FINAL DRAFT - Recovery Outline for the Topeka Shiner

Common Name: Topeka shiner

Scientific Name: *Notropis topeka*

Classification: Endangered

Effective Listing Date: January 14, 1999

Recovery Priority Number: 8C

Lead Region: Region 6

Cooperating Regions: Region 3

Lead Office: Kansas ES Field Office
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Photo courtesy of Garold Sneegus

Citation:

U.S. Fish and Wildlife Service. 2017. Recovery Outline for the Topeka Shiner. Manhattan, Kansas. 24 pp.

Purpose of the Recovery Outline

In the interim between listing and recovery plan approval, a recovery outline provides preliminary strategies for conservation that conform to the mandates of the Endangered Species Act (ESA), as amended. It organizes near-term recovery actions, provides a range-wide conservation context for U.S. Fish and Wildlife Service (USFWS) decisions, and sets the stage for additional recovery planning and stakeholder involvement. This document replaces the previous Recovery Outline for the Topeka Shiner dated January 27, 1999.

The information contained in this document is non-regulatory and non-binding. It is intended to serve as preliminary, general and temporary guidance for the Topeka shiner prior to completion of an official recovery plan.

Information Sources and Treatment of Uncertainties

This recovery outline is based on the best available data, including the Topeka Shiner Species Status Assessment (SSA) Workshop (USFWS 2014), Topeka Shiner – 5 Year Review: Summary and Evaluation (USFWS 2009), the listing decision (USFWS 1998, 63 FR 69008), pertinent information from articles in scientific journals, and recent information from the states and species experts. Research needed to address information gaps is described in this document and will be part of the implementation table in the recovery plan. For issues in which there is uncertainty associated with the conservation needs, caution will be exercised until such uncertainty can be resolved.

I. RECOVERY STATUS ASSESSMENT

A. Species Description and Life History

The Topeka shiner is a small minnow, native to small prairie streams of the eastern and central Great Plains. The Topeka shiner has a short head, small terminal mouth and no barbels. The dorsal fin has eight rays, the anal fin seven rays. It has a dusky mid-lateral stripe, with a chevron shaped spot at the base of the caudal fin; and scales outlined by dark pigment on a silver-white body. Maximum size ranges to 75mm (3 inches) total length.

The Topeka shiner typically inhabits small prairie streams, primarily in pools (including off-channel areas), with relatively cool water temperatures, generally good (although variable) water quality, and substrates consisting of clean gravel, cobble or coarse sand (Cross and Collins 1995; Kerns and Bonneau 2002, Pflieger 1997; Stark et al. 2002). It also occurs in pools with bedrock and clay hardpan substrates, often overlain by silt and detritus (Evermann and Cox 1896; Hatch 2001; Michl and Peters 2001; Stark et al. 2002). The species has adapted to its headwater stream habitats, being generally tolerant of acute periods of harsh conditions (elevated temperatures, low dissolved oxygen, etc.) that can occur seasonally in some streams across its range (Koehle and Adelman 2007) and during periods of drought. The Topeka shiner is an opportunistic omnivore, feeding on aquatic insects, microcrustaceans, larval fish, algae, and detritus (Hatch and Besaw 2001).

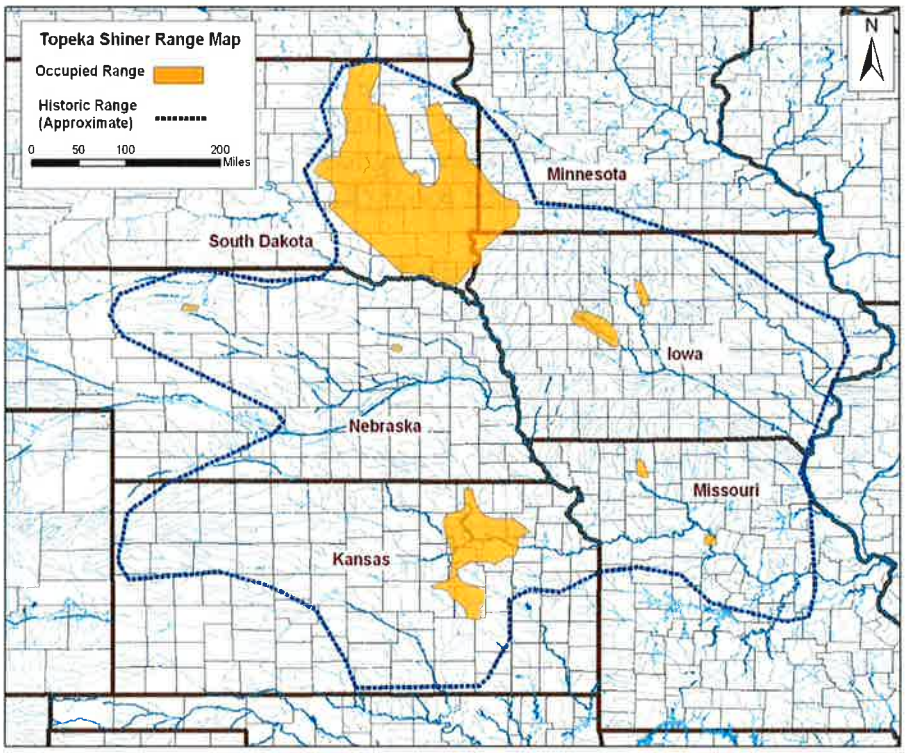
The Topeka shiner spawns in pools, most often over orangespotted sunfish (*Lepomis humilis*) and/or green and longear sunfish (*L. cyanellus, L. megalotis*) nests in late spring to mid-summer (Cross and Collins 1995; Kerns and Bonneau 2002; Mammoliti 2004; Pflieger 1997; Stark et al. 2002). Upstream movement sometimes precedes spawning (Barber 1986;

Kerns and Bonneau 2002 ; Minckley and Cross 1959). The Topeka shiner male establishes a territory on the periphery of the sunfish nest and as females enter the nest area to spawn the male fertilizes them. The male sunfish then cares for the nest, sweeping silt and other depositional material from the nest, thus caring for sunfish and the Topeka shiner eggs (Pflieger 1997; Stark et al. 2002). Successful spawning has been documented without sunfish associations in aquaria and experimental ponds (Katula 1998; Campbell et al. 2016).

Dahle (2001) discovered 4-year classes in individuals from Minnesota, dominated by age 0- and age 1-year classes (Hatch and Besaw 2001). He also found that the species is a multiple clutch spawner; clutch size was smaller than previous studied specimens from Kansas; and that relative abundance was higher in off-channel habitat than instream habitat. Kerns and Bonneau (2002) reported, the number of mature ova increased with length, weight, and age of the female; and that only 62 percent of age-1 females were mature, compared with 100 percent of age-2 females. Stark et al. (2002) studied the natural history of an isolated population in Kansas, documenting feeding, reproduction, and interspecies activities from spring through summer. Winston (2002) observed the spatial and temporal associations of other stream species with the Topeka shiner, suggesting interspecific actions with other species during some life stages of the Topeka shiner.

B. **Distribution and Population Status**

The Topeka shiner continues to occur in portions of its historic range, including Iowa, Kansas, Minnesota, Missouri, Nebraska and South Dakota (see Map 1 below). In Iowa it presently occurs in the Boone and North Raccoon River watersheds; in Kansas, portions of the upper Cottonwood and the Kansas/Big Blue River watersheds; in Minnesota, portions of the Rock and Big Sioux River watersheds; in Missouri, portions of the Missouri and Grand River watersheds; in Nebraska, in one stream in the Elkhorn and one localized area in the upper Loup River watersheds; and in South Dakota in portions of the Big Sioux, Vermillion and James River watersheds (see Map 2, page 9) (USFWS 2017).



Map 1. Historic and current range of the Topeka shiner.

Iowa

Topeka shiners appear to have been extirpated from historically occupied areas in the eastern half of Iowa. Currently, Iowa has 38 occupied low-order streams. The Topeka shiner extant watersheds identified by the Iowa Department of Natural Resources include:

- 22 waterways in the North Raccoon River watershed, including the mainstem
- 12 waterways in the Boone River watershed, including the mainstem
- A single tributary of Des Moines River: Brushy Creek
- 2 waterways in the Rock River watershed, and the Rock River mainstem (all three shared with Minnesota)

The results of research project surveys (Clark 2000; Bakevich 2012) indicate Topeka shiners have declined by 73% in central Iowa since listing. The Rock River watershed was not resurveyed by Bakevich (2012), but per the Iowa Department of Natural Resources (USFWS 2014), anecdotal information suggests declines are occurring there as well.

Photo 1. High quality Topeka shiner habitat in the Flint Hills Region of Kansas.

Kansas

The Topeka shiner extant watersheds in Kansas found to be occupied by presence/absence sampling since listing include 36 low-order streams in two major drainages:

- 8 drainages in the upper Cottonwood River watershed (not found in the mainstem)
- 30 drainages in the Kansas River watershed (not found in mainstem)
- 1 drainage in the Smoky Hill River watershed (not found in mainstem)

Those remaining occupied streams in Kansas lie generally in the northern portion of the Flint Hills Region. This region is rocky and relatively unsuitable for grassland conversion to cultivated crops, and dominated by large ranches. Watersheds that still harbor Topeka shiner occupied streams display two general characteristics, low levels of rowcrop agriculture and intact groundwater resources (Barber 1986; Cross and Moss 1987).

Trend data is lacking in Kansas, as surveys are typically random in nature. Survey and resurvey efforts yield data is not consistent between agencies and academia. The Kansas Department of Wildlife, Parks and Tourism indicate local extirpations (thus species declines) are occurring based on lack of Topeka shiner records during efforts to capture the species, combined with known landscape and instream impacts (e.g. construction of dams) (USFWS 2014).

Minnesota

With exception of the relatively small Cedar Creek drainage (a small portion of the Des Moines River drainage that exists primarily in Iowa) Topeka shiners remain extant within their historic range in Minnesota (Hatch 2001), despite a recent decline in prevalence (Nagle and Larson 2014). Minnesota shares some of its occupied streams with two other States, Iowa and South Dakota. The number of streams occupied within this three state range is 48, with occupied streams crossing state borders in some cases. Not all waterways within these watersheds are named; and many are connected and therefore may interact as populations. The tally of 48 indicates the number of individual waterways from which the species was collected between 1999 and 2015 (Nagle and Larson 2014; USFWS 2014; Cunningham 2015). They include:

- 22 tributaries draining into the Big Sioux River (10 of those shared with South Dakota)
- 30 tributaries draining into the Rock River, and the Rock River mainstem (mainstem and two tributaries shared with Iowa)

Since 2004, the Minnesota Department of Natural Resources has conducted standardized, annual (exception: 2011), presence/absence monitoring in streams formally designated as Critical Habitat. In recent years, a declining trend was detected (Figure 11); Topeka shiners were present in an average of 76% of sites surveyed 2004-2010, but that began to drop in 2009, reaching a low of 30% in 2013 (Nagle and Larson 2014). Surveys in 2014 revealed an uptick in detections as Topeka shiners were located at 45% of sites surveyed (Nagle and Larson 2014; USFWS 2014), and 2015 surveys also rose (Cunningham 2015).

All of Minnesota's occupied streams that cross borders with South Dakota and Iowa originate in Minnesota, and flow downstream to the Big Sioux River.

Missouri

Missouri experienced a fast decline in Topeka shiner populations within the 25 year timeframe before the 1999 listing of the species, and the species was lost from one occupied watershed in the state in the 1990's. Missouri now has two watersheds with Topeka shiner collection records since 1999:

- Sugar Creek in the Thomson River watershed
- 9 waterways in the Moniteau Creek watershed, including the mainstem

Sugar Creek in the Thomson River watershed is considered by the Missouri Department of Conservation (MDC) to be susceptible to extirpation due to the relatively low numbers of individuals typically captured during sampling efforts and paucity of sites with collection records (USFWS 2014). The agency has completed annual monitoring of occupied Topeka shiner streams since 1999. Of 180 seining events in Sugar Creek between 1999-2013, only 13 resulted in capture of 10 or more individuals at a time. The number of sites with Topeka shiners present has not exceeded the number of sites without Topeka shiners since 2000, and in two years (2008 and 2009) no Topeka shiners were located at any of the 12 monitored locations in Sugar Creek (the species was found again in low numbers 2010-2013) (Missouri Dept. of Conservation, unpublished data). Comparatively, the Moniteau Creek watershed appears to have a more stable population of Topeka shiners, with relatively consistent Topeka shiner collections annually within its 7 occupied tributaries, typically found in greater numbers.

In addition, the Missouri Department of Conservation (MDC), in conjunction with the Service began a reintroduction effort in 2013. Presently, the MDC has reintroduced Topeka shiner into 3 small watersheds in north-central Missouri, as non-essential, experimental populations. At this time, it is too early to determine the long-term success of these efforts. Additional reintroductions are currently being planned.

Nebraska

The Topeka shiner appears nearly extirpated in Nebraska. At a 2014 workshop on the species, only two, widely separated, low-order tributaries were identified as potentially still harboring the species. The occupied waterways include:

- Taylor Creek in the Elkhorn River Watershed
- Big Creek in the North Loup River watershed

The Nebraska Game and Parks Commission also submitted that one additional tributary in the North Loup watershed may still be occupied, Brush Creek, which has not been surveyed for Topeka shiners since 1989 due to the inability to gain landowner permission (USFWS 2014).

South Dakota

The Topeka shiner occurs in nearly all of its historically known occupied waterways in South Dakota, however collection/locality information was very limited prior to listing. The known distribution of Topeka shiners in the state changed after the species was listed in 1999 due to increased sampling effort that lead to discovery of 56 additional occupied streams. The current number of occupied streams in South Dakota is 67.

At the 2014 Topeka shiner Species Status Assessment workshop in Sioux Falls, SD, personnel from South Dakota Game, Fish and Parks indicated there are gaps in Topeka shiner location data. Of the 66 occupied streams in South Dakota reported at the workshop (clarification of records and one new stream located in 2015 now reveals there are currently 67), 28 have reports of Topeka shiners at only one site in the waterway, collected during only one year. Twenty-five of these single-locale stream records are dated 2006 (11 years ago as of this writing) or earlier, and 8 of them were not reconfirmed to contain Topeka shiners since 1999 or earlier (USFWS 2014).

South Dakota Game, Fish and Parks (SDGFP) personnel have monitored three sites within each of 11 tributaries (total 33 sites), performing two rounds of sampling (total 66 collection efforts) between 2004 and 2011. Topeka shiners were documented in all 11 streams during both rounds of sampling, although the number of sites yielding Topeka shiners was reduced by 18% in round two (Pasbrig and Lucchesi 2012). In 2014, they captured one specimen from these same streams; and in June 2017 captured 177 specimens from three of these streams (SDGFP).

The South Dakota Department of Environment and Natural Resourses sampled three streams with previous occurrences in 2013, but did not capture the species; in 2014 they captured four specimens from one of 2 streams; they captured 199 Topeka shiners from five of twelve sites in 2015; and in 2016 they caught six species from two of eight sites (SDDENR). Documentation of continued occupancy over time can be indicative of resilience to natural and anthropogenic activities, but since such data is lacking in nearly half of South Dakota's Topeka shiner streams, detection of population trends at a state-wide level is not currently

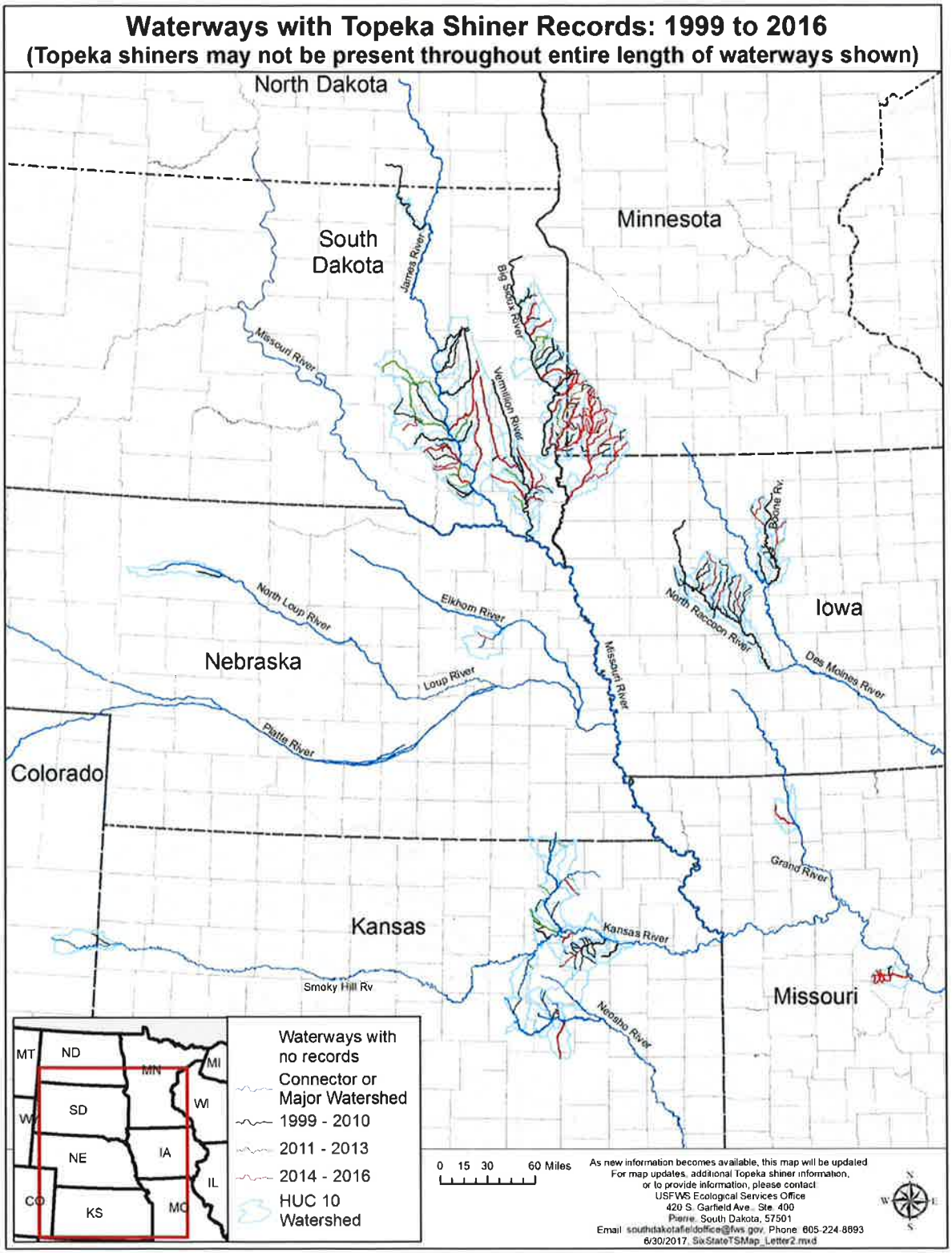
possible.

The number of occupied streams identified by presence/absence sampling in South Dakota includes:

- 26 tributaries within the James River watershed (not documented in the James River mainstem)
- 15 tributaries within the Vermillion River watershed, including the Vermillion River mainstem
- 29 tributaries within in the Big Sioux River watershed (the Big Sioux River mainstem is not considered occupied due to unsuitable habitat). Ten of these 26 tributaries Big Sioux River tributaries are arise in Minnesota and flow into South Dakota.

Photo 2. High quality Topeka shiner habitat in South Dakota (USFWS 2017).

Map 2. Topeka Shiner occurrences 1999-2016 (not inclusive of Missouri reintroduction sites).



C. **Landownership**

Private – Approximately 97 percent of the present range of the Topeka shiner overlaps privately owned lands.

Federal – Federal lands within the current distribution of the Topeka shiner include the Tallgrass Prairie National Preserve (National Park Service -NPS) and the Fort Riley Military Installation (U.S. Army) in Kansas, and Pipestone National Monument in Minnesota (NPS).

State – State lands within the current distribution of the species include State Conservation Areas in Missouri managed by the Missouri Department of Conservation (MDC), Split Rock State Park in Minnesota, and Deep Creek Fishing Area in Kansas.

Other – Non-governmental organizations within the Topeka shiner distribution include The Nature Conservancy.

D. **Threats to the Species**

The 1998 listing rule indicated destruction and modification of habitat was a substantial threat to the species resulting in historic and ongoing range curtailment. The rule listed the following factors as reducing stream suitability, including sedimentation; increased nutrient loading; decreased stream flow; and increased water temperature. These changes were associated with intensive rowcrop agricultural development and overgrazing; urbanization and highway construction; mainstem reservoir development and tributary impoundment; channelization and maintenance of altered waterways and drainage ditches; and dewatering of streams (63 FR 69008, December 15, 1998) .

The present or threatened destruction, modification, or curtailment of its habitat or range (Factor A) - The conversion of prairie to cropland has altered the hydrology of streams throughout much of the species' historic and present range. Some areas where the species has declined coincide with reduced aquifers and drainage patterns affecting the quantity of water (Cross 1970). Decreased flows of springs, seeps, and other groundwater sources continue to threaten some existing populations, especially highly isolated populations (Cross 1970; Cross and Moss 1987). It is unknown at this time how much encroachment of woody vegetation and forest into former prairie has, and continues to alter stream hydrology and other ecological processes, particularly in Kansas and Missouri.

Stream Hydrology

Cropland irrigation and stream water use have the potential to impact stream hydrology for the Topeka shiner across portions of its range (Cross and Moss 1987; Berg et al. 2004). Groundwater withdrawals for these purposes have had a substantial impact in portions of irrigation dependent areas like Kansas and Nebraska (Juracek 2015). However, this is also relevant across portions of the remainder of the species' range. The severity of this threat is likely to increase over time as increased acreages of land are cultivated for cropland use (Stubbs 2007; U.S. Department of Agriculture 2007; U.S. Department of Agriculture 2008). Agricultural drainage tiling has increased in South Dakota and Minnesota. This process uses surface ditches, subsurface permeable pipes, or both, to remove standing or excess water from poorly drained lands, resulting in more available land for agricultural purposes.

In addition, it can cause wetland loss and the lowering of groundwater levels, which in turn can impact stream water quality, quantity, and temperatures.

Agricultural Impacts on Water Quality

Sedimentation from agricultural runoff and over-grazing of riparian areas continues to impact spawning habitat and water quality across the species' range (Cross and Moss 1987; Angelo et al. 2003). These water quality parameters include nutrient enrichment and turbidity, which decrease dissolved oxygen and increase water temperatures. Watersheds with high levels of cultivation, and subsequent siltation and domestic pollution, are unsuitable for the species (Cross and Moss 1987). These streams often cease to flow and become warm and muddy during the summer months (Cross and Moss 1987).

Confined animal feeding operations occur throughout the Topeka shiner range. These operations vary from large corporate operations feeding cattle and producing hogs and poultry, to small scale winter feeding areas on family farms. Manure lagoon failures and accidents occasionally occur, often resulting in catastrophic impacts to stream habitat and water quality to the detriment of aquatic organisms. Small scale (less than 200 cattle are unregulated) winter feeding lots can introduce large amounts of sediment and nutrients to streams during precipitation events (Bayless and McManus 2001). These spills can result in isolated fish kill events in some stream segments.

Road and Bridge Construction

Highway and bridge construction and repair actions can impact habitat downstream despite active consultation and the best management practices (BMPs) implemented during the action, primarily during large precipitation and flow events. These activities inherently disturb in-channel and riparian areas, which are then subject to weather-related events during and immediately following construction. In many cases, heavy rains with associated runoff will release large volumes of sediment to the channel despite use of BMPs for erosion control.

The placement of culverts associated with road and bridge work also can impact Topeka shiner. Throughout much of the species' range there are culverts that inhibit or prohibit fish passage due to extreme stream elevation changes and/or high water velocities (Bouska 2008). This impact should be diminished by the implementation of BMPs requiring on-grade installation of culverts as they are replaced over time.

Urbanization

Urbanization continues to impact the species and its habitat. Impacts include nutrient enrichment, hydrologic changes and the related need for future channelization and bank stabilization, and the escapement of predacious fishes from many newly constructed small impoundments in the watershed (Keller 1985). Residential development in the Bonne Femme watershed near Columbia, Missouri, likely contributed greatly to the recent extirpation of Topeka shiners from that drainage (Kerns pers. comm. 2005). Increased urbanization is considered a major threat in Kansas and Missouri. In 2005, repeated heavy rains in the Wildcat Creek watershed near Manhattan, Kansas led to large volumes of sediment being eroded from a large construction site. This caused habitat degradation downstream (Tabor pers. comm. 2005).

Impoundments

In the 30 years prior to listing, large numbers of tributary impoundments were constructed in portions of the species' Kansas, Missouri, and Nebraska range. These impoundments are strongly suspected in the extirpation of the species from many streams and watersheds (Pflieger in litt. 1992; Layher 1993; Perkins et al. 2016). During times of diminished flows or drought, Topeka shiner populations upstream from impoundments attempt to use these water bodies as refuges. These populations are then subject to predation by piscivorous fishes in these ponds and lakes (Layher 1993; Mammoloiti 2002). In unaltered systems, stream fishes move downstream to find suitable habitat (Deacon 1961). Tributary dams also prevent upstream migration of fishes following drought, prohibiting recolonization of upstream reaches due to the dams. At present, several now isolated populations of Topeka shiners in Kansas occupy habitat upstream and downstream of impoundments (Tabor pers. comm. 2009). These populations continue to be threatened by present conditions and may be extirpated during future periods of protracted drought.

Dredging

In-channel dredging continues to impact habitat in portions of the species' range. In Kansas and Missouri, instream gravel mining/dredging can release large volumes of sediment into downstream habitat impacting water quality and spawning substrate (Cross et al. 1982). Dredging/mining alters stream morphology, by reducing pool and riffle complexes, and encourages upstream head-cutting which releases additional sediment to the stream as the streambed is eroded and streambanks collapse.

Overutilization for commercial, recreational, scientific, or educational purposes (Factor B) - Overutilization is not considered a factor in the decline of the Topeka shiner.

Disease or predation (Factor C) - The original listing rule concluded disease was not likely a significant threat to the Topeka shiner except during certain habitat conditions (63 FR 69008, December 15, 1998). This remains the case. Poor water quality and crowding can occur during periods of reduced flows (USFWS 1990). Specifically, low dissolved oxygen, high water temperatures, and elevated nutrient levels can cause increased stress to fishes, reduce resistance to pathogens and promote disease outbreaks (USFWS 1990).

Predation of Topeka shiners by introduced piscivores is now believed to provide a greater threat to the species than previously known. The spotted bass (*Micropterus punctulatus*) and largemouth bass (*M. salmoides*) also are naturally occurring predators of the Topeka shiner in the southern portions of its range. However, these basses' natural range typically overlapped only the downstream extremes (typically larger, deeper pools), and not the Topeka shiner's characteristic small stream, headwater pool habitats (Cross and Collins 1995; Pflieger 1997).

The construction of tributary impoundments on streams with Topeka shiners, and the subsequent introduction of piscivorous fishes not typically found in headwater habitats, such as largemouth bass and crappies (*Pomoxis spp.*) can seriously impact the species (Layher 1993; Winston 2002; Knight and 2005). During drought or periods of low flows, Topeka shiners seek refuge in permanent stream pools or impoundments now occupied by these introduced fishes. Some of the most common fishes typically captured in streams directly upstream and downstream of tributary impoundments in Kansas and Missouri are largemouth bass, bluegill (*Lepomis macrochirus*), and crappie. These species predate and

can eliminate Topeka shiners and other stream cyprinids (minnow species) (Mammoliti 2002; Kerns pers. comm. 2005).

The inadequacy of existing regulatory mechanisms (Factor D) –
Prior to listing, the Topeka shiner had no significant State or Federal protections. Listing enabled the USFWS to provide some oversight of Federal actions potentially impacting the species, particularly through section 7 consultation. Through this function, many impacts affecting the species have been lessened or avoided. These actions include several ongoing threats to the species including dam construction, road and bridge construction, gravel mining, and wetland drainage (tiling) associated with Federal subsidies. Without protections afforded by the Act, these actions would likely occur without Federal review of impacts to the species.

The majority of habitat occupied by the Topeka shiner is under private ownership and long-term impacts from land-use and land-cover changes persist. Many actions impacting the species are not included under the existing venue of Federal or State regulatory mechanisms including the clearing and cropping of riparian areas, small winter cattle feeding operations, urban/suburban development, and small pond construction. However, regulated activities vary by state. In summary, the current Federal regulatory oversight has minimized many impacts across the range. However, current Federal oversight has not been sufficient to prevent the species' continued decline and loss in some areas. In the absence of the Act's protections, we believe the species' decline in southern portions of its range would be greatly expedited as other protective regulatory mechanisms appear limited. While it is also likely the Act's protections have benefited the species in the northern portion of its range, ongoing threats in this portion of the range appear less immediate.

Other natural or manmade factors affecting its continued existence (Factor E) - Drought
The occurrence of drought in the prairie landscape is a natural phenomenon historically tolerated by the Topeka shiner in unaltered habitat. Drought has an increasing impact on the species as watershed development and land-use changes occur, decreasing the connectivity and increasing the isolation of existing populations. In its natural environment, the Topeka shiner was able to disperse downstream or off-channel to areas with suitable waters during dry periods. Conversely, the species was able to return to its headwater habitats when flows returned. Much of the remaining range of the Topeka shiner in Iowa, Kansas, Missouri, and Nebraska consists of highly fragmented, isolated populations with long distances of altered or unsuitable habitat between them, prohibiting redistribution. Many of these populations do not have the necessary downstream or off-channel refuges available to survive long-term drought conditions at this time. Increased periods of protracted drought, potentially resulting from climate change, would exacerbate the impacts of habitat fragmentation and isolation (Deacon 1961; Cross 1967; Mammoliti 2002; Knight and Gido 2005; Karl et al. 2009). Increased drought could also impact presently stable population complexes, forcing these populations to seek refuge downstream into larger streams with more predacious fishes and diminished habitat value.

Climate Change
According to the Intergovernmental Panel on Climate Change (IPCC) (2007, p. 1) "Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice,

and rising global average sea level." Average Northern Hemisphere temperatures during the second half of the 20th century were very likely higher than during any other 50-year period in the last 500 years and likely the highest in at least the past 1300 years (IPCC 2007). It is very likely that over the past 50 years: cold days, cold nights and frosts have become less frequent over most land areas, and hot days and hot nights have become more frequent (IPCC 2007). It is likely that: heat waves have become more frequent over most land areas, and the frequency of heavy precipitation events has increased over most areas (IPCC 2007).

E. **Past and Current Conservation Efforts**

Iowa

The Service has been restoring off-channel habitats in Iowa since 2000 by removing the sediment layer, restoring groundwater input, and providing refugia for Topeka shiners (see: http://www.fws.gov/endangered/news/episodes/bu-01-2013/story3/). The effort has been successful as the species is known to reproduce and overwinter in these restored sites. Currently approximately 65 off-channel sites have been restored, primarily in the North Raccoon River watershed (Aleshia Kenney, USFWS, pers. comm. 2015). Given the prevalence of Topeka shiner occurrence in Iowa's off-channel habitats, such restorations may be instrumental to the persistence of this species in the state.

Kansas

While Kansas has a Topeka shiner Recovery Plan, much land (98%) exists in private ownership in the State and water laws prioritize agricultural use and flood control, thus management for Topeka shiners is difficult and activities known to impact populations continue. Conservation measures on a large scale have generally not been implemented in Kansas to date.

Minnesota

An annual monitoring program to determine population distribution and qualitative trends of populations began in Minnesota in 2004 (Ceas and Anderson 2004). This program continues. In 2008, the USFWS, Minnesota DNR, and the City of Adrian, MN entered into a Habitat Conservation Plan. This plan serves to limit the amount of incidental take of Topeka shiners due to increased groundwater pumping from municipal wells.

Missouri

Guided by 2 consecutive 10-year management plans (Missouri Dept. of Conservation 1999; 2010), MDC staff conducts annual surveys, reintroductions, implements habitat improvements, and conducts research on the Topeka shiner. Some conservation measures have also been implemented on private lands in Missouri, such as establishment of riparian buffers and the reduction of grazing impacts to streams.

MDC and USFWS personnel have ongoing, successful captive rearing programs for the Topeka shiner at the State's Lost Valley Hatchery and the Service's Neosho National Fish Hatchery, respectively. The fish produced by these programs are being used in reintroduction efforts, initiated in 2013, in three watersheds within the historic range of the Topeka shiner in Missouri. Within the Grand River watershed in Harrison County, Topeka shiners were

stocked in 2013 in Little Creek and 5 isolated nursery ponds (3 in the Little Creek watershed and 2 in nearby East Fork Big Muddy Creek Watershed). Follow-up surveys in 2014 showed initial success of the reintroduction efforts; pond and stream survey results indicate Topeka shiners had survived, grown, and were in good condition at all release sites (Wiechman 2014). Reintroductions continued in 2014 as Topeka shiners were stocked in East Fork Big Muddy Creek itself, additional shiners were added to Little Creek to supplement the 2013 reintroduction, plus a third nursery pond was established in East Fork Big Muddy Creek watershed. Also in 2014, Sullivan County reintroductions were performed in three branches of Spring Creek within the Chariton River watershed: Dry Branch, Ranch Branch, and Savannah Branch. Surveys in 2015 of the Sullivan County sites revealed continued success of these sites, and documented movement of Topeka shiners about a mile upstream of stocking locations in the Savannah Branch (Thornhill 2015). Surveys in 2016 were limited to the Little Creek Watershed of Harrison County where the species is increasing in abundance; 321 individuals were collected from 10 sites within 22 pools in that watershed. These results are clearly positive, although it is not yet known whether the reintroductions into the creeks will become stable and self-sustaining, for that reason these waterways are currently not included in the current range.

Nebraska

We are not aware of recognized conservation actions currently being implemented in Nebraska for the Topeka shiner.

South Dakota

The State completed their *Topeka shiner (Notropis topeka) Management Plan for the State of South Dakota* in 2003 and implemented monitoring on eleven streams for three separate two year periods. In 2017, the governor announced a voluntary riparian initiative to reduce sediment in streams and improve water quality.

F. **Recovery Status Assessment Summary**

We concluded that the species' recent significant reduction in range and the extirpation of the species throughout most of its historic range, within the context of the continuing and expected impacts from past, present, and planned projects and activities, supported the determination of endangered status. This conclusion has proven accurate in southern and central portions of the range (Kansas, Missouri, Nebraska, and Iowa) where historic changes in land-use, land-cover, and hydrology have largely reduced the species to small, isolated populations susceptible to ongoing and projected threats (Menzel pers. comm. 2002; 69 FR 44736, July 27, 2004; Howell pers. comm. 2006; Kansas Department of Wildlife and Parks 2006; Kansas Department of Wildlife and Parks 2007; McPeek pers. comm. 2007; Stark 2007; Davis 2008; USFWS 2014). Even with Federal protection, it is likely that additional sites in this portion of the range will be lost within the foreseeable future, consistent with extirpations in the recent past (Missouri Department of Conservation 1999; Stark et al. 1999; Kerns pers. comm. 2007; Tabor pers. comm. 2009; USFWS 2009; USFWS 2014).

However, new distributional data and a better understanding of threats in the northern portion of the species' range has altered our perception of the species' status on the whole. At the time of listing, the Topeka shiner was known from 20 stream sites in Minnesota,

South Dakota, and Iowa's Rock River watershed (69 FR 71071, December 08, 2004). This apparently limited distribution and the assumption that the species had been lost from so many areas, supported our assertion that the species was highly susceptible to threats across its entire range and trending toward extinction. Since listing, additional survey work has resulted in an increase in the number of known occupied stream across this portion of the species' range. Topeka shiner populations in Minnesota and South Dakota now appear to be closely representative of the species' known historic range in these areas (Ceas and Anderson 2004; Wall et al. 2004; Wall and Thompson 2007; Ceas and Larson 2008; USFWS 2009; USFWS 2014). Such data indicates the species continues to be geographically widespread despite impacts to stream habitat (Ceas and Monstad 2005; Wall and Thompson 2007; Ceas and Larson 2008). However, trend data that can determine resiliency and population health is lacking. While the reason for this apparent resiliency is not certain, it may be related to ecological differences caused by the area's geologic morainal features (Clark 2000; Wall et al. 2004). These features appear to have positively influenced groundwater inputs to streams and perennial pools in intermittent streams benefiting the species' ability to persist (Berg et al. 2004; Wall et al. 2004).

G. **Recovery Needs**

Initial recovery efforts should focus on identifying resiliency; trends and/or persistence throughout their current range; identifying habitat conditions in their range; and identifying priority watersheds for conservation actions. Another initial focus should be on continuing and improving ongoing conservation actions and protections for the species and its habitat, and riparian/sedimentation issues impacting habitat and water quality. Long-term efforts will include focus on further investigating additional propagation facilities for use in reintroductions and augmentations; developing non-essential, experimental population designations; and habitat conservation plans. Additionally, continue and expand using landowner incentive programs for habitat improvement; partner with counties on fish barrier removal/replacement; further investigate impacts of introduced piscivorous fishes; continued refinement of genetic information; and continuing investigation on the impacts of changing hydrological regimes on Topeka shiner and its habitat

II. PRELIMINARY RECOVERY STRATEGY

A. Recovery Priority Number

The recovery priority number for Topeka shiner remains an 8C, indicating that: (1) populations face a moderate degree of threat; (2) recovery potential is high; (3) the entity is listed at the species level; and (4) the species is in conflict with construction or other development projects or other forms of economic activity.

The magnitude of threat is currently moderate range-wide. Information suggests that the South Dakota/Minnesota populations are likely have a low to moderate magnitude of threat (although trend and population data is needed), whereas continued population declines indicate a moderate to high magnitude of threat in the Iowa, Kansas, Missouri, and Nebraska range. Recovery potential is considered high because many of the threats can ultimately be managed or abated, and should reach a threshold for recovery when the Topeka shiner populations across its entire range are self-sustaining.

We do not anticipate implementation of recovery actions to conflict with construction, agriculture, or other forms of economic activity.

B. Recovery Goals

The ultimate goal of the recovery effort is to ensure the long-term survival of the Topeka shiner by controlling or reducing threats to the extent that populations are self- sustaining and protections afforded by the Endangered Species Act are no longer required. The interim goal is to secure the species to the point that we may prioritize downlisting from endangered to threatened status. The identification of appropriate recovery objectives will likely involve substantial discussion and analysis of the Species Status Assessment; therefore, objectives will be identified in the recovery plan rather than in this recovery outline. The recovery plan will identify specific, measureable criteria that will describe the precise standards to objectively determine that the species has achieved its recovery objectives for downlisting and delisting.

C. Initial Action Plan

Below are the primary actions which are anticipated, including ongoing conservation measures outlined under Past and Current Conservation Efforts.

1. Monitor population status and habitat conditions
    a. Conduct regular surveys to monitor population status and habitat conditions across the Topeka shiner's six state range.
    b. Incorporate protocols for data collection that can be used to determine trends and/or persistence over a minimum of five generations/year classes of the species.
    c. Analysis should be on a level to identify population trends and/or persistence within some subset of watershed (e.g. USGS Hydrologic Unit Code), which will later be identified in the recovery plan.
    d. Incorporate protocols for a similar standard of habitat analysis to be utilized across the species range.

2. Captive propagation
    a. Develop additional captive propagation, augmentation, and reintroduction plans for select area of the species' range (as determined by the recovery plan). Continue coordination of Section 10(a)(1)(a) recovery permits with State agencies, the Service and academia.
    b. Determine areas/watersheds within the historic range where reintroduction and/or augmentations are needed to achieve species recovery.
    c. Pursue additional Section 10(j) experimental, non-essential population status within suitable watersheds in which the species has been extirpated.
    d. Pursue Habitat Conservation Plans with landowners and watershed interest groups within watersheds where the species remains extant but likely requires population augmentation for species conservation.

3. Protect populations and habitat
    a. Through Section 7(a)(2) of the Act, insure that any activities authorized, funded, or carried out by a Federal agency are not likely to jeopardize the continued existence of the species.
    b. Utilize landowner incentive programs to implement conservation practices on private property that will protect riparian and stream habitat near and/or

adjacent to Topeka shiner streams and reduce non-point sources of water quality and instream habitat degradation within streams (i.e. reduce sediment and nutrient input into streams within Topeka shiner watersheds).

c. Coordinate with the state environmental/water quality agencies, the state fisheries and conservation agencies, and the U.S. Environmental Protection Agency to ensure water quality criteria and standards are suitable for reproduction, survival of early life stages, and recruitment into successful year classes.

4. Identify fish passage barriers
   a. Identify watersheds/sub-watersheds with isolated and/or populations segmented due to barriers (i.e. perched road culverts, small impoundments, etc.).
   b. Prioritize watersheds/streams with barriers where removal and/or replacement will improve long-term conservation of the species.
   c. Pursue and secure sources of fish passage funding through Federal and State agencies, and with private sources.
   d. Develop working relationships with county road and bridge departments to assist in funding small bridge/culvert projects that will improve passage at select stream crossings.
   e. Coordinate with willing landowners in priority watersheds to breach and drain small impoundments and farm ponds.

5. Other research -The following are areas of important research needed for effective management of Topeka shiner and not outlined under other conservation measures:
   a. Continue to investigate the role of largemouth bass and other piscivorous fishes introduced to Topeka shiner habitat via escapement from impoundments and farm ponds related to population declines in portions of the species' range.
   b. Continue to assess pond rearing of the species for reintroduction and augmentation within priority watersheds.
   c. Refine the current knowledge of the genetics of Topeka shiners to assure the sourcing of appropriate genetic strains for reintroduction and augmentation.
   d. Investigate how the changes in hydrologic systems within varying watersheds impacts reproduction, recruitment, survival, and habitat characteristics.

III. PREPLANNING DECISIONS

A. Recovery Plan Development

A recovery plan for the Topeka shiner will be prepared pursuant to section 4(f) of the Endangered Species Act. The USFWS anticipates utilizing the existing recovery team and other applicable experts to serve the USFWS with their expertise for guidance in recovery plan development and review. The existing team will also be updated with new members due to attrition by several past members. The new members of the team have yet to be

identified, but will include knowledgeable representatives from appropriate State and Federal agencies, academics, and others with similar expertise.

B. Stakeholder Involvement

Other potential stake holders in recovery efforts, including members of outside interest groups, will have opportunity for involvement through portions of the recovery planning process. As the Service finds appropriate, this process may include coordination with consulting experts and/or meetings with interested parties to facilitate information exchange. A public comment period will open when a notice announcing the availability of the draft Recovery Plan is published in the *Federal Register*. In addition, we will seek peer review from at least three independent species (Topeka shiner) experts during the public comment period.

C. Recovery Plan Timeframe

Draft Recovery Plan anticipated: December 2018

Final Recovery Plan anticipated: April 2019

D. Information Management

All information relevant to the recovery of the Topeka shiner will be housed in the Manhattan Kansas Field Office's administrative files. The lead biologist will be responsible for maintaining an administrative record for the recovery planning and implementation process for the species.

Approved:

Regional Director, Region 6
U.S. Fish and Wildlife Service

Oct. 4, 2017
Date

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