PETITION TO LIST THE PRAIRIE CHUB (*Macrhybopsis australis*) UNDER THE U.S. ENDANGERED SPECIES ACT

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Petition Submitted to the U.S. Secretary of Interior
Acting through the U.S. Fish and Wildlife Service

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303-573-4898

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WILDEARTH GUARDIANS
A FORCE FOR NATURE

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I. Introduction

WildEarth Guardians hereby petitions the Secretary of the Interior and the U.S. Fish and Wildlife Service ("FWS" or "the Service") to issue a rule listing the prairie chub (*Macrhybopsis australis* Hubbs and Ortenburger 1929) as Threatened or Endangered under the Endangered Species Act, ("ESA") 16 U.S.C. § 1531 *et seq*. throughout its historic range and to designate critical habitat for the species. This petition is filed under 5 U.S.C. § 553(e), 16 U.S.C. § 1533(b)(3)(A) and 50 C.F.R. § 424.19 (1987), bestowing interested persons the right to petition for issuance of a rule.

M. australis is a freshwater fish endemic to streams in the upper Red River basin along the borders of Oklahoma and Texas (Hubbs et al. 2008). The species' range is within the Great Plains in the mid- or mixed-grass prairie ecoregion.

Prairie chubs are at risk to extinction by numerous threats to their waters including dams and other water impoundments, pollution, land use practices such as farming and domestic livestock grazing, invasive plant species such as tamarisk (*Tamarix spp.*) and Russian olive (*Elaeagnus angustifolia*) that are prolific along the banks of Red River basin streams, and climate change. *M. australis* is already extirpated from a significant portion of its range, including from the Washita River and North Fork of the Red River upstream from the Altus dam. The species is not protected by any state laws or regulations within its range in Oklahoma or Texas.

II. Endangered Species Act Implementing Regulations

Section 424 of the regulations implementing the Endangered Species Act (50 C.F.R. § 424) is applicable to this petition. Subsections that concern the formal listing of the prairie chub as an Endangered or Threatened species are:

> 424.02(e) "*Endangered species* means a species that is in danger of extinction throughout all or a significant portion of its range."…(k) "species" includes any species or subspecies that interbreeds when mature. *See also* 16 U.S.C § 1532(6).
>
> (m) "*Threatened species* means any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range." *See also* 16 U.S.C § 1532(20).

ESA Section 4 (16 U.S.C. § 1533(a)(1)) sets forth listing factors under which a species can qualify for ESA protection (see also 50 C.F.R. § 424.11(c)):

A. The 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. The inadequacy of existing regulatory mechanisms; and
E. Other natural or manmade factors affecting its continued existence.

At least three of the five factors listed above (A, D, and E) set forth in 50 C.F.R. § 424.11(c) and in ESA Section 4 (16 U.S.C. § 1533(a)(1)) have resulted in the continued decline of the prairie chub and are causing the species to face extinction or endangerment in the foreseeable future. A taxon needs to meet only one of the listing factors outlined in the ESA to qualify for federal listing.

III. Species Characteristics

A. Taxonomy

Macrhybopsis australis is known by its common names: prairie chub or Red River chub. Throughout the petition, we refer to this species as the *M. australis* or prairie chub. The prairie chub is a monotypic species with no known subspecies (Eisenhour 1999; Hubbs et al. 2008). It is in the *Cyprinidae family*, which includes minnows and carps. It is within the *Macrhybopsis aestivalis* complex (the speckled or blacktailed chub complex) (Underwood et al. 2003; ITIS 2009).

Until the late 1990s, researchers believed the complex of five distinct species to be one wide-ranging species: *M. aestivalis* (Eisenhour 1999; Underwood et al. 2003 Eisenhour 2004). Other species within the *M. aestivalis* complex include the speckled chub (*M. aestivalis*) that inhabits the Rio Grande basin; shoal chub (*M. hyostoma*) of the Arkansas and the Red River basins; the burrhead chub (*M. marconis*) of the San Antonio, Guadalupe, and Colorado River drainages; and peppered chub or Arkansas River speckled chub (*M. tetranema*) that inhabits the Arkansas River (Eisenhour 2004). The prairie chub is most closely related to *M. tetranema* and *M. hyostoma* (Eisenhour 1999; Underwood et al. 2003). Genetic analyses by Underwood et al. (2003) found *M. australis* and *M. tetranema* to be "sister species" and detected potential interbreeding by *M. australis* and *M. hyostoma*.

Table 1. Taxonomic Hierarchy for *M. australis* (ITIS 2009)

Kingdom	*Animalia*
Phylum	*Chordata*
Subphylum	*Vertebrata*
Superclass	*Osteichthyes*
Class	*Actinopterygii*
Subclass	*Neopterygii*
Infraclass	*Teleostei*
Superorder	*Ostariophysi*
Order	*Cypriniformes*
Superfamily	*Cyprinoidea*
Family	*Cyprinidae*
Genus	*Macrhybopsis*
Species	*Macrhybopsis australis* (Hubbs and Ortenburger, 1929)

B. General Description

Prairie chubs are pale to translucent in appearance. They generally are darker and grey in the dorsal region and lighter and white to silver in the ventral region. The fish is otherwise characterized by small black spots appearing across its dorsal regions to the tail. Female prairie chubs can reach a total length of 70.0 mm (2.8 in) and males 65.0 mm (2.6 in) (Eisenhour 2004). Miller and Robison (2004: 126-127) provide a more complete description of the species:

> The prairie chub is a streamlined, terete fish adapted for life on the bottom of flowing waters. Its body is fairly deep at the dorsal origin, tapering rapidly to a conical head and moderately slender caudal peduncle. Dorsal and anal fins are slightly falcate, usually with 7 anal rays. Pelvic fins are pointed; pectoral fins in males are long and falcate, reaching past pelvic bases. The mouth is inferior and horizontal with a bulbous snout overhanging it, and lips are greatly thickened posteriorly. This chub has two pairs of well-developed barbells, the anterior pair longer than orbit length and the posterior pair greater than 50 percent of orbit length. Pharyngeal teeth 4-4. Eyes are small and the head is conical with a relatively pointed snout. Lateral line scales 36-42, caudal peduncle scales 12-16. Color is tan to creamy above, with a silvery lateral strip, white belly, and randomly scattered small black spots on the upper half of the body. The belly anterior to pelvic fin base is usually naked. Nuptial males show biserial pectoral fin tuberculation, and the lateral stripe centered one scale row above lateral line may be absent or weakly expressed.

For a more detailed description of the prairie chub see Eisenhour (2004).

A study of the speckled chub by Bottrell et al. (1964) found the fish to be a pulse-flood spawner, meaning they spawn during high stream flows. Scientists assume that prairie chub pulse-flood spawn as well (Miller and Robison).

C. Habitat

M. australis inhabits main streams within the Red River basin. The fish is normally found in shallow waters. It seems to prefer gravel or clean sandy bottoms over silt (Miller and Robison 2004). Prairie chubs may inhabit intermittent streams and can be found in isolated pools. The fish may tolerate high levels of salinity (Eisenhour 2004). For more on the Red River Basin see Matthews et al. (2005)

<u>IV. Distribution, Population, and Trends</u>

A. Distribution

The prairie chub is endemic to the upper Red River basin (Hubbs et al. 2008). See Figure 1. The fish inhabits medium to large streams in the upper Red River basin in the Texas panhandle, east into Oklahoma, and along the borders of Oklahoma and Texas. Some of the larger streams of the upper Red River basin include: Washita River, North Fork Red River, Salt Fork Red River, Prairie Dog Town Fork, Pease River, and Wichita River. NatureServe (2009) included the follow watersheds in the prairie chub's range:

- Washita Headwaters Watershed
- Elm Fork Red Watershed
- Middle North Fork Red Watershed
- Lower Salt Fork Red Watershed
- Groesbeck-Sandy Watershed
- Pease Watershed
- Wichita Watershed
- Lower North Fork Red Watershed
- Blue-China Watershed

See Figure 2. Underwood et al. (2003) reported that researchers have collected and catalogued specimens from the following areas:

> OKLAHOMA: 17) OSUS 27514 Elm Fork of the Red River at State Highway 34 bridge, Greer Co.; 18) OSUS 27522 Salt Fork of the Red River at State Highway 34 bridge, Greer Co.; 19) OSUS 27515 North Fork of the Red River at State Highway 62 bridge, Jackson Co.; 20) OSUS 27516 Prairie Dog Town Fork of the Red River at State Highway 6 bridge, SW of El Dorado, Jackson Co. TEXAS: 21) OSUS 27517 South Fork of the Wichita River, 2.4 km N of Vera, Knox Co.; 22) OSUS 27523 Red River at State Highway 79 bridge, 4.2 km NE of Byers, Clay Co.

M. australis is extinct in a significant portion of its history range. The fish once occurred in the Washita River but has been extirpated. Miller and Robison (2004: 127) reported, "Winston and colleagues (1981) considered it extirpated from the upper North Fork of the Red River as a result of reservoir construction."

Figure 1. The Upper Red River Basin (Red River Compact Commission 2004)

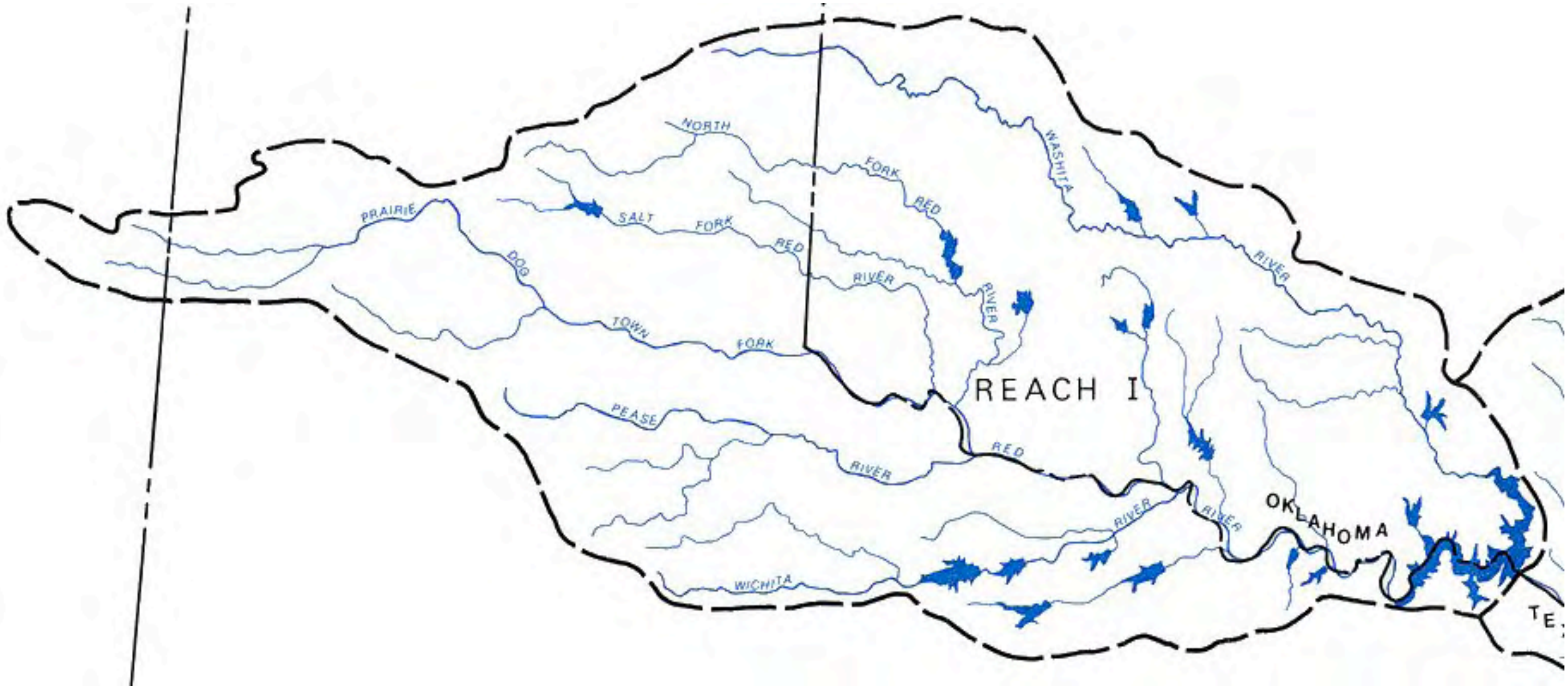
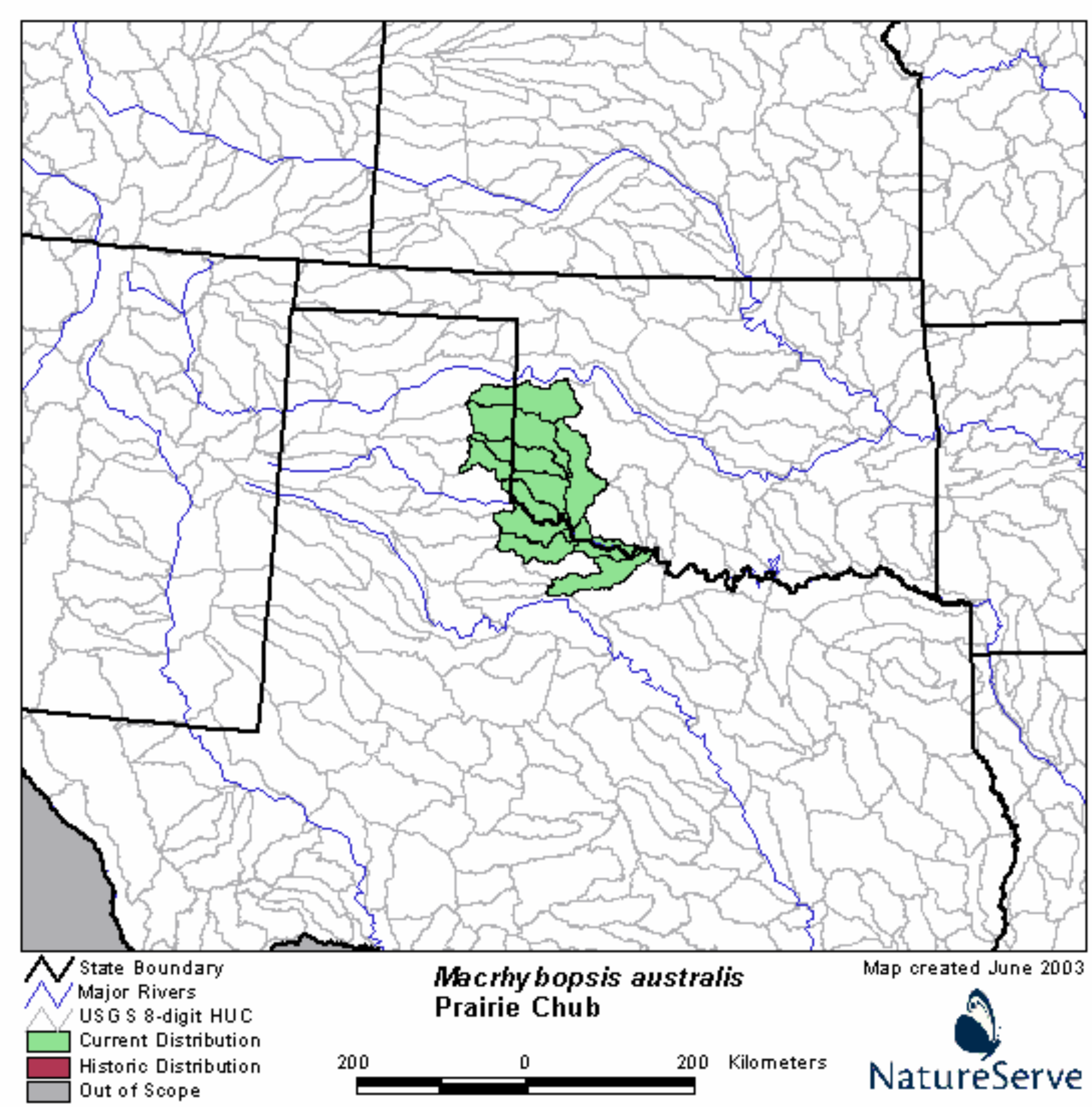


Figure 2. *M. australis* Range Within Watershed of the Red River Basin (NatureServe 2009)



B. Population Status

NatureServe (2009) ranked the prairie chub as G2G3, rounded G2 (Imperiled) in 2002. NatureServe (2009) reported, "Eisenhour (1997) mapped about 25 collection sites, but not all of these represent distinct occurrences."

V. Endangered Species Listing Factors

The Texas Wildlife and Parks Department listed a set of threats to the prairie chubs' habitat in its Comprehensive Wildlife Conservation Strategy. These include (TWPD 2005: 781-782):

- Development
- Erosion
- Fragmentation
- Human Disturbance
  - Foot traffic
  - Garbage
  - Noise
  - Vegetation Disturbance
  - Popular with collectors, accidental takes, or popular for target practice
  - Fishing Line
  - Recreation
  - Land or drainage alteration; land-use changes (i.e. draining, filling, bulkheading)
  - Dredging activities
  - Fishing (commercial)
  - Increased turbidity
  - Conflict with rookeries
  - Drainage of wetlands
  - Vandalism
  - Food source is threatened
- Natural
  - Hurricanes
  - Flood events
- Pollution
- Political (fragmentation due to tax policies)
- Protection (lack of protection)

A. The Present or Threatened Destruction, Modification, or Curtailment of its Habitat or Range

Humans have completely altered waterways within the Red River basin. Predominant land uses along the river include cattle ranching, crop farming, and oil and gas operations (Matthews et al. 2005). All of these can have detrimental impacts to the river basin and *M. australis*. Jester et al. (1992) found prairie chubs to be intolerant of changes to their habitat and moderately intolerant to changes to water quality on a scale that included rankings of intolerant, moderately intolerant, moderately tolerant, and tolerant.

Steuter et al. (2003)'s report for The Nature Conservancy, *Conserving the Biological Diversity of the Central Mixed-Grass Prairie*, identified a range of threats to Great Plains' river basins and streams, including those of the Red River system. Steuter et al. (2003: 53) described how the southern short- and midgrass rivers systems, including the Red River basin streams, in the southern plains have been altered by land use changes:

> Fire, bison grazing, and flood events once shaped the mosaic of floodplain communities. Fire is generally suppressed, bison are no longer present, and river flows are greatly altered by dams and massive withdrawals for irrigation. The loss of fire and bison from the system as well as reduced river flows has allowed some of the woodland communities, where they are still present, to expand. They are often invaded by exotic species such as Russian olive or saltcedar.

Tamarisk occurs in the Red River basin (Anderson and Masters undated). The Steuter et al. (2003) report later described threats to the Upper Red River and Tributaries:

> There is a proposed dam on the South Fork of the Red River. Salt cedar, russian [*sic*] olive and corbicula are major invaders. Incompatible management, fire suppression and grazing have all contributed to the mesquite problem in this area. (p. 225)

The report also addressed threats to the Elm Fork of the Red River basin and the larger area around the fork known as Elm Fork Breaks:

> Threats include: invasive species (mesquite, redberry juniper, Bromus spp.), herbicide application, altered fire regime, dams, improper livestock grazing, harvest/collecting (Echinocereous spp.), and mining (gypsum). A site visit during the planning process identified the following threats: incompatible crop production practices, incompatible grazing practices, incompatible mining for gypsum and salt, incompatible oil or gas drilling, excessive groundwater withdrawl [*sic*], fire suppresion [*sic*], and spraying of mesquite which could impact forbs. (p. 154)

Water diversions and impoundments have had a major impact on stream flows of the Red River and its tributaries. Such structures can completely alter native fish abundance and diversity. Bonner (2000: 1) described some of the impacts of dams and impoundments to stream flows and fishes:

> Dams and impoundments alter physical and chemical conditions in streams and rivers (Baxter 1977; Stanford and Ward 1979). Changes in water temperature, substrate, presence of backwaters, and in the timing and volume of discharge may directly affect stream fish populations (Baxter 1977; Holden 1979; Bain et al. 1988). Reduced discharge can result in changes in channel morphology, reducing multiple braided-channels to a single channel (Friedman et al. 1998), and indirectly affect stream fish populations (Patton and Huber 1993). The effects of

> these changes are greatest on obligate riverine fishes, those that require streams and rivers for all or part of their life history (Holden 1979; Wilde and Ostrand 1999).

Winston et al. (1991) found that the Altus Dam on the Red River caused major alterations to the fish community above the dam, including the extirpation of *M. australis*.

Some of the major dams and dikes that likely negatively affect prairie chubs include: Lake Tanglewood Dam, Altus Dam, Altus Auxiliary Dike, Altus East Dike, Altus Lugert Dike, Altus North Dike, Altus South Dike, Farmers Creek Dam, and Fish Creek Dam. The fish does not occur below Lake Texoma. See Figure 3. Another dam is proposed for the South Fork of the Red River.

Eisenhour (2004: 30-31) described the potential impacts of water modifications to *M. australis*:

> If this species is a flood-pulse spawner like its putative sister species, *M. tetranema* (Bottrell et al., 1964), alteration of present stream flows (e.g., reservoir construction, channelization, and excessive removal of groundwater) likely would disrupt reproduction or recruitment. Many of the streams inhabited by *M. australis* dry to isolated pools in late summer (Winston et al., 1991). Downstream refugia in the form of large, permanent flowing streams may be necessary for *M. australis* to recolonize tributaries that suffer periodic local extirpations. Stream modifications that disrupted recolonization have already resulted in extirpation of most populations of *M. tetranema* (Luttrell et al., 1999). An additional potential threat is a large scale chloride removal project planned for the upper Red River basin (A. A. Echelle, pers. comm.). Distributions of several fish species in the upper Red River basin, including *M. australis*, are correlated with high levels of dissolved salts (Echelle et al., 1972; Taylor et al., 1993). The effects of chloride removal are uncertain but could be detrimental to *M. australis* and other associated cyprinids (e.g., *Hybognathus placitus*, *Notropis bairdii*).

Matthews et al. (2005: 304) discussed the potential negative impacts of the Army Corps of Engineers' chloride treatment facility:

> [T]he Army Corps of Engineers has begun a massive program to reduce chlorides in the upper basin, which, if ever completed, will threaten the existing, natural salinity gradient that is the template for much of the distribution of flora and fauna in the upper river. In addition, if the waters of the upper Red River were lower in salinity such that they could be directly used for irrigation, water withdrawals would no doubt increase, and hydrological estimates suggest that "no flow" days in the upper basin might be tripled annually.

Concerns over the proposed facility were also expressed by Taylor et al. (1993) on the basis that the chloride control program could have a substantial effect on fish community structure.

Kashiwigi and Miranda (2009) noted that even small impoundments can have significant impacts to riverine fish:

> small impoundments fragment headwater streams and can also disrupt fish communities. Distresses occur both upstream and downstream of impoundments, through several mechanisms including isolation of upstream tributaries from their downstream reaches, alteration of seasonal flow patterns below the impoundment, and modification of habitat characteristics both above and below the impoundment (Yeager 1993). These environmental changes can affect fish communities upstream by preventing recolonization after droughts, resulting in the extirpation of species unable to find refuge in the impoundment (Reyes-Gavilan et al. 1996, Winston et al. 1991), by changing fish abundances (Erman 1973), and by shifting assemblage composition (Pyron et al. 1998), reportedly from fluvial specialists to macrohabitat generalists (Herbert and Gelwick 2003). Downstream effects on fish communities include reduced species richness and diversity (Edwards 1978), increased species richness and habitat alteration (Taylor et al. 2001), and the establishment of reservoir-adapted species (Swink and Jacobs 1983).

Tiemann et al. (2004) found that lowhead dams decreased fish abundance. Other research has found that water impoundments have a detrimental affect on Great Plains river fishes (Quist et al. 2005).

The Red River basin has experienced considerable degradation (Smallhorst 1960; Smith et al. 2002). Invasive plant species, such as tamarisk and Russian olive, can be detrimental to native plains fishes. Both plant species are prolific along the Red River and its tributaries (DeLoach 2009). Pollution is a problem in the basin. For example, Malathion is used to eradicate boll weevils from cotton crops in the region (Grefenstette and El-Lissy 2003), which drains into the basin's waterways through groundwater.

In 2009, the U.S. Fish and Wildlife Service issued a positive 90-Day Finding for *M. tetranema*, the sister fish and closest relative of *M. australis*, and thus acknowledged that *M. tetranema* may warrant listing under the Endangered Species Act (74 Federal Register 66866-66905, December 16, 2009). The Finding (74 Federal Register 66866-66905, December 16, 2009: 66887) outlined some of the threats facing *M. tetranema*:

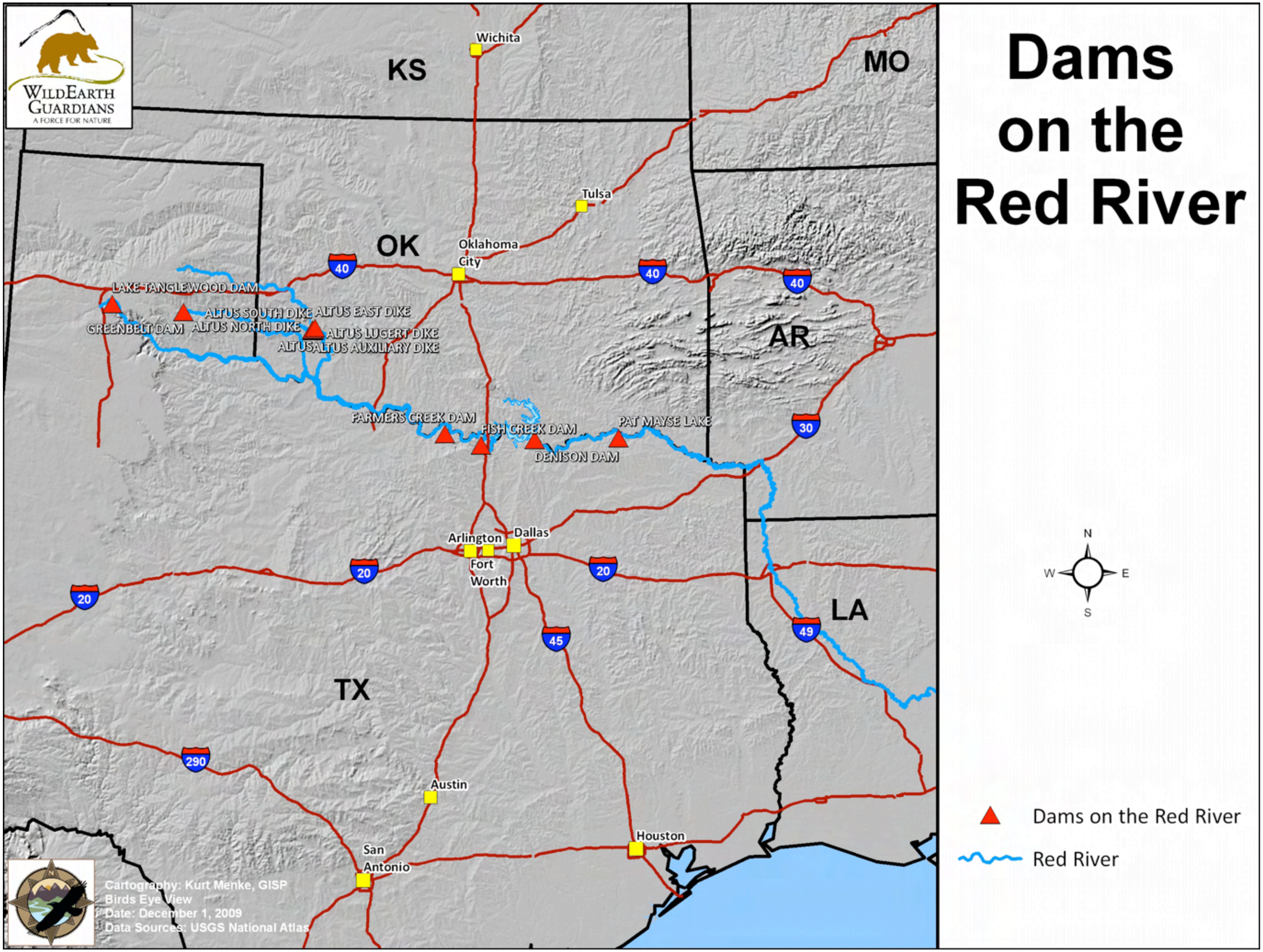
> The Arkansas River speckled chub may be threatened by continuing river impoundments, water diversion projects, drought, and depletions of groundwater.
>
> Reservoirs and dewatered river stretches may pose further threats to the species by creating barriers to movement and recolonization (Luttrell *et al*. 1999). According to NatureServe (2007) and Luttrell *et al*. (1999), the species has declined in Kansas and Arkansas due to dewatering of streams, and low-water dams and other obstructions, which may have fragmented habitat and blocked upstream recolonization. NatureServe (2007) claims that pollution from oil, feedlots, and pesticides is probably also preventing upstream recolonization.

> Based on our evaluation of the information provided in the petition, we have determined that the petition presents substantial information to indicate that listing the Arkansas River speckled chub may be warranted due to the present or threatened destruction, modification, or curtailment of its habitat or range resulting from water impoundment and diversion projects, and due to other natural or manmade factors affecting its continued existence resulting from restricted recolonization.

As stated above, *M. tetranema* inhabits the Arkansas River basin, a river system that is similar and proximal to the Red River Basin. The Red River basin has experienced similar degradation and other threats that as the Arkansas River basin, which have imperiled *M. tetranema*. The impact of threats to *M. tetranema* are comparable to *M. australis* because of the similarities of these species, their habitats, and their ranges.

Both Texas and Oklahoma water quality inventories of the Upper Red River Basin demonstrate that several regions of the system are degraded (ODEQ 2008; TCEQ 2008a; 2008b; 2008c; 2008d; 2008e; 2008f; 2008g). For example, in Texas, 11 stream segments of the basin are on the Environmental Protection Agency's 303(d) list of degraded waters that make up close to 1,400 km (900 mi) (TCEQ 2008a; 2008b; 2008c; 2008d; 2008e; 2008f; 2008g).

Figure 3. Red River Basin Dams and Dikes



B. Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

The extent to which overutilization is a threat to the prairie chub is unknown.

C. Disease or Predation

The extent to which disease is a threat to the prairie chub is unknown. Predations by non-native faunal species, such as bullfrogs (*Rana catesbeiana*) and other non-native fishes, may be a problem.

D. The Inadequacy of Existing Regulatory Mechanisms

M. australis receives no protection as a federally or state protected species in either Texas or Oklahoma. The species is a federal Species of Concern, but this designation confers no regulatory protection.

In Oklahoma, the species is listed as a Tier I priority under the state's Comprehensive Wildlife Conservation Strategy (ODWC undated). It is unclear from the plan what types of conservation actions will be taken on behalf of the species specifically. Conservation actions in the Oklahoma plan do not have a species focus but a general focus on the landscape of "Large Rivers and Sloughs/Ponds". This is important. However, the conservation actions listed in the plan (pgs. 120-123) that pertain to rivers, sloughs, and ponds are primarily information and distribution activities and not true conservation actions that will lead to increased conservation.

The Texas Comprehensive Wildlife Conservation Strategy listed the prairie chub as a medium priority Species of Concern. The conservation strategy proposed a range of conservation actions (pg. 761, pgs. 783-789) for the species.

NatureServe lists *M. australis* as a G2G3 species with a rounded global status of G2 (Imperiled) (NatureServe 2009). State ranks for Texas and Oklahoma are under review by the institution.

E. Other Natural or Manmade Factors Affecting its Continued Existence

1. Invasive Species

Invasive, non-native fish species may cause native fish population declines in the southern Great Plains river systems (Gido et al. 2004). Some non-native species that have invaded the Red River basin include common or European carp (*Cyprinus carpio*), threadfin shad (*Dorosoma petenense*), and inland silverside (*Menidia beryllina*).

2. Climate Change

Climate change poses a fundamental challenge for species survival in coming years and decades. Climate change is already causing a rise in temperatures across the United States and an increase in extreme weather events, such as droughts and increased rainfall (Parmesan et al. 2000; NSC 2003; CCSP 2008; Karl et al. 2009). Temperatures during the latter period of warming have increased at a rate comparable to the rates of warming that conservative projections predict will occur during the next century with continued increases of greenhouse gases. A 2007 report from the Intergovernmental Panel on Climate Change described the rising temperature trend (IPCC 2007: 30):

> Eleven of the last twelve years (1995-2006) rank among the twelve warmest years in the instrumental record of global surface temperature (since 1850). The 100-year linear trend (1906-2005) of 0.74 [0.56 to 0.92]°C is larger than the corresponding trend of 0.6 [0.4 to 0.8]°C (1901-2000) given in the TAR (Figure 1.1). The linear warming trend over the 50 years from 1956 to 2005 (0.13 [0.10 to 0.16]°C per decade) is nearly twice that for the 100 years from 1906 to 2005.

As climate change progresses, maximum high and minimum low temperatures are expected to increase, as are the magnitude and duration of regional droughts (IPCC 2001). The most recent IPCC report (IPCC 2007: 48) predicted the follow impacts on ecosystems from climate change:

- The resilience of many ecosystems is *likely* to be exceeded this century by an unprecedented combination of climate change, associated disturbances (e.g. flooding, drought, wildfire, insects, ocean acidification) and other global change drivers (e.g. landuse change, pollution, fragmentation of natural systems, overexploitation of resources).

- Over the course of this century, net carbon uptake by terrestrial ecosystems is *likely* to peak before mid-century and then weaken or even reverse16, thus amplifying climate change.

- Approximately 20 to 30% of plant and animal species assessed so far are *likely* to be at increased risk of extinction if increases in global average temperature exceed 1.5 to 2.5°C (*medium confidence*).

- For increases in global average temperature exceeding 1.5 to 2.5°C and in concomitant atmospheric CO_2 concentrations, there are projected to be major changes in ecosystem structure and function, species' ecological interactions and shifts in species' geographical ranges, with predominantly negative consequences for biodiversity and ecosystem goods and services, e.g. water and food supply.

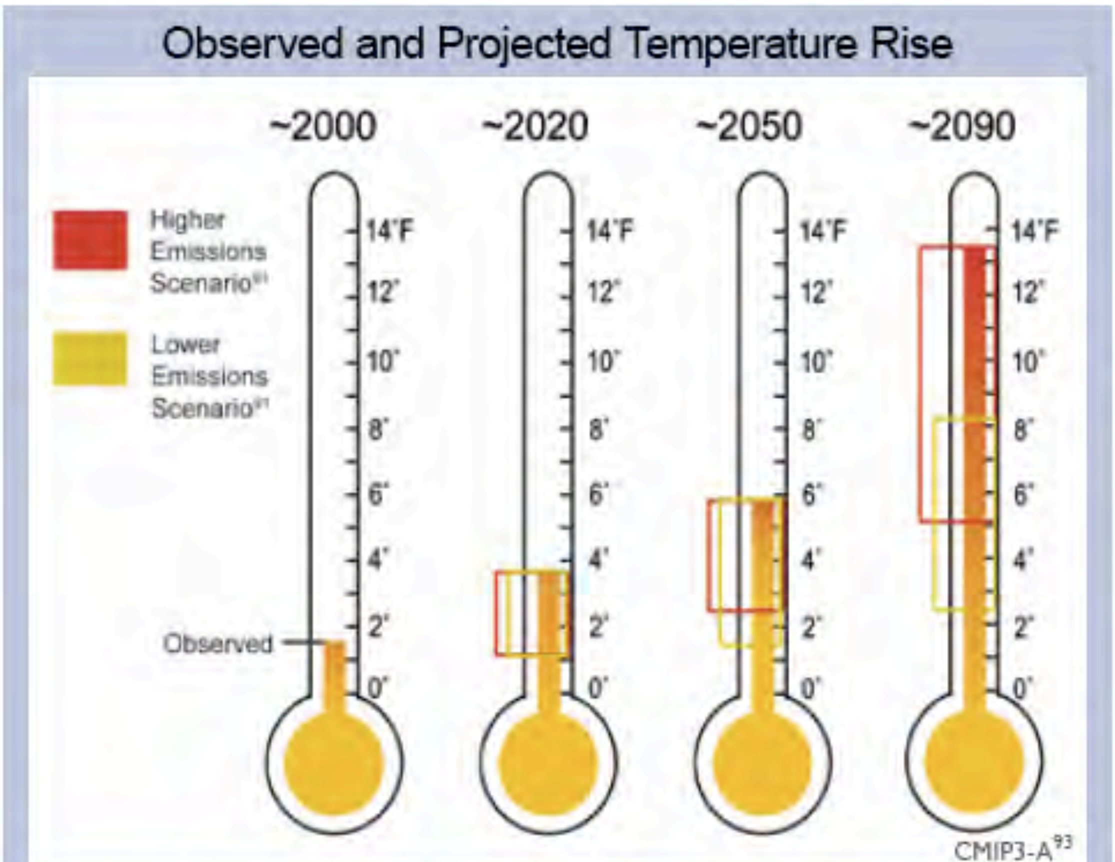
In the spot-tailed earless lizard's Great Plains range, climate change is expected to cause more extreme and frequent weather events that include droughts, heavy rainfall, and heat waves (Karl et al. 2009). Temperatures are expected to increase significantly. See Figure 4. The species may not be able to adapt to these changes. Karl et al. (2009: 126) described the predicted affects of climate change impacts to Great Plains ecosystems:

> Climate-driven changes are likely to combine with other human-induced stresses to further increase the vulnerability of natural ecosystems to pests, invasive species, and loss of native species. Changes in temperature and precipitation affect the composition and diversity of native animals and plants through altering

their breeding patterns, water and food supply, and habitat availability. In a changing climate, populations of some pests such as red fire ants and rodents, better adapted to a warmer climate, are projected to increase.

Fischlin et al. (2007) proposed that the productively, structure, and carbon balance of grassland ecosystems are extremely sensitive to climatic shifts.

Figure 4. Predicted Temperature Increases in the Great Plains Due to Climate Change (Karl et al. 2009)



The average temperature in the Great Plains already has increased roughly 1.5°F relative to a 1960s and 1970s baseline. By the end of the century, temperatures are projected to continue to increase by 2.5°F to more than 13°F compared with the 1960 to 1979 baseline, depending on future emissions of heat-trapping gases. The brackets on the thermometers represent the likely range of model projections, though lower or higher outcomes are possible.

Climate change is likely already increasing the severity and duration of droughts in the southern Great Plains. Matthews and Marsh-Matthews (2003: 1232) stated, "Do droughts hurt fish? Yes. Drought, as an immediate, proximate stressor, clearly affects local populations by outright destruction of individuals as pools dry or water quality erodes." Some Red River tributaries dry up completely during periods of drought (Matthews and Marsh-Matthews 2003). However, native fishes adapted to the harsh drought cycles of the region are often able to recover. Climate change may make recovery less certain.

Matthews and Marsh-Matthews (2003: 1245-1246) added:

> [I]f anticipated levels of global warming become reality, massive changes in fish faunas will follow. Fish confined to discrete aquatic systems are particularly vulnerable, not just in lakes, but in many stream networks as well (Matthews & Zimmerman, 1990). … The best estimates suggest that, although some of the species like red shiners are genetically malleable, they cannot adapt at a sufficient rate to escape extinction (Matthews & Zimmerman, 1990) if local temperature increases match those predicted by many current models. As global warming increases, we will probably see widespread extirpations of fish species in many regions …

While climate change may increase length and severity of droughts, it may also cause increased severity and duration of floods (Thomson et al. 2005). The increasing weather extremes caused by climate change will in turn cause changes to riverine ecosystems that fishes, such as the prairie chub, may not be able to withstand.

VI. Conclusion

1. Requested Designation

WildEarth Guardians hereby petitions the U.S. Fish and Wildlife Service under the Department of Interior to list the prairie chub (*Macrhybopsis australis*) as an Endangered or Threatened species pursuant to the Endangered Species Act. This listing action is warranted, given the numerous threats this species faces, as well as its extremely low population numbers. The prairie chub is threatened by at least three of the five listing factors: present and threatened destruction, modification and curtailment of habitat and range; the inadequacy of existing regulatory mechanisms; and other natural or manmade factors affecting its continued existence.

2. Critical Habitat

Petitioner requests that critical habitat be designated for this species concurrent with final ESA listing.

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