas-related actions in Unit 1A - Measures to minimize potential for degradation of water quality from oil and gas activities would continue to be recommended

Table 3, continued

Resource Category	No Action Alternative	Alternative I	Alternative II
Transportation	- §7 consultation on effects to Arkansas River shiner under the jeopardy standard would be required for federally supported actions - Bridge crossing projects in occupied habitat would continue to be likely to trigger formal consultation; mandatory measures to minimize take, such as translocation of Arkansas River shiner from construction sites and monitoring of take, would continue to be recommended	- §7 consultation on effects to Arkansas River shiner under both the jeopardy and adverse modification or destruction of critical habitat standards would be required in units 1A, 1B, 2 and 3 for federally supported activities - Additional discretionary conservation measures to protect long-term capability of critical habitat may be recommended - Discretionary measures to minimize impacts to unoccupied areas designated as critical habitat may be recommended; potential for adverse modification determinations from bridge projects is low due to localized area of impact and short duration of effects **OPTION A** - Critical habitat considerations would not be incorporated in §7 consultations conducted on federal transportation-related actions in Unit 1A	- §7 consultation on effects to Arkansas River shiner under both the jeopardy and adverse modification or destruction of critical habitat standards would be required in units 1A, 1B, and 3 for federally supported activities - Additional discretionary conservation measures to protect long-term capability of critical habitat may be recommended in designated critical habitat **OPTION A** - Critical habitat considerations would not be incorporated in §7 consultations conducted on federal transportation-related actions in Unit 1A
Recreation	- Potential restriction of ORV use to areas outside of the river channel from July to September at the Rosita ORV Area at Lake Meredith National Recreation Area to protect spawning Arkansas River shiner	- No change **OPTION A** - No change	- No change **OPTION A** - No change
Socioeconomic Conditions and Environmental Justice	- §7 consultation on effects to Arkansas River shiner under the jeopardy standard would be required for federal actions - Actions on private lands that have the potential to result in take of Arkansas River shiner would be subject to section 10 of the ESA, which requires development of a Habitat Conservation Plan as part of an application to the Service for an incidental take permit - Estimated annual economic impacts of $8 to $11 million	- §7 consultation on effects to Arkansas River shiner under both the jeopardy and destruction or adverse modification standards would be required - Economic impacts would result from increased administrative time for federal agencies and project proponents to consider critical habitat in §7 consultations - Critical habitat designation would not result in any taking of private lands	- Same effects as Alternative I

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter describes aspects of the environment that may potentially be impacted by designating critical habitat for the Arkansas River shiner. Potential effects of critical habitat designation under each alternative are then described for the various resource categories. Resource categories addressed in the analysis were selected based on issues identified during the public comment period on the proposed rule (*cf.* section 1.7) and conservation considerations for Arkansas River shiner.

3.1 Assessment of Impacts

3.1.1 Nature of Impacts from Critical Habitat Designation for Arkansas River Shiner

Impacts on the environment from designation of critical habitat stem from the section 7 consultation requirements of the ESA (*cf.* section 1.4.1.2). Under section 7(a)(2) of the ESA, federal agencies are required to consult with the Service on actions that they fund, implement, or authorize, which may affect listed species or critical habitat (50 CFR §402). The purpose of section 7 consultation, with respect to critical habitat, is to ensure that the actions of federal agencies do not destroy or adversely modify critical habitat. Critical habitat is defined as habitat that is essential for the conservation of a listed species.

Critical habitat designation does not have any impact on the environment other than through the section 7 consultation process on federal actions. Critical habitat designation alone does not establish blanket rules or restrictions on land use, nor does it automatically prohibit or modify any activity. Critical habitat designation does not change land ownership or cause transfer of any lands to the federal government. Each proposed federal action that may potentially affect designated critical habitat is analyzed individually during the section 7 consultation process. Individuals, organizations, states, local governments, and other non-federal entities are potentially affected by the designation of critical habitat only if their actions occur on federal lands, require a federal permit, license, or other authorization, or involve federal funding.

The potential for destruction or adverse modification of critical habitat by a federal action is assessed by determining the effects of the proposed federal action on primary constituent elements or habitat qualities that are essential to the conservation of the species. These anticipated effects are then analyzed to determine how they will influence the function and conservation role of the affected critical habitat unit. This analysis provides the basis for determining the significance of anticipated effects of the proposed federal action on critical habitat. The threshold for destruction or adverse modification is evaluated in the context of whether or not the critical habitat would remain functional (or retain the current potential for primary constituent elements to be functionally established) to serve the intended conservation role for the species.

Critical habitat is defined in section 3(3) of the ESA as those areas that are essential for

conservation of the species, and the definition of conservation includes species recovery. Conservation and recovery of Arkansas River shiner will likely require sustaining existing populations in the Canadian River in New Mexico, Texas, and Oklahoma (units 1A and 1B), augmenting remnant or marginal aggregations of Arkansas River shiner in the Beaver/North Canadian River in Oklahoma (Unit 2) and Cimarron River in Kansas and Oklahoma (Unit 3), and repatriating the species to a portion of the Arkansas River in Kansas (Unit 4).

The conservation value of proposed critical habitat for Arkansas River shiner in units 1A and 1B (Canadian River in New Mexico, Texas, and Oklahoma) would be to sustain existing populations. The threshold for destruction or adverse modification in these units would likely be a reduction in the capability of the habitat to sustain existing populations. It is likely that actions that would reduce the capability of the habitat to sustain a population would also result in take in units 1A and 1B under the jeopardy standard, since such actions would affect individuals that occupy the habitat. Consequently, the outcome of section 7 consultations at these units may not be substantially different with designation of critical habitat compared to listing of the species alone. Critical habitat designation may interject additional considerations for protection of habitat function, suitability, or capability over the long term into section 7 consultations. This could result in specification of additional requirements or conservation recommendations.

The conservation value of proposed critical habitat in units 2 (Beaver/North Canadian River in Oklahoma) and 3 (Cimarron River in Kansas and Oklahoma) is two-fold. First, it may help to sustain any aggregations of Arkansas River shiner that persist in these units. Secondly, these proposed critical habitat units identify areas where efforts should be undertaken to augment and expand aggregations to develop persistent, self-sustaining populations of Arkansas River shiner. The threshold for destruction or adverse modification in these units would likely be: 1) a reduction in the capability of occupied areas within the units to sustain existing aggregations or remnant populations; or 2) a reduction in the capability or potential of habitat within the units to provide all of the requirements for Arkansas River shiner as defined by the proposed primary constituent elements (*cf.* section 1.4.1.3). Because these units are considered to be inhabited by Arkansas River shiner at the present time, the effect of critical habitat designation would be similar to that described for units 1A and 1B.

The conservation value of proposed critical habitat in Unit 4 (Arkansas River in Kansas) would be for repatriation of Arkansas River shiner. As described in the proposed rule, reestablishing Arkansas River shiner in suitable unoccupied, historic habitat is a crucial component of recovery of the species to the point that protection under the ESA is no longer necessary (69 FR 59859: 59866). Therefore, the conservation value of proposed critical habitat in Unit 4 is for repatriation of Arkansas River shiner and reestablishing persistent, self-sustaining populations of the species in suitable, unoccupied habitat within its historic range. The threshold for destruction or adverse modification in Unit 4 would be a reduction in the capability or potential of proposed critical habitat to provide all of the requirements for Arkansas River shiner as defined by the proposed primary constituent elements (*cf.* section 1.4.1.3). Because there are no Arkansas River shiner in Unit 4, section 7 consultations under the jeopardy standard for Arkansas River shiner currently are not conducted. However,

designation of critical habitat in this unit would result in the requirement for federal agencies to consult with the Service under the destruction or adverse modification standard on actions that may potentially affect critical habitat. It could also cause public opposition to the reintroduction of Arkansas River shiner over concern from likely impact of the designation, making it difficult if not impossible to carry out the reintroduction.

Federal actions that may directly or indirectly cause destruction or adverse modification of proposed critical habitat for Arkansas River shiner, and therefore could potentially be affected by critical habitat designation, include those that result in significant and detrimental alteration of minimum flow or natural flow regime, beneficial riparian vegetation, channel morphology, or water chemistry. Additionally, federal actions in proposed critical habitat that create barriers or deterrents to dispersal of fish, inundate or de-water habitat, or significantly convert habitat could result in a destruction or adverse modification determination. Finally, any federal action that results in the introduction, spread, or augmentation of nonnative species in proposed critical habitat could result in its destruction or adverse modification (69 FR 59859:59873). Examples of actions that could potentially have some of these effects include federally-supported water diversion or impoundment projects, federal hydropower generation projects, federally-supported river channelization projects, federally-supported road and bridge construction, federally permitted dredge and fill actions, federally permitted discharge of wastewater, and others. However, other federal actions, such as support for removal of nonnative riparian vegetation, could have beneficial effects to conservation of Arkansas River shiner.

The distribution and habitat needs of interior least tern, an endangered species listed in 1985, overlap considerably with Arkansas River shiner (Service, 1990; Figure 6). Consequently, federal actions that may potentially affect interior least tern could also have effects on Arkansas River shiner. In this case, mandatory alternatives or terms and conditions or discretionary conservation measures developed through section 7 consultation on effects to interior least tern may address some of the conservation needs of Arkansas River shiner. The distribution of nesting interior least tern in the Arkansas River basin includes the upper and middle portions of Unit 1B (Canadian River) in Texas and Oklahoma and almost all of Unit 3 (Cimarron River) in Kansas and Oklahoma (Figure 6).

Habitat modifications implicated in the decline of interior least tern have also been identified as factors in the decline of Arkansas River shiner, including channelization, water withdrawal, impoundments, and regulation of stream flow (Service, 1990: 22). Habitat for and abundance of small fishes, upon which interior least tern feed, are important factors in determining least tern reproduction (*e.g.* Tibbs and Galat, 1998). Federal actions in areas occupied by interior least tern that may have detrimental impacts on habitat and abundance of small fishes, such as Arkansas River shiner, would likely have indirect, negative impacts on interior least tern under the jeopardy standard. Therefore, actions that may negatively affect interior least tern could also have negative impacts on Arkansas River shiner and its habitat, and *vice versa*.

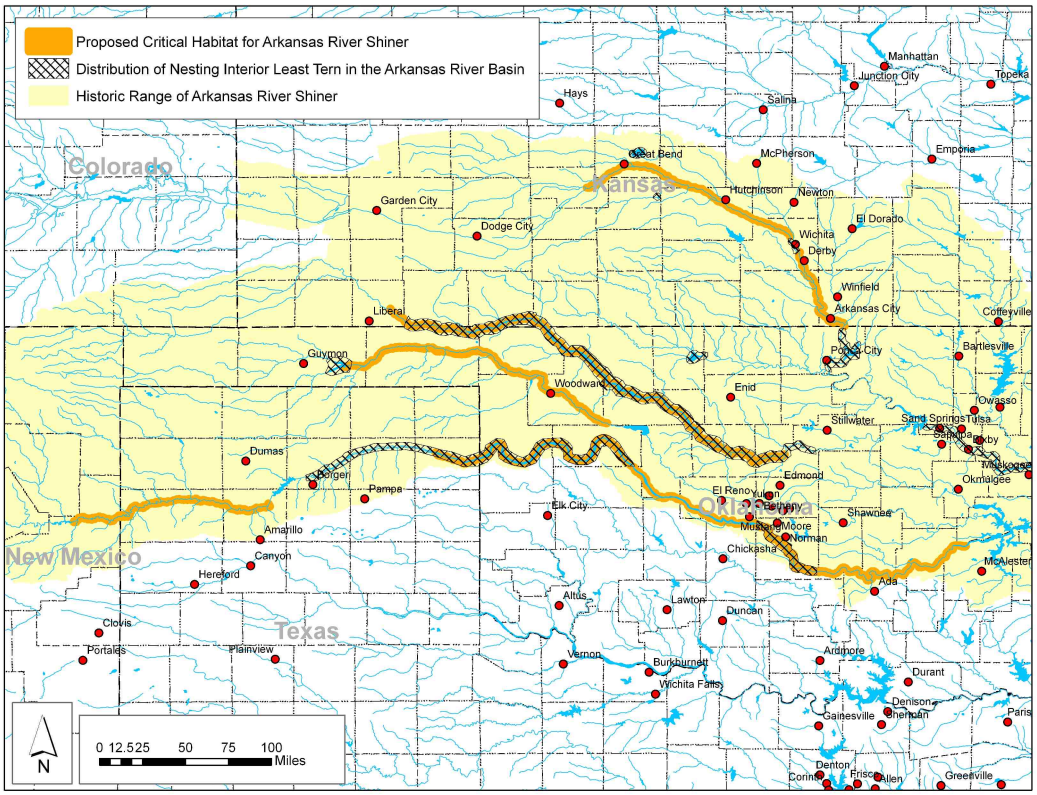


Figure 6. Distribution of nesting interior least tern in the Arkansas River basin (from Service, 1990: 11; D. Mulhern, Service, pers. comm., 27 April 2005). Proposed critical habitat and historic range of Arkansas River shiner are also shown.

3.1.2 Impact Assessment Method

Many federal actions analyzed in the context of the National Environmental Policy Act involve a specific action with well-defined parameters, such as issuance of a Clean Water Act 404 permit for proposed construction of a pipeline crossing of the Canadian River that has a specific construction time frame and well-defined project boundary. Such federal actions involve physical impacts to the environment. In contrast, critical habitat designation is a rule-making action that does not have any direct, physical impacts.

The consequences of section 7 consultation on potential effects to Arkansas River shiner and critical habitat may be highly variable, depending on the characteristics, context, location, duration, geographic extent, and timing of each proposed action subject to consultation. This complexity is heightened by the dynamic nature of the natural environment. Biological conditions that influence the magnitude of potential impacts may change over time and from place to place. The complexity of the effects of critical habitat designation was addressed by using past section 7 consultations that involved Arkansas River shiner and interviews with Service biologists on potential future consultation issues as a basis for the impact assessment.

A separate analysis of the economic impacts of all conservation activities for Arkansas River shiner

was conducted and relevant results were incorporated into this EA (Industrial Economics, Inc., 2005).

The proposed action analyzed in this EA is designation of critical habitat. Therefore, the No Action alternative was defined as no designation of critical habitat for Arkansas River shiner, but the species would continue to be listed as threatened under the ESA. Listing of the Arkansas River shiner and designation of critical habitat are associated actions. It is possible that Arkansas River shiner could be listed without designation of critical habitat. However, the opposite is not possible: critical habitat cannot be designated unless the species is listed.

3.2 Conservation of Arkansas River Shiner

3.2.1 Existing Conditions

Existing conditions are defined as no designation of critical habitat for Arkansas River shiner. Under these conditions, section 7 consultation under the jeopardy standard would be triggered when a proposed federal action is likely to affect Arkansas River shiner. This could include actions that directly or indirectly affect habitat occupied by the species. Currently, habitat occupied by the species includes proposed critical habitat units 1A (Canadian River in New Mexico and Texas), 1B (Canadian River in Texas and Oklahoma), 2 (Beaver/North Canadian River in Oklahoma), and 3 (Cimarron River in Kansas and Oklahoma). Only proposed critical habitat unit 4 (Arkansas River in Kansas) is considered unoccupied by Arkansas River shiner at the present time (69 FR 59859: 59861). Accordingly, section 7 consultations on federal actions that may potentially affect aquatic or riparian habitat in Unit 4 currently do not consider potential effects on Arkansas River shiner under the jeopardy standard (D. Mulhern, Service, pers. comm., 27 April 2005).

A federal action agency makes the initial determination of whether or not their action may affect Arkansas River shiner. If the action agency determines that there would be no effect to the species, they are not required to consult with the Service. Section 7 consultation is triggered when it is determined that the proposed federal action has the potential to affect Arkansas River shiner. Arkansas River shiner receives protection from unauthorized take, which is defined to include not only physical harm to individuals but also significant habitat modification or degradation that results in impairment of behavioral patterns such as breeding, feeding, or sheltering. Designation of critical habitat has no bearing on take considerations.

Existing conditions also include section 7 consultation with the Service when a proposed federal action may affect interior least tern. As described in section 3.1.1, nesting interior least tern occur in some of the areas being considered for designation of critical habitat for Arkansas River shiner (Figure 6). Federal actions that have an adverse affect on interior least tern under the jeopardy standard could also result in destruction or adverse modification of proposed critical habitat for Arkansas River shiner. Such federal actions are currently subject to section 7 consultation under the jeopardy standard for interior least tern, and possibly also under the jeopardy standard for Arkansas River shiner.

Since Arkansas River shiner was listed as a threatened species in November 1998, there have been four formal consultations and about 394

informal consultations involving Arkansas River shiner (Table 2). Two-thirds of the section 7 consultations, including three of the four formal consultations, were on oil and gas projects (31 percent), federal land or water management projects (10 percent), communications projects (9 percent), transportation projects (8 percent), and municipal wastewater management projects (7 percent). There have not been any jeopardy opinions involving Arkansas River shiner since the species was listed in 1998. The four formal consultations included Incidental Take Statements with mandatory reasonable and prudent measures to minimize take and associated terms and conditions. Formal consultations that included Arkansas River shiner were on federal actions proposed by the U.S. Army Corps of Engineers, Federal Highway Administration, and Environmental Protection Agency.

Designated critical habitat for Arkansas River shiner was in effect from May 2001 to September 2003. None of the section 7 consultations conducted during this two-and-one-half year period contained a determination that the proposed action would destroy or adversely modify critical habitat.

A conservation plan is currently being cooperatively developed by the Canadian River Municipal Water Authority and other stakeholders for proposed critical habitat unit 1A. This conservation plan is intended to address sustaining the existing population in the Canadian River from Ute Dam, New Mexico downstream to the reach above Lake Meredith in Texas. Major issues addressed by the plan will be stream flow and restoration of native riparian habitat through removal of nonnative salt cedar.

3.2.2 Effects on Conservation of Arkansas River Shiner

3.2.2.1 No Action Alternative Section 7 consultations would be conducted pursuant to the jeopardy standard provisions of the ESA, but would not be conducted relative to the destruction or adverse modification provisions with selection of the No Action Alternative. In a practical sense, this would mean that federal actions that are not expected to affect Arkansas River shiner, but are planned in habitats that have proposed primary constituent elements and that are within the proposed critical habitat designation boundary, would not trigger section 7 consultation.

Critical habitat designation provides a regulatory mechanism, through section 7 consultation, to evaluate the effects of proposed actions on key habitat features within areas that are essential to the conservation of the species. These benefits to conservation of Arkansas River shiner would not occur with the No Action Alternative.

The No Action Alternative would also avoid whatever negative public reaction might occur to the designation of critical habitat on private lands, perhaps creating a more positive climate for recovery-related actions that cannot be achieved through the designation of critical habitat.

Table 4. Formal and informal consultations that included Arkansas River shiner from 1998 to the present time . INF = informal section 7 consultations, FOR = formal section 7 consultations.

ACTIVITY	OKLAHOMA		KANSAS		TEXAS		NEW MEXICO		TOTAL
	INF	FOR	INF	FOR	INF	FOR	INF	FOR	
Concentrated Animal Feeding Operation	0	0	0	0	0	1	0	0	1
Grazing	8	0	0	0	0	0	0	0	8
Gravel Mining or Borrow Pit	1	0	0	0	0	0	0	0	1
Road, Bridge, or Railroad Construction	15	1	4	0	11	2	0	0	33
Oil and Gas	100	0	1	0	25	0	0	0	126
Power Production	13	0	1	0	5	0	0	0	19
Water Supply	22	0	0	0	7	0	0	0	29
Cultivation or Irrigation	0	0	0	0	0	0	0	0	0
Dredge and Fill	8	0	0	0	0	0	0	0	8
Pesticide Registration or Use	2	0	0	0	0	0	0	0	2
Recreational Activity	1	0	0	0	0	0	0	0	1
Wastewater Management	25	0	3	0	0	0	0	0	28
Federal Land or Water Management	21	0	0	0	21	0	0	0	42
Communications	21	0	0	0	14	0	0	0	35
Other Construction	40	0	1	0	14	0	0	0	55
Miscellaneous	0	0	1	0	7	0	2	0	10
TOTAL	277	**1**	11	**0**	104	**3**	2	**0**	398

The non-regulatory aspects of critical habitat designation that would contribute to conservation of Arkansas River shiner would also not be realized with the No Action Alternative. These non-regulatory aspects include informing the public and private sector of areas that are important for species recovery, focusing attention on specific geographic areas that are essential to conservation of Arkansas River shiner, identifying areas that may require special management considerations or protection, and providing protection to areas where significant threats to the species have been identified to help to avoid accidental damage to such areas.

3.2.2.2 Alternative I Alternative I would have the effect of requiring section 7 consultation on the impacts of proposed federal actions on designated critical habitat described in units 1A, 1B, 2, 3, and 4 (Figure 4). Section 7 consultation on potential effects to designated critical habitat from activities on private lands would occur only when a federal action, such as funding or permitting, is involved.

Alternative I would provide protections to designated critical habitat afforded by section 7 of the ESA that are above and beyond those afforded under the jeopardy standard alone. Consultation under the jeopardy standard alone typically focuses on effects of a proposed action in the context of "take" and jeopardizing the continued existence of the species, as defined by the ESA and implementing regulations. While the jeopardy analysis usually includes consideration of impacts to habitat necessary for breeding, feeding, and sheltering of the listed species, it may not fully address longer-term, more subtle impacts to recovery of the species. Designation of critical habitat provides a companion section 7 analysis that focuses on the value of the designated habitat for recovery of the Arkansas River shiner.

Recovery of the species will likely require maintenance of existing populations and repatriation of the fish to selected areas, including suitable unoccupied habitat within its historic range (69 FR 59859: 59866). Through section 7 consultation, critical habitat designation would provide a mechanism to ensure that habitat characteristics and function essential for conservation of Arkansas River shiner are protected from adverse impacts from federal activities, but not solely State or private actions, in the designated units, whether or not they are occupied by the species. Critical habitat designation also informs government agencies and the general public of areas that are important for species recovery and where conservation actions may be most effective. Critical habitat designation focuses attention to and awareness of specific geographic areas that are essential to conservation of Arkansas River shiner.

Critical habitat also identifies areas that may require special management considerations or protection, but does not necessarily bring about that special management. Critical habitat designation may help reduce conflicts by identifying the habitat needs of Arkansas River shiner early in the project planning process. When a federal agency proposes an action and can see that the action is located within the boundaries of a critical habitat unit, they can plan their projects in a proactive fashion consistent with section 7(a)(1) of the ESA. At the same time, the demonstrated public opposition to designation of critical habitat could create controversy and hostility towards recovery of the shiner where it would not otherwise exist.

Critical habitat designation for Arkansas River shiner under Alternative I could also have benefits to other rare or sensitive fish species, including speckled chub (*Macrhybopsis aestivalis*), plains minnow (*Hybognathus placitus*), and Arkansas darter (*Etheostoma cragini*), as well as other species. In this sense, Arkansas River shiner may serve as an umbrella species, whose conservation could contribute to conservation of the suite of other fish and wildlife species that occur in the same riverine habitats.

3.2.2.3 Alternative II Alternative II would have the effect of requiring section 7 consultation on the impacts of proposed federal actions on designated critical habitat described in units 1A, 1B, and 3 (Figure 5). Section 7 consultation on the effects of proposed federal actions specifically on Arkansas River shiner in units 2 and 4 would not also be required to consider project impacts to recovery of the species. Section 7 consultation on potential effects to designated critical habitat in units 1A, 1B, and 3 from activities on private lands would occur only when a federal action, such as funding or permitting, is involved.

The effects of federal actions proposed in Unit 2 (Beaver/North Canadian River in Oklahoma) on Arkansas River shiner would continue to be evaluated in section 7 consultations under the jeopardy standard, as they are with existing conditions. However, assessment of impacts to habitat in this unit may not fully consider impacts to recovery of Arkansas River shiner. There would be no trigger for section 7 consultation on the effects of proposed federal actions on habitat essential to the conservation of Arkansas River shiner in Unit 4 (Arkansas River in Kansas). The regulatory and non-regulatory benefits of critical habitat to conservation of Arkansas River shiner described above under Alternative I would not accrue to units 2 and 4 under Alternative II. Protection of the suitability, function, and capability of habitats in units 2 and 4 for conservation of Arkansas River shiner would depend on the effectiveness of other mechanisms, such as conservation agreements, cooperative management plans, or other measures.

On the other hand, conservation of Arkansas River shiner may be facilitated by not designating critical habitat in units 2 and 4 (69 FR 59859: 58871). Use of the provisions in section 10(j) of the ESA to establish of additional populations of Arkansas River shiner within its historic range may be the most effective approach to achieve recovery goals. Augmenting existing aggregations and repatriation of Arkansas River shiner to areas within its historic range will require cooperation with private landowners, because almost all of the lands in these two units are in private ownership. Section 10(j) of the ESA would allow the Service to designate certain re-established populations of Arkansas River shiner as "experimental." Use of section 10(j) is meant to encourage local cooperation through management flexibility. This management flexibility includes development of site-specific rules that contain prohibitions and exceptions necessary and appropriate to conserve the listed species, while addressing concerns of local landowners and the public. Section 10(j)(2)(c)(ii) of the ESA states that critical habitat shall not be designated for any experimental populations that are determined to be nonessential to the continued existence of the species.

About 25 informal consultations have been conducted in Unit 2 since 4 April 2001. All of these were informal and none reached the point of adverse modification. Only nine consultations were conducted in Unit 4 since 2001. All of these were informal and none reached adverse modification. Designation of critical habitat in

these units may not provide substantial habitat protection due to the predominance of private lands and paucity of federal actions in these areas.

3.2.2.4 Option A Option A would exclude Unit 1A from critical habitat designation. This option could be combined with either Alternative I or Alternative II. Section 7 consultations on effects of federal actions to Arkansas River shiner under the jeopardy standard would still be triggered, as they are at the present time. However, assessment of impacts to habitat in Unit 1A that may affect its long-term suitability for recovery of Arkansas River shiner may not be fully analyzed. The regulatory and non-regulatory benefits of critical habitat to conservation of Arkansas River shiner described above under Alternative I would not accrue to Unit 1A with this option. However, decreasing the amount of designated critical habitat may lessen public hostility towards conservation and recovery efforts, as discussed in the previous section.

3.3 Water Resources

3.3.1 Existing Conditions Water resources management in the proposed critical habitat project area includes both groundwater withdrawal and impoundment and diversion of surface water. Groundwater pumping is the predominant water use in the western portion of the project area in units 2 (Beaver/North Canadian River) and 3 (Cimarron River). Groundwater in this region is withdrawn from the High Plains aquifer and is the primary water source (Oklahoma Water Resources Board, 1990; Kansas Division of Water Resources, 1992; Texas Water Resources Board, 1990). The primary use of this groundwater is for irrigation of crops. Relatively little groundwater use occurs in Unit 1A (Canadian River in New Mexico and Texas) as most of the adjacent area is used as rangeland for livestock grazing (63 FR 64772: 64792).

Continuation of groundwater withdrawal may further reduce or eliminate base flows in western sections of the Arkansas River basin, where precipitation and runoff contribute little recharge to the underlying aquifers (63 FR 64772: 64793). In the Canadian River basin in Texas below Lake Meredith, demand for water is expected to decrease only slightly through 2040, primarily as a result of improvements in irrigation efficiency (Texas Water Development Board, 1990). Water use is projected to increase statewide in Oklahoma over a similar period (Oklahoma Water Resources Board, 1997). Municipal and industrial demands are expected to increase by about 30 percent and agricultural demands by 29 percent (63 FR 64772: 64793).

Federal involvement in water resources in the proposed critical habitat project area is confined primarily to flood control operations at Sanford Dam and a proposed future water supply project at Ute Dam (Industrial Economics, 2005: 4-1). Section 404 of the federal Clean Water Act may apply indirectly to water resources through permitting of water pipeline crossings of rivers, but the permitting process does not have any influence on the amount of surface water or groundwater that is pumped, diverted, or conveyed by the pipeline.

Sanford Dam was constructed as part of the Canadian River Project by the Bureau of Reclamation in 1965 and is located in Hutchinson County, Texas (Figure 4). The impoundment created by Sanford Dam is Lake Meredith. The Canadian River Project provides municipal and industrial water, recreation, fish and wildlife habitat, and flood control (Bureau of Reclamation, 2005). Ownership of the water distribution

system associated with Sanford Dam was transferred from the Bureau of Reclamation to the Canadian River Municipal Water Authority on 25 May 1999 and thus is no longer under federal control (Bureau of Reclamation, 2005). Releases from Sanford Dam are made for the purpose of supplying water to municipal and industrial water users. No releases from the dam have ever been made for Arkansas River shiner (K. Collins, Service, pers. comm.). Flood control operations to control reservoir storage above an elevation of 2,941.3 feet are under the direction of the U.S. Army Corps of Engineers (Bureau of Reclamation, 2005). Maximum possible elevation of impounded water behind Sanford Dam, in Lake Meredith, is 2,965 feet (Figure 7). As shown in Figure 7, reservoir storage has never exceeded 2,941.3 feet. The highest lake level was 2,914.85 feet in April 1973 (Figure 7). The maximum possible lake level of 2,965 feet has not been reached in the 40 years since Sanford Dam was constructed. The downstream end of proposed critical habitat Unit 1A (the confluence of Coetas Creek and the Canadian River), at an elevation of about 2,950 feet, has never been inundated by Lake Meredith (Figure 7).

Ute Dam was constructed in 1963 and is owned and operated by the New Mexico Interstate Stream Commission for the purpose of supplying municipal and industrial water to communities in eastern New Mexico. Initial storage capacity of the reservoir impounded by the dam was 109,600 acre-feet. The dam was raised in 1984 to increase storage in the reservoir to 272,800 acre-feet (U.S. Supreme Court, 1991). Currently, there is no delivery system in place for New Mexico to utilize water from Ute Reservoir for municipal or industrial water supply or irrigation (C. Roepke, New Mexico Interstate Stream Commission, pers. comm.). Plans for a water distribution system (the Eastern New Mexico Water Supply Project) have been developed since about 1972. The project is jointly proposed by the Bureau of Reclamation and the Eastern New Mexico Rural Water Authority, the local sponsor. However, as of June 2004, the Bureau of Reclamation indicated that it was not prepared to support the project as currently designed and requested a thorough review with the local sponsor to resolve design issues and questions (Keys, 2004).

Releases from Ute Dam are made to provide water to Texas and Oklahoma and are governed by the Canadian River Compact, which was approved in 1952 with Texas, New Mexico, and Oklahoma as parties. A stipulated judgement and decree in 1993 in the U.S. Supreme Court lawsuit entitled *Oklahoma and Texas v. New Mexico* provided an operating schedule for releases from the dam. In general, New Mexico is allowed to store 200,000 acre-feet of water and must release all water in excess of that storage amount for use downstream by the states of Oklahoma and Texas. Releases from Ute Dam are made by the New Mexico Interstate Stream Commission, which is a non-federal entity, and operation of the dam is not subject to section 7 consultation.

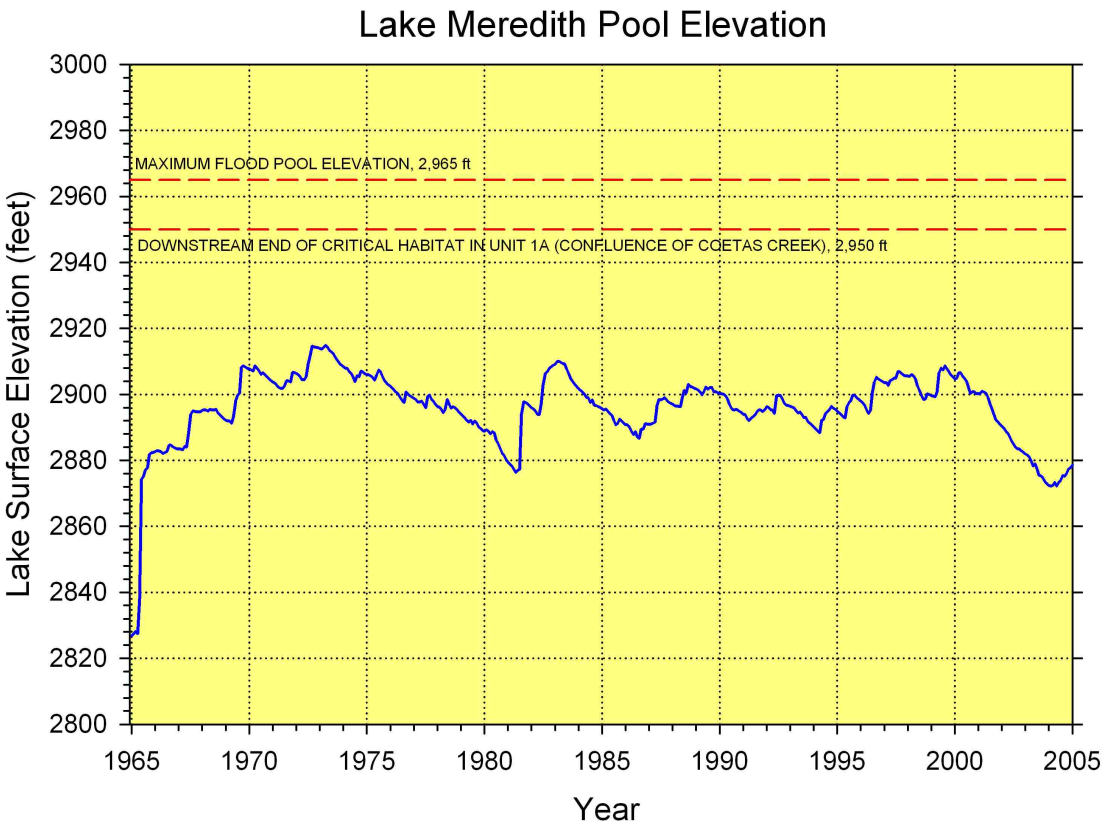


Figure 7. Water surface elevation of Lake Meredith since construction of Sanford Dam was completed in August 1965 (Canadian River Municipal Water Authority, 2005*b*).

In addition to releases made to meet Canadian River Compact requirements, stream flow in the Canadian River below Ute Dam to the confluence of Revuelto Creek , located approximately 2.3 miles downstream from the dam, is maintained by seepage from the dam and natural brine seeps located along the river. Seepage from the dam and natural brine seeps maintain a base flow of two to four cubic feet per second in the Canadian River below Ute Dam to the confluence of Revuelto Creek. Seepage below Ute Dam increased when the dam was raised in 1984 to expand the size of the impoundment (K. Collins, Service, pers. comm.). The Lake Meredith Salinity Control Project, which was constructed in 1999-2000, was implemented jointly by the Bureau of Reclamation, the State of Texas, and the Canadian River Municipal Water Authority. The project consists of a series of wells completed to a depth of 120 to 260 feet, from which saline groundwater is pumped. These wells are located along the Canadian River below Ute Dam and above the confluence of Revuelto Creek. The saline groundwater is then piped south to an injection well, where the brine is disposed of in a limestone formation about 3,000 feet below the surface. The purpose of this project is to reduce salinity in the Canadian River to improve water quality downstream in Lake Meredith. The Bureau of Reclamation consulted with the Service on this project regarding potential effects to Arkansas River shiner. The Service determined that the project's affects on stream flows were anticipated to be so small as to be unmeasurable and therefore would not have an adverse effect on Arkansas River shiner (K. Collins, Service, pers. comm.).

A program of salt cedar control is currently being implemented in Unit 1A (Canadian River from Ute Dam to Lake Meredith). Salt cedar removal and control efforts in this unit are being conducted in order to achieve substantial saving of water in the basin, as well as for the benefit of Arkansas River shiner and other species (Canadian River Municipal Water Authority, 2005*a*). Ongoing salt cedar control is funded by the U.S. Bureau of Reclamation and the National Park Service around Lake Meredith, the states of New Mexico and Texas, the Canadian River Municipal Water Authority, numerous soil and water conservation districts, and the Natural Resources Conservation Service (Canadian River Municipal Water Authority, 2005*a*). The effect of salt cedar control efforts to date on stream flows in Unit 1A have not been documented. Salt cedar control efforts with a federal nexus trigger section 7 consultation under the jeopardy standard, as this segment of the Canadian River is occupied by Arkansas River shiner. No salt cedar control projects have resulted in formal consultation. The Service typically recommends revegetation with native riparian species following removal of salt cedar, as well as conducting herbicide applications in accordance with label directions, in order to protect Arkansas River shiner and its habitat.

Since Arkansas River shiner was listed in 1998, there have been 29 consultations (all informal) on water supply projects and 42 consultations (all informal) on federal land or water management projects (Table 2). Most of these informal consultations consisted solely of information requests. There have not been any formal section 7 consultations on water projects where Arkansas River shiner was involved.

3.3.2 Effects on Water Resources

3.3.2.1 No Action Alternative Federal involvement in water management actions in the project area would continue to be very limited and

would be associated with potential flood control operations at Sanford Dam and the Eastern New Mexico Water Supply Project, if development of that project continues. These actions may be subject to section 7 consultation under the jeopardy standard, as both could potentially effect reaches of the Canadian River that are occupied by Arkansas River shiner. Water management actions throughout the remainder of the project area, such as groundwater pumping, lack a federal nexus and would continue to occur without being subject to section 7 consultation under the jeopardy standard. Section 7 consultations on federal water resource actions would not include analysis of effects to habitat considered to be essential for conservation of Arkansas River shiner, unless it overlapped with analysis conducted under the jeopardy standard.

Existing stream flow conditions below Sanford Dam would continue in the future with the No Action Alternative. Non-flood control releases are conducted by the Canadian River Municipal Water Authority, which is a non-federal entity, and are therefore not subject to section 7 consultation under the jeopardy standard. However, the prohibition against "take" of the shiner from the operations of the dam would be applicable. It is unlikely that there would be sufficient water impounded behind Sanford Dam in the future to make continued, persistent downstream releases to improve habitat conditions for Arkansas River shiner. The channel banks below Sanford Dam are stabilized by dense growths of salt cedar that prevent the river from reverting to a more natural condition (*i.e.* a wider, shallower channel with associated habitat diversity), which would benefit Arkansas River shiner. Releases from Sanford Dam would have to be of sufficient magnitude, duration, and frequency to scour and remove salt cedar. The potential for continued storage and release of such large amounts of water is extremely unlikely. Similarly, the potential for lake elevations to inundate portions of the Canadian River immediately upstream from Lake Meredith is remote. The water surface elevation of Lake Meredith would have to exceed 2,950 feet in order for such a situation to occur. This has not occurred in the 40 years since Sanford Dam was constructed and is unlikely to occur in the future.

Flood control operations at Sanford Dam would be conducted by the U.S. Army Corps of Engineers, a federal entity, and consequently could be subject to section 7 consultation under the jeopardy standard. However, water surface elevation of Lake Meredith has never approached the threshold for flood control management of the dam by the U.S. Army Corps of Engineers (*i.e.* a reservoir water surface elevation of 2,941.3 feet; Figure 7).

Existing stream flow conditions below Ute Dam are likely to continue into the future under the No Action Alternative. Releases from Ute Dam are conducted by the New Mexico Interstate Stream Commission, which is a non-federal entity, and are therefore not subject to section 7 consultation under the jeopardy standard. Capture or curtailment of base flows resulting from dam seepage and natural brine seeps is unlikely to occur. Sealing of the dam to prevent seepage would likely be prohibitively expensive and there are no indications that such an action is contemplated by any party. Similarly, additional groundwater pumping below the dam to reduce salinity in the Canadian River downstream from Ute Dam is not anticipated by the Bureau of Reclamation (K. Collins, Service, pers. comm.). New Mexico cannot store any more water in the future in Ute Reservoir than is currently allowed and must continue to release water downstream in accordance with Canadian River Compact

requirements. The proposed Eastern New Mexico Water Supply Project would utilize existing stored water in Ute Reservoir and consequently would not be likely to result in changes in flows downstream from Ute Dam.

Stream flows may continue to decline in the lower Canadian, Beaver/North Canadian, and Cimarron drainages due to continued groundwater pumping, despite declining agricultural demand in Texas and decreases in the amount of water used per irrigated acre throughout the Arkansas River basin. Depletion of the High Plains aquifer from groundwater pumping is expected to continue to occur in Kansas, New Mexico, Oklahoma, and Texas (63 FE 64772: 64793). However, groundwater pumping in these areas lacks a federal nexus and consequently would not be subject to section 7 consultation under the jeopardy standard. Prohibitions on "take" of the species resulting from these actions would still be in effect.

Salt cedar control programs in Unit 1A (Canadian River from Ute Dam to Lake Meredith) would continue with no designation of critical habitat. The portions of these programs that are federally funded or implemented by federal agencies would continue to trigger section 7 consultation under the jeopardy standard. The Service would likely continue to recommend revegetation of treated areas with native riparian plant species and application of herbicides in accordance with label directions to protect Arkansas River shiner and its habitat.

In summary, consultation under the jeopardy standard on effects to Arkansas River shiner is unlikely to result in any substantial changes to existing water resources management conditions under the No Action Alternative. This is due primarily to the rarity of federal involvement in water resources management in the project area. In those areas occupied by Arkansas River shiner, such as the Canadian River, federal involvement in the stream flows and reservoir releases is largely lacking. Situations in which there could be federal involvement in releases from dams, such as flood control operations at Sanford Dam, have not occurred in the past and are unlikely to occur in the future because of the remote possibility of sufficiently large runoff events to occur.

3.3.2.2 Alternative I As discussed under effects of the No Action Alternative, there is little federal involvement in water resources management in the project area. Proposed critical habitat units 3 and 4 do not contain any federal water management facilities and there are no indications that any are proposed in these units. Critical habitat unit 2 begins below Optima Dam, which has not filled since it was constructed in 1978 and does not store enough water to allow for downstream releases (S. Nolan, U.S. Army Corps of Engineers, pers. comm. *fide* Industrial Economics, Inc., 2005: 4-12). Therefore, occurrence of federal nexus in water management actions is largely restricted to units 1A and 1B, which is the Canadian River in New Mexico, Oklahoma, and Texas. Consequently, critical habitat designation as proposed in Alternative I could potentially have effects on water management in units 1A and 1B, which are both occupied by Arkansas River shiner.

Impacts to federal water resource actions in units 1A and 1B above and beyond those that would occur with the No Action Alternative could potentially occur with critical habitat designation under Alternative I. However, these impacts are not likely to result in substantial changes or modifications to federal water resource management actions. Habitat considerations

under the jeopardy standard already serve to trigger section 7 consultations on federal actions in units 1A and 1B. Interjection of critical habitat considerations in these federal actions may result in identification of additional discretionary conservation measures that focus on maintenance of long-term habitat function, but substantial changes in mandatory requirements pursuant to section 7 determinations are unlikely.

It is likely that a determination of adverse modification of critical habitat in units 1A or 1B would also have an associated determination of a likely adverse affect to the species. This is because the conservation role or value of proposed critical habitat in units 1A and 1B is primarily to sustain the existing populations that occur there (*cf.* section 3.1.1). Thus, the population-maintenance role of proposed critical habitat and determination of effects to the species under the jeopardy standard have considerable overlap.

Critical habitat designation is unlikely to have any effect on downstream releases from Ute Dam. This is because releases from Ute Dam are made by the New Mexico Interstate Stream Commission, which is a non-federal entity and, accordingly, would not be subject to section 7 consultation under the adverse modification standard. As described above in section 3.3.2.1, the Eastern New Mexico Water Supply Project would utilize existing water storage in Ute Reservoir and therefore would not influence the amount of water stored or released from Ute Dam. If the project proceeds and is constructed with involvement of the Bureau of Reclamation, section 7 consultation under both the jeopardy and adverse modification standards could be triggered. However, the potential for effects to Arkansas River shiner or critical habitat is unlikely, as existing dam releases, water storage amounts, and downstream flow conditions are not likely to be changed by the project.

Similarly, critical habitat designation is not likely to have any effect on downstream releases from Sanford Dam. As with Ute Dam, releases at Sanford Dam are made by a non-federal entity, the Canadian River Municipal Water Authority. Therefore, releases from the dam are not subject to section 7 consultation under the adverse modification standard. Dam operation and reservoir storage could potentially shift to the U.S. Army Corps of Engineers, in the event that the reservoir pool reached an elevation of 2,941.3 feet (*cf.* section 3.3.1 and Figure 7). However, as described above, this reservoir elevation has never been reached and is unlikely to be reached in the future, due to the magnitude of flooding that would be required to fill the reservoir to that level. Critical habitat designation under Alternative I could potentially influence flood operations by the U.S. Army Corps of Engineers if the reservoir elevation exceeded 2,950 feet, which is the elevation of the Canadian River at the downstream end of proposed critical habitat unit 1A (Figure 4). However, a reservoir pool elevation above 2,950 has never occurred in the 40 years since the dam was built and is unlikely to occur in the future. If a sufficiently large flood event did occur and a portion of the lower end of critical habitat unit 1A was inundated, this effect would be short-term and would impact only about four miles of river. It would be unlikely to result in lasting changes in the capability of the habitat to support Arkansas River shiner (K. Collins, Service, pers. comm.).

The absence of a federal nexus in water resource actions in the other proposed critical habitat units in Alternative I would render unlikely any affect on proposed water resources projects in those units from critical habitat designation. However, if a federal water resource action were proposed

in units 2 or 3, section 7 consultation could be triggered under both the jeopardy and destruction or adverse modification standards. As described above for units 1A and 1B, critical habitat considerations in such consultations would likely result in identification of additional discretionary conservation measures. Additional mandatory project modifications could also be identified in the event that formal consultation is conducted, particularly with respect to the function of critical habitat for expansion or augmentation of existing aggregations of Arkansas River shiner in these stream systems. However, it is unlikely that critical habitat designation would trigger additional formal consultations, for the same reasons as described above for units 1A and 1B.

If a federal water resource action were proposed in Unit 4, critical habitat designation for Arkansas River shiner would trigger section 7 consultation on potential effects to habitat of Arkansas River shiner within the designated area. This could result in identification of discretionary conservation measures by the Service or, if impacts are severe enough to result in destruction or adverse modification of critical habitat, specification of mandatory reasonable and prudent alternatives to the proposed federal water resource action.

Critical habitat designation may not have any effect on ongoing salt cedar control efforts in Unit 1A. Salt cedar control programs that have a federal nexus currently trigger section 7 consultation under the jeopardy standard because the Ute Dam to Lake Meredith segment of the Canadian River is occupied by Arkansas River shiner. Consultations under the jeopardy standard ensure protection of surface water quality in Unit 1A. Removal and control of salt cedar in Unit 1A would have a beneficial effect on the habitat of Arkansas River shiner and would not be likely to result in a determination of destruction or adverse modification of critical habitat designated under this alternative. However, public hostility to a critical habitat designation could result in a lessening of non-federal removal efforts, to the extent those are identified with conservation of the Arkansas River shiner.

3.3.2.3 Alternative II Exclusion of units 2 and 4 would eliminate consideration of potential effects of federal water resources actions on critical habitat, which would not be considered under the jeopardy standard. This is unlikely to have an appreciably different effect than Alternative I, due to the lack of a federal nexus in water resource projects that may occur in these units and the existence of a section 7 trigger under the jeopardy standard.

3.3.2.4 Option A The effect of excluding Unit 1A from critical habitat designation would be to eliminate consideration of potential effects of federal water resources actions on critical habitat, which would not be considered under the jeopardy standard. As described under the effects of Alternative I, critical habitat designation in this unit may result in identification of additional discretionary conservation measures that focus on maintenance of long-term habitat function. Such discretionary conservation measures would not necessarily be identified if Unit 1A is excluded from critical habitat designation.

3.4 Agriculture and Concentrated Animal Feeding Operations

3.4.1 Existing Conditions

Agriculture is a principal land use within the proposed critical habitat project area. Agricultural land use in the eastern portion of the project area consists mainly of pasture and hay production and dryland crop production (Figure 8). The eastern portion of the project area includes the lower reaches of the Canadian River in Oklahoma and the lower Arkansas River in Kansas (Figure 8).

The central portion of the project area is an important region for dryland production of winter wheat. The central portion of the project area includes the middle reach of the Canadian River in Texas and Oklahoma, the Cimarron River (Unit 3), most of the Beaver/North Canadian River (Unit 2), and the upper Arkansas River in Unit 4 (Figure 8). Livestock production is also a major agricultural land use in this area. Irrigated crop land is also a major agricultural land use in the central portion of the project area. The main irrigated crops are corn, alfalfa hay, grain sorghum, winter wheat, corn silage, soybeans, and cotton (Industrial Economics, Inc., 2005: 2-18).

The western portion of the project area includes the upper Canadian River in New Mexico and Texas (Unit 1A) and the upstream end of the Beaver/North Canadian River (Unit 2) in Oklahoma (Figure 8). Livestock production on native rangeland and irrigated crop land are the predominant agricultural land uses in this part of the project area (Industrial Economics, Inc., 2005: 2-16).

Animal feeding operations, including cattle feed lots, dairies, and swine production facilities, are an important agricultural activity in the project area (Industrial Economics, Inc., 2005: 2-18). Cattle feed lots are concentrated in the western portion of the project area in the Oklahoma panhandle and southwestern Kansas and in the central portion of the project area in Kansas. Dairy facilities are less common and are located in the central and eastern portions of the project area. Swine production facilities are widespread throughout the project area (Industrial Economics, Inc., 2005: 2-25).

To date, row crop and livestock grazing activities in the project area have not been impacted by Arkansas River shiner There have not been any section 7 consultations on cultivation or irrigation activities (Table 2). There have been eight section 7 consultations (all informal) on livestock grazing since Arkansas River shiner was listed in 1998. All of these consultations were in Oklahoma and involved actions proposed by the Bureau of Land Management (one consultation) or the Bureau of Indian Affairs (seven consultations). None of these consultations determined that there would be effects on Arkansas River shiner and no project modifications due to consideration of Arkansas River shiner occurred.

Projects implemented under federal farm assistance programs, such as the Environmental Quality Incentive Program, Wildlife Habitat Incentives Program, and Conservation Reserve Enhancement Program, have not resulted in any determinations of effect to Arkansas River shiner since the species was listed. The goal of these programs is conservation of soil, water, and wildlife habitat, which is consistent with and complementary to conservation of Arkansas River shiner.

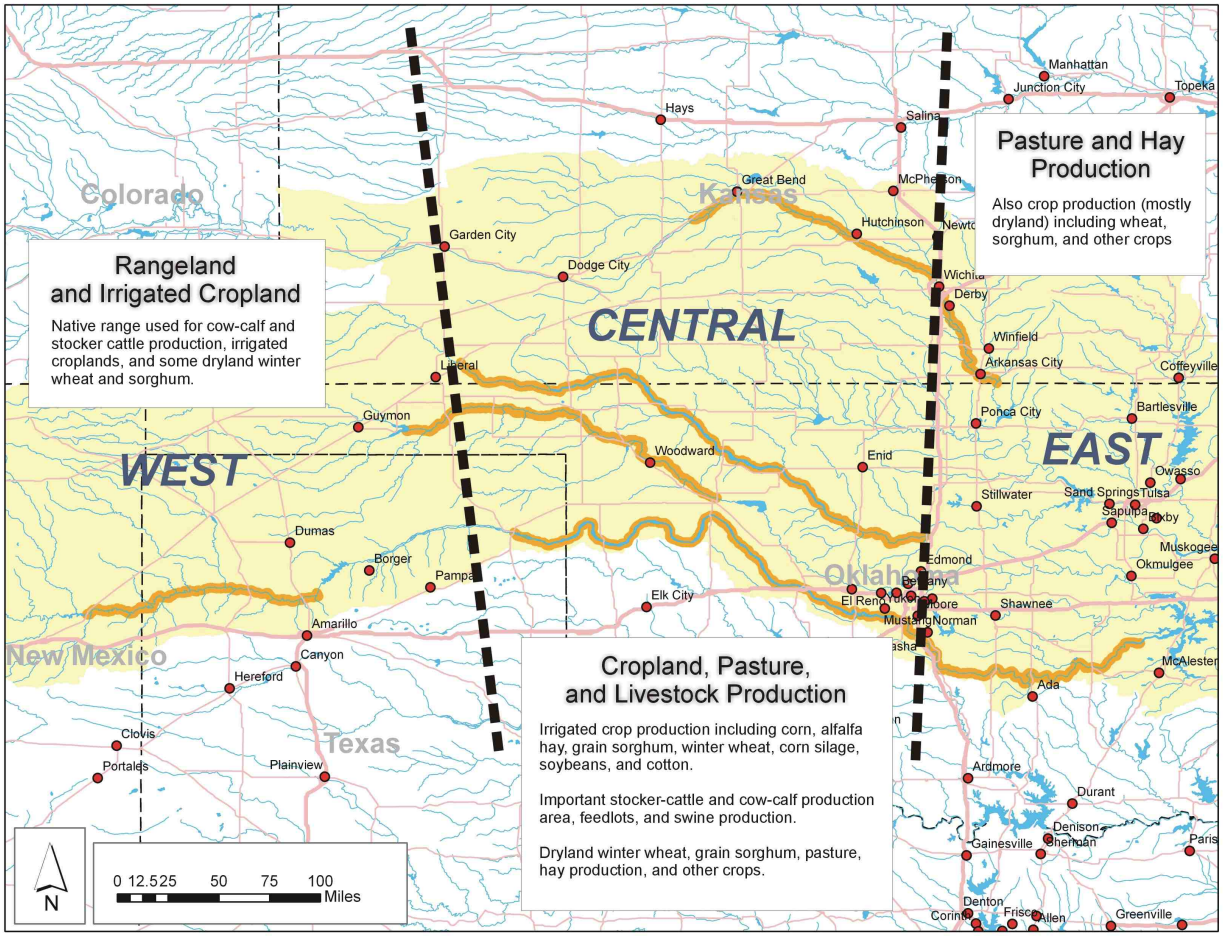


Figure 8. Overview of major agricultural land uses in the project area. Adapted from information provided in Industrial Economics, Inc. (2005: 2-15). River segments comprising the four critical habitat units proposed in Alternative I are highlighted in orange and the historic range of Arkansas River shiner in the Arkansas River basin is indicated by the yellow area.

There was one formal section 7 consultation conducted in Texas concerning two National Pollutant Discharge Elimination System (NPDES) general permits for Concentrated Animal Feeding Operations (consultation no. 2-12-99-F-095). One of the proposed general permits covered Concentrated Animal Feeding Operations (CAFOs) in non-water quality impaired watersheds in Texas (TXG800000), while the other covered CAFOs located in watersheds in Texas with impaired surface water quality (TXG810000). The Service determined that discharges authorized under the permits, such as overflow of waste retention ponds during a chronic or catastrophic storm event, may adversely affect the Arkansas River shiner in the Canadian River (Service, 1999: 21, 27). This determination was made under the jeopardy standard when critical habitat had not yet been designated for Arkansas River shiner. The Service specified a mandatory reasonable and prudent measure for minimizing take of Arkansas River shiner and associated terms and conditions for implementing the measures.

Terms and conditions for protection of Arkansas River shiner included no permitting of CAFOs in Oldham, Potter, Hutchinson, Roberts, and Hemphill counties that had the potential to discharge directly into the Canadian River. The Environmental Protection Agency was requested to determine, on a site-by-site basis, the permitting buffer area based on site-specific topography, rain fall, surface water run-off patterns, soil type, and soil permeability (Service, 1999: 34). Also, the approximately 10 existing CAFOs with potential to discharge directly into the Canadian River would be required to meet the more stringent requirements described in General Permit TXG810000. These requirements include a top free-board in waste ponds of three feet and in no case less than two feet, basing land application rates of wastewater on phosphorus requirements of crops in the application area, and basing land application rates of manure and other solids on available phosphorus content of the waste (Service, 1999: 7). Off-site disposal of wastes by land application must be certified to assure that application rates are based on phosphorus agronomic requirements of crops and that agronomic rates are calculated using a nutrient budgeting system.

3.4.2 Effects on Agriculture and Concentrated Animal Feeding Operations

3.4.2.1 No Action Alternative Federal agriculture-related actions that have the potential to affect Arkansas River shiner under the jeopardy standard would continue to trigger section 7 consultation under the No Action Alternative. Section 7 consultations on federal agriculture-related actions would not include analysis of effects to habitat eligible for designation of critical habitat unless it overlapped with analysis conducted under the jeopardy standard.

Row-crop production and livestock grazing in the project area have not been affected by listing of the Arkansas River shiner. As described above, there have not been any section 7 consultations on cultivation or irrigation activities (Table 2). There have been eight section 7 consultations (all informal) on livestock grazing since Arkansas River shiner was listed in 1998. All of these consultations were in Oklahoma and involved actions proposed by the Bureau of Land Management (one consultation) or the Bureau of Indian Affairs (seven consultations). None of these consultations determined that there would be effects on Arkansas River shiner and no project modifications due to consideration of Arkansas

River shiner occurred. Private row-crop and livestock grazing actions on private lands do not have a federal nexus and consequently are not subject to section 7 consultation under the jeopardy standard.

Modification of waste-handling facilities and procedures at CAFOs to protect Arkansas River shiner may be required in other areas within the occupied range of the species including the Beaver/North Canadian River and Cimarron River watersheds. Measures to protect surface water quality similar to those specified in the formal consultation on the NPDES general permit for CAFOs in Texas could be required through section 7 consultation under the jeopardy involving Arkansas River shiner. These modifications could include increased storage requirements for waste retention structures to allow for containment of water from a 100-year, 24-hour storm event, increased size of vegetated buffers, surface and groundwater monitoring requirements, development of spill remediation plans, and testing of sludge proposed for land application to determine metals concentration. Implementation of these measures could result in economic impacts consisting of one-time capital costs and recurring annual costs (Industrial Economics, Inc., 2005: 6-2). It is likely that only CAFOs within a specified distance from habitats occupied by Arkansas River shiner would be subject to potential requirements for waste handling facilities. This distance would likely be somewhere between 1,000 feet and three miles from occupied habitat (K. Collins, Service, pers. comm.).

3.4.2.2 Alternative I Critical habitat designation under Alternative I could only affect agricultural activities when there is federal involvement (*e.g.* federal lands, federal permitting, federal funding). As described above, row-crop production and almost all livestock grazing activities within the project area do not have any federal involvement. Accordingly, these activities would not be subject to section 7 consultation under the jeopardy or adverse modification standards.

The Environmental Protection Agency (EPA) delegated NPDES permitting authority for CAFOs in Unit 4 to the State of Kansas. Unless the state NPDES permitting program undergoes another review by the Environmental Protection Agency, changes to the existing CAFO permit are unlikely (K. Collins, Service, pers. comm.). If the Kansas NPDES program were to undergo another review by the EPA, additional measures to protect surface water quality from NPDES-permitted CAFO waste discharge could be required in Unit 4 (Arkansas River in Kansas) with designation of critical habitat under Alternative I. Because Unit 4 is considered to be unoccupied by Arkansas River shiner, NPDES permitting of CAFO waste discharge would not likely be triggered under the jeopardy standard for the species. Accordingly, designation of critical habitat for Arkansas River shiner in Unit 4 could possibly result in one-time capital costs and recurring annual costs for CAFOs within a specified distance of the Arkansas River in the unit (Industrial Economics, Inc., 2005: 6-2), if the Kansas NPDES permitting program was subject to another review by the EPA.

Specification of additional mandatory requirements or discretionary conservation measures in section 7 consultations on NPDES-permitted waste discharges from CAFOs in units 1A, 1B, 2, or 3 would not be likely to occur because these areas are considered to be occupied by the species. Section 7 consultations on CAFO NPDES permitting would already be triggered under the jeopardy standard in these units. The intent of these consultations would be to prevent

or minimize the introduction of contaminants into surface waters used by the species. There are no other issues related to CAFO NPDES permitting that would arise due to critical habitat designation.

The only other agricultural activities with a federal nexus that could potentially be affected by critical habitat designation are voluntary federal farm-assistance programs and grazing on public lands. With respect to the latter, section 7 consultations on federal grazing actions (*e.g.* Bureau of Land Management or Bureau of Indian Affairs lands) in the project area already triggered under the jeopardy standard. Designation of critical habitat for Arkansas River shiner may add discretionary conservation measures to protect the long-term suitability or capability of habitat for conservation of the species, but it is unlikely to result in substantive modifications of proposed federal grazing actions.

The goal of projects implemented under federal farm-assistance programs is conservation of soil, water, and wildlife habitat. Such projects would be unlikely to have any negative impacts on the value or function of critical habitat designated under Alternative I. The potential for any of these projects to result in destruction or adverse modification of designated critical habitat is extremely remote.

3.4.2.3 Alternative II Alternative II may eliminate potential impacts from NPDES permitting on CAFOs in Unit 4 (Arkansas River in Kansas) that are described under the effects of Alternative I.

3.4.2.4 Option A The effect of excluding Unit 1A from critical habitat designation would be to eliminate consideration of potential effects of federal agriculture-related actions on critical habitat in that unit, which would not be considered under the jeopardy standard. Exclusion of Unit 1A from critical habitat designation, when combined with either Alternative I or Alternative II, is unlikely to result in any change in effects to agricultural activities. This is because agricultural activities in the vicinity of the Canadian River are conducted almost entirely on private lands with little or no federal involvement. Consequently, almost all agricultural activities conducted in Unit 1A are not subject to section 7 consultation.

3.5 Oil and Gas Resources

3.5.1 Existing Conditions

Production and transmission of oil and gas are important economic activities in the proposed critical habitat project area. Oil and gas production is highest in the counties containing critical habitat Unit 1B (Canadian River in Texas and Oklahoma; Table 5).

Table 5. Oil and gas production in 2003 in the project area. Data are totals for all counties containing each of the proposed critical habitat units and were summarized from Industrial Economics, Inc. (2005: 5-4).

Critical Habitat Unit	Oil Production in 2003 (barrels)	Gas Production in 2003 (1000 ft^3)
1A	248,115	19,451,976
1B	18,471,320	728,510,685
2	5,147,681	209,294,216
3	5,887,936	163,504,494
4	4,045,123	4,390,781

Oil and gas production levels in 2003 were similar in counties containing proposed critical habitat Unit 2 (Beaver/North Canadian River in Oklahoma) and Unit 3 (Cimarron River in Kansas and Oklahoma; Table 5). No oil and gas is produced in Quay County, New Mexico in Unit 1A, but there is some production in Oldham and Potter counties in Texas in this unit (Industrial Economics, Inc., 2005: 5-4).

Since Arkansas River shiner was listed in 1998, there have been about 126 section 7 consultations on oil and gas projects that involved Arkansas River shiner (Table 2). All of these consultations were informal. All of the consultations were in Texas (100) and Oklahoma (25), except for a single informal consultation in Kansas (Table 2). Formal consultation is currently being conducted on a proposed natural gas pipeline crossing of the Canadian River, which is expected to result in an adverse affect (*i.e.* take) of Arkansas River shiner. Also, formal consultation on potential impacts to Arkansas River shiner may be conducted for proposed wastewater discharge from an oil refinery in Hutchinson County, Texas (O. Bocanegra, Service, pers. comm., 19 April 2005).

Oil and gas resource actions that have been subject to section 7 consultation involving Arkansas River shiner have consisted mainly of development of new wells and pipeline construction and maintenance. Well development may trigger section 7 consultation through federal NPDES permitting, federal surface ownership, or federal lease of the resource. Pipeline projects may have federal involvement through Clean Water Act section 404 permitting by the U.S. Army Corps of Engineers or permitting by the Federal Energy Regulatory Commission.

Typical recommendations for well development that are provided by the Service under the jeopardy standard of section 7 consultations focus on measures to prevent the likelihood of pollutants entering surface water inhabited by Arkansas River shiner. For example, development of a new well at the Schroeder Federal #1-23D site in Canadian County, Oklahoma, underwent informal consultation in 2002 (consultation no. 2-14-02-I-0581). The Service concurred that constructing lined ditches around the existing pad, installation of a geo-membrane around the edge of the pad, placement of silt fence and hay bales around the pad site, and restoration of native vegetation on disturbed areas were sufficient to avoid potential adverse effects to Arkansas River shiner, critical habitat designated for the fish, and interior least tern. The Service also recommended that new well pads proposed in the vicinity of habitat for Arkansas River shiner be constructed with an impervious surface, a surrounding containment berm, and surface contouring to allow collection of any spilled or leaked product in an on-site sump.

Pipeline crossings of habitat occupied by Arkansas River shiner also have triggered section 7 consultation through federal permitting requirements. In-channel construction activities in occupied habitat generally have a relatively high likelihood of causing take of Arkansas River shiner, due to direct impacts from construction equipment. The Service has recommended directional boring of pipelines under occupied habitat to avoid the potential for take and formal section 7 consultation. The Federal Energy Regulatory Commission requires that a spill response plan be developed by proponents of pipeline projects. The Service does not commonly recommend any additional measures in these spill response plans (K. Collins, Service, pers. comm.; O. Bocanegra, Service, pers. comm.).

3.5.2 Effects on Oil and Gas Resources

3.5.2.1 No Action Alternative Federal oil and gas resource actions in occupied habitats (critical habitat units 1A, 1B, 2, and 3) that have the potential to affect Arkansas River shiner under the jeopardy standard would continue to trigger section 7 consultation under the No Action Alternative. Section 7 consultations on federal oil and gas resource actions would not include analysis of effects to habitat considered to be essential for conservation of Arkansas River shiner, unless it overlapped with analysis conducted under the jeopardy standard.

The Service would continue to recommend measures that are intended to reduce the potential for contamination of surface and groundwater in habitats occupied by Arkansas River shiner during drilling and operation of new oil and gas wells where there is federal involvement (*e.g.* NPDES permitting, federal lease). Measures recommended by the Service could include construction and lining of sumps for collection of any spilled petroleum products, thereby prevent contamination of surface or groundwater, constructing lined ditches to direct surface water runoff around well pads, and lining of well-casing storage holes to prevent potential contamination of groundwater (K. Collins, Service, pers. comm.). Implementation of these measures may prevent degradation of surface and groundwater quality in habitats occupied by Arkansas River shiner that could be caused by contaminants associated with oil and gas well construction and operation. Additionally, the Service often recommends relocation of oil and gas well pads that are proposed within 300 feet of habitat occupied by Arkansas River shiner to reduce the potential for contamination of surface water in the event of a spill or a flood event (K. Collins, Service, pers. comm.).

Similarly, the Service would continue to recommend directional boring for oil and gas pipeline crossings in habitats occupied by Arkansas River shiner. This recommendation is typically made in an effort to avoid direct impacts associated with trenching through occupied habitat that could result in incidental take of Arkansas River shiner. If a project proponent decides to directionally bore under occupied habitat, section 7 consultation is typically completed informally and the project can be executed in an expedient manner. Directional boring of pipeline crossings prevents water quality impacts and short-term habitat alterations associated with open trenching. However, a project proponent may decide not to conduct directional boring and instead trench across occupied habitat. In this case, formal consultation would likely be conducted, which would require preparation of a biological assessment and substantial coordination with the Service. This may result in substantial delays in project implementation.

3.5.2.2 Alternative I Critical habitat designation is not likely to trigger additional section 7 consultations for oil and gas activities with federal involvement in habitats considered to be occupied by the species (proposed critical habitat units 1A,1B, 2 and 3). Section 7 consultations under the jeopardy standard in habitats occupied by Arkansas River shiner include measures to minimize the potential for contamination of surface and groundwater, as described above under the No Action Alternative. Contamination of surface or groundwater is the major potential threat to Arkansas River shiner from oil and gas activities. Therefore, critical habitat designation would not be likely to result in any additional

recommendations by the Service, compared to section 7 consultations under the jeopardy standard, because the issue of potential contamination of surface and groundwater is already addressed.

Unit 4, the Arkansas River in Kansas, is considered to be unoccupied by the Arkansas River shiner. Any proposed oil and gas activities with federal involvement that affect this river segment would not trigger section 7 consultation under the jeopardy standard, but could under the destruction or adverse modification standard if critical habitat is designated. There are no anticipated pipeline crossing projects anticipated in Unit 4 over the next 20 years due to the scarcity of oil or natural gas resources in this area and absence of pipeline projects in the area over the last six years (Industrial Economics, Inc., 2005: 5-19). Critical habitat designation in Unit 4 could result in recommendations by the Service of measures to minimize the potential for water quality degradation from oil and gas activities that have federal involvement. These recommendations would likely be the same as those described above for occupied habitat. The Service could also recommend directional boring for pipeline crossings in Unit 4. However, it is unlikely that the Service could require directional boring in unoccupied habitat. This is because impacts to habitat from open-cut, or trenching, of a pipeline crossing are short-term and very localized. Such impacts would be unlikely to result in an adverse modification determination. Therefore, formal consultation and the potential for a mandatory requirement to directionally bore is very unlikely (K. Collins, Service, pers. comm.).

3.5.2.3 Alternative II Exclusion of units 2 and 4 from critical habitat designation would eliminate consideration of potential effects of oil and gas production and pipeline projects with federal involvement on critical habitat, which would not be considered under the jeopardy standard. Implementation of measures to minimize the potential for water quality degradation from oil and gas activities and short-term impacts to habitat in unoccupied areas would not likely be recommended by the Service under this alternative..

3.5.2.4 Option A Exclusion of Unit 1A from critical habitat designation would not be likely to result in any changes to oil and gas activities that have federal involvement in this unit. As described under the No Action Alternative, measures to minimize the potential for water quality degradation from oil and gas activities are a component of section 7 consultations under the jeopardy standard. Because Unit 1A is occupied by the species, these considerations are part of section 7 consultation. Critical habitat designation would not have any additional impacts on oil and gas activities in this unit. Therefore, excluding Unit 1A from critical habitat designation would not change effects on oil and gas activities that have federal involvement in Unit 1A.

3.6 Transportation

3.6.1 Existing Conditions

The proposed critical habitat project area includes about 61 river crossings by federal or state highways or railroad lines (Table 6; Figure 9). The number of crossings is greatest in Unit 1B, which is the Canadian River in Texas and Oklahoma, and fewest in Unit 1A (Canadian River in New Mexico and Texas).

Table 6. Number of road and railroad crossings in each of the proposed critical habitat units, based on geographic analysis of the project area.

Critical Habitat Unit	Interstate Highway	U.S. Highway	State Highway	Railroad	Total
1A	0	2	0	3	5
1B	3	7	5	4	19
2	0	5	5	1	11
3	0	8	3	5	16
4	0	2	4	4	10
Total	**3**	**24**	**17**	**17**	**61**

There have been about 33 consultations on road or railroad construction projects, most involving bridge crossings in habitats of Arkansas River shiner (Table 2).

Bridge reconstruction projects have been the subject three of the four formal consultations conducted to date that involved Arkansas River shiner. Construction work proposed in river channels in areas occupied by Arkansas River shiner have resulted in determinations of take under the jeopardy standard for Arkansas River shiner. In order to minimize take, mandatory reasonable and prudent measures and terms and conditions for implementing those measures have been specified by the Service. For example, the Service issued a biological opinion on proposed construction of a railroad bridge over the Cimarron River near Waynoka, Oklahoma (Service, 2004). The Service required that project impacts be monitored and reported, that fish seining be conducted to translocate Arkansas River shiner from the project area, and that contractors be fully informed of conservation requirements. The Service also recommended post-construction revegetation of disturbed areas (Service, 2004: 14-16).

3.6.2 Effects on Transportation

3.6.2.1 No Action Alternative Federal transportation-related actions that have the potential to affect Arkansas River shiner under the jeopardy standard would continue to trigger section 7 consultation under the No Action Alternative. Section 7 consultations on federal transportation-related actions would not include analysis of effects to habitat considered to be essential for conservation of Arkansas River shiner, unless it overlapped with analysis conducted under the jeopardy standard. Section 7 consultation under the jeopardy standard would continue to be initiated for federal transportation-related actions in occupied habitat. Projects that involve direct impacts to the river channel in occupied habitat would continue to trigger formal consultation. The Service would likely continue to specify mandatory reasonable and prudent measures and associated terms and conditions to minimize take of Arkansas River shiner as in past projects. These mandatory measures would likely continue to include translocation of Arkansas River shiner from project areas, monitoring of take of individual fish, minimizing disturbed areas and duration of disturbances in the stream channel, and post-project seeding and restoration of disturbed areas.

3.6.2.2 Alternative I Impacts to federal transportation-related actions above and beyond those that would occur with the No Action Alternative may occur with critical habitat designation under Alternative I, such as locating temporary storage and staging areas outside of the 300-foot buffer area along both sides of the river channel in critical habitat.

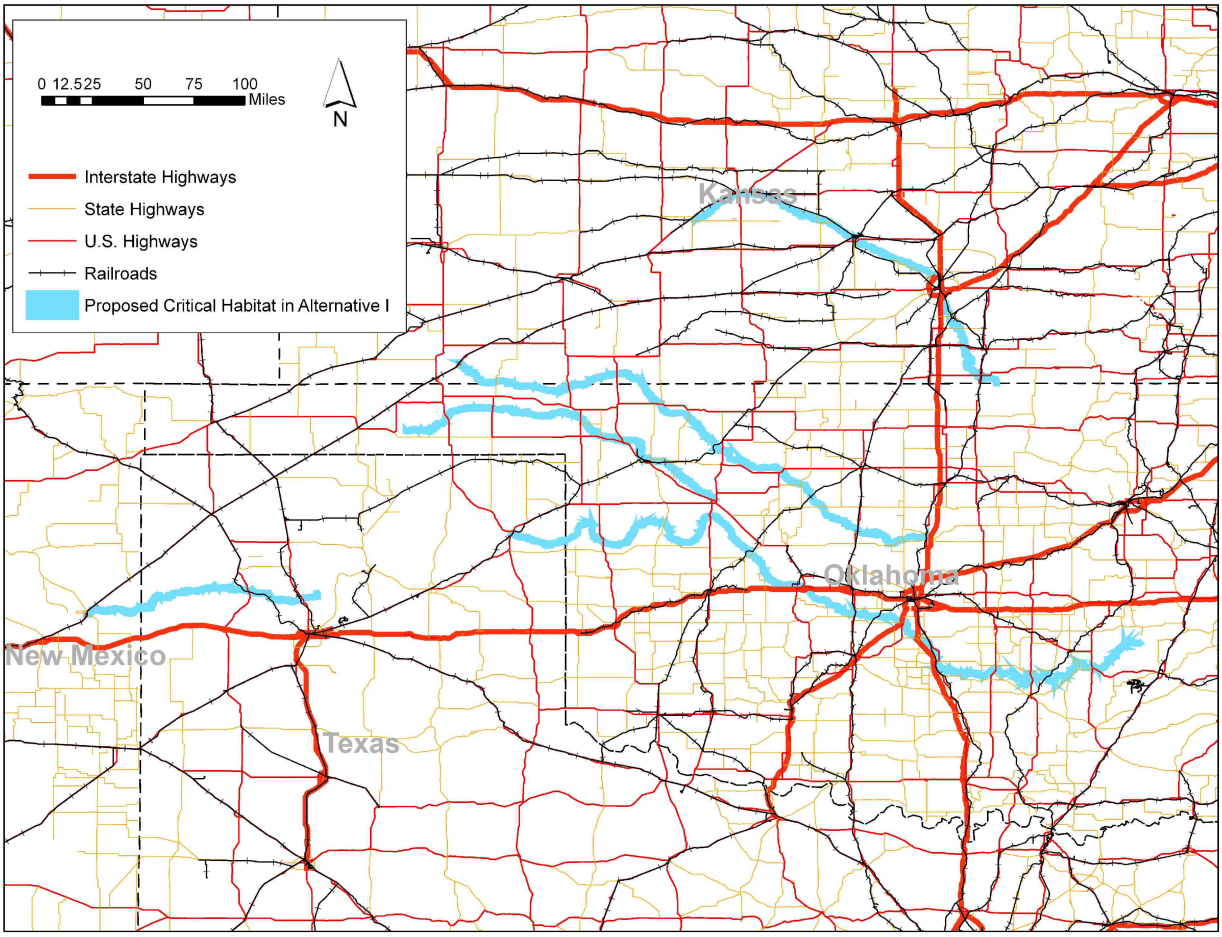


Figure 9. Highways and railroads in the proposed critical habitat project area.

However, these impacts are not likely to result in substantial changes, modifications, or additional costs to federal transportation-related actions proposed in units 1A, 1B, 2, and 3. Populations or aggregations of Arkansas River shiner occupy these proposed critical habitat units. Habitat considerations under the jeopardy standard already serve to trigger section 7 consultations on federal transportation-related actions that may potentially affect Arkansas River shiner in these units. Interjection of critical habitat considerations may result in identification of additional discretionary conservation measures that focus on maintenance of long-term habitat function, but substantial changes in mandatory requirements pursuant to section 7 determinations are unlikely. It is likely that a determination of adverse modification of critical habitat in units 1A, 1B, 2 or 3 would also have an associated determination of a likely adverse affect to the species. This is because the conservation role or value of proposed critical habitat in units 1A and 1B includes sustaining existing populations or aggregations that occur there (*cf.* section 3.1.1). Thus, the population-maintenance role of proposed critical habitat and determination of effects to the species under the jeopardy standard have considerable overlap.

Federal transportation-related activities proposed in Unit 4 would trigger section 7 consultation on potential effects to habitat of Arkansas River shiner within the designated area. This could result in the Service recommending conservation measures to minimize impacts, such as minimizing the area of disturbance and restoration of impacted areas following completion of construction. Bridge crossing projects are unlikely to result in a determination of destruction or adverse modification of critical habitat because impacts from these projects are typically short-term and very localized. Consequently, lasting effects that appreciably reduce the capability of critical habitat for conservation of the species are unlikely.

3.3.2.3 Alternative II Exclusion of units 2 and 4 would eliminate consideration of potential effects of federal transportation-related actions on critical habitat, which would not be considered under the jeopardy standard. As described under the effects of Alternative I, critical habitat considerations in section 7 consultations are not likely to result in substantial changes, modifications, or additional costs to federal transportation-related actions except perhaps in Unit 4. There would be no section 7 consultation trigger under the destruction or adverse modification standard for Arkansas River shiner critical habitat in Unit 4 with implementation of Alternative II. Consequently, Arkansas River shiner conservation is unlikely to have any impact on federal transportation-related activities in Unit 4 with this alternative.

3.3.2.4 Option A The effect of excluding Unit 1A from critical habitat designation would be to eliminate consideration of potential effects of federal transportation-related actions on critical habitat, which would not be considered under the jeopardy standard. As described under the effects of Alternative I, critical habitat designation in this unit may result in identification of additional discretionary conservation measures that focus on maintenance of long-term habitat function. Such discretionary conservation measures would not necessarily be identified if Unit 1A is excluded from critical habitat designation.

3.7 Recreation

3.7.1 Existing Conditions

There are few recreation activities in the proposed critical habitat project area that could potentially be affected by conservation measures implemented for Arkansas River shiner. There has only been one section 7 consultation on recreation-related activities since Arkansas River shiner was listed in 1998 (Table 2). This was an informal consultation conducted in Oklahoma.

Recreation activities involving a federal nexus are primarily restricted to National Park Service lands at Lake Meredith National Recreation Area in Moore and Potter counties, Texas. Off-road vehicle (ORV) use is allowed in two areas at Lake Meredith National Recreation Area: the Big Blue Creek ORV Area on the north side of the lake, and the Rosita ORV Area at the upper end of the lake (Figure 10). Only the Rosita ORV Area is located within the proposed critical habitat project area.

The National Park Service is considering restricting ORV use in the Rosita ORV Area to lands outside of the river channel during the spawning season of Arkansas River shiner, which is July through September (Industrial Economics, Inc., 2005: 9-1). This contemplated restriction would be enacted to prevent potential adverse effects of Arkansas River shiner under the jeopardy standard. The primary concern with ORV use in the river channel is with direct mortality of Arkansas River shiner, particularly during low-flow periods when fish are concentrated in pools (K. Collins, Service, pers. comm., 22 April 2005).

3.7.2 Effects on Recreation

3.7.2.1 No Action Alternative Potential restriction of ORV use at the Rosita ORV area may be enacted by the National Park Service to prevent impacts to Arkansas River shiner during the spawning season. This would occur regardless of critical habitat designation.

3.7.2.2 Alternatives I, II and Option A Critical habitat designation is unlikely to have any affect on recreational activities. Recreation activities have not been identified as a potential source of habitat degradation in proposed critical habitat for Arkansas River shiner.

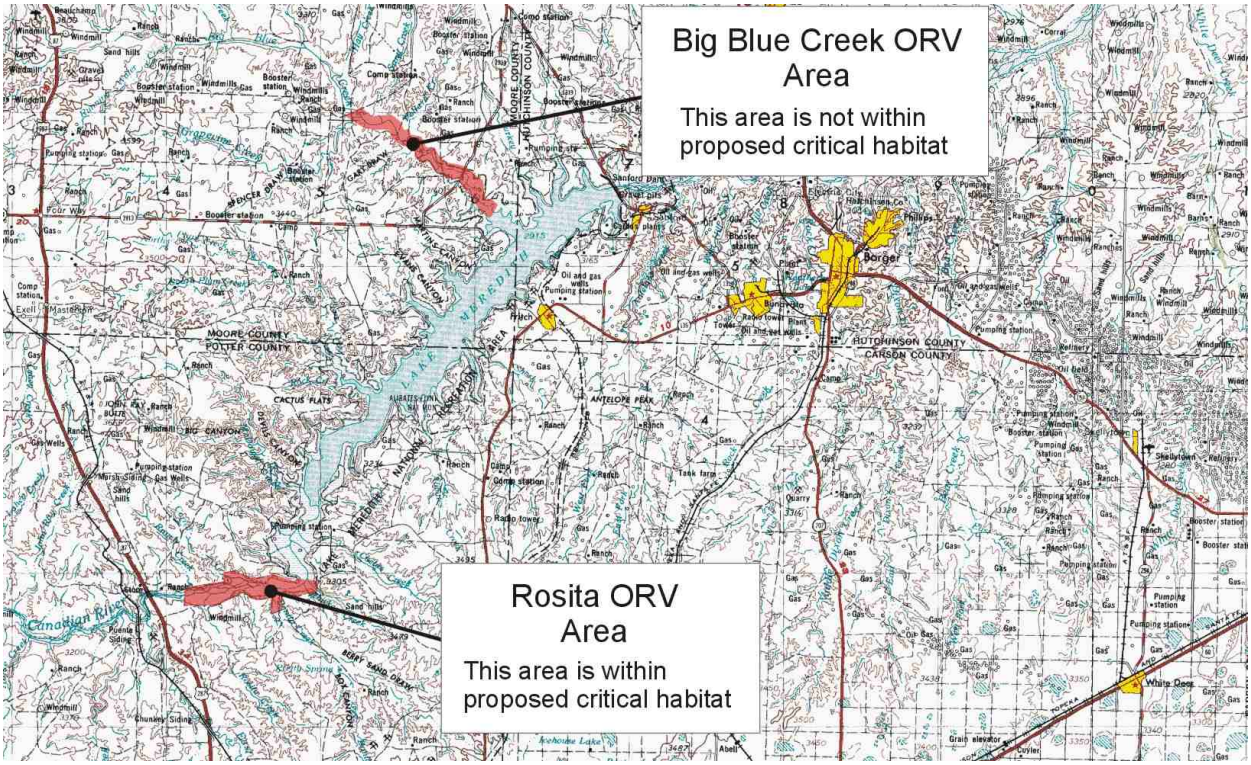


Figure 10. Location of ORV areas at Lake Meredith National Recreation Area.

3.8 Socioeconomic Conditions and Environmental Justice

Regulations for implementing NEPA require analysis of social effects when they are interrelated with effects on the physical or natural environment (40 CFR §1508.14). Federal agencies are also required to "identify and address disproportionately high and adverse human health or environmental effects" of their programs and actions on minority populations and low-income populations, as directed by Executive Order 12898 (Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations).

3.8.1 Existing Conditions

3.8.1.1 Land Use The proposed critical habitat project area consists of 1,244 miles in segments of four rivers: the Canadian River; the Beaver/North Canadian River; the Cimarron River; and the Arkansas River. The river reaches are located in 39 counties across in Oklahoma, Kansas, Texas and New Mexico. Although the proposed critical habitat project area covers only a very small portion of many of these counties, all 39 counties are considered in their entirety as the areas of analysis for socioeconomic purposes. There is one county in New Mexico in the 39-county analysis area. In Texas there are three counties, and in Kansas and Oklahoma, there are 11 and 24 counties, respectively (Table 7; Figure 11).

Table 7. Counties in the analysis area for critical habitat designation for Arkansas River shiner.

STATE	COUNTIES
NM	Quay
TX	Hemphill, Oldham, Potter
KS	Barton, Clark, Comanche, Cowley, Meade, Pawnee, Reno, Rice, Sedgwick, Seward, Sumner
OK	Beaver, Blaine, Caddo, Canadian, Cleveland, Custer, Dewey, Ellis, Grady, Harper, Hughes , Kay, Kingfisher, Logan, McClain, Major, Pittsburg, Pontotoc, Pottawatomie, Roger Mills, Seminole, Texas, Woods, Woodward

Land ownership in the four proposed critical habitat units is largely private property (Table 8; Figure 11). There are small tracts of tribal lands near Oklahoma City. Federal lands in the proposed critical habitat area include the Lake Meredith National Recreation Area in Texas, managed by the National Park Service, and a small parcel of land in Kansas owned by the U.S. Army Corps of Engineers. There are also small parcels of land in the project area that are managed by other entities including the New Mexico State Land Office, Texas Parks and Wildlife Department, Kansas Department of Wildlife and Parks, Oklahoma Department of Wildlife Conservation, Oklahoma Department of Parks and Tourism, and The Nature Conservancy (69 FR 59859).

Predominant land uses in the project area are agricultural production and cattle grazing (Industrial Economics, Inc. 2005: 2-17). Other land uses include oil and gas production, transportation, residential housing, municipal and industrial areas, and open space.

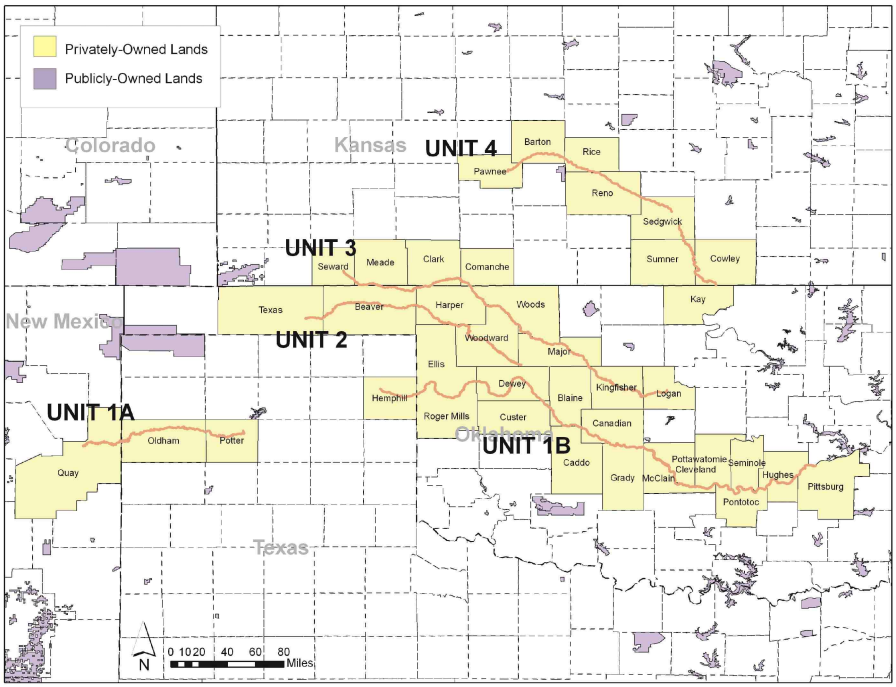


Figure 11. Land ownership in the analysis area.

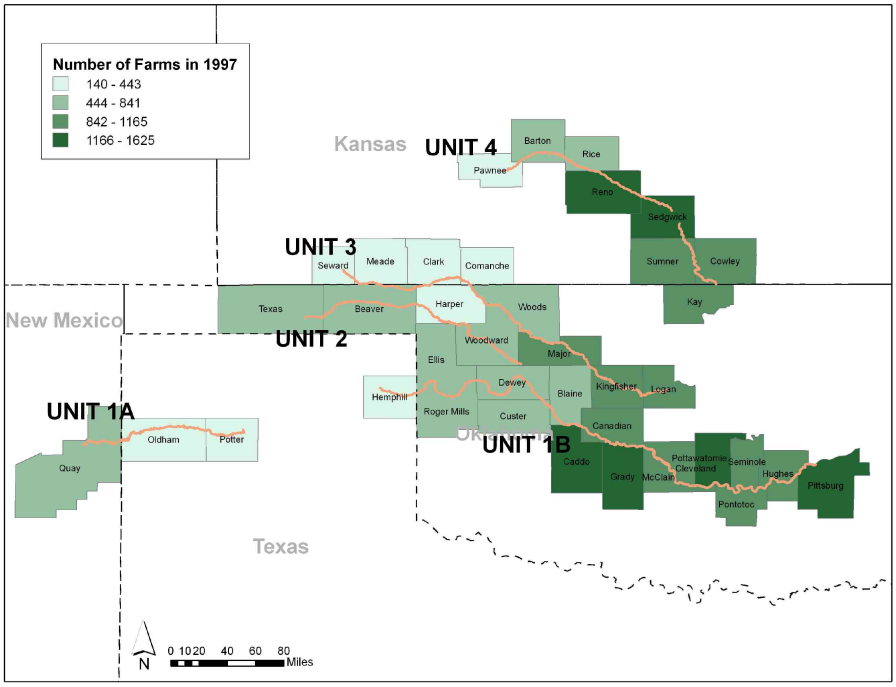


Figure 12. Number of farms in 1997 in the counties encompassing the project area.

Table 8. Land ownership in the proposed critical habitat project area (69 FR 59859).

Land Ownership	Unit 1a	Unit 1b	Unit 2	Unit 3	Unit 4
Private Individuals, Companies, or Non-Profit Groups	X	X	X	X	X
Kansas Department of Wildlife and Parks (manager of U.S.					X
New Mexico State Land Office	X				
Oklahoma Department of Parks and Tourism			X		
Oklahoma Department of Wildlife		X	X		
Texas Parks and Wildlife Department		X			
Tribal		X			
National Park Service	X				
U.S. Army Corps of Engineers					X

The number of farms per county in the project area increases from west to east and is highest through the middle reaches of Unit 4 (Arkansas River in Kansas) and the lower reaches of Unit 1B (Canadian River in Oklahoma; Figure 12). Changes from 1997 through 2002 in the number of farms in counties encompassing the proposed critical habitat units has been variable (Industrial Economics, Inc., 2005: 2-17). Some areas, such as Seward County, Kansas and Beaver County, Oklahoma have had substantial increases (32 percent and 18 percent, respectively) in the number of farms from 1997 through 2002. However, other areas have had marked declines, such as Sumner County, Kansas (21 percent decline) and Blaine County, Oklahoma (12 percent decline).

3.8.1.2 Communities Social and cultural conditions in the 39-county analysis area are diverse, encompassing human settlements ranging from all or parts of several major metropolitan areas (*e.g.* Wichita, Kansas; Amarillo, Texas; Oklahoma City, Oklahoma) to dozens of smaller cities and towns (*e.g.* Liberal, Kansas; Woodward, Oklahoma) to large areas of dispersed rural populations such as Quay County, New Mexico and Oldham County, Texas. Although large metropolitan areas are located within these 39 counties, the areas proposed to be designated as critical habitat specifically exclude stream segments through these cities (69 FR 59859). Population in the rural counties in the project area has generally decreased from 1990 through 2000 (Industrial Economic, Inc., 2005: 2-7).

3.8.1.3 Economy Within the 39 counties where critical habitat is proposed, the leading industries, as measured by annual payroll, are services[4], manufacturing, and retail trade. These three industries also account for more than 90 percent of the job base in the analysis area with over 78 percent attributed to the services sector. Manufacturing and retail trade account for approximately seven and six percent, respectively,

[4] Services includes professional, scientific, and technical services; management of companies and enterprises; administration, support, waste management, and rededication services; educational services; health care and social assistance; and accommodation and food services (Industrial Economics, Inc., 2005: 2-8)

of all jobs in these counties (Industrial Economics, 2005; page 2-9).

3.8.1.4 Environmental Justice Based on the 2000 census, Texas had the largest statewide population, but Oklahoma had the greatest number of people in the analysis area, followed by Kansas. New Mexico had the smallest population and the fewest number of people in the analysis area (Table 9).

Table 9. Population of the four states and their associated counties in the analysis area (U.S. Census Bureau, 2005*a*).

State	Total State Population	Population of Analysis Area
Kansas	2,688,418	657,593
New Mexico	1,819,046	10,155
Oklahoma	3,450.654	793,732
Texas	20,851,820	119,082
Total	**28,809,938**	**1,580,562**

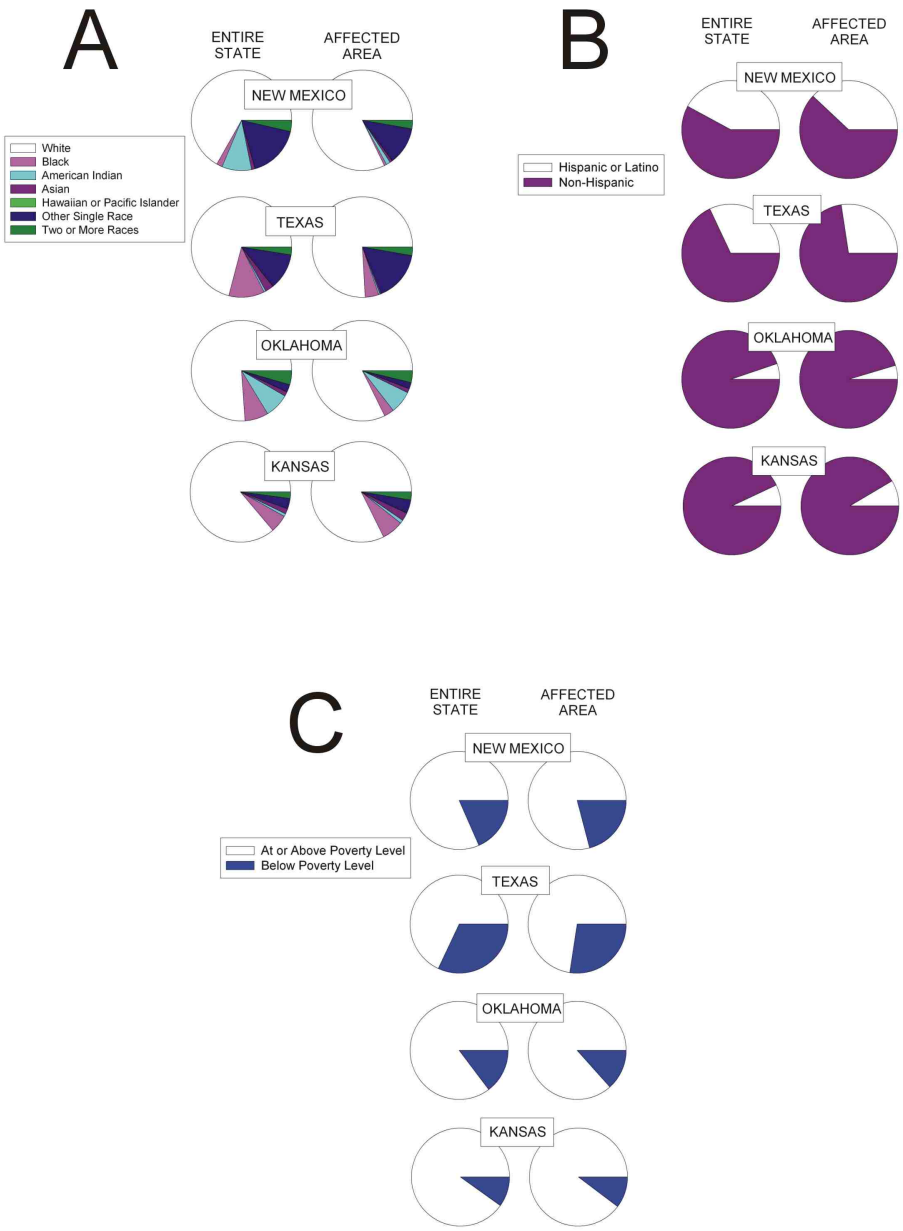
With the exception of New Mexico, racial characteristics are generally similar in all states and their corresponding counties in the analysis area (Figure 13A). The only potentially-affected county in New Mexico (Quay) has an appreciably higher percentage of white persons (*i.e.* 14.3 percent) than the total statewide percentage. Oklahoma has 6.2 percent more white persons in the combined population of its potentially-affected counties than the overall state average.

Texas and Kansas have 0.5 percent and 3.6 percent more racial minorities in their potentially-affected counties, respectively, than in each of their state's populations.

The percentage of Hispanic or Latino persons in the potentially-affected counties was lower than in the overall state populations in 2000 (Figure 13B). Texas has the greatest difference with its three potentially-affected counties having an combined average of 4.6 percent less of their population composed of Hispanic or Latino persons as compared to the state. Oklahoma varied only 0.6 percent between combined counties and the state in percentage of persons of Hispanic or Latino descent.

In Oklahoma, there are somewhat fewer persons (1.3 percent) below the poverty level in the potentially-affected counties compared to the state (Figure 13C). The percentage of the population that is below the poverty level is only slightly higher (0.4 percent) in the potentially-affected counties in Kansas and the state overall. However, in Texas and New Mexico, the percentage of the population below the poverty level in the potentially-affected counties is 3.6 percent and 2.5 percent higher, respectively, than in those states overall.

Figure 13. Demographic characteristics of the project area. Selected demographics are shown for the populations of the four states compared with counties containing units of proposed critical habitat for Arkansas River shiner (U.S. Census Bureau, 2005*c*; U.S. Census Bureau, 2005*d*; U.S. Census Bureau, 2005*e*).



3.8.2 Environmental Justice and Effects on Socioeconomic Conditions

3.8.2.1 No Action Alternative Section 7 consultations regarding the effects of proposed actions on Arkansas River shiner under the jeopardy standard (*i.e.* as a result of the species being listed) would continue to occur in the project area. Actions on private lands that have the potential to result in take of Arkansas River shiner would be subject to section 10 of the ESA, which requires development of a Habitat Conservation Plan as part of an application to the Service for an incidental take permit.

The economic analysis estimated that conservation activities for Arkansas River shiner would have impacts ranging from $8 to $11 million annually (Industrial Economics, Inc., 2005: ES-2). Most of the estimated economic impact associated with conservation measures for Arkansas River shiner, including those for water resources, oil and gas resources, and transportation projects, are attributable to Arkansas River shiner being listed under the ESA and would occur regardless of critical habitat designation. These potential costs may be incurred as a result of section 7 consultations under the jeopardy standard, with or without designation of critical habitat for Arkansas River shiner.

3.8.2.2 Alternative I, II, and Option A Overall, the percentages of racial minorities, Hispanic or Latino persons, or people living below poverty level are about the same or lower in the analysis area than in the combined, four-state population. These data indicate that any impacts that may result from critical habitat designation under either of the action alternatives, with or without Option A, would not disproportionately affect minorities or low-income groups.

Economic impacts that may be attributable solely to critical habitat designation could occur to pipeline construction activities and highway or railroad bridge construction projects (*cf.* sections 3.5.2.2 and 3.6.2.2). Other economic impacts may include increased administrative costs for federal agencies and project proponents resulting from incorporation of critical habitat considerations in section 7 consultations (Industrial Economics, Inc., 2005: 3-4).

Social conditions related to use of the land are unlikely to change with critical habitat designation under either of the action alternatives, with or without Option A, as compared to the existing condition. Designation of critical habitat under either alternative would not have any effect on the following social concerns: community disruption or disintegration, land use patterns, lifestyles, social interactions, family ties, kinship patterns, displacement or relocation of businesses, the ability to provide and deliver social services, public health, public safety, displacement of community facilities, public vehicular access, public pedestrian access, or community tax base.

Critical habitat designation under either of the action alternatives, with or without Option A, would not result in taking of private lands. The federal government has no authority pursuant to the critical habitat provisions of the ESA to take private lands. Section 5 of the ESA, which has no relationship to critical habitat designation, provides the Service with the legal authority to acquire land from willing sellers.

Designation of critical habitat affects only federal actions. Private parties that receive federal funding, assistance, or require approval or

authorization from a federal agency for an action in proposed critical habitat could potentially be indirectly affected by critical habitat designation under either of the action alternatives, with or without Option A. However, the legally binding duty to avoid destruction or adverse modification of critical habitat rests squarely on the federal agency (69 FR 59859: 59875).

Some within the project area may perceive critical habitat designation, whether it has an actual impact on them or not, as another in a long line of federal intrusions on personal liberty and the sovereignty of the individual that are ideals on which the nation is founded. Others may perceive critical habitat designation as a public responsibility and an important measure to promote a sustainable environment and conserve part of the natural heritage of the U.S.

3.9 Cumulative Effects

Cumulative effects are the effects from other projects that are not part of this proposed action, which may have an additive effect when combined with the effects expected from the proposed action. The geographic extent for which cumulative effects are considered vary for each resource. The past, present, and reasonably foreseeable future actions in the proposed critical habitat analysis area that, combined with the proposed action, could contribute to cumulative effects include:

- effects of listing, critical habitat designation, and section 7 consultations for other species and other designated critical habitats; and
- existing land management policies and plans.

Effects of proposed critical habitat designation on most resource areas generally consist primarily of the potential for minor increases in federal agency staff effort during section 7 consultations to incorporate critical habitat considerations. These potential impacts are not likely to result in any cumulative effects, when added to the effects of existing section 7 consultations for other species and existing land management plans and policies.

3.10 Relationship Between Short-Term and Long-Term Productivity

Proposed designation of critical habitat is a programmatic policy that would have no effect on short-term or long-term productivity.

3.11 Irreversible and Irretrievable Commitment of Resources

Irreversible commitments of resources are those effects that cannot be reversed. For example, the extinction of a species is an irreversible commitment. Irretrievable commitments of resources are those that are lost for a period of time, but may be reversed, such as building a shopping center on farmland. The land cannot be used for farming again until the pavement is removed and soils are restored to productivity. Designation of critical habitat for Arkansas River shiner would result neither in irreversible or irretrievable commitments of resources.

4.0 COUNCIL ON ENVIRONMENTAL QUALITY ANALYSIS OF SIGNIFICANCE

Pursuant to the Council on Environmental Quality regulations for implementing NEPA, preparation of an environmental impact statement is required if an action is determined to significantly affect the quality of the human environment (40 CFR §1502.3). Significance is determined by analyzing the context and intensity of a proposed action (40 CFR §1508.27).

Context refers to the setting of the proposed action and includes consideration of the affected region, affected interests, and locality (40 CFR §1508.27[a]). The context of both short- and long-term effects of proposed designation of critical habitat are the proposed critical habitat units in Oklahoma, Texas, Kansas, and New Mexico. The effects of proposed critical habitat designation at this scale, although long-term, would be small.

Intensity refers to the severity of an impact and is evaluated by considering ten factors (40 CFR §1508.27[b]). The intensity of potential impacts that may result from proposed designation of critical habitat for Arkansas River shiner is low.

- The potential impacts may be both beneficial and adverse, but minor.
- There would be no effects to public health or safety from proposed designation of critical habitat, and the proposed action would not affect unique characteristics of the geographic area.
- Potential impacts from critical habitat designation on the quality of the environment are unlikely to be highly controversial and do not involve any uncertain, unique, or unknown risks.
- Proposed designation of critical habitat for Arkansas River shiner does not set a precedent for future actions with significant effects and would not result in significant cumulative impacts.
- Significant cultural, historical, or scientific resources are not likely be affected by proposed designation of critical habitat.
- Proposed critical habitat designation would have a beneficial effect on Arkansas River shiner.
- Proposed critical habitat designation would not violate any federal, state, or local laws or requirements imposed for the protection of the environment.

5.0 REFERENCES

Bestgen, K. R., S. P. Platania, J. E. Brooks, and D. L. Propst. 1989. Dispersal and life history traits of *Notropis girardi* (Cypriniformes: Cyprinidae), introduced into the Pecos River, New Mexico. *American Midland Naturalist* 122(2) :228-235.

Bonner, T. H. and G. R. Wilde. 2000. Changes in the Canadian River fish assemblage associated with reservoir construction. *Journal of Freshwater Ecology* 15(2):189-198.

Bonner, T. H., G. R. Wilde, R. Jimenez, Jr., and R. Patillo. 1997. *Habitat Use and Ecology of the Arkansas River Shiner and Speckled Chub in the Canadian River, New Mexico and Texas*. Unpublished report submitted to U.S. Fish and Wildlife Service, Texas Tech University, Lubbock, Texas.

Bureau of Reclamation. 2005. Canadian River Project, Texas. http://www.usbr.gov/dataweb/html/canadariver.html.

Canadian River Municipal Water Authority. 2005*a*. *Proposed Management Plan to Benefit Arkansas River Shiner*. News Release, 17 March 2005, http://www.crmwa.com/news13ars.htm

Canadian River Municipal Water Authority. 2005*b*. Lake Meredith water data. http://www.crmwa.com.

Cross, F. B. 1967. *Handbook of Fishes of Kansas*. University of Kansas Museum of Natural History Miscellaneous Publication No. 45, Lawrence, Kansas.

Cross, F. B., O. T. Gorman, and S. G. Haslouer. 1983. The Red River shiner, *Notropis bairdi* in Kansas, with notes on depletion of its Arkansas River cognate, *Notropis girardi*. *Transactions of the Kansas Academy of Science* 86:93-98.

Cross, F. B., R. E. Moss, and J. T. Collins. 1985. *Assessment of Dewatering Impacts on Stream Fisheries in the Arkansas and Cimarron Rivers*. University of Kansas Museum of Natural History, Lawrence, Kansas.

Felley, J. D. and E. G. Cothran. 1981. *Notropis bairdi* (Cyprinidae) in the Cimarron River, Oklahoma. *The Southwestern Naturalist* 25:654.

Hubbs, C. L. and A. I. Ortenburger. 1929. Further notes on the fishes of Oklahoma with descriptions of new species of Cyprinidae. *Publications of the University of Oklahoma Biological Survey* 1(2):17-43.

Industrial Economics, Inc. 2005. *Draft Economic Analysis of Critical Habitat Designation for the Arkansas River Shiner*. Prepared for the U.S. Fish and Wildlife Service, Division of Economics, Arlington, Virginia.

Jimenez, R., Jr. 1999. *The Food Habits of the Arkansas River Shiner and the Speckled Chub*. Unpublished M.S. Thesis, Texas Tech University, Lubbock, Texas.

Johnston, C. E. 1999. The relationship of spawning mode to conservation of North American minnows (Cyprinidae). *Environmental Biology of Fishes* 55:21-30.

Kansas Division of Water Resources. 1992. *1992 Kansas Irrigation Water Use*. Kansas Water Office and Division of Water Resources, Topeka, Kansas.

Keys, J. W. III. 2004. *Statement of John W. Keys, III, Commissioner of Reclamation, U.S. Department of the Interior, on S. 2513, Before the Senate Energy and Natural Resources Committee, Subcommittee on Water and Power, United States Senate.* http://www.doi.gov/ocl/2004/S2513. htm.

Larson, R. D., A. A. Echelle and A. V. Zale. 1991. *Life History and Distribution of the Arkansas River Shiner in Oklahoma*. Federal Aid Project No. E-8, Job No. 1, Final Report: Status of threatened and endangered fishes in Oklahoma, June 1, 1989 through August 31, 1991. Oklahoma Department of Wildlife Conservation, Oklahoma City, Oklahoma.

Lee, D. S., C. R. Gilbert, C. H. Hocutt, R. E. Jenkins, D. E. McAllister, and J. R. Stauffer, Jr. 1980. *Atlas of North American Freshwater Fishes*. Publication #1980-12 of the North Carolina Biological Survey, North Carolina State Museum of Natural History, Raleigh, North Carolina.

Marshall, C. I. 1978. The distribution of *Notropis bairdi* along the Cimarron River in Logan County, *Oklahoma. Proceedings of the Oklahoma Academy of Science* 58:109.

Matthews, W .J. 1987. Physicochemical tolerance and selectivity of stream fishes as related to their geographic ranges and local distributions. Pages 111-120 *in* W. J. Matthews and C. C. Heins (eds.). *Community and Evolutionary Ecology of North American Stream Fishes*. University of Oklahoma Press, Norman, Oklahoma.

Miller, R. J., and H. W. Robinson. 1973. *The Fishes of Oklahoma*. Oklahoma State University Press, Stillwater, Oklahoma.

Moore, G. A. 1944. Notes on the early life history of *Notropis girardi*. *Copeia* 1944:209-214.

Oklahoma Water Resources Board. 1990. *Oklahoma Water Atlas*. Oklahoma Water Resources Board Publication 139, Oklahoma City, Oklahoma.

Platania, S. P. and C. S. Altenbach. 1998. Reproductive strategies and egg types of seven Rio Grande Basin cyprinids. *Copeia* 1998(3):559-569.

Polivka, K. M. and W. J. Matthews. 1997. *Habitat Requirements of the Arkansas River Shiner, Notropis girardi*. Federal Aid Project No. E-33, Final Report: August 1, 1994 through August 7, 1997. Oklahoma Department of Wildlife Conservation, Oklahoma City, Oklahoma.

Robison, H. W. and T. M. Buchanan. 1988. *Fishes of Arkansas*. University of Arkansas Press, Fayetteville, Arkansas.

Sidle, J. G. 1987. Critical habitat: is it prudent? *Environmental Management* 11: 429-437.

U.S. Census Bureau. 2005*a*. American Fact Finder. P1. Total population [1] - universe: total population; data set: Census 2000 summary file (SF 1) 100-percent data. http://factfinder.census.gov/

U.S. Census Bureau. 2005*b*. American Fact Finder. Fact sheet. Balmorhea city, Texas. http://factfinder/census.gov/

U.S. Census Bureau. 2005*c*. American Fact Finder. P7. Race [8] - universe: total population; data set: Census 2000 summary file (SF 1) 100-percent data. http://factfinder.census.gov/

U.S. Census Bureau. 2005*d*. American Fact Finder. P8. Hispanic or Latino by race [17] - universe: total population; data set: Census 2000 summary file (SF 1) 100-percent data. http://factfinder.census.gov/

U.S. Census Bureau. 2005*e*. American Fact Finder. P87. Poverty status in 1999 by age [17] - universe; population for whom poverty status is determined; data set: Census 2000 summary File 3 (SF 3) - sample data. http://factfinder/census.gov/

USDI Fish and Wildlife Service. 1990. *Recovery Plan for the Interior Population of the Least Tern (Sterna antillarum)*. U.S. Fish and Wildlife Service, Twin Cities, Minnesota.

USDI Fish and Wildlife Service. 1999. *Biological Opinion, National Pollutant Discharge Elimination System General Permits for Concentrated Animal Feeding Operations in Texas, Consultation No. 2-12-99-F-095*. U.S. Fish and Wildlife Service, Region 2, Arlington, Texas.

USDI Fish and Wildlife Service. 2004. *Biological Opinion, Burlington Northern and Santa Fe Railway Company Proposed Railway Bridge Construction over the Cimarron River Near Waynoka, Oklahoma, Consultation No. 2-14-04-F-0645* . U.S. Fish and Wildlife Service, Region 2, Tulsa, Oklahoma.

U.S. Supreme Court. 1991. *Oklahoma v. New Mexico*, 501 U.S. 221 (1991), *On Exceptions to Report of Special Master*, No. 109, Orig., Argued April 16, 1991, Decided June 17, 1991. http://caselaw.lp.findlaw.com/scripts/getcase.pl?court=us&vol=501&invol=221

Texas Water Development Board. 1990. *Water for Texas Today and Tomorrow, 1990*. Texas Water Development Board Document No. GP-5-1, Austin, Texas.

Tibbs, J. E. and D. L. Galat. 1998. The influence of river stage on endangered least terns and their fish prey in the Mississippi River, USA. *Regulated Rivers: Research and Management* 14(3): 257-266.

Ward, P. 2004. The father of all mass extinctions. *Conservation in Practice* 5(3): 12-19.

Wilde, G. R., T. H. Bonner and R. Patiño. 2000. *Habitat Use and Ecology of the Arkansas River Shiner and Speckled Chub in the Canadian River, New Mexico and Texas*. Unpublished report prepared for the U.S. Fish and Wildlife Service, Texas Tech University, Lubbock, Texas.

Wilson, E. O. 1992. *The Diversity of Life*. Belknap Press of Harvard University Press, Cambridge, Massachusetts.