Arkansas River Shiner (*Notropis girardi*) Management Plan for the Canadian River From U. S. Highway 54 at Logan, New Mexico to Lake Meredith, Texas

Canadian River Municipal Water Authority

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This management plan is a cooperative effort between various local, state, and federal entities. Funding for this plan was provided by the Canadian River Municipal Water Authority.

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Cover photograph: Arkansas River Shiner by Ken Collins, USFWS

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List of Abbreviations

Acronyms that are used throughout this document are defined below.

BMP ..... best management practice
CAFO..... ……..concentrated animal feeding operation
CPI ……Conservation Partnership Initiative
CPGL ……..….Conservation of Private Grazing Land
CRMWA ……...….Canadian River Municipal Water Authority
CRP .....Conservation Reserve Program
CRC……...…..Canadian River Commission
CREP…….……Conservation Reserve Enhancement Program
CSP ..... Conservation Security Program
CTA …… Conservation Technical Assistance
CWA .....Clean Water Act
EQIP.....Environmental Quality Incentives Program
EROS .....Earth Resources Observation Systems
ESA ..... Endangered Species Act
EWP ..... Emergency Watershed Program
GRP ……..Grassland Reserve Program
FSA ..... Farm Services Agency
GIS ..... Geographic Information Systems
GRP..... Grasslands Reserve Program
GWCD …….……Groundwater Conservation District
HCP..... Habitat Conservation Plan
LMSCP …….……..Lake Meredith Salinity Control Project
NMCES …….……New Mexico Cooperative Extension Service
NMCGA ……New Mexico Cattle Growers Association
NMDA ……..…New Mexico Department of Agriculture
NMDGF …….……New Mexico Department of Game and Fish
NMED ……New Mexico Environmental Department
NMISC ……New Mexico Interstate Streams Commission
NMSE ……..…….New Mexico State Engineer
NPDES..... National Pollution Discharge Elimination System
RC&D ..... Resource Conservation and Development
RRA……...Red River Authority of Texas
SWCA …….……..……Soil and Water Conservation Assistance
SWCAEC …….SWCA, Environmental Consultants
SWCD ……Soil and Water Conservation District
TMDL ..... Total Maximum Daily Load
TSCRA ……..Texas & Southwestern Cattle Raisers Association
TAES…….……Texas Agricultural Experiment Station
TAMU ……..……Texas A&M University

TCEQ……Texas Commission on Environmental Quality
TCE ..……Texas Cooperative Extension Service
TCFA ……..…….Texas Cattle Feeders Association
TDA …….……..Texas Department of Agriculture
TxDOT……Texas Department of Transportation
TFB ……..Texas Farm Bureau
TGLO ……...……...Texas General Land Office
TORA ……...…….Texas Off-Roaders Association
TPWD……..Texas Parks and Wildlife Department
TSSWCB ……....Texas State Soil and Water Conservation Board
TTU…….……..……..Texas Tech University
USARS……..…….. United States Agricultural Research Service
USBR ……..……..United States Bureau of Reclamation
USBLM …….……..United States Bureau of Land Management
USCOE .....United States Army Corps of Engineers
USEPA …….……United States Environmental Protection Agency
USFWS ..... United States Fish and Wildlife Service
USGS ..... United States Geological Survey
USNPS …….United States National Park Service
USDA-NRCS……..USDA Natural Resource Conservation Service
WRP……..……Wetlands Reserve Program
WHIP ..... Wildlife Habitat Improvement Program
WTAMU ……..……..West Texas A&M University

Introduction and Background

The U.S. Fish and Wildlife Service (USFWS) listed the Arkansas River Shiner ("AR shiner") (*Notropis girardi*) as threatened under the Endangered Species Act (ESA) in November 1998 (USFWS 1998). Prior to listing, limited survey data suggested the shiner only occupied 20% of its historic range (USFWS 1998). Recent studies in New Mexico and the Western Texas Panhandle have documented the AR shiner in these areas with populations apparently less affected than in other portions of the species' historic range. Other areas of its historical range are less well populated, and the species is apparently extirpated from the AR in Arkansas, Kansas, and Oklahoma. These findings suggest AR shiners are more abundant in New Mexico/Western Texas Panhandle than some other portions of its range. (USFWS 1998)

Proposals to designate critical habitat for the AR shiner under the ESA have included (as "Unit 1A") the stretch of the main (south) Canadian River from U. S. Highway 54 in New Mexico (just downstream from Ute Dam) to the mouth of Coetas Creek in the central Texas Panhandle, a location within the bounds of the Lake Meredith National Recreation Area about 6.4 miles East-Northeast of the U. S. 87-287 crossing of the Canadian River.

This Management Plan is intended to apply to the proposed Unit 1A critical habitat area as well as that portions of the Canadian River between the mouth of Coetas Creek and the upstream end of Lake Meredith..

This management plan is a cooperative effort between various local, state, and federal entities within Eastern New Mexico and the Western Texas Panhandle, with input and cooperation of local landowners. While the Canadian River Municipal Water Authority took the lead in drafting this plan, other entities, such as the USFWS, Natural Resource Conservation Service (NRCS), Bureau of Reclamation (USBR), National Park Service (USNPS), USGS, Texas Commission on Environmental Quality (TCEQ), New Mexico State Engineer and Interstate Streams Commission (NMSE and NMISC), Texas Parks and Wildlife Department (TPWD), New Mexico Department of Game and Fish (NMDGF), Texas Department of Transportation (TxDOT), Texas and New Mexico Departments of Agriculture (TDA and NMDA), Texas State Soil and Water Conservation Board (TSSCWB), local soil and water conservation districts, Red River Authority, Canadian River Commission, groundwater conservation districts (Panhandle Groundwater Conservation District, North Plains Groundwater Conservation District, High Plains Groundwater Conservation District), state universities (Texas A&M University, Texas Agricultural Experiment Station, West Texas A&M University, Texas Tech University), and private organizations (Texas Cattle Feeder's Association, Texas Farm Bureau, New Mexico Cattle Growers Association), provided input at various levels. Local groups and private landowners will have opportunities for participation through outreach activities.

In circulating the Plan to the proposed Partners, each of the participating entities was asked to express support for the Plan, and to provide a letter or Resolution of its governing body stating willingness to participate in the implementation of the Plan. Where necessary, agencies have been asked to provide assurance that funding will be sought, within the overall program of the entity, to provide for the execution of the Plan. Major participating agencies have been asked to enter a Memorandum of Agreement outlining the activities they will engage in and their support of the Management Plan.

The goals of this management plan are to:

- Conserve and protect the existing healthy self-sustaining population of ARS.
- Maintain the existing ecological functions and processes that currently support the population of ARS. Maintain and improve habitat integrity. Provide a mechanism for monitoring the status of the AR shiner in these portions of its habitat.
- Encourage landowners and other involved parties to utilize good management practices on lands adjacent to the Canadian River to prevent damage to the riparian ecology. Minimize harm from the activities of off-road and all-terrain vehicles.
- A short-term intended purpose of this plan is to exclude the need to designate critical habitat in Unit 1A by identifying and enacting those conservation strategies listed in this plan.
- A long-range goal of this plan is to contribute to the eventual de-listing of the AR shiner upon re-establishment of the species in sufficient portions of its range, while maintaining a healthy population in the Canadian River from Ute Dam to Lake Meredith, and elsewhere as may be accomplished by other efforts.

Specific objectives needed to meet these plan goals include:

- Management actions that address stream hydrology, geomorphology, and water quality.
- Establishment of procedures that will lead to a monitoring and assessment protocol to evaluate the status of the AR shiner in the Canadian River of eastern New Mexico and the Western Texas Panhandle.
- Development of public outreach and education strategies to inform all entities involved about AR shiner management in New Mexico/Western Texas Panhandle.

The Canadian River Municipal Water Authority and its partners in this endeavor consider a flexible, adaptive, and proactive management approach to be an appropriate and effective means of achieving continued conservation of the AR shiner in the Canadian River of eastern New Mexico and the Western Texas Panhandle while contributing to national recovery efforts. Specific functions of this plan are: 1) to provide a planning framework from which specific operational plans or tools can be developed and implemented; 2) to establish specific actions which can be undertaken to improve the condition of the AR shiner habitat in this region; 3) to make use of the state expertise related to fish communities, their related habitats, and existing programs designed to promote and restore healthy ecosystems.

Species Biology

Description
The AR shiner is a small minnow first discovered by A. I. Ortenburger in 1926 in the Cimarron River northwest of Kenton, Cimarron County, Oklahoma. It is a small, robust shiner with a small, dorsally flattened head, rounded snout, and small subterminal mouth. Adults attain a maximum length of 51 millimeters (2 inches). Dorsal, anal, and pelvic fins all have eight rays, and there is usually a small, black chevron present at the base of the caudal fin. Dorsal coloration tends to be light tan, with silvery sides gradually grading to white on the belly. (after USFWS 1998, 50 CFR Part 17, and citations therein)

Life History
AR shiners spawn in the summer, usually coinciding with flood flows following heavy rains. However, the exact timing of spawning is uncertain and spawning may take place several times during the months of May, June, and July. The eggs are non-adhesive and passively drift with the current during high flows. Hatching occurs within 24-48 hours after spawning. The larvae float with the current until they are capable of swimming within 3-4 days; they then seek out backwater pools and quiet water at the mouths of tributaries where food is more abundant. Researchers have inferred that this species will not spawn unless conditions are favorable to the survival of the larvae. Maximum lifespan is unknown, but the species lifespan in the wild is likely less than three years. (after USFWS, 1998; including citations therein)

Habitat
AR shiners generally occupy the main channels of wide, shallow, sandy-bottomed rivers of larger streams of the AR basin. Adults are uncommon in quiet pools or backwaters, and almost never occur in tributaries having deep water and bottoms of mud or stone. (after USFWS, 1998; including citations therein)

Range
Historically, the AR shiner was widespread throughout the AR drainage. The species' range included eastern New Mexico as far upstream as the Sabinosa area in central San Miguel County, Ute and Revuelto Creeks and the Conchas River. AR shiners also were found in the main Canadian River throughout the Texas Panhandle from boundary to boundary and across Oklahoma in both the Canadian and North Canadian. The historic range also included the Arkansas River and tributaries in Oklahoma and Kansas. Currently, populations of AR shiners occupy 20% of the species' historic habitat (USFWS 1998). However, recent studies in eastern New Mexico and the Western Texas Panhandle indicate the AR shiner still occupies a high percentage of known historic locations from U. S. Highway 54 at Logan, New Mexico to the headwaters of Lake Meredith in the Texas Panhandle. Downstream of Lake Meredith, to Canadian, Texas, AR shiners are not common. From Canadian, Texas, downstream to the upper end of Lake Eufaula in Oklahoma, they are still present. Smaller populations exist in other streams of the original range. (after USFWS, 1998; including citations therein)

Reasons for Range-wide Decline

Declines in Arkansas River shiner populations cannot be isolated to a single factor; moreover, any combination of changes at the systemic and local levels may have contributed to a reduction in the species' range and abundance. Reductions in stream flow and in the occurrence and magnitude of high flow events, most likely produced by the construction of dams and diversion of water for irrigation or municipal/industrial use, have altered the nature of streambeds with probable impacts on the opportunities for spawning. However, base flow has been stabilized due to the construction of Ute Dam in New Mexico, which has been beneficial to the AR shiner. Invasion of phreatophytic non-native plants, such as tamarisk (saltcedar) and Russian Olive, have further depleted streamflow and produced water quality changes that are not favorable to the AR shiner. Naturally occurring saline inflows are concentrated by the high water use of phreatophytes lining the stream channels. In some areas, saltcedar growths have narrowed the stream channels and resulted in deepening of the streams, while forming concentrated forests of plants in the flood plain which trap water during floods and prevent its return to the main channel. In eastern New Mexico and the western Texas Panhandle, there was historically little influence by inflows of groundwater since the Canadian River in this vicinity was incised to a depth substantially below the Ogallala Aquifer, so the influence of groundwater pumping has been minimal. Spring flows from other aquifers may have been influenced by groundwater withdrawals, but probably did not cause significant reductions in streamflow in eastern New Mexico and the western Texas Panhandle. Activities of off-road and all-terrain vehicles may have caused some harm to individuals and floating eggs of the species in limited areas.

Legal Status

The Arkansas River shiner was proposed as a federally endangered species by the USFWS in 1994 (USFWS). On November 23, 1998, the AR shiner became officially listed as threatened under the ESA (USFWS 1998). The AR shiner is state-endangered in New Mexico, and is listed as threatened in Texas (31 TAC §65.175). The U. S. Fish and Wildlife Service designated critical habitat for the AR shiner as provided for in the ESA on April 4, 2001 (USFWS 2001). This designation was vacated by court action in September 2003. A Proposed Rule to re-designate Critical Habitat, as directed by the Court, was published on October 6, 2004 (USFWS 2004). The Proposed Rule includes Unit 1A in the proposed Critical Habitat designation.

Arkansas River Shiner Research in Eastern New Mexico/Western Texas Panhandle

Research concerning the AR shiner in Eastern New Mexico/Western Texas Panhandle has focused primarily on species' distribution and associated habitat. Research done prior to the original listing of the AR shiner as threatened is listed in the Federal Register publication of the original Rule (USFWS 1998) (see Appendix A). Gene R. Wilde and Timothy H. Bonner described the results of their work in "Habitat Use and Ecology of the AR shiner and Speckled Chub in the Canadian River – New Mexico and Texas" dated March 17, 2000, as performed for the U. S. Fish and Wildlife Service. The environmental consulting firm, SWCAEC, has performed investigations for the New Mexico Interstate Stream Commission in the Canadian River in eastern New Mexico and

in the Pecos River of New Mexico, which included consideration of the AR shiner in both streams. The initial fisheries survey was conducted October 20–23, 2003, with a second survey completed May 17–19, 2004. This study coincided with the driest period in the drought beginning in approximately 1996. During each survey, streamflow and water quality parameters were measured, physical habitats were characterized, and fish collections were made. The findings of this investigation suggest that the population of ARS between Ute Dam and the New Mexico–Texas state line is healthy and self-sustaining under current hydrologic and geomorphologic conditions. SWCAEC also performed sampling and collection of AR shiners at locations in Oklahoma.

Goal Statement

All entities involved in developing and implementing this plan have an interest in protection and restoration of the AR shiner and its habitat within the area covered by this Plan. These interests may be inherent in the agency's mission or bound by obligations under state or federal law.

The overall goal of this plan is to maintain and improve habitat integrity in the Canadian River in eastern New Mexico downstream from U. S. Highway 54 at Logan, and in the western Texas Panhandle upstream from Lake Meredith.

The CRMWA feels the best way to maintain the current abundance and distribution of AR shiners in this portion of the species' range is to improve the existing stream habitat by removal of invasive plant species which cause waste of water and lower the levels of existing stream flow while adversely affecting water quality, and to encourage the application of conservation programs that can preserve and protect riparian zones to prevent loss of habitat. The intent of these activities is to work towards future delisting of the species pursuant to the ESA. The purposes of the ESA are to "provide a means whereby the ecosystems upon which the endangered species and threatened species depend may be conserved, to provide a program for the conservation of such endangered species and threatened species, and to take such steps as may be appropriate to achieve the purposes of the treaties and conventions set forth in subsection (a) of this section." Given the relative abundance and intact distribution of AR shiners in Eastern New Mexico/Western Texas Panhandle, CRMWA believes that a concerted effort to 1) maintain streamflows at existing levels of base flow, augmented by the benefits of phreatophyte removal, 2) maintain opportunity for existing tributary flood inflow from Revuelto Creek to occur periodically and mimic the natural hydrograph, and 3)enhance and improve the existing habitat, can significantly advance recovery of the AR shiner in this portion of its original habitat.

Relationship to Federal Recovery Plan

A Recovery Plan for the AR shiner has not yet been developed. Participants in this Plan will seek to provide input to and participation in any Recovery Plan which may be developed in the future.

Distribution of Arkansas River Shiners in the Canadian River of Eastern New Mexico/Western Texas Panhandle

The AR shiner occupies the main channel of the Canadian River in this area. The species has not been recorded in the major tributaries, although it is possible that some of the species may occasionally be found in Revuelto Creek of Eastern New Mexico, due to the similarity of the stream channel in that stream to the braided channels of the main river.

Threats vs. Effects Analysis for Arkansas River Shiner Populations in New Mexico/Western Texas Panhandle

This plan addresses the five factors utilized by the USFWS in listing, delisting, or downlisting actions:

A. Present or threatened destruction, modification, or curtailment of habitat or range.
B. Overutilization for commercial, recreational, scientific, or educational purposes.
C. Disease or predation.
D. Inadequacy of existing regulatory mechanisms.
E. Other natural or manmade factors.

By meeting the definition of a threat for at least one of these factors, a species meets the definition of threatened or endangered as described in Section 4(a)(1) of the ESA. Each factor is evaluated based on its potential as a threat or effect to AR shiner populations in New Mexico/Western Texas Panhandle. For the purposes of this report a threat is an impact that, if uncorrected, will likely result in further decline or extirpation of the species from a significant portion of its range. An effect is an impact that may reduce localized populations, but will not result in the overall decline or extirpation of AR shiner populations from Eastern New Mexico/Western Texas Panhandle.

A. The present or threatened destruction, modification, or curtailment of habitat or range within the Canadian River between U. S. Highway 54 at Logan, New Mexico and Lake Meredith

Information on the historic range of the AR shiner in New Mexico/Western Texas Panhandle is somewhat lacking. The historic distribution of the AR shiner and most other nongame fish in Eastern New Mexico/Western Texas Panhandle was determined through a compilation of various surveys and reports from past fisheries investigations. (USFWS 1998) Range estimations are complicated by the qualitative, and sometimes

incomplete, nature of historic data. However, these records are the only source lending insight into the historic distribution of AR shiners.

Habitat impacts, from activities such as stream channelization, reservoir construction, streamflow alteration and depletion, and, to a lesser extent, water quality degradation, are cited by the USFWS as the primary threats facing AR shiner populations. The relevancy of each impact as it relates to AR shiner populations in eastern New Mexico/Western Texas Panhandle is discussed.

(1) Stream Channelization

Little artificial stream channelization has taken place along the Canadian River in Eastern New Mexico and the Western Texas Panhandle. Downstream from Ute Dam, and upstream from the mouth of Revuelto Creek, there has been minor tendency toward channelization due to the influence of Ute Dam, with the absence of sediments (which are trapped by Ute Dam) and the lowered incidence of larger floods causing a narrowing and deepening of the stream channel. Releases through the outlet works at Ute Dam are limited to flows of no more than approximately 375 cubic feet per second, and flows over the spillway, which would be larger in magnitude, are rare. However, the Canadian River, although marginally narrower than its historic width, retains much of its historic character, due to the influence of large flows originating from uncontrolled Revuelto Creek that maintain channel widths. The presence of invasive non-native plants such as saltcedar (tamarisk) along the riverbanks has tended to confine the river channel and to remove the flood plain characteristics that allowed the formation of braided channels favored by the AR shiner. This condition is general along the entire reach of the river from Ute Dam to the headwaters of Lake Meredith.

(2) Reservoir Construction

According to the USFWS, reservoir construction is the most widespread cause of habitat loss for the AR shiner. Impoundments have inundated, dewatered, fragmented, or otherwise directly altered considerable sections of riverine habitat once inhabited by AR shiners. Inundation following impoundments eliminated AR shiner spawning habitat, isolated populations, and favored increased abundance of predators both upstream and downstream of these reservoirs. Water releases may be infrequent or non-existent in the western portions of the Arkansas River basin. (USFWS, 1998)

Several reservoirs have been constructed in the Canadian River Basin which have affected the habitat of the AR shiner. Conchas reservoir was completed by the U.S. Corps of Engineers in 1938 as a multi-purpose structure, providing storage space for both flood control and irrigation uses as well as sediment storage space. Since its completion, most of the mountain snowmelt that might provide rises to help trigger AR shiner spawning has been captured in Conchas Reservoir.

Ute Reservoir, near the upstream end of the reach proposed to be designated as critical habitat for the AR shiner in eastern New Mexico and the Western Texas Panhandle, was completed in 1963. .

Ute Reservoir currently provides a downstream reach of excellent habitat for the AR shiner. Historically, the reach of the Canadian River below Ute Reservoir was dry approximately 20% of the time. The seepage from Ute Reservoir now maintains a constantly wet habitat in the Canadian River with flows in the 3 to 5 cfs range. Combined with the return flows from the Arch Hurley Irrigation District delivered through Revuelto Creek and the flow spikes associated with normally-occurring flood flows from the uncontrolled Revuelto Creek drainage, the reach below Ute Reservoir presents a fecund habitat for AR shiner survival, spawning, and propagation.

Ute Reservoir currently has capacity above 200,000 acre-feet of conservation storage available to contain flood waters. Under the 1993 U.S. Supreme Court Decree, any waters impounded in Ute Reservoir above 200,000 acre-feet are released upon the call of Texas. Waters impounded below 200,000 acre-feet capacity are waters of and available for use by the State of New Mexico and currently are used to provide local municipal and domestic supplies through hydrologically connected wells with additional temporary industrial uses. A pipeline project to utilize the entire yearly yield of 24,000 acre-feet for municipal and domestic uses is currently entering the final design process.

When releases are made from Ute Lake due to storage in the Canadian River Basin in New Mexico below Conchas Dam having exceeded the amount allowed to New Mexico under the terms of the Canadian River Compact, the maximum flow which can be passed by the outlet works is about 375 cubic feet per second. Larger flows at the streamgage near Logan, New Mexico, are only experienced when Ute Reservoir rises to a level above the spillway crest and a spill occurs. This condition is infrequent, having been experienced in only two of twenty years since enlargement of Ute Dam was completed in 1984. (USGS records, Canadian River at Logan, New Mexico and Ute Reservoir near Logan, New Mexico) Revuelto Creek, a relatively large tributary which enters the Canadian River about seven miles downstream from Ute Dam, still provides significant inflow that contributes to rises on the Canadian River and which likely triggers the spawning reflex in the AR shiner. In most years, at least one and usually several events with peak flows above 350 cubic feet per second are recorded by the USGS gage on Revuelto Creek near Logan, New Mexico. In addition, return flows from Arch Hurley Irrigation District are carried by Revuelto Creek, which helps to maintain adequate minimum streamflows in the Canadian. (USGS records, Revuelto Creek near Logan, New Mexico) Flood inflow at the Canadian River confluence with Revuelto Creek provides sufficient variability from existing base flow to trigger spawning activity. Lake Meredith, constructed for CRMWA by the U. S. Bureau of Reclamation between 1963 and 1965, affects streamflow on the Canadian River downstream from its location, but not in the portion of the River which is

the subject of this document. Water impounded in Lake Meredith during severe flood events would extend upstream into the area proposed to be designated as critical habitat, but to date no such event has been recorded since construction of Sanford Dam which forms Lake Meredith. Therefore Lake Meredith has little or no direct effect on AR shiner habitat in the section of the Canadian River covered by this document, in terms of alteration of streamflows in that reach of the river. However, the presence of Sanford Dam has isolated the population of the species between Lake Meredith and Ute Dam.

Storage in Ute Lake and Lake Meredith is regulated by the Canadian River Compact (ratified by the United States Congress under Public Law 345, 82nd Congress, 2nd Session, approved June 2, 1952, and adopted by the Legislature of each of the States of New Mexico, Texas and Oklahoma). The Compact is administered by the Canadian River Commission, with a member from each State and a Federal chairperson. Under its terms, New Mexico is entitled to free and unrestricted use of all waters originating in the drainage basin of the Canadian River above Conchas Dam, and to impound up to 200,000 acre-feet of water in conservation storage in the Canadian River basin below Conchas Dam. New Mexico has operated Ute Lake in conformance with this provision. When storage in the Canadian River Basin in New Mexico below Conchas Dam exceeds 200,000 acre-feet, New Mexico makes releases of water from Ute Dam at the request of the State of Texas. Similarly, the State of Texas is entitled to store up to 500,000 acre-feet of water in conservation storage on the Canadian River in Texas, and would be required to make releases at the request of Oklahoma should that quantity be exceeded. (Other provisions of the Compact affect the quantity allowed to be stored in Texas, but are not cited for simplicity.)

(3) Streamflow Alteration and Depletion

Possible changes in streamflow due to the construction of reservoirs are described in the foregoing section. Alteration and depletion of flow in the Canadian has also occurred due to the diversion of water for use in irrigation of the Tucumcari Project of the U. S. Bureau of Reclamation, and for irrigation of other lands in New Mexico. According to reports of the U. S. Geological Survey, about 52,000 acres of land are irrigated above Conchas Lake and another 36,000 acres are irrigated on the USBR Tucumcari Project and on the Bell Ranch below Conchas Lake. (Water Resources Data, New Mexico, Water Year 2002) The New Mexico State Water Plan indicates that the surface water yield of the Canadian and Dry Cimarron River basins is on the order of 240,000 acre-feet per year, and that depletions are approximately equal to yield (the proportion of the yield and depletion in the Canadian basin alone are not given). Surface water withdrawals in the Canadian basin for municipal and industrial uses, upstream from Lake Meredith, are of minor significance. In New Mexico, most domestic and public water supply use in the area of interest here is currently from groundwater. However, in the near future, municipal and domestic uses will require the estimated yield of Ute Lake, about 24,000 acre-feet per year.

Alteration of streamflows also occurs because of invasive phreatophytic vegetation such as saltcedar (tamarisk) which has become common along the streambanks of the Canadian River and its tributaries. Saltcedar has been found to utilize as much as six acre-feet of water for each acre of heavily infested growth. (Mooney and Hobbs, 2000) Thousands of acres have become covered by these plants in the Canadian River basin. In addition to the direct water use of these plants by transpiration, heavily infested flood plain areas tend to trap floodwaters so that losses are significantly increased.

In some portions of the range of the AR shiner, groundwater pumping has been blamed for lowering of water tables and resultant decreases in streamflows. However, in the area of interest for this document, the Canadian River channel has become incised to an elevation below the major regional aquifer, the Ogallala, so there is little influence on the river flows due to the presence of the aquifer. There is some flow from seeps and springs which has, in the past, contributed a minor portion of the river flow, but these flows historically represented less than one percent of the total flow of the river (USFWS, 1998).

(4) Water Quality Degradation

Most factors affecting water quality in the Canadian River of Eastern New Mexico/Western Texas Panhandle are related to natural forms of contamination by non-point sources. While there is one instance of discharge of treated effluents by a municipality, that source has little adverse affect on overall water quality of the river. Other than the irrigated area of the Tucumcari Project near Tucumcari, NM, there is little cultivated area within the contributing drainage area of the Canadian River. Only minor amounts of nutrients have been recorded from agricultural sources.

There have, in the past, been some misunderstandings of the true nature of water quality in this reach. Past reports have indicated that water quality degrades as the River passes across the Texas Panhandle (USFWS 1998, citing a 1984 report of the Texas Department of Water Resources), but the reverse is actually true, especially as regards the area upstream from Lake Meredith. Natural inflows of saline brine, occurring in the vicinity of Logan, New Mexico, create significantly high concentrations of chlorides in the River from the vicinity of Logan to the New Mexico/Texas state line. Chloride concentrations of base flows in the river upstream from the mouth of Revuelto Creek range from 2000 to 3000 milligrams per liter (Mg/L), and total dissolved solids are up to 5000 Mg/L. After passing the state line, the highly mineralized flows are diluted by the inflow of fresher tributary inflows, and flows of the river at US 87/287 north of Amarillo show weighted averages of chloride on the order of 400 Mg/L and total dissolved solids of 1200 Mg/L. (USGS Water Resources Data, Texas, Water Year 2002).

While the degree of sensitivity of the AR shiner to salinity of the water in its habitat is not well defined, studies have found that more species are present in water of lower conductivity (Reash, 1990). Pigg (1999) reported on studies by

Matthews and Hill and by Polivka that daily fluctuations in water temperature, dissolved oxygen, and salinity strongly influenced the microhabitats selected by the AR shiner, and on other studies by Matthews and Hill and by Harrison indicating that the relative abundance of AR shiners in the South Canadian River is related to specific conductance, current velocity, turbidity, and water depth. These findings would seem to indicate that a reduction in salinity may represent an improvement in the habitat of the AR shiner.

The Lake Meredith Salinity Control Project (LMSCP), constructed jointly by the U. S. Bureau of Reclamation and the Canadian River Municipal Water Authority, is designed to produce improvement of the water quality in the Canadian River by intercepting brine inflows, originating from brine aquifers in the vicinity of Logan, to prevent the brine from entering the river. The upwelling brine is generally about twice as salty as seawater and is being produced from the solutioning of halite layers at depth. The brine aquifer is under artesian pressure so that the brine moves upward through a system of crevices and fissures, appearing in the Canadian River as a series of seeps and springs. Once intercepted by shallow wells of the Project which are drilled into the alluvium under the River, the brine is disposed of by injection into a deep well, to a depth substantially below the source aquifers, and intervening impervious strata prevent the brine from re-entering the aquifer or rising back to the surface. The Project as originally installed and placed in operation in 2001 is expected to intercept up to one-half of the sodium chloride-laden brine which historically has entered the river upstream from the mouth of Revuelto creek. Up to the present time, the Project has demonstrated that it can prevent the inflow of brine to the river in the vicinity of project facilities. However, the extent of ultimate water quality improvement in the River will necessarily depend on climatic conditions, since substantial flood flows are needed to “flush” accumulated salts from the sandy river channel between the project area and Lake Meredith. Thereafter, river flows should be of improved quality compared to historical base flows.

CRMWA has previously committed to operate the LMSCP in a manner which will provide the most benefit to the AR shiner, to the extent practicable. In addition, as a means of evaluating Project performance, CRMWA conducts periodic surveys of the River, both in the immediate vicinity of the Project facilities and for the entire distance from Ute Dam downstream to Lake Meredith, to measure streamflows and to collect water samples for testing of chlorides and conductivity. In conjunction with data collected by the USGS, these periodic surveys will provide a means of evaluating any changes which take place as a result of the conservation efforts laid out in this Plan.

The other primary non-point contaminant of Canadian River flow is an influx of sulfates, which seems to be of general contribution from the entire watershed. Careful review of water quality throughout the basin has revealed no concentrated sources of sulfates, and all streams and impoundments in eastern New Mexico and the Western Texas Panhandle show similar levels of concentration of these

compounds. The moderately elevated levels of sulfates (on the order of 350 Mg/L) should have no adverse affect on the AR shiner.

USFWS has indicated a belief that water quality degradation within the Arkansas River basin can cause localized impacts to AR shiner populations (USFWS 1998), but there are no indications of anthropogenic impacts within the reach of the river from Lake Meredith to Ute Lake. The single source of treated municipal effluent mentioned above is the City of Amarillo, which operates one wastewater treatment plant with a permit to discharge into East Amarillo Creek near the downstream end of the river reach covered by this document. Most of the discharge of this wastewater treatment plant, however, is actually delivered to a power generating station north of the City of Amarillo, and actual discharges to the Creek and thence to the River are very infrequent. Therefore the impact of these discharges on water quality in the Canadian River is minimal or zero. Oil and gas activities which might create an impact are minimal in this section of the Canadian River basin. Manufacturing return flows enter the river downstream from Lake Meredith but not upstream.

There are no concentrated animal feeding operations, industrial facilities with permitted discharges, or other sources of effluents located in the watershed area of the Canadian River between Lake Meredith and Ute Lake. The Village of Logan, New Mexico, is located near the upper end of the reach, but discharges its treated effluent to a series of lagoons that prevent any flow into the River. There are no other municipalities near the River.

The presence of invasive non-native, salt-loving plants such as saltcedar (tamarisk) may also contribute to the degradation of water quality in the Canadian River of Eastern New Mexico and the Western Texas Panhandle. Saltcedar growths consume tremendous quantities of water and draw salts up to the surface from deep in the soil. These salts are secreted on the plant's leaves, which fall every year, and give rise to increasingly saline surface and shallow soils. Saltcedar will tolerate this accretion of salt up to levels of 36,000 Mg/L, while native growths can only tolerate salinities on the order of 1,500 Mg/L. (Mooney and Hobbs, 2000) When the area of growth is inundated by flooding or river rises, the salt is undoubtedly dissolved in the floodwaters and increases the salinity of the streamflow.

Deleted:

Table A. Potential / Actual Threats, due to Factor A, Influencing Arkansas River Shiner Populations in New Mexico/Western Texas Panhandle.

Factor			Magnitude Of Threat	Immediacy of Threat	Comments
A.1. Channelization (present in limited areas)	Destruction	habitat	Low	non-imminent	
A.2. Reservoir construction (present)	modification	habitat	Low to Moderate threat	on-going	Depends on climate
A.3. Alteration/depletion (present)	curtailment	habitat	Moderate threat	on-going, likely to increase	due to flood reduction and phreatophytes
A.4. Degradation (Not present except for non-point sources)	curtailment	habitat	No threat	No threat	Should improve further

B. Overutilization for commercial, recreational, scientific, or educational purposes

This impact is of little threat to AR shiners in New Mexico/Western Texas Panhandle. (USFWS, 1998) There is believed to be little, if any, collection of bait fish from the Canadian River in the area of interest for this document, so the impacts on the AR shiner from this cause would be of little or no consequence. The incidental take of AR shiners during bait collection by individual anglers may occur on occasion. However, fishing rules and regulations of the States prohibit the use or take of state or federally listed species as bait. The collection of endangered fish species for educational or scientific purposes requires a scientific collector permit issued by NMDGF, TPWD (31TAC§65.301), and USFWS. Only under special circumstances does this permit allow take of AR shiners.

The impacts of overutilization for commercial, recreational, scientific, or educational purposes do not present a threat to AR shiner populations in Eastern New Mexico/Western Texas Panhandle. Any incidents resulting in take of AR shiners from these purposes occurs on a limited or isolated basis and would only have minor effects to the entire AR shiner population within Eastern New Mexico/Western Texas Panhandle.

Table B. Potential / Actual Threats, due to Factor B, Influencing Arkansas River Shiner Populations in New Mexico/Western Texas Panhandle.

Factor		Magnitude of Threat	Immediacy of Threat	Comments
B.1. overutilization	commercial	no threat	no threat	
B.2. overutilization	recreational	no threat	no threat	
B.3. overutilization	scientific	no threat	no threat	
B.4. overutilization	educational	no threat	no threat	

C. Disease or predation

The impacts of disease on AR shiner populations are relatively unknown. (USFWS 1998) No reports exist in Eastern New Mexico/Western Texas Panhandle of AR shiner specific diseases or abnormalities. Most diseases incurred by AR shiners are likely stress-induced resulting from marginal habitat conditions (e.g., elevated water temperatures, organic pollution, low dissolved oxygen levels). Mitigation of impacts to AR shiner habitat will address any stress-induced diseases resulting from poor habitat conditions. The lack of data regarding diseases incurred by AR shiners prevents further evaluation of this impact.

Predation is not a significant impact on AR shiners in Eastern New Mexico/Western Texas Panhandle. Predation by game fish, such as the introduced largemouth bass (*Micropterus salmoides)*, native green sunfish *(Lepomis cyanellus)*, and native channel catfish *(Ictalarus punctatus)*, and other fish species as well as by birds and reptiles, undoubtedly occurs, but the extent is unknown. (USFWS, 1998)

The impacts of disease and predation on AR shiner populations in Eastern New Mexico/Western Texas Panhandle are likely to be localized and insignificant. The lack of information on diseases in AR shiner populations makes assessment of the magnitude or immediacy of this factor difficult; however, no surveys or genetics research has reported a disease specific to this species. Predation by introduced game fish may occur on an isolated basis. Therefore, the impact of game fish predation on the overall AR shiner population is considered to be low.

Table C. Potential / Actual Threats, due to Factor C, Influencing Arkansas River Shiner Populations in New Mexico/Western Texas Panhandle.

Factor	Magnitude of Threat	Immediacy of Threat	Comments
C.1. disease	Unknown	unknown	no data to support
C.2. predation	Low	non-imminent	likely occurs in isolated areas

D. Inadequacy of existing regulatory mechanisms

Special measures protect the AR shiner and its habitat in Eastern New Mexico/Western Texas Panhandle. Scientific collector permits, administered by the New Mexico Game and Fish Department and the Texas Parks and Wildlife Department, only allow take of AR shiners under special circumstances. Bait regulations outlined in fishing rules and regulations of the respective States (31TAC§65.171 in Texas) prohibit the take of state or federally listed species. The New Mexico State Engineer, the New Mexico Environmental Department, and the Texas Commission on Environmental Quality (together with EPA) regulate water quality (water quality standards, wastewater discharge, concentrated animal feeding operations) through various permitting processes. Water quantity (municipal water withdrawal, crop irrigation) is managed by State agencies such as the NMSE and the TCEQ through permits. The AR shiner receives special protection as a federally listed species under the ESA. Accordingly, the USFWS

reviews all projects with a federal nexus that may impact the AR shiner or its habitat. Projects involving the dredging or filling of waterways (e.g., impoundments) require a CWA Section 404 permit issued by the USCOE. As long as AR shiners maintain their current distribution and abundance in New Mexico/Western Texas Panhandle, existing regulatory mechanisms should be adequate.

The New Mexico State Engineer's Office ("OSE") administers groundwater and surface water depletions from the Canadian River to insure that any changes to current places or purposes of use of such water do not impair existing users and are not detrimental to public welfare. NMSA 1978, Sections 72-12-7 (for groundwater) and 72-5-23 (surface water). The OSE declared the boundaries of the underground waters of the basin in 1973, pursuant to NMAC 19.27.25.8. and extended in 1998 to cover the area in New Mexico related to this Plan. This factor does not pose a threat to AR shiner populations in Eastern New Mexico/Western Texas Panhandle. Those agencies involved directly with AR shiner management or projects/activities that may impact AR shiners and their associated habitat have enacted procedural and regulatory mechanisms to protect the species in compliance with state and federal laws. The design of these mechanisms is not necessarily to protect every individual AR shiner, but to prevent the long-term destruction or loss of stream habitat. Further regulatory mechanisms may not result in increased protection for the AR shiner or its habitat in Eastern New Mexico/Western Texas Panhandle.

Table D. Potential / Actual Threats, due to Factor D, Influencing Arkansas River Shiner Populations in New Mexico/Western Texas Panhandle.

Factor			**Magnitude of Threat**	**Immediacy of Threat**	**Comments**
D.1. inadequate	Existing	Regulation	no threat	no threat	

E. Other natural and manmade factors

No other natural (species competition, niche overlap, hybridization) or manmade (urbanization, impoundments) factors are known to pose an imminent threat to AR shiners in Eastern New Mexico/Western Texas Panhandle. However, the species in this portion of its range could be threatened by the occurrence of a significant drought, resulting in a period of sustained zero flow, or by the introduction of competitive species. Red River shiners have been introduced into other portions of the AR shiner habitat with adverse impacts.

AR shiners have evolved in the environment of occasional severe drought cycles which exists in Eastern New Mexico and the Western Texas Panhandle. During periods of no flow, AR shiners must take refuge in pools and backwater of tributaries, and extended periods of drought make these less than perfect sanctuaries. However, several relatively severe periods of no flow in the Canadian have been observed in recent years, and AR shiners have still been found. Furthermore, the seepage of water from Ute Reservoir has reduced intermittency within this reach. Therefore, it is believed that drought poses no greater threat to the species than some other conditions.

Activity of off-road or all-terrain vehicles in and near the river at certain locations along the River in the Texas Panhandle could result in harm to the AR shiner or its habitat. Driving such vehicles in the river during spawning season could harm floating eggs, and driving vehicles through isolated pools during dry periods when the river is not flowing and surviving AR shiners have taken refuge in pools could result in harm to the individual members of the species. Also, such activity could cause some pollution from leakage or spillage of hydrocarbons, or by damage to riverbanks at multiple points of entry.

Table E. Potential / Actual Threats, due to Factor E, Influencing Arkansas River Shiner Populations in New Mexico/Western Texas Panhandle.

Factor		Magnitude of Threat	Immediacy of Threat	Comments
E.1. other	Drought cycles	Moderate threat	unknown	
E.2. other	Introduced competitive species	unknown	Not immediate	
E.3. Other	ORV or ATV use	Low	On-going	

Effect of Management Plan on Primary Constituent Elements of Critical Habitat

The primary constituent elements required to provide for the physiological, behavioral, and ecological requirements of the AR shiner were found by the USFWS to include 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 absence of barriers) to allow AR shiners to recolonize upstream habitats. (USFWS 2004) Application of the conservation measures listed in this Plan will work to provide assurance that these elements will be provided without application of extraordinary or special management procedures.

Removal of saltcedar growths that restrict streamflows will encourage sustained river flows by preventing peak flood flows from being excessively reduced or “flattened” as the floods progress downstream. This should help induce spawning and provide for more efficient egg transport during spawning of the AR shiner. Removal of saltcedar growths will also restore more natural flow regimes and increase the volume of water in the stream on a day-to-day basis. Water quality will be improved by eliminating the excess salinity caused by the saltcedar.

More sustained flows resulting from saltcedar control will also improve the ability of the AR shiner to withstand dry periods (by increasing the level of pools and backwater areas)

and will also allow more freedom for the newly spawned fry to pass back upstream so that spawning can re-occur in the next generation. A more natural regime of the river will result in better substrate for proliferation of food organisms with less silt and a return to sandy, braided channels which are preferred by the AR shiner. These improved conditions will favor the growth and development of juvenile AR shiners.

Voluntary self-regulation of ORV or ATV use along the river will protect the AR shiner, its eggs and habitat from harm which might result from such activity.

The net result of these conservation activities will be improved habitat for the AR shiner without the need for additional regulation through the designation of critical habitat and other intensive management by regulatory methods or through flood-level releases from Ute Reservoir.

Management Actions

The overall goal of this management plan is to maintain and improve habitat integrity in this segment of the AR shiner range, thus management objectives will focus on those primary issues that influence habitat integrity: hydrology, geomorphology, and water quality. Given the current abundance and distribution of AR shiners in Eastern New Mexico/Western Texas Panhandle, meeting the objectives of this plan proves more feasible than those recovery efforts required to restore shiner populations in other portions of the species' range. Strategies and tasks presented under each objective should maintain and enhance habitat in AR shiner streams through local- and watershed-level BMPs, conservation programs, and regulatory incentives. A combination of riparian zone restoration and water quality improvement may provide the best means for improving site-specific stream habitat and watershed integrity as a whole. The objectives below address those habitat effects discussed under *Present or threatened destruction, modification, or curtailment of habitat or range*. Order of listing or numbering does not denote level of importance or priority. However, it is important to note that the three issues (hydrology, geomorphology, and water quality) discussed below are interconnected in the context of watershed integrity and impacts or improvements to one may result in changes (negative or positive) to the others.

The conservation of existing habitat will provide the best option in meeting the goal of this plan. Since the Canadian River in eastern New Mexico/Western Texas Panhandle flows through private land, landowner involvement will be a crucial aspect in maintaining AR shiner populations. However, landowner participation in any programs listed in this plan is strictly voluntary. This plan does not establish any new or additional regulations or restrictions for private landowners with regards to endangered species, but provides interested landowners and land users with a variety of conservation program options. Options may include cost share programs (e.g., Conservation Reserve Program, or Environmental Quality Incentives Program, Texas Brush Control Program, Water Quality Management Plan Program, or the CWA §319 Program) or endangered species

programs (e.g., Safe Harbors Agreements or HCPs). Appendix B provides a description of relevant programs.

Many strategies discussed in this plan relate to practices and programs already implemented throughout eastern New Mexico/Western Texas Panhandle. AR shiner watersheds with few protected acres or stream reaches with high erosion would best benefit from additional conservation enrollments. Any increased streamflow resulting from the activities listed will produce multiple benefits, by adding to the available water supply from Lake Meredith as well as assisting in recovery of the AR shiner through improvement of the habitat of the species.

Current On-Going Activities

There are several programs and activities already existing or underway that represent activities beneficial to the AR shiner or its habitat.

The State of New Mexico, operating with state-appropriated funds through a consortium of local Soil and Water Conservation Districts, has initiated a Non-Native Phreatophyte Eradication Control Program aimed at saltcedar growths in the tributaries and the main stem of the Canadian River. Funding amounting to $1.4 million was provided to this program during 2004, its third year of operation. These funds were used to treat some areas in the upper watershed (3,476 acres in Colfax, Mora, and Harding Counties at a cost of $800,000) to begin monitoring and biological renovation of areas previously treated ($360,000), and to provide for mapping of infested areas including areas in the lower basin at a cost of $223,000. The 2004-2005 budget for the New Mexico program also included administrative costs of $172,000. The total program proposed for the Canadian River Basin in New Mexico amounts to nearly $20 million, to treat some 31,735 estimated acres. Prior to the 2004-2005 fiscal period, funding of $500,000 was provided for use in the Ute Creek watershed during the 2003-2004 period. Previously, some saltcedar control work was done in the Ute Creek drainage through the use of NRCS programs. New Mexico has demonstrated a resolve to follow through on the need to eradicate saltcedar along all of its streams as a means of improving the availability of water supplies in the State.

Some EQIP funding (about $40,000) was also provided to New Mexico in 2004, with about 200 acres of saltcedar being treated along canal banks of the Tucumcari Irrigation Project, which is located within the drainage basin of the (South) Canadian River. Reducing water lost to these plants will result in improved irrigation efficiency.

CRMWA initiated a program of providing financial assistance to landowners along the Canadian River and its tributaries downstream from Ute Dam in New Mexico, using the continuous sign-up provisions of the CRP program of USDA-NRCS with CRMWA paying the local cost shares, resulting in the treatment of

855 acres of saltcedar in 2004 by aerial spraying. Total cost of this work was $161,970, with CRMWA paying $116,636, NRCS funding of $40,274 and cost of $5,060 to one landowner. A total of 855 acres of infested area was treated in New Mexico in 2004. A similar program was initiated along the Texas portion of the Canadian River, based on the USDA-NRCS EQIP program (using $600,000 in federal EQIP funds along with allocated CRMWA funding to pay the local cost shares), but early dormancy of the plants prevented any spraying in Texas in 2004. Eleven Texas landowners, comprising a total area of 2,094 acres, signed contracts with USDA-NRCS to treat their land. The program will be re-initiated in 2005, using EQIP funds which are still in place (about $323,740) and CRMWA funds ($92,000) which have been provided in the 2004/2005 budget year. Up to $300,000 has been provided in the CRMWA operating Budget to pay for work in Texas and New Mexico in 2005, and the CRMWA Board of Directors has exhibited willingness to provide additional funding in future years to complete the program of spraying all saltcedar along the Canadian upstream from Lake Meredith. In addition to the acreages already treated in New Mexico and under contract in Texas, about 1,150 acres remain to be treated in New Mexico and 2,050 acres are not yet under contract in Texas. Funding to help pay for work on lands whose owners are ineligible for the federal cost shares is being sought. If state or federal funding for that part of the cost is not obtained, local (CRMWA) costs to complete treatment could amount to an additional $450,000 beyond the funds already committed. At the current rate of funding under the CRMWA operating budget, initial treatment would be complete in 2007.

As noted previously, the LMSCP is being operated to benefit the AR shiner wherever practicable.

When releases are required to be made from Ute Lake, coordination of the involved state agencies is accomplished with input from USFWS to provide flows of benefit to trigger spawning reflex of the AR shiner. This effort involves a willingness to notify and make adjustments based on input from all cooperators.

The USBR, in cooperation with the USNPS, TAES, Red River Authority, and CRMWA, has initiated a demonstration biological control project for saltcedar in the upper reaches of Lake Meredith, using imported beetles to provide a natural means of control. This program was recently initiated, with the first generation of locally-hatched beetles released in 2004. Funding to initiate the saltcedar biocontrol program, provided by Reclamation's General Investigation Program, ended in September 2004. The biocontrol program will now be continued with funding for future monitoring of beetle impacts, disbursements, etc., provided by Reclamation's Science and Technology Program and by CRMWA, subject to available funds. Expenditures for this program have amounted to $233,000 since FY 2001, including $153,000 for photographic mapping and interpretation, and $80,000 for field assistance. In addition, amounts spent on the insect release program include $21,000 in 2004, and $31,000 in 2005 plus $7,500 contributed for the study by CRMWA in 2004 and $12,500 from the USNPS since 2001.

Programming reflects allowances of $40,000 in 2006, with expectations of continued funding for future years at the same or comparable levels. If this program is successful, it very likely will receive on-going funding from the federal, state, or local level.

The USNPS has for several years operated a program to remove saltcedar plants from the land areas of the Lake Meredith National Recreation Area, using both mechanical methods and fire. There are an estimated 6,000 acres of saltcedar infestation within the Lake Meredith National Recreation Area. This program has treated an average of 500 acres of saltcedar per year for the past three years. Each year, about 200 acres have been mechanically grubbed, 100 acres removed with chainsaws followed by chemical treatments, and 200 acres by burning also followed by chemical treatment. Their costs have averaged $175,000 per year. Their program is scheduled to diminish slightly because funding for use of chainsaw crews has not been renewed, so costs in subsequent years will cover about 400 acres per year at a cost of $125,000 annually. These funds are provided on a year-by-year basis subject to appropriation.

The BLM, managers of the Cross Bow Ranch public lands fronting on nine miles of the south side of the Canadian river west of the US 87/287 Highway, has been working for the last four years to control salt cedar on that property. The stands were burned in the spring of 2002 and resprouts have since been sprayed each year with herbicide. Approximately 90 percent of the saltcedar on the Cross Bow has been killed using this procedure. BLM has also attempted to control grazing of itinerant cattle by fencing as much of their riparian habitat as possible.

Water quality monitoring in the Canadian River of Eastern New Mexico/Western Texas Panhandle is being performed by several agencies under several different programs. The USGS operates stream gaging stations with water quality reporting at several points. The TCEQ sets water quality standards under the oversight of USEPA and collects samples for water quality monitoring. The Red River Authority, as part of the Clean Rivers Program of the State of Texas, monitors water quality and reports annually on sites which do not meet the established stream standards. These sites are then considered for placement on the Clean Water Act list of waterbodies needing establishment of a TMDL for remedial action. At the present time, there are no reaches of the Canadian River in Eastern New Mexico/Western Texas Panhandle that are recommended for inclusion on the CWA 303-d list. The Red River Authority of Texas, a partner with TCEQ in the Texas Clean Rivers Program, monitors the water quality and reports annually on the status of the water quality throughout the basin. The TCEQ utilizes the data for assessing water bodies that do not meet established stream standards for placement on the Texas Surface Water Quality Inventory. The results of the assessment are published periodically in the *Texas Water Quality Inventory and 303(d) List*, as required by Sections 305(b) and 303(d) of the federal Clean Water Act. On the Draft 2004 Texas 303(d) List dated November, 2004, no segments on the main stem of the Canadian River above

Lake Meredith are included. For Water Quality Concerns there is a nutrient enrichment concern for East Amarillo Creek above Lake Meredith, and a public water supply concern for Lake Meredith due to dissolved solids. CRMWA collects water samples at various points in the watershed above Lake Meredith to assure that no contaminant reaches the Lake in harmful quantities. As part of its operation of the Lake Meredith Salinity Control Project, CRMWA also conducts periodic surveys of the entire stream from Ute Dam to Lake Meredith, measuring base flow of the stream and collecting samples for testing of chlorides, sulfates, and Total Dissolved Solids. These measurements and samples are utilized to calculate stream loadings of chlorides to evaluate the performance of the Project.

All of these on-going activities will be considered under this Plan.

Hydrology

Objective 1.1: Maintain the existing hydrology in Unit 1A, and provide flexibility to augment base flows to conserve and protect streams containing AR shiners in the Canadian River from Ute Dam to Lake Meredith

Discussion:
Stream hydrology refers to the precipitation, evaporation, runoff, and infiltration of water that occurs within a watershed. Stream systems, in the strictest sense, can be recognized as self-adjusting conveyors of water and sediment. Alterations to stream hydrology disrupt the transport of water and sediment, ultimately impacting aquatic habitat. Those land use activities or the presence of invasive plants that alter water delivery to streams, retention time within the basin, and infiltration rates change the hydrology of stream systems. The resulting effects on the Canadian River may range from sedimentation due to increased erosion or surface runoff, longer periods of intermittent flows, and tendency toward channelization. Those practices that maintain the existing base flow regime, and provide for flood flows sufficient to promote spawning, are critical for the persistence of the AR shiner.

Strategy 1.1A: Restore those AR shiner watersheds whose base flows have been most altered from historic conditions by the invasion of non-native phreatophytic plants on streambanks and where losses have increased due to growths on floodplains.

Task: Identify areas infested by saltcedar or Russian olive and assess which conservation measures would be most practical and effective for restoring historic levels of base flows and to eliminate streamflow losses during floods.

Programs/Tools:

Landsat imagery, aerial photography
Streamflow modeling
USGS gauging stations
Texas Brush Control Program
CWA §303 (d) Program

Task: Provide landowner incentives to eradicate unwanted plants and to increase native vegetative cover and other conservation measures in areas identified. Where necessary, funds to pay local cost share of control activities will be provided by supporting agencies, to the extent funds are available. Authorization to enter private lands to perform treatment will be obtained when necessary by permit or easement from the landowner. For treatment performed under a program of the USDA-NRCS, landowners will contract directly for the treatment and be reimbursed by USDA-NRCS and CRMWA, so that no entry permit is required.

Programs/Tools:

CRP, CCRP, EQIP
Cooperative agreements with landowners
Texas Brush Control Program
CWA §303 (d) Program

Agencies/Organizations:

Landowners
USDA-NRCS, SWCD's
TCE, NMCES
TSSCWB and local SWCD's
CRMWA

Task: Manage amount and timing of releases from Ute Dam, when required pursuant to the Canadian River Compact, to benefit to the spawning process of the AR shiner.

Agencies/Organizations:

CRC, NMISC
TCEQ, CRMWA
USFWS

Task: Manage and maintain existing base flow of 3-5 cfs from Ute Dam, as measured at the Logan Gage on the South Canadian River, as part of the ISC Strategic Water Reserve[1].

Agencies/Organizations:

NMISC

1 Please note that the seepage of 3 to 5 cfs represents an appropriated, renewable water source of approximately three thousand acre-feet annually, sufficient to supply the needs of 12,000 people. To ensure flows beneficial to the AR shiner continue below Ute Reservoir, the ISC would incorporate that seepage into the Strategic Water Reserve or otherwise manage the water, as long as this management plan was in effect.

Task: Maintain and improve current levels of grassland resources by promoting restoration of uplands to native grasses and control brush such as mesquite.

Programs/Tools:

CCRP
EQIP
Grassland management
Texas Brush Control Program
CWA §303 (d) Program
USNPS Fire Management Plan (USNPS FMP)

Agencies/Organizations:

Landowners
Agricultural associations
USDA-NRCS
USFWS - Partners for Fish and Wildlife
TSSCWB and local SWCD's
TDA and NMDA
USFWS
USNPS

Task: Prevent regrowth of saltcedar in areas upstream from Lake Meredith where control has been performed, to the extent policy decisions, authority, and funds allow.

Programs/Tools:

Biological control programs using imported beetles to prevent uncontrolled regrowth. If biocontrol is not found to be effective in control of regrowth, other procedures will need to be developed or a program of retreatment will need to be instituted.
Texas Brush Control Program
CWA §303 (d) Program

Agencies/Organizations:

USBR
USNPS
TAES
TSSCWB and local SWCD's
CRMWA
USDA-NRCS

Task: Control growths of saltcedar in the immediate area of Lake Meredith using fire, mechanical methods, aerial spraying, or biocontrol, to the extent policy decisions, authority, and funds allow.

Programs/Tools:

Maintenance activities
Biological control methods
Texas Brush Control Program
CWA §303 (d) Program

Agencies/Organizations:

USNPS, USBR
TSSCWB and local SWCD's
TAES, RRA, CRMWA

Geomorphology

Objective 1.2: Maintain the fluvial geomorphic processes that create and maintain riverine habitat of the ARS in the Canadian River from Ute Dam to Lake Meredith**.**

Discussion:
Geomorphology refers to the physical features (e.g., channel dimensions, substrate, gradient) that characterize a stream. Geomorphology and riparian vegetation are the principle factors influencing aquatic habitat. Land use practices and manmade structures (e.g., large-scale impoundments) often have direct and/or indirect impacts to a stream's geomorphic features. The resulting channel degradation (i.e., erosion) or aggradation (i.e., sedimentation) changes the aquatic habitat to which native fish have adapted. Impacts to AR shiner streams may include loss of instream habitat, loss of spawning substrate, channel incision, and increased stream velocities.

Strategy 1.2A: Encourage erosion control measures along riparian zones and slopes adjacent to AR shiner streams. Encourage minimal disturbance of these areas during construction projects.

Task: Work with government agencies to develop BMPs that minimize erosion from construction / project activities. Require blading of roads and installation/maintenance of pipelines within the Lake Meredith National Recreation Area to comply with the USNPS Nonfederal Oil and Gas Plan, December 2002.

Agencies/Organizations:

TxDOT
USCOE
NRCS
Railroads
Pipeline Companies
TGLO
USFWS
USNPS

Task: Provide financial and technical assistance to landowners interested in reestablishing native vegetation along riparian zones, especially along areas with high erosion potential.

Programs/Tools:

CRP, EQIP
Habitat fence construction (for CCRP riparian buffers)

Agencies/Organizations:

Landowners
USFWS - Partners for Fish and Wildlife
NRCS

TSSWCB and local SWCD's

Task: Minimize riparian disturbance in areas with high erosion potential.

Programs/Tools:

Alternate watering sources for livestock – EQIP
Habitat fence construction
Stream bank stabilization
Provide livestock shelter / wintering areas outside riparian areas – tree plantings

Agencies/Organizations:

Landowners
USDA-NRCS
TSSWCB and local SWCD's

Strategy 1.2B: Minimize harm to floating eggs, disturbance of pools, and damage to riparian zones from the activities of off-road and all-terrain vehicles. Prevent pollution or contamination of riparian areas adjacent to AR shiner habitat.

Task: Work with recreational users and groups to educate members of the public about potential harm to the AR shiner and its habitat from their activities, including disturbance of pools which could shelter AR shiner individuals during periods when river flow is not sufficient to allow normal species activities. Avoid driving or riding in pools along the river channel under such conditions. During the period from June 1 to July 30, when spawning is likely, minimize the number of vehicles that are in the River proper and the time they spend there, so as to avoid disrupting spawning behavior or washing eggs up on shore.

Programs/Tools:

Educational Programs
Notification of participants when river flow is low or zero
Self-regulation of recreational users

Agencies/Organizations:

TORA
USFWS
USNPS

Task: Minimize pollution of water or contamination of riparian areas from accumulation of waste, trash, or spillage of oil or gasoline during ORV or ATV activities. Discourage vehicles being parked in the water, especially during events that attract a large number of vehicles.

Programs/Tools:

Clean-up events after organized rallies
Educational programs and brochures

Agencies/Organizations:

TORA

Task: Minimize harm to the river banks. Stable river banks are needed to provide good habitat for the AR shiner.

Programs/Tools:

Limit access points
Educational Programs

Agencies/Organizations

TORA

Water Quality

Objective 1.3: Minimize non-point source water quality impacts in streams containing Arkansas River shiners.

Discussion:
Point source impacts (e.g., wastewater discharge) to stream systems have been greatly reduced since enactment of the Clean Water Act in 1977; however, non-point source impacts (e.g., habitat loss) are often cited for the continued decline of aquatic resources. (It should be noted that there are no reaches of the Canadian River in Eastern New Mexico/Western Texas Panhandle which are required to have an established TMDL program, even though salinity is high.) One of the main impairments to New Mexico/Western Texas Panhandle streams is the inflow of saline brines in the upper end of the reach, below Ute Dam. Impacts to AR shiner habitat may range from high salinity to stress-induced mortality due to elevated water temperatures. Non-point source impacts to stream hydrology and geomorphology are previously discussed.

Strategy 1.3A: Reduce inputs of saline brine into AR shiner streams from non-point sources.

Task: Continue operation of Lake Meredith Salinity Control Project to minimize brine inflows

Agencies/Organizations:
CRMWA
USBR

Task: Continue routine periodic evaluation of base-level streamflow and chloride concentrations to evaluate performance of LMSCP and to document changes in quality and/or quantity of flows resulting from control of saltcedar and reduction of brine inflow. Also continue regular monitoring of water quality being performed under other data collection programs.

Agencies/Organizations:
CRMWA
USBR
USGS
TCEQ
RRA
NMED

Task: Continue routine inspections of sewage treatment facilities to ensure compliance with water quality standards.

Agencies/Organizations:
TCEQ
NMED
EPA

Task: Continue technical assistance for permitting and designing concentrated animal feeding operations.

Agencies/Organizations:

TCEQ
NMED
EPA

Task: Provide incentives for landowners to establish riparian buffers or filter strips along agricultural fields with high runoff potential.

Programs/Tools:

CRP
EQIP
CWA Section §319 Program
Water Quality Management Plan Program

Agencies/Organizations:

Landowners
USDA-NRCS
USFWS - Partners for Fish and Wildlife
TSSWCB and local SWCD's

Population Monitoring and Assessment

Upon approval of the Plan by the USFWS, TPWD staff may undertake monitoring of the species status in this segment of the Canadian River dependent on staff and equipment requirements. TPWD may opt to modify the Proposed Monitoring Plan to better fit with existing protocols. TPWD will coordinate development of the methodologies with the USFWS and will ultimately develop a protocol that will provide reliable data on the status of the AR shiner and the associated fish community.

Currently, NMDGF is sponsoring a drainage–wide, systematic fish survey of the South Canadian River drainage in New Mexico. Data from that study will be important for determining baseline population status of AR shiner and for other purposes.

CRMWA Saltcedar Monitoring Plan

Stream Surveys/Water Quality: Stream surveys should be conducted on a monthly basis or as conditions and time allow from 0.8 mile below Ute Dam to the Texas N.M. State line and yearly basis from Ute Dam to Lake Meredith. Flow measurements, and water samples should be taken to test for chlorides and sulfates at predetermined locations in the "gravel pit reach" and every four miles there after starting at mile six. Conductivity should be taken at every measurement site plus at every mile to either the state line or Lake Meredith.

Real time flow and conductivity data from two flumes located 2.55 and 3.8 miles below Ute Dam will be used in addition to the stream surveys.

Shallow Monitoring Wells: Establish eight sites for shallow monitoring wells along the reach of the Canadian River near Ute Dam to Lake Meredith to monitor daily fluctuations of the alluvial aquifer before and after aerial treatment of saltcedar by Habitat or Arsenal. Monitoring wells will be placed in stands of saltcedar that have either been treated, scheduled to be treated or are not scheduled to be treated. An additional well will be place in a cottonwood stand to compare water use between saltcedar and cottonwood. Wells will be hand drilled with a 3¼ inch AMS Soil auger and bailer. Soil samples will be collected every foot to the aquifer and tested to determine specific yield of the soil. After the hole has been constructed a five foot by two inch PVC well point, with 0.0010 slots, will be fitted to a joint of two inch PVC to the determined depth allowing for a one to three foot riser. A sensor and data logger will be inserted into the pipe to collect the data from the aquifer. The data from the wells will be downloaded every month or two and the data compared between sites.

Vegetation Monitoring: Three sites for vegetation monitoring will be established in or near stands of saltcedar that have either been treated, scheduled to be treated or are not scheduled to be treated. Line transects will be set up for plant identification and cover and will be conducted once in the spring and once in the fall.

Public Outreach / Education

Public outreach and education will play a critical role in informing the citizens of Eastern New Mexico/Western Texas Panhandle about the AR shiner. Cooperating agencies, landowners, and the general public need to be informed about the management plan as well as the AR shiner in general. Outreach efforts will focus on the past and present status of the AR shiner, why the species was federally listed, why an AR shiner management plan for this area is important, and what the agencies involved in the Eastern New Mexico/Western Texas Panhandle have done in managing the shiner and in working towards delisting.

Outreach Objective: Develop an awareness program that informs the public on the status of the AR shiner, the importance of maintaining watershed health, the management efforts in Eastern New Mexico/Western Texas Panhandle, and the importance and function of the AR shiner management plan.

> **Task:** Continue coordination with federal, state, and local entities through an AR shiner advisory group (to be formed of representatives of participating agencies and interested parties) to identify potential problems and management options for the shiner.

Task: Provide biannual press releases to various agricultural (e.g., TX and NM Cattlemen's Assn. and Farm Bureaus) and conservation groups (e.g., conservation Districts) on current state and federal activities involving the AR shiner.

Task: Utilize media sources to inform the public about AR shiner recovery efforts, including recovery plans formulated by the USFWS and any recovery team created to address recovery planning in Eastern New Mexico/Western Texas Panhandle.

Task: Develop an informational brochure for distribution to landowners, schools, and members of the public to explain the importance of recovery of the shiner and activities under the Conservation Plan.

Task: Prepare and deliver a presentation on the AR shiner and state management plan at professional society meetings and workshops.

Evaluation

Activities in New Mexico/Western Texas Panhandle that contribute to national recovery efforts of the AR shiner will be summarized in an annual progress report. Annual progress reports will include a list of projects completed, status of current projects, other relevant activities, and a summary of monitoring and assessment data. These reports will be submitted to the local and regional USFWS offices. Further evaluation will include semi-annual and annual meetings between those entities involved in developing this state management plan.

Certainty of Execution for Critical Conservation Measures:

As noted in the section entitled "Currently On-Going Activities", many programs are already underway that will be of benefit to the AR shiner. All of the activities called out in the listed Management Actions that have to do with control of saltcedar so as to eliminate water waste and improve the base flow level of the Canadian River are on-going programs that have been funded and are in at least the second year of activity. The State of New Mexico is in the fourth year of funding its aggressive control program in the tributaries and main stem of the Canadian River. (ref: Canadian River Restoration Project document, Mesa SWCD et al, New Mexico) Through the 2002 Farm Bill, the USDA-NRCS has provided funding for many programs that will be helpful in controlling the growth of saltcedar and other water-wasting plants. There is no indication that funding for these activities will be withdrawn.

The program initiated by CRMWA in 2004, to assist landowners with saltcedar control activities, is fully funded for the current year as well, and should continue until all areas along the river and major tributaries have been treated. Contracts between landowners and the USDA-NRCS for a large portion of the main river in Texas are already in place and funds have been committed. There is no reason to believe that funding by CRMWA of the local cost share will not be continued, for additional areas that can be treated under

the USDA-NRCS programs. In addition, efforts are being made to find ways of financing control measures on areas that do not qualify for the USDA-NRCS programs. CRMWA is committed to improve the base flow of the River, and will dedicate the necessary resources to accomplish this goal. The result will be improved habitat for the AR shiner.

The U. S. Bureau of Reclamation, in cooperation with the ARS and USNPS, is beginning the third year of the biological control research program which utilizes leafeating beetles to control saltcedar along the banks of Lake Meredith and the Canadian River at the upper end of the Lake Meredith National Recreation Area. Every indication is that this program will be capable of controlling regrowth in the immediate area, and that spreading of the beetles will benefit the river further upstream. Only time will tell, of course, whether the beetles will spread upstream rapidly enough that additional releases will not be necessary, but it is very likely that permits could be sought for additional release sites if needed. This program will help immensely to keep down the costs of continuing maintenance of controlled areas.

USNPS activities to control saltcedar within the bounds of the Lake Meredith National Recreation Area are likewise part of an on-going program and are unlikely to be discontinued, short of a showing that success of the biological control program renders the use of fire and mechanical means unnecessary.

Upon consideration of the status of each of the programs discussed above, it seems certain that measures to control saltcedar along the Canadian River upstream from Lake Meredith will indeed be carried out.

Certainty of Effectiveness of Management Activities

While it seems simple enough to show that conservation measures to control saltcedar along the Canadian River and its tributaries are certain to be carried out, providing certainty that those measures will indeed result in increased flow of water in the Canadian River can only be accomplished by looking to the results of similar activities which have been carried out at other locations. Even if activities carried out under this Management Plan are successful in raising the base flow of the Canadian River, benefits to the AR shiner will be less significant than if assurances of frequent flood flows could be provided. Increasing base flows should assist the shiner in coping with extreme dry periods, by virtue of keeping some flow available for longer periods, but will not provide any increased benefits to the spawning process. Flows adequate to trigger the spawning reflex will still depend on moderate flooding during and after thunderstorms as well as occasional releases from Ute Dam when storage there exceeds the amount allowed under the Canadian River Compact.

Nevertheless, the occurrence of occasional periods of zero flow in the Canadian has been sufficiently frequent that increases in base flow will definitely assist the AR shiner to maintain a viable population during those periods. Even a rise in the level of the groundwater table in the flood plain will benefit the shiner by keeping more water in the

residual pools along the river when flow down the river ceases, thereby providing a haven for the shiner to survive critical periods. On such occasions, benefits would accrue even if flow down the river has stopped for some period.

Evaluating the results of saltcedar control programs at other locations to infer results which may be obtained along the Canadian River provides a wide range of comparative benefit levels. Some programs have reported success in their efforts to salvage water from control of saltcedar. Others have reported that water savings have not been as significant as expected. None have reported that more water is lost after control of the saltcedar. The following is a brief summary of some reports on such research.

Robinson (1965) reported on the extent of saltcedar growth in the western states. He found that areas infested had increased from an estimated 10,000 acres in 1920 to more than 900,000 acres in 1961, and postulated that saltcedar would be growing on 1.5 million acres by 1970. He found that water use by saltcedar varied with factors such as cover density, size of the plants, depth to the water table, and climate. Under favorable conditions, use of water by saltcedar can be more than 9 acre-feet per infested acre. The regimen of streams whose flood plains contain established stands of saltcedar have depleted streamflow, an increase in the area inundated by floods, and an increase in the deposition of sediment in the area of saltcedar growth. He did not report on prospects for water salvage by eradication.

Studies by van Hylckama, 1974, studied water use by saltcedar on the Buckeye Project, Arizona, from 1961 through 1967 using the water budget method. Growing plants in tanks of soil, the study found that water use varies with many factors, and that data obtained by this method should be used with caution. Usage from the tanks varied up to 122 inches, but in fifty percent of the tanks water use was less than 59 inches. Variations were observed with depth to the water table, stand density, and other factors. Other types of vegetation were not studied, but some data were collected on water loss from bare-soil tanks.

The Buckeye Project was the subject of a second report by van Hylckama (1980), in which he discussed other methods of measuring evapotranspiration and described the microclimate of vegetation on a typical flood plain. This report does not further quantify the water use observed at the Buckeye Project, but arrives at a conclusion that evapotranspiration could be better measured by the eddy-correlation method.

During the 1960's and 1970's, several studies were performed in connection with the Gila River Phreatophyte Project, Arizona. Culler, et al (1982) reported on water losses before and after clearing phreatophytes in the Project area. Water losses from saltcedar had been measured at about 7 feet, compared to 4.7 feet for baccharis and 3.3 feet for mesquite. Vegetation on the Gila River was mostly saltcedar and mesquite, but cottonwood, seepwillow, seepweed, and arrowweed were also present. Clearing was done by root plow, repeated as necessary to control regrowth. Measurement of water loss was by the water budget method. In general, the study reported that annual *ET* on the project area averaged 43 inches before clearing and was reduced by an average of 19

inches per year by complete clearing. This reduction was considered temporary because replacement vegetation was not established. Comparing the *ET* of varieties of replacement vegetation produced a conclusion that no water salvage would result if any of several types of grasses were introduced as replacement on the entire area, optimum production maintained, and the grass roots extended to the capillary fringe of the water table. No measurements of actual water salvage were obtained. The study reported a maximum water salvage of 31 inches per year for areas of 100 percent coverage of phreatophytes converted to no permanent vegetation.

After clearing saltcedar from the Pecos River in New Mexico in the reach between Acme and Artesia, N. M. in 1967 and 1974, observed base flows did not show readily identifiable gains as a result of the clearing. Weeks, et al (1987) investigated evapotranspiration losses from representative plots of saltcedar and of replacement vegetation, in order to determine if initial estimates of consumptive use by the saltcedar were erroneously high and (or) whether estimates of use by replacement vegetation were erroneously low to the extent that actual salvage from evapotranspiration was quite small. Measurements were by the eddy-correlation technique or by combined eddy-correlation and energy-budget techniques. Although the report indicates large uncertainties in the estimates, the measurements indicate that annual water use by saltcedar is about 0.3 meters greater than by the replacement vegetation. This magnitude of reduction should have produced increased base flow on the order of 10,000 to 20,000 acre-feet per year. The fact that such gains have not been identified from streamflow records may arise from masking of short-term gains by variations in climate and in groundwater pumpage and from a continuing decline in the groundwater contribution to base flow from the shallow aquifer.

More recent work along the Pecos River, both in New Mexico and in Texas, has consisted of aerial spraying of saltcedar. In Texas, 128 miles of saltcedar along the Pecos River were treated with Arsenal herbicide applied by aerial (helicopter) methods. Water salvage resulting from these control programs is still being quantified. (personal communication, Jesse D. Roberts to John Williams) (Personal communication, Alyson McDonald to Rod Goodwin, CRMWA) Early indications are that water salvage is on the order of 3 to 5 acre-feet per acre. (Hart, 2003)

In a study for the Shelton Farms of the Arkansas River Valley, Colorado, Horton found that water salvage from phreatophytes (primarily saltcedar) in that stream would average 2.1 acre-feet per acre for each growing season. (Horton, 1973)

Efforts to control saltcedar along the Middle Rio Grande River in New Mexico have been underway since the 1940's. Dahm (2002) reported on studies to evaluate evapotranspiration *(ET)* as an element in the water budget of the Middle Rio Grande, using three-dimensional eddy-based covariance methods from tower-based micrometeorological measurements. These studies indicated that *ET* rates of 111 to 122 cm/yr could be measured from dense stands of saltcedar or a mature cottonwood stand with an extensive understory of saltcedar. Riparian zone *ET* along the 320 km length of

the Middle Rio Grande constitutes approximately 20 to 33 % of total estimated depletions along this reach of river.

To support his Master's thesis, Hays (2003) conducted studies of water use by saltcedar and associated vegetation on the Canadian, Colorado, and Pecos rivers in Texas. Shallow wells hand cored to the water table were used to estimate daily water use from drawdown plus recharge during the drawdown period. Paired plot studies were done in the Colorado River portion of the study to evaluate potential water savings. The results indicated a savings of approximately 0.4043 m of water at the Colorado location. However, the herbicide treatment only achieved a 49% mortality of salt cedar, and native vegetation had not reestablished by the end of the study. No similar studies were done at the Canadian or Pecos locations. Average water use values measured during a growing season were 3.69 m for the Canadian location, 0.527 m for the Colorado site, and 1.9385 to 2.7642 m for the Pecos plots (two years). Water table was highest at the Canadian site, but saltcedar was not the dominant vegetation type at that location, where there was a dense understory of other vegetation.

Jachens and Mull (2000) evaluated conditions in the Canadian River of Texas and conducted an exhaustive literature review to assess water use rates for naturally occurring phreatophytes in a study for the U. S. Bureau of Reclamation. Their review concludes that the actual potential water savings from control of phreatophytes along the Canadian River floodplain is estimated to be 1.0 to 3.0 acre feet per acre of area converted to native vegetation.

Shafroth, et al (2005) concluded that increases in water yield following saltcedar control are only likely to occur when a saltcedar stand containing a high leaf area is replaced by vegetation with a lower leaf area. They recommend thorough pre-project assessment of restoration potential to obtain realistic differences in *ET* rates between vegetation types.

The USDA-NRCS has reported good success with water salvage through control of saltcedar on the Arroyo de la Cejita, a tributary of Ute Creek in the Canadian River Basin near Roy, New Mexico. The creek flowing through property owned by Harry and Lindit Hopson was reported to have flowed naturally until the drought of the 1950's, when it became intermittent. The area became thickly infested with salt cedar. In 2001, the riparian area of the creek on the Hopson property was treated to kill the saltcedar. Neighboring property was also treated in 2003, and the creek began flowing again in the summer of 2003, with increases reported up to the winter of 2004. (USDA, NRCS, Natural Resources Reporter, Winter 2004)

The plain conclusion, which may be easily reached from review of the studies and case histories outlined above, is that control of saltcedar does result in a decrease in the amount of water used. Whether a substantial increase in streamflow is observed may depend upon a number of factors, but the level of groundwater is increased and the resulting improvement in habitat will be beneficial to the AR shiner. In the case of the Canadian River in the Western Texas Panhandle and Eastern New Mexico, the flood plain adjacent to the River probably originally contained little or no vegetation, so that

evaporation from the bare soil was less than *ET* from the current saltcedar growths. Where vegetation comes in to replace the saltcedar after it is removed, water salvage will be less but conditions will still be improved substantially, both as to the quantity and quality of flow in the River and as to habitat for the AR shiner.

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Literature Cited

Culler, R. C., Hanson, R. L., Myrick, R. M., Turner, R. M., and Kipple, F. P. 1982. Evapotranspiration before and after clearing phreatophytes, Gila River flood plain, Graham County, Arizona. Professional Paper 655-P. Washington, D. C., U. S. Department of the Interior, Geological Survey. 67 pp.

Dahm, C. N., Cleverly, J. R., Coonrod, J. E. A., Thibault, J. R., McDonnell, D. E., and Gliroy, D. J. 2002 Evapotranspiration at the land/water interface in a semi-arid drainage basin. In Freshwater Biology (2002) 47: 831-843 Blackwell Science Ltd.

Hart, C. R., McDonald, A. 2003. Pecos River Ecosystem Monitoring Project. Texas A&M University Cooperative Extension, Texas Water Resources Institute.

Hays, K. B. 2003. Water use by Saltcedar (*Tamaris* sp.) and associated vegetation on the Canadian, Colorado, and Pecos Rivers in Texas (Thesis) Texas A&M University. 116pp.

Horton, J. S., and Erickson, J. R. 1973. Salvage of water due to phreatophyte clearing – Shelton Farms – Arkansas River Valley, Colorado (report prepared for Fairfield and Woods and Southeastern Colorado Water Conservancy District) 16 pp.

Jachens, C. and Mull, T. 2000. Consumptive use literature review of phreatophytes common to the Canadian River in Texas. U. S. Bureau of Reclamation, Water Supply, Use and Conservation Group, Technical Service Center, Denver Co. 38 pp.
Mooney, Harold A. and Hobbs, Richard J.: Invasive Species in a Changing World, Island Press, 2000 (A project of SCOPE: The Scientific Committee on Problems of the Environment)

Matthews, W.J. 1987. Physicochemical tolerance and selectivity of stream fishes as related to their geographic ranges and local distributions. Pp 111-120 *in* W. J. Matthews and D. C. Heins, eds. Community and Evolutionary Ecology of North American Stream Fishes. Univ. Okla. Press. Norman, OK. 299 pp.

Pigg, J., Gibbs, R., and Cunningham, K.K. 1999. Decreasing abundance of the Arkansas River Shiner in the South Canadian River, Oklahoma. Proc. Oka. Acad. Sci. 79:7-12

Polkiva, K.M. 1999, The microhabitat distribution of the Arkansas River shiner, Notropis girardi: A habitat-mosaic approach. Environmental Biology of Fishes, July 1999, 55: 265-278.

Robinson, T. W. 1965. Introduction, spread, and areal extent of saltcedar in the western states. Professional Paper 491-A. Washington, D. C., U. S. Department of the Interior, Geological Survey. 11 pp.

Shafroth, P. B., J. Cleverly, T. L Dudley, J. Stuart, C. Van Riper, and E. P. Weeks. 2005. Saltcedar removal, water salvage and wildlife habitat restoration along rivers in the southwestern U. S. Environmental Management (in press).

USDA-NRCS, Salt Cedar Experience, Natural Resources Reporter Winter 2004

USFWS, 1998: Final Rule to List the Arkansas River Basin Population of the Arkansas River Shiner *(Notropis Girardi)* As Threatened (Federal Register/Vol. 63 No. 225/Monday November 23, 1998.

USFWS, 2001: Final Designation of Critical Habitat for the Arkansas River Basin Population of the Arkansas River Shiner (Federal Register /Vol 66, No. 65/ Wednesday, April 4, 2001.

USFWS, 2004: Proposed Designation of Critical Habitat for the Arkansas River Basin Population of the Arkansas River Shiner (Federal Register/ Vol 69, No 193/ Wednesday, October 6, 2004.

USGS (U.S. Geological Survey). Water Resources Data- New Mexico- Water Years 2002 and prior

USGS (U. S. Geological Survey). Water Resources Data – Texas – Water Years 2002 and prior

van Hylckama, T. E. A. 1980. Weather and evapotranspiration studies in a saltcedar thicket, Arizona. Professional Paper 491-F. Washington, D. C., U. S. Department of the Interior, Geological Survey. 78 pp.

Weeks, E. P., Weaver, H. T., Campbell, G. S., and Tanner, B. D. 1987. Water use by saltcedar and by replacement vegetation in the Pecos River floodplain between Acme and Artesia, New Mexico. Professional Paper 491-G. Washington, D. C., U. S. Department of the Interior, Geological Survey. 33 pp.

Appendix A: Literature Cited by USFWS in the above referenced 1998 Final Rule publication and the 2004 Draft Rule designating Critical Habitat.

References Cited-Arkansas River Shiner Final Rule (1998)

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. Am. Midl. Nat. 122(2) :228-235.

Brune, G. 1981. Springs of Texas volume 1. Branch-Smith, Inc. Fort Worth, TX

Bonner, T. H., G. R. Wilde, R. Jiminez, 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. Annual Rept. submitted to U.S. Fish and Wildlife Service by Texas Tech University. Lubbock, TX. n.p.

Carlander, K. D. 1969. Handbook of freshwater fishery biology-volume one, life history data on freshwater fishes of the United States and Canada, exclusive of the Perciformes. Iowa State Univ. Press. Ames, Iowa. 752 pp.

Cross, F. B. 1970. Occurrence of the Arkansas River shiner, *Notropis girardi* Hubbs and Ortenburger, in the Red River System. Southwest. Nat. 14(3):370.

Cross, F. B. 1967. Handbook of fishes of Kansas. Univ. Kans. Mus. Nat. Hist. Misc. Publ. No. 45. 357 pp.

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*, Trans. Kans. Acad. Sci. 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. Univ. Kans. Mus. Nat. Hist. Lawrence. 161 pp.

Cross, F. B., W. W. Dalquest, and L. Lewis. 1955. First records from Texas of *Hybopsis gracilis* and *Notropis girardi*, with comments on geographic variations of the latter. Texas J. Sci. 7(2):222-226.

Dugan, J. T. and J. B. Sharpe. 1996. Water-level changes in the High Plains Aquifer-predevelopment to 1994. Water-Resources Investigations Report 95-- 4208. U.S. Geological Survey. Lincoln, Nebraska.

Feley, J. D., and E.G. Cothran. 1981. *Notropis bairdi* (Cyprinidae) in the Cimarron River, Oklahoma. Southwest. Nat. 25:654.

Gilbert, C. R. 1980. *Notropis girardi* Hubbs and Ortenburger Artkansas River shiner. P. 268 *In*:D.S. Lee *et al.* Atlas of North American freshwater fishes. N. Carolina Biol. Surv. Publ. No. 1980-12. N. Carolina State Mus. Nat. Hist., Raleigh. 854 pp.

Hubbs, C. L. and A. I. Ortenburger. 1929. Further notes on the fishes of Oklahoma with descriptions of new species of Cyprinidiae. Publ. Univ. Okla. Biological Surv. 1(2):17-43.

Johnson, H. L. and C. E. Duchon. 1995. Atlas of Oklahoma Climate. Univ. of Okla. Press, Norman. 32 pp.

Kansas Water Office and Division of Water Resources. 1992. 1992 Kansas Irrigation Water Use. Topeka. 115 pp.

Kauffman, J. B. and W. C. Krueger. 1984. Livestock impacts on riparian ecosystems and streamside management implications...a review. J. Range Manage. 37(5): 430-438.

Kromm, D. E. and S. E. White. 1992. Groundwater problems. Pp. 44-63 *in* D.E. Kromm and S.E. White, eds. Groundwater exploitation in the High Plains. Univ. Kansas Press. Lawrence. 240 pp.

Larson, R. D., A. A. Echelle and A. V. Zale. 1990. Life history and distribution of the Arkansas River shiner in Oklahoma. Job no. 1: Status of threatened and endangered fishes in Oklahoma June 1, 1989 through May 31, 1990. Annual Performance Rept., Federal Aid Proj. No. E-8-l. Okla. Dept. Wildl. Cons., Oklahoma City. 15 pp

Larson, R. D., A. A. Echelle and A. V. Zale. 1991. Life history and distribution of the Arkansas River shiner in Oklahoma. Job No. 1: Status of threatened and endangered fishes in Oklahoma June 1, 1989 through August 31, 1991. Final Rept., Federal Aid Proj. No. E-8. Okla. Dept. Wildl. Cons., Oklahoma City. 94 pp..

Lewis, L. D. and W. W. Dalquest. 1955. Basic survey of and inventory of species of fishes present in, and their distribution in the Canadian River in Texas, including the following counties Hartley, Oldham, Potter, Moore, Carson, Hutchinson, Roberts, Hemphill and Lipscomb. Inland Fisheries Job Compl. Rept., Proj. No. F-7-R-2, Jobs A-1 and B-5. Texas Game and Fish Commission, Division of Inland Fisheries. Austin, TX. 16 pp.

Luckey, R. R. and M. F. Becker. 1998. Estimated predevelopment discharge to streams from the High Plains Aquifer in Northwestern Oklahoma, Southwestern Kansas, and Northwestern Texas. U.S.G.S. Water-Resources Investigations Rept. 97--4287. U.S. Dept. of Int., U.S. Geological Survey, Oklahoma City, OK. 28 pp.

Luttrell, G. R., D. M. Underwood, W. L. Fisher, and J. Pigg. 1995. Distribution of the Red River shiner, (*Notropis bairdi*), in the Arkansas River Drainage. Proc. Okla. Acad. Sciences 75:61-62.

Luttrell, G. R., A. A. Echelle and A.V. Zale. 1993. Status of threatened and endangered fishes in Oklahoma, Study 3 - Status of the speckled chub in the Arkansas River Basin, September 1, 1991 - March 31, 1993. Final Rept., Federal Aid Proj. No. E-8. Okla. Dept. Wildl. Cons. , Oklahoma City. 37 pp.

Marshall, C. I. 1978. The distribution of *Notropis bairdi* along the Cimarron River in Logan County, Oklahoma. Proc. Okla. Acad. Sci. 58:109.

Matthews, W .J. 1998. Patterns in freshwater fish ecology. Chapman and Hall, International Thomson Publishing. New York. 756 pp.

Matthews, W. J. and F. Gelwick. 1990. Fishes of Crutcho Creek and the North Canadian River in central Oklahoma: effects of urbanization. Southwest. Nat. 35(4):403-410.

Miller, R. J., and H. W. Robinson. 1973. The fishes of Oklahoma. Okla. State Univ. Press, Stillwater. 246 pp.

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

Nielsen, L. A. and D. L. Johnson, eds.1983. Fisheries techniques. Amer. Fish. Soc., Bethesda, MD 468 pp.

Oklahoma Water Resources Board. 1997. Update of the Oklahoma comprehensive water plan 1995. Okla. Water Res. Board Publ. 139. Oklahoma City, OK. 148 pp.

Oklahoma Water Resources Board. 1990. Oklahoma water atlas. Okla. Water Res. Board Publ. 139. Oklahoma City, OK. 360 pp.

Oklahoma Water Resources Board. 1980. Oklahoma comprehensive water plan. Okla. Water Res. Board Publ. 94. Oklahoma City, OK. 248 pp.

Opie, J. 1993. Ogallala water for a dry land. Univ. Of Nebraska Press. Lincoln. 412 pp.

Peckham, D. S. and J .B. Ashworth. 1993. The High Plains aquifer system of Texas, 1980 to 1990 overview and projections. Texas Water Development Board. Austin, TX. 34 pp.

Peterson, G. L. 1986. Annual report Commercial Fisheries Research and Development Act - January 1, 1986 through December 31, 1986. NMFS Proj. 2-410-R-3, Oklahoma Commercial Fishery Statistics. Okla. Dept. Wildl. Cons., Oklahoma City. 11 pp.

Peterson, G. and H. Weeks. 1983. Final report Commercial Fisheries Research and Development Act-January 1, 1983 through December 31, 1983. NMFS Proj. 2-396-R-1. Oklahoma Commercial Fishery Statistics II. Okla. Dept. Wildl. Cons., Oklahoma City. n.p.

Pigg, J. 1991. Decreasing distribution and current status of the Arkansas River shiner, *Notropis girardi*, in the rivers of Oklahoma and Kansas, Proc. Okla. Acad. Sci. 71:5-15.

Pigg, J. 1989. The current status of the Arkansas River shiner, *Notropis girardi* in the Arkansas River Drainage of Oklahoma. Draft Rept. Okla. Dept. Of Health, State Water Quality Laboratory, Oklahoma City. n.p.

Pigg, J., M. Coleman., and R. Gibbs. 1997a. Temporal and spatial distribution of cyprinid fishes between 1921 and 1995 in the North Canadian River Drainage, Oklahoma. Proc. Okla. Acad. Sci. 77:43-92.

Pigg, J., M. S. Coleman, and J. Duncan. 1992. An ecological investigation of the ichthyofauna of the North Canadian River in Oklahoma: 1976-1989. Proc. Okla. Acad. Sci. 72:21-32

Pigg, J., R. Gibbs, and G. Cottam. 1997b. A record for the Red River pupfish, *Cyprinodon rubrofluviatilis* (Fowler), from the Salt Fork of the Arkansas River in Oklahoma. Proc. Okla. Acad Sci. 77:122

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:* August 1, 1994 - August 7, 1997. Final Rept., Federal Aid Proj. No. E-33. Okla.Dept. Wildl. Cons., Oklahoma City. 13 pp.

Robison, H. W. and T. M. Buchanan. 1988. Fishes of Arkansas. Univ. of Ark, Press, Fayetteville, AR. 536 pp.

Schreck, C. B. and P. B. Moyle, eds. 1990. Methods for fish biology. Amer. Fish. Soc., Bethesda, MD 684 pp.

Simpson, P. W., J. R. Newman, M. A. Keirn, R. M. Matter, and P .A. Guthrie. 1982. Manual of stream channelization impacts on fish and wildlife. FWS/OBS-82/24. Office of Biological Services

Fish and Wildlife Serv. Washington, DC 155 pp.

Stinnett, D. P., R. W. Smith, and S. W. Conrady. 1988. Riparian areas of western Oklahoma: a case study of the Canadian River. Pp. 22-29 *In*: P. J. Stuber, Coord., Proceedings of the national symposium on protection of wetlands from agricultural impacts-a compilation of papers and discussion presented at Colorado State University, Fort Collins, Colorado, April 25-29, 1988. U.S. Fish and Wildlife Service Biol. Rept. 88(16), Washington, DC. 221 pp.

Stoner, J. D. 1985. Reported withdrawals and estimated use of water in Oklahoma during 1982. U.S. Geol. Surv. Water-Resources Invest. Rept. 85-4084, Geological Survey, Oklahoma City. 96 pp.

Sublette, J. E., M. D. Hatch, and M. Sublette. 1990. The fishes of New Mexico. Univ. New Mexico Press. Albuquerque, NM. 393 pp.

Texas Department of Water Resources. 1984. Water for Texas-technical appendix, volume 2. Tex. Dept. Water Res. Austin, TX

Texas State Board of Water Engineers. 1938a. Oldham County, Texas records of wells and springs driller's logs, water analysis and map showing location of wells and springs. WPA Project 6017-5674. State Board of Water Engineers, U.S.Geological Survey, and Univ. Texas Bureau of Industrial Chemistry. Austin. 50 pp.

Texas State Board of Water Engineers. 1938b. Potter County, Texas records of wells, springs, and representative earthen tanks, driller's logs, water analysis and map showing location of wells. WPA Ground-water Survey Project 5674. State Board of Water Engineers, Univ. Texas Bureau of Industrial Chemistry, and U.S. Geological Survey. Austin. 52 pp.

Texas Water Development Board. 1990. Water for Texas today and tomorrow-1990. TWDB Doc No. GP-5-1 (Pp 3-20,21), Tex. Water Dev. Board. Austin.

U.S. Bureau of Reclamation. 1997. Draft environmental assessment incorporation of ground water facilities into the Canadian River Project, Texas. Prepared by Lee Wilson and Assoc. for the Great Plains Region, Oklahoma -Texas Area Office. Austin, TX 59 pp.

U.S. Bureau of Reclamation. 1995. Final supplemental environmental assessment Lake Meredith Salinity Control Project Texas-New Mexico. Great Plains Region, Oklahoma-Texas Area Office. Oklahoma City, OK. 57 pp.

U.S. Bureau of Reclamtion. 1993. Eastern New Mexico Water Supply special environmental report-final. Great Plains Region, Albuquerque Area Office, Albuquerque, NM. 71 pp. w/appendices.

U.S. Bureau of Reclamation. 1991. Northwest Oklahoma Water Supply Study, special report. Great Plains Region, Oklahoma-Texas Area Office. Oklahoma City, OK. 71 pp.

U.S. Congress, Office of Technology Assessment. 1993. Harmful non-indigenous species in the United States. OTA-F-565. U.S. Gov. Print. Off. Washington, DC. 391 pp.

U.S. Environmental Protection Agency, 1998. The quality of our Nation's water: 1996. EPA-S-97-001. EPA Office of Water, Washington, DC. 197 pp.

U.S. Environmental Protection Agency. 1994. The quality of our Nation's water:1992. EPA-S-94-002. EPA Office of Water, Washington, DC.

U.S. Fish and Wildlife Service. 1990. Status report on Arkansas River shiner (*Notropis girardi*). Kansas Field Office, Region 6, Manhattan, KS. 19 pp.

U.S. Geological Survey. 1963. Surface water records of Texas. U.S. Dept. Int., Geological Survey Austin, TX. 421 pp.

U.S. Geological Survey. 1961. Surface water records of New Mexico. U.S. Dept. Int., Geological Survey. Santa Fe, NM. 211 pp.

Wallace, C. R. 1997. Annual report Oklahoma commercial fishery statistics - January 1, 1997 through December 31, 1997. Federal Aid Proj. Rept. Okla. Dept. Wildl. Cons., Oklahoma City. 13 pp.

Williams, G. P. and M. G. Wolman. 1984. Downstream effects of dams on alluvial rivers. Geological Survey Professional Paper 1286. U.S. Dept. Interior, Washington, DC. 81 pp.

REFERENCES CITED
Arkansas River Shiner Proposed Rule--Critical Habitat 2004

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. Am. Midl. Nat. 122(2) :228-235.

Brinson, M. M., B. L. Swift, R. C. Plantico, and J. S. Barclay. 1981. Riparian ecosystems: their ecology and status. FWS/OBS-81/17. Office of Biol. Serv., USDOI, Fish and Wildlife Service. Kearneysville, WV. 155 pp.

Bonner, T. H., G. R. Wilde, R. Jiminez, 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. Annual Rept. submitted to U.S. Fish and Wildlife Service by Texas Tech University. Lubbock, TX. n.p.

Bonner, T. H. and G. R. Wilde. 2000. Changes in the Canadian River fish assemblage associated with reservoir construction. J. Fresh. Ecol. 15(2):189-198

Castelle, A. J., A. W. Johnston, and C. Connolly. 1994. Wetland and stream buffer size requirements--A review. J. Environ. Qual. 23:878-882.

Cross, F. B. 1967. Handbook of fishes of Kansas. Univ. Kans. Mus. Nat. Hist. Misc. Publ. No. 357 pp.

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*, Trans. Kans. Acad. Sci. 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. Univ. Kans. Mus. Nat. Hist. Lawrence. 161 pp.

Federal Interagency Stream Restoration Working Group. 1998. Stream corridor restoration: principles, processes, and practices. 87 pp.

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

Gilbert, C. R. 1980. *Notropis girardi* Hubbs and Ortenburger Artkansas River shiner. P. 268 *in* D.S. Lee *et al.* Atlas of North American freshwater fishes. N. Carolina Biol. Surv. Publ. No. 1980-12. N. Carolina State Mus. Nat. Hist., Raleigh. 854 pp.

Hubbs, C. L. and A. I. Ortenburger. 1929. Further notes on the fishes of Oklahoma with descriptions of new species of Cyprinidiae. Publ. Univ. Okla. Biological Surv. 1(2):17-43.

Jimenez, R., Jr. 1999. The food habits of the Arkansas River shiner and the speckled chub. Unpul. M.S. Thesis, Texas Tech University. Lubbock, TX. 95 pp.

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

Lande, R. 1999. Extinction risks from anthropogenic, ecological, and genetic factors. Pp. 1-22 *in* L. F. Landweber and A. P. Dobson, eds. Genetics and the extinction of species. Princeton University Press, Princeton, NJ. 189 pp.

Larson, R. D., A. A. Echelle and A. V. Zale. 1990. Life history and distribution of the Arkansas River shiner in Oklahoma. Job no. 1: Status of threatened and endangered fishes in Oklahoma June 1, 1989 through May 31, 1990. Annual Performance Rept., Federal Aid Proj. No. E-8-l. Okla. Dept. Wildl. Cons., Oklahoma City. 15 pp

Larson, R. D., A. A. Echelle and A. V. Zale. 1991. Life history and distribution of the Arkansas River shiner in Oklahoma. Job No. 1: Status of threatened and endangered fishes in Oklahoma June 1, 1989 through August 31, 1991. Final Rept., Federal Aid Proj. No. E-8. Okla. Dept. Wildl. Cons., Oklahoma City. 94 pp.

Leopold, L. B., M. G. Wolman and J. P. Miller. 1992. Fluvial processes in geomorphology. Dover Publ., Inc. New York, NY. 522 pp.

Lynch, J. A., E. S. Corbett, and K. Mussallem. 1985. Best management practices for controlling nonpoint-source pollution on forested watersheds. J. Soil Water Conserv. 40:164-167.

Marshall, C. I. 1978. The distribiution of *Notropis bairdi* along the Cimarron River in Logan County, Oklahoma. Proc. Okla. Acad. Sci. 58:109.

Matthews, W .J. 1987. Physicochemical tolerance and selectivity of stream fishes as related to their geographic ranges and local distributions. Pp. 111-120 *in* W.J. Matthews and C.C. Heins, eds. Community and Evolutionary Ecology of North American Stream Fishes. Univ. Okla. Press. Norman, OK. 299 pp.

Miller, R. J., and H. W. Robinson. 1973. The fishes of Oklahoma. Okla. State Univ. Press, Stillwater. 246 pp.

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

Moring, J. R., G. C. Garmon and D. M. Mullen. 1993. Effects of logging practices on fishes in streams and techniques for protection: a review of four studies in the United States. Pp.

194-207 *in* I.G. Cowx, ed. Rehabilitation of Freshwater Fisheries. Fishing News Books. Oxford, UK. 496 pp.

Natural Resources Conservation Service. 1998. Conservation practice standard--guidelines for development of riparian buffers. 9 pp.

Pigg, J. 1991. Decreasing distribution and current status of the Arkansas River shiner, *Notropis girardi*, in the rivers of Oklahoma and Kansas. Proc. Okla. Acad. Sci. 71:5-15.

Pigg, J. 1989. The current status of the Arkansas River shiner, *Notropis girardi* in the Arkansas River Drainage of Oklahoma. Draft Rept. Okla. Dept. Of Health, State Water Quality Laboratory, Oklahoma City. n.p.

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

Patlis, J. M. 2001. Paying tribute to Joseph Heller with the Endangered Species Act: When critical habitat isn't. Stanford Environmental Law Journal 20:133-217.

Polivka, K. M. and W. J. Matthews. 1997. Habitat requirements of the Arkansas River shiner, *Notropis girardi:* August 1, 1994 - August 7, 1997. Final Rept., Federal Aid Proj. No. E-33. Okla.Dept. Wildl. Cons., Oklahoma City. 13 pp.

Robison, H. W. and T. M. Buchanan. 1988. Fishes of Arkansas. Univ. of Ark, Press, Fayetteville, AR. 536 pp.

Rosgen, D. 1996. Applied River Morphology. Printed Media Co., Minneapolis, MN

Sidle, J. G. 1987. Critical habitat designation: Is it prudent?. Environmental Manage. 11(4):429-437.

U.S. Army, Corps of Engineers. 1999. Stream management--concepts and methods in stream protection and restoration. Working Document

U.S. Fish and Wildlife Service. 1990. Status report on Arkansas River shiner (*Notropis girardi*). Kansas Field Office, Region 6, Manhattan, KS. 19 pp.

U.S. Geological Survey. 2004. Water resources of the United States. http://water.usgs.gov/waterwatch/

Wilde, G. R. 2002. Distribution and habitat use of the Arkansas River shiner in the North Canadian River, Oklahoma. Final report submitted to the U.S. Army Corps of Engineers, Tulsa District. 23 pp.

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. Unpubl. Rept. Prep. For U.S. Fish and Wildlife Service. Texas Tech Univ. Lubbock, TX. 270 pp.

Appendix B. Conservation programs for landowners. Program descriptions were adopted from agency websites, website links are provided below.

Conservation Partnership Initiative (CPI) -- NRCS
The Conservation Partnership Initiative is a voluntary program established to foster conservation partnerships that focus technical and financial resources on conservation priorities in watersheds of special significance. Under CPI, funds are awarded to State and local governments and agencies that have a history of working with agricultural producers. The CPI is a component of the Conservation Technical Assistance (CTS) program and is administered by the NRCS.

Conservation of Private Grazing Land (CPGL) -- NRCS
When available, the non-cost-sharing CPGL initiative will ensure that technical, educational, and related assistance is provided to those who own private grazing lands. This assistance will offer opportunities for better grazing land management, protecting soil from erosive wind and water, using more energy-efficient ways of producing food and fiber, conserving water, providing habitat for wildlife, sustaining forage and grazing plants, using plants to sequester greenhouse gasses and increase soil organic matter, and using grazing lands as a source of biomass. This program was authorized by the 1996 Farm Bill but has not yet been funded.

Conservation Reserve Program (CRP) - FSA / NRCS
The Conservation Reserve Program (CRP) provides technical and financial assistance to eligible farmers and ranchers to address soil, water, and related natural resource concerns on their lands in an environmentally beneficial and cost-effective manner. The voluntary program provides assistance to farmers and ranchers in complying with Federal, State, and tribal environmental laws, and encourages environmental enhancement.

The Conservation Reserve Program reduces soil erosion, protects the Nation's ability to produce food and fiber, reduces sedimentation in streams and lakes, improves water quality, establishes wildlife habitat, and enhances forest and wetland resources. It encourages farmers to convert highly erodible cropland or other environmentally sensitive acreage to vegetative cover, such as tame or native grasses, wildlife plantings, trees, filter strips, or riparian buffers. Farmers receive an annual rental payment for the term of the multi-year contract. Cost sharing is provided to establish the vegetative cover practices.

Under a segment of the CRP known as Continuous Sign-up, environmentally sensitive land devoted to certain conservation practices may be enrolled at any time. This cost-sharing variation of the CRP has been used to support the establishment of riparian buffers, including the treatment of invasive plants such as saltcedar and the establishment of buffer strips along streams where native vegetation needs to be re-established by protection from grazing. Federal cost sharing, plus contribution of the local cost share by supporting agencies such as CRMWA or the State of New Mexico, has enabled landowners to obtain treatment of saltcedar at little or no cost.

Conservation Reserve Enhancement Program (CREP) – NRCS/FSA

The CREP is a voluntary land retirement program that helps agricultural producers protect environmentally sensitive land, decrease erosion, restore wildlife habitat, and safeguard ground and surface water. The program is a partnership among producers, state and federal governments, and sometimes, private groups. CREP provides payments to participants who offer eligible land in the form of an annual rental rate plus a maintenance incentive payment and cost share of up to 50% of the eligible costs to install the practice. A sign-up incentive is generally included. Non-federal entities provide the balance of the funds as well as technical support and in-kind services.
CREP is administered by the Farm Service Agency.

Wetland Reserve Program (WRP) - NRCS
The Wetlands Reserve Program is a voluntary easement program offering landowners the opportunity to protect, restore, and enhance wetlands on their property. The USDA Natural Resources Conservation Service (NRCS) provides technical and financial support to help landowners with their wetland restoration efforts. The NRCS goal is to achieve the greatest wetland functions and values, along with optimum wildlife habitat, on every acre enrolled in the program. This program offers landowners an opportunity to establish long-term conservation and wildlife practices and protection.

Environmental Quality Incentives Program (EQIP) - NRCS
The Environmental Quality Incentives Program (EQIP) was reauthorized in the Farm Security and Rural Investment Act of 2002 (Farm Bill) to provide a voluntary conservation program for farmers and ranchers that promotes agricultural production and environmental quality as compatible national goals. EQIP offers financial and technical help to assist eligible participants to install or implement structural and management practices on eligible agricultural land.

EQIP offers contracts with a minimum term that ends one year after the implementation of the last scheduled practices and a maximum term of ten years. These contracts provide incentive payments and cost-shares to implement conservation practices. Persons who are engaged in livestock or agricultural production on eligible land may participate in the EQIP program. EQIP may cost-share up to 75 percent of the costs of certain conservation practices. Incentive payments may be provided for up to three years to encourage producers to carry out management practices they may not otherwise use without the incentive. However, limited resource producers and beginning farmers and ranchers may be eligible for cost-shares up to 90 percent.

Soil and Water Conservation Assistance – NRCS
SWCA provides cost-share and incentive payments to farmers and ranchers to voluntarily address threats to soil, water, and related natural resources, including grazing land, wetlands, and wildlife habitat. SWCA will help landowners comply with Federal and state environmental laws and make beneficial, cost-effective changes to cropping systems, grazing management, and irrigation.

Wildlife Habitat Incentive Program (WHIP) - NRCS

The Wildlife Habitat Incentives Program (WHIP) is a voluntary program for people who want to develop and improve wildlife habitat primarily on private land. Through WHIP, USDA's Natural Resources Conservation Service provides both technical assistance and up to 75 percent cost-share assistance to establish and improve fish and wildlife habitat. WHIP agreements between NRCS and the participant generally last from 5 to 10 years from the date the agreement is signed. WHIP has proven to be a highly effective and widely accepted program across the country. By targeting wildlife habitat projects on all lands and aquatic areas, WHIP provides assistance to conservation minded landowners that are unable to meet the specific eligibility requirements of other USDA conservation programs.

Small Watershed Program - NRCS
The Small Watershed Program, including River Basin operations, works through local government sponsors and helps participants solve natural resource and related economic problems on a watershed basis. Projects include watershed protection, flood prevention, erosion and sediment control, water supply, water quality, fish and wildlife habitat enhancement, wetlands creation and restoration, and public recreation in watersheds of 250,000 or fewer acres. Both technical and financial assistance are available.

Conservation Security Program (CSP) - NRCS
The Conservation Security Program (CSP) is a voluntary program that provides financial and technical assistance for the conservation, protection, and improvement of soil, water, air, energy, plant and animal life, and other conservation purposes on Tribal and private lands. The program provides payment for producers who practice good stewardship on their agricultural lands and incentives for those who want to do more. CSP assistance was authorized in the Farm Security and Rural Investment Act of 2002 (Farm Bill) and the program is available for selected watersheds.

Grassland Reserve Program (GRP) - NRCS
The Grassland Reserve Program is a new voluntary program in which landowners receive financial incentives to restore and protect grasslands. Eligible land includes restored, improved, or natural grassland, rangeland, pastureland and prairie. Practice cost share will be up to 75% on restored grasslands, 90% on virgin grasslands (prairies).

Partners for Fish and Wildlife - USFWS
The Partners for Fish and Wildlife program is a cooperative effort between the Fish and Wildlife Service, private landowner, and other interested entities to restore and improve degraded or marginal habitat. The Partners program improves fish and wildlife habitat on private land, contributes to the land's health and rural quality of life, restores habitat through voluntary partnerships with private landowners, emphasizes landowner choice and control, and offers advice and funding for habitat projects on private lands.

Safe Harbor Agreements - USFWS
Safe Harbor Agreements are voluntary arrangements between the USFWS and cooperating non-Federal landowners. The agreements benefit endangered and threatened species while giving the landowners assurances from additional restrictions. Following development of an agreement, the USFWS will issue an "enhancement of survival" permit, to authorize any necessary future incidental take to provide participating landowners with assurances that no additional restrictions will be imposed as a result of their conservation actions.

Habitat Conservation Plan (HCP) - USFWS
Habitat Conservation Plans (HCPs) are an agreement between the USFWS and non-Federal entities designed to protect a species while allowing development. An HCP allows the U.S. Fish and Wildlife Service to permit the take of endangered or threatened species incidental to otherwise lawful activities, when the taking is mitigated by conservation measures. This process should reduce conflicts between listed species and private development and provide a framework that would encourage "creative partnerships" between the private sector and local, state and federal agencies in the interest of endangered and threatened species and habitat conservation.

Texas Brush Control Program

In 1985, Senate Bill 1083, Acts of the 69th Legislature, Regular Session created the Texas Brush Control Program to enhance the State's water resources through selective control of brush species. This statute was codified in Chapter 203 of the Agricultural Code (PDF). The Texas State Soil and Water Conservation Board (TSSWCB) the agency responsible for administering the program , which includes a cost share program for brush control. The cost share rate is limited to 80% of the total cost of a practice, and application is limited to critical areas designated by the TSSWCB and to methods of brush control approved by the TSSWCB.

Water Quality Management Plan Program

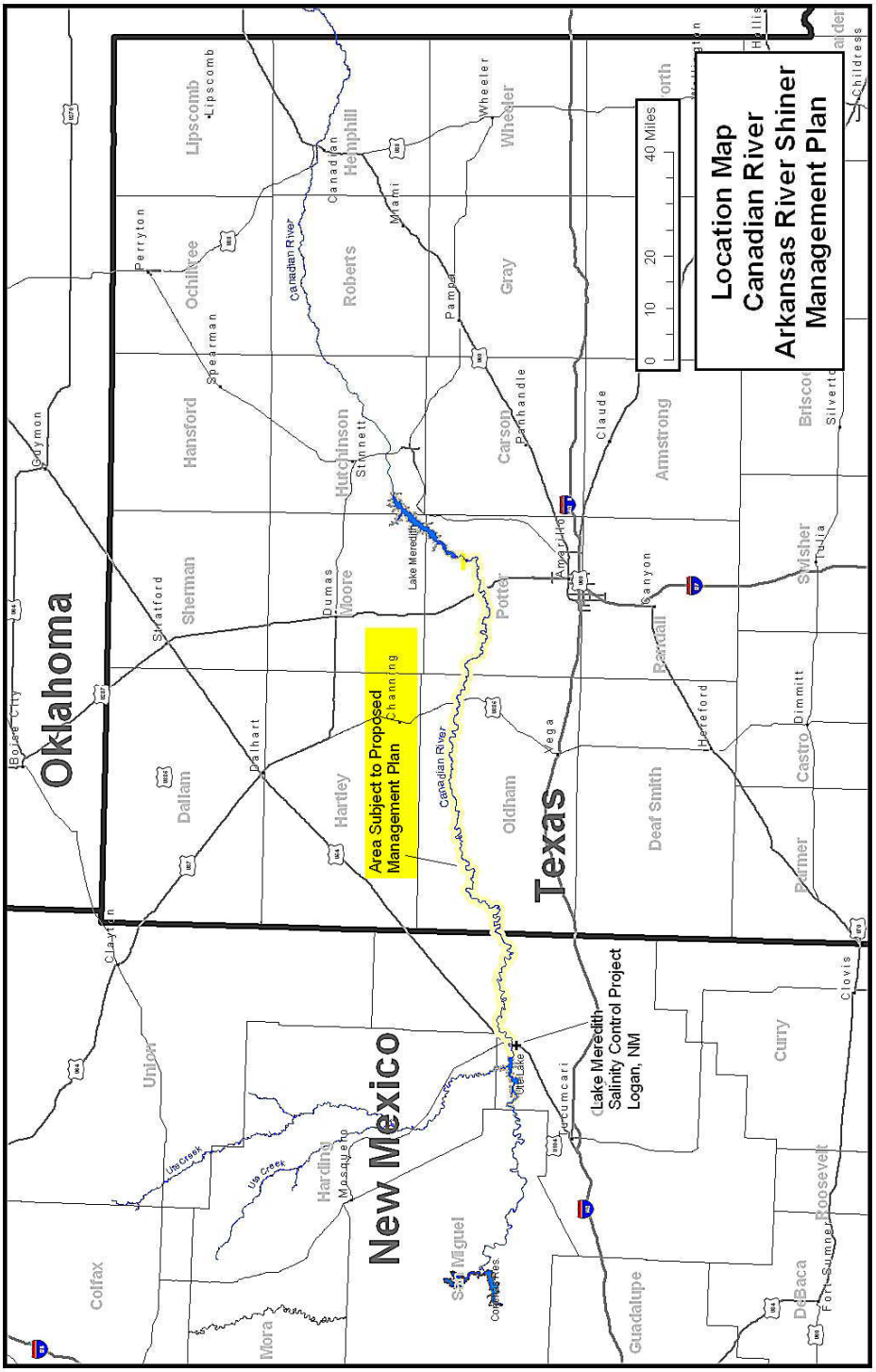
A water quality management plan (WQMP) is a site-specific plan developed through and approved by soil and water conservation districts for agricultural or silvicultural lands. The plan includes appropriate land treatment practices, production practices, management measures, technologies or combinations thereof. The purpose of WQMPs is to achieve a level of pollution prevention or abatement determined by the TSSWCB, in consultation with local soil and water conservation districts, to be consistent with state water quality standards.

Clean Water Act §319 Program

In compliance with Section 319(h) of the Clean Water Act, the United States Environmental Protection Agency (EPA) provides funding to the Texas State Soil and Water Conservation Board (TSSWCB) to implement activities that result in progress in achieving Congress' goal of controlling and abating nonpoint source (NPS) pollution. NPS pollution originates from different sources that cannot be traced to any single point,

such as a pipe. It is normally associated with agricultural and silvicultural runoff, urban stormwater and runoff from construction sites.

Sources:
http://www.nrcs.usda.gov/
http://partners.fws.gov/
http://grants:fws.gov
http://endangered.fws.gov/
http://www.tsswcb.state.tx.us/programs/319.html


Location Map
Canadian River
Arkansas River Shiner
Management Plan
0 10 20 40 Miles
Oklahoma
Texas
New Mexico
Area Subject to Proposed
Management Plan
Lake Meredith
Salinity Control Project
Logan, NM
Canadian River
Ute Creek
Ute Creek
Ute Lake
Lipscomb
Ochiltree
Hansford
Hutchinson
Roberts
Hemphill
Wheeler
Gray
Carson
Armstrong
Briscoe
Sherman
Hartley
Oldham
Deaf Smith
Randall
Swisher
Castro
Parmer
Dallam
Moore
Potter
Curry
Roosevelt
Union
Harding
Mora
San Miguel
Guadalupe
DeBaca
Clovis
Quay
Tucumcari
Perryton
Miami
Pampa
Claude
Amarillo
Canyon
Hereford
Dimmitt
Dalhart
Stratford
Clayton
Logan
Conchas Res

Memorandum of Agreement

**Special Interest on Restoration and Conservation of Habitat
In and Along the Canadian River From
U. S. Highway 54 at Logan, New Mexico to the
Headwaters of Lake Meredith, Texas**

The coalition of conservation and other organizations, local government agencies, state agencies, and federal agencies listed below collectively, ("the Parties") hereby enter into this Memorandum of Agreement ("MOA") to restore and conserve habitat in and along the Canadian River from U.S Highway 54 at Logan, New Mexico to the headwaters of Lake Meredith, Texas ("River"), as follows.

IT IS AGREED THAT:

1. The Parties recognize this reach of the River as an area of special interest.

2. The Parties accept the Canadian River Municipal Water Authority Management Plan ("Plan") as an assessment of the Arkansas River Shiner and its habitat that relies on the best available science, and further accept the measures stated in the Plan as the measures believed to be adequate to address the threats to the Arkansas River Shiner habitat on the reach of the River from U.S Highway 54 at Logan, New Mexico to the headwaters of Lake Meredith, Texas.

3. The Parties recognize the complex nature of ecological initiatives regarding habitat conservation and accept an adaptive management strategy based on the best available scientific information to assist in successful protection and recovery of the Arkansas River Shiner.

4. The Parties, to the extent that authorities and resources allow, will work together to implement the Plan, and execute the tasks as enumerated in the Plan.

5. This MOA incorporates the Plan as attached in its entirety by reference.

6. The Parties shall form an "Executive Committee" as follows:

    a. Each Party will provide a single representative and an alternate for the Executive Committee.

    b. The Canadian River Water Management Authority will provide initial leadership of the Executive Committee.

    c. The Parties will work together to identify factors that are, or may in the future, degrade River habitat.
    d. The Executive Committee will meet at least annually to plan and review the Plan's objectives, to initiate work needed to implement the Plan and adaptive management strategy, and to inform the public and the Canadian River Commission of their actions pursuant to the Plan.

    e. The Executive Committee will coordinate activities; find funding for projects, and leverage existing funds in furtherance of the Plan.

7. This MOA shall be effective upon execution by the participating Parties.

[Signatures and approvals on following page.]

Signed By:

Kent Satterwhite Date: August 9, 2005
Canadian River Water Municipal Water Authority

Date: 8/10/05
Estevan Lopez, Director
New Mexico Interstate Stream Commission

Date: August 11, 2005
Robert Cook, Executive Director
Texas Parks and Wildlife Department

Larry D Butler Date: August 17, 2005
Larry Butler, State Conservationist
Natural Resources Conservation Service: Texas

Rosendo T Date: August 17, 2005
Rosendo Trevino, State Conservationist
Natural Resources Conservation Service: New Mexico

Date: 8/15/05
Karen Brown, Superintendent, Lake Meredith National Recreation Area
U.S. National Park Service

Marla K. Peck Date: August 23, 2005
Marla Peck, Oklahoma Farm Bureau
Coordinator, Arkansas River Shiner Coalition

Date: 8/16/05
Scott Salter, President
Texas Off Roaders Association

for Tommy A Bell Date: August 18, 2005
H. Dale Hall, Regional Director, Southwest Region
U.S. Fish and Wildlife Service

Note: Signatures on this sheet were copied from the original signed documents which are on file at Canadian River Municipal Water Authority.

ARKANSAS RIVER SHINER MANAGEMENT PLAN
For The Canadian River
From U. S. Highway 54 At Logan , New Mexico
To Lake Meredith, Texas

Supporting Documents

CRMWA Resolution
Letters from Agencies

RES. 2005-04--10

RESOLUTION
OF THE BOARD OF DIRECTORS
CANADIAN RIVER MUNICIPAL WATER AUTHORITY

WHEREAS, the United States Fish and Wildlife Service (Service) has heretofore designated the Arkansas River Shiner as a "threatened" species under the Endangered Species Act , and;

WHEREAS, the Service has published notice that it proposes to designate Critical Habitat for the Arkansas River Shiner, to include that portion of the Canadian River from the upper end of Lake Meredith to U. S. Highway 54 at Logan, New Mexico, and;

WHEREAS, a Management Plan for the Canadian River of Eastern New Mexico and the Western Texas Panhandle has been prepared which will provide support for the recovery of the Arkansas River Shiner while providing benefits to the water resources of the Canadian River and eliminating the need for designation of critical habitat and;

WHEREAS, the Management Plan has been coordinated with the Texas Parks and Wildlife Department (Department) as required by Texas law, and;

WHEREAS, the Board of Directors of Canadian River Municipal Water Authority wishes to express its intention to support the Management Plan and to execute those portions of the plan which indicate the need for action by CRMWA;

NOW, THEREFORE, BE IT RESOLVED BY THE BOARD OF DIRECTORS OF THE CANADIAN RIVER MUNICIPAL WATER AUTHORITY:

THAT the Arkansas River Shiner Management Plan for the Canadian River of Eastern New Mexico and the Western Texas Panhandle is hereby adopted as the policy and intention of the Canadian River Municipal Water Authority, subject to acceptance and approval of the Plan by the Service and the Department, and

THAT the General Manager is authorized to execute the Plan, upon approval by the Service and the Department, using funds provided for salt cedar control in the current Budget for General Operation and Maintenance, and to include amounts in future budgets for consideration of the Board to continue execution of the Plan.

PASSED, ADOPTED, AND MINUTES APPROVED ON MOTION OF DIRECTOR Sell, SECOND BY DIRECTOR Tucker AT PLAINVIEW, TEXAS THIS 20TH DAY OF APRIL, 2005.

Norman Wright
Norman Wright, President

Kent Satterwhite
Kent Satterwhite, Secretary

101
199

TEXAS PARKS & WILDLIFE

April 7, 2005

Mr. Kent Satterwhite, P.E.
General Manager
Canadian River Municipal Water Authority
P.O. Box 9
Sanford, TX 79078

Dear Mr. Satterwhite:

Texas Parks and Wildlife Department (TPWD) received your letter dated March 17, 2005 requesting TPWD input on the Management Plan and recommended Monitoring Plan for the Arkansas River shiner.

TPWD staff has reviewed the Arkansas River shiner (*Notropis girardi*) Management Plan for the Canadian River of Eastern New Mexico and the Western Texas Panhandle. The Plan sets out an aggressive and progressive approach for conservation of the Arkansas River shiner and methods for restoring stream flows to historically normal levels of base flow, while providing opportunity for moderate flood flows to occur periodically and mimic the natural hydrograph. If the plan is successful, TPWD concurs it can enhance and improve the existing habitat and provide conservation benefit to the Arkansas River shiner in this portion of its original habitat.

Upon approval of the Plan by the U.S. Fish and Wildlife Service (USFWS), TPWD staff may undertake monitoring of the species status in this segment of the Canadian River dependent on staff and equipment requirements. TPWD may opt to modify the proposed Monitoring Plan to better fit with our existing protocols. TPWD will coordinate development of the methodologies with the USFWS and will ultimately develop a protocol that will provide reliable data on the status of the Arkansas River shiner and the associated fish community.

TPWD appreciates the opportunity to provide comments to you on this issue and look forward to working with you and USFWS on the management and monitoring of this species. If you have any questions please contact Dr. Gary Garrett, Inland Fisheries Division research biologist, at (830) 866-3356.

Sincerely,

Robert L. Cook
Executive Director

RECEIVED
APR 11 2005

RLC:KB:GG:ne

4200 SMITH SCHOOL ROAD
AUSTIN, TEXAS 78744-3291
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Peter Pino, Commissioner
Zia Pueblo, NM

Leo Sims, Commissioner
Hobbs, NM

M. H. "Dutch" Salmon, Commissioner
Silver City, NM

11 July 2005

John Williams, Special Advisor
Canadian River Municipal Water Authority
Post Office Box 9
Sanford, Texas 79078

Dear Mr. Williams;

We appreciate you keeping us involved in development of the "Arkansas River Shiner (*Notropis girardi*) Management Plan for the Canadian River of Eastern New Mexico and the Western Texas Panhandle" drafted by your agency. As drafted, the Plan proposes to conserve the shiner primarily by working with private entities to control or eliminate nonnative riparian vegetation (mainly salt cedar, *Tamarix chinensis*) to increase river surface water and by discouraging ATV activities in the river channel that might degrade shiner habitat. As we pointed out in previous correspondence to you, these efforts should positively benefit habitat of the species, and hopefully the species itself. We also noted that conservation and recovery of Arkansas River shiner require more than habitat enhancements and improvements.

We support your efforts and the principals set forth in your Management Plan as positive steps to benefit the Arkansas River shiner. Ultimately, a plan that addresses all issues related to Arkansas River shiner recovery will need to be drafted and implemented. In anticipation of development of such a plan, the Department is sponsoring a systematic inventory of the fishes of the South Canadian River drainage in New Mexico. Information from this work will be made available to all entities participating in development of a comprehensive recovery plan for Arkansas River shiner. To the extent practical, we will further consider incorporating those efforts in a multiparty and multi-state memorandum of agreement to benefit this fish in advance of a more comprehensive conservation plan.

United States Department of Agriculture

NRCS
Natural Resources Conservation Service
101 South Main Street
Temple, Texas 76501-7602

July15, 2005 (same as 4/13/05 ltr) (except attachment)

Mr. Ken Satterwhite
Canadian River Municipal Water Authority
P.O. Box 9
Sanford, TX 79078

Dear Mr. Satterwhite:

We have reviewed your document entitled Arkansas River Shiner Management Plan for the Canadian River in Eastern New Mexico and the Western Texas Panhandle. Our agency is in complete agreement with the intent of your management plan and is against the designation of additional critical habitat for this species.

Hartley, Oldham, and Potter Counties are in a priority area under the 2002 Farm Bill Environmental Quality Incentives Program (EQIP) whose purpose is to enhance the riparian zones on the Canadian River and its tributaries by removing salt-cedar (*Tamarisk* spp.). In 2004 we contracted to spend $323,740.00 to remove salt-cedar on 2,094 acres. We believe that this practice will likewise enhance the habitat for the Arkansas River shiner. This program will continue as long as the local work group elevates this priority.

In the body of your document, please change the name of our agency from "USNRCS" (occurs several places) to "USDA-NRCS". The glossary definition should read "USDA - Natural Resources Conservation Service".

Thank you for the opportunity to comment. We welcome the opportunity to work with you on this or other natural resource issues in the Canadian River Watershed.

Sincerely,

Acting
LARRY D. BUTLER, Ph.D.
State Conservationist

Attachment

cc w/ attachment: Susan Baggett, SRC, Texas
Mickey Black, ASTC (FO), Lubbock Zone Office
Charles Coffman, Biologist, Lubbock Zone Office

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Received Jul-15-2005 13:48 From-2547429889 To-CRMWA Page 003

NEW MEXICO DEPARTMENT OF AGRICULTURE

Agricultural Programs and Resources Division
MSC APR
New Mexico State University
P.O. Box 30005
Las Cruces, NM 88003-8005
Phone: (505) 646-2642

April 5, 2005

Mr. Kent Satterwhite, P. E.
General Manager
Canadian River Municipal Water Authority
P. O. Box 9
Sanford, Texas 79078

Dear Mr. Satterwhite:

New Mexico Department of Agriculture (NMDA) has carefully reviewed the draft Management Plan for the Canadian River.

As you are aware, NMDA is the lead agency in phreatophyte control in New Mexico and already deeply involved in this and related processes. NMDA supports the draft plan and will cooperate in the planning effort as possible, given time and financial constraints. Please feel free to contact me or Bud Starnes in this matter, at 505-646-2642.

Sincerely,

Julie Maitland
Division Director

JM/ws

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SUSAN COMBS, COMMISSIONER

TEXAS DEPARTMENT
OF AGRICULTURE

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March 24, 2005

Mr. Ken Satterwhite
General Manager
Canadian River Municipal Water Authority
P.O. Box 9
Sanford, Texas 79078

Dear Mr. Satterwhite:

Thank you for sending a copy of your Arkansas River Shiner Management Plan for the Canadian River of Eastern New Mexico and the Western Texas Panhandle.

I agree that control of saltcedar is essential to the reclamation of both the Arkansas River Shiner habitat and stream flows necessary for agriculture and municipal use. Your plan is well prepared and documents the potential water enhancement by controlling this invasive plant.

Your forward thinking and proactive actions are to be commended. The Texas Department of Agriculture (TDA) supports your efforts to avoid a critical habitat designation while addressing the real issues of river flow and habitat restoration.

Thank you for providing TDA the opportunity to comment on your plan.

Sincerely,

Susan Combs
Commissioner

SC/MM

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April 5, 2005

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APR - 7 2005
Replied ✓

John Williams
Canadian River Municipal Water Authority
P.O. Box 9
Sanford, TX 79078

Dear Mr. Williams:

The Texas State Soil and Water Conservation Board (TSSWCB) would like to assert our support of the *Arkansas River Shiner Management Plan for the Canadian River of Eastern New Mexico and the Western Texas Panhandle*. The TSSWCB has been involved in treating saltcedar along the Pecos and Colorado Rivers by providing the required matching funds for federal EQIP funds through the Texas Brush Control Program. The TSSWCB has also initiated projects to treat saltcedar that is contributing to water quality impairments in the E.V. Spence Reservoir watershed using Clean Water Act §319(h) funds. Finally, through the TSSWCB Water Quality Management Plan (WQMP) Program, state cost-share is being provided to landowners to implement conservation practices in Oldham, Potter, Carson, Hutchinson, Moore, Hartley, and Dallam Counties through the local Soil and Water Conservation Districts.

The TSSWCB would be happy to be listed as a participant throughout the Management Plan and have attached our comments to this letter. The TSSWCB believes that implementation of the Management Plan will be of great benefit to this region and the State of Texas and is willing to assist in any way possible.

Thank you for allowing us to comment on and participate in the Management Plan. Don't hesitate to contact me if I can provide you any assistance.

Respectfully,

Rex Isom
Executive Director

Cc: Bob Gruner
Johnny Oswald
Aubrey Russell

Comments incorporated

101
199

Texas Department of Transportation

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April 6, 2005

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Mr. Kent Satterwhite, P.E.
Canadian River Municipal Water Authority
P.O. Box 9
Sanford, Texas 79078

Dear Mr. Satterwhite:

Thank you for soliciting input from the Texas Department of Transportation (TXDOT) regarding the Canadian River Municipal Water Authority's (CRMWA) proposed Management Plan for the Arkansas River Shiner (*Notropis girardi*). As part of TXDOT's obligations under the Endangered Species Act the Department consults with the U.S. Fish and Wildlife Service (USFWS) regarding TXDOT activities that may affect the Arkansas River Shiner or its critical habitat. TXDOT recently completed the formal section 7 consultation process on a project involving the US 385 crossing of the Canadian River. This project included saltcedar eradication within the project limits to improve Arkansas River Shiner habitat and the use of best management practices to minimize construction disturbance impacts to water quality.

TXDOT applauds the CRMWA's efforts to improve habitat for the Arkansas River Shiner. TXDOT will continue to consult with the USFWS as necessary on a project by project basis to avoid and minimize impacts to the Arkansas River Shiner and its habitat. Should you have any questions or need additional information please contact Cheryl Luther of the TXDOT Amarillo District at (806) 356-3249 or Charlotte Kucera of the Environmental Affairs Division at (512) 416-3035.

Sincerely,

M. W. Behrens

Michael W. Behrens, P.E.
Executive Director

cc: Dianna F. Noble, P.E., Director, Environmental Affairs Division, TxDOT
Charlotte Kucera, Environmental Affairs Division, TxDOT
Cheryl Luther, TxDOT, Amarillo District, TxDOT

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Web site: www.nm.nrcs.usda.gov

June 22, 2005

Mr. Norman Wright, President
Canadian River Municipal Water Authority
P.O. Box 9
Sanford, Texas 79078

RE: Memorandum of Agreement

Dear Mr. Wright:

We have received the *Arkansas River Shiner Management Plan for the Canadian River from U. S. Highway 54 at Logan, New Mexico to Lake Meredith, Texas* and your request for Natural Resources Conservation Service (NRCS) participation in a Memorandum of Agreement (MOA) to implement the plan. We again thank you for the opportunity to comment on the draft plan after it was developed. We respectfully decline to enter into the MOA. NRCS technical assistance and Farmbill programs will continue to be available, on a voluntary basis, for landowners along the affected reaches of the Canadian River depending on budgets and the availability of staff. Farmbill ranking procedures provide priority to conservation plans that contain provisions to address declining species, including the Arkansas River Shiner.

Sincerely,

ROSENDO TREVIÑO III
State Conservationist

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[Note - MOA was later executed by Trevino.]

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