

Topeka Shiner
(Notropis topeka)

**5-Year Status Review:
Summary and Evaluation**



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**U.S. Fish and Wildlife Service
Interior Regions 5 and 7
Denver, Colorado**

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U.S. FISH AND WILDLIFE SERVICE
5-YEAR STATUS REVIEW for
TOPEKA SHINER
(*Notropis topeka*)

Species Reviewed: Topeka shiner (*Notropis topeka*)

Federal Register Notice of Listing Determination and Designation of Critical Habitat:

- December 15, 1998. Endangered and Threatened Wildlife and Plants; Final Rule To List the Topeka Shiner as Endangered (63 FR 69008).
- July 27, 2004. Endangered and Threatened Wildlife and Plants; Final Designation of Critical Habitat for the Topeka Shiner (69 FR 44736).

Federal Register Notice Announcing Initiation of this Review:

- May 27, 2016. Endangered and Threatened Wildlife and Plants; Initiation of 5-Year Status Reviews of 21 Species in the Mountain-Prairie Region (81 FR 33698).

Lead Region: Legacy Region 6, Interior Regions 5 and 7, Kansas Ecological Services Field Office, Jason Luginbill, Project Leader, 785-539-3474; jason_luginbill@fws.gov.

Classification: Endangered

Methodology used to complete the review: In accordance with section 4(c)(2) of the Endangered Species Act of 1973 (16 U.S.C. 1531 *et seq.*), as amended (Act), the purpose of a 5-year status review is to assess each threatened species and endangered species to determine whether its status has changed and it should be classified differently or removed from the Lists of Threatened and Endangered Wildlife and Plants. Status reviews are to be completed in accordance with Sections 4(a) and 4(b) of the Act (16 U.S.C. Section 1533(c)). We solicited data for this 5-year status review, and the associated species status assessment (SSA) report, from interested parties through a May 27, 2016, *Federal Register* notice announcing this review (81 FR 33698). We reviewed all information that we received and incorporated information relevant to our analysis in our SSA report (Service 2018, entire). We also used the SSA report for the Topeka shiner to inform recovery planning for the species.

The SSA report for the Topeka shiner included input from species experts and agency biologists who work with the species. The SSA report was independently reviewed by peer reviewers and partners, including State wildlife agencies, Federal agencies, and other stakeholders (Service 2018, entire). The SSA report represents our evaluation of the best available scientific information at the time, including the resource needs and the current and future condition of the species under various conservation scenarios (Service 2018, pp. 138–151). Our SSA report was one source of scientific information that we used to help inform this 5-year status review. We also considered new information that we received since we completed the SSA report, such as a supplementary report that reviews threats to the species that were not included in the SSA report (Service 2020, entire).

Recovery Planning: We announced the availability of a draft recovery plan for the Topeka shiner in the *Federal Register* on January 17, 2020 (85 FR 3073). The Regional Director approved the final recovery plan for the Topeka shiner on March 25, 2021 (Service 2021, entire). Partners and stakeholders across the range of the Topeka shiner, including the States of Iowa, Kansas, Minnesota, Missouri, Nebraska, and South Dakota, contributed greatly to our understanding of this species and the development of the recovery plan.

REVIEW ANALYSIS

Overview of the Species Status Assessment Process

The SSA report provides the U.S. Fish and Wildlife Service's (Service's) comprehensive biological status review for the Topeka shiner, including a thorough account of the Topeka shiner's current and future viability, or the "ability of a species to sustain populations in the wild over time" (Service 2016, p. 21; Service 2018, entire). Scientific experts contributed to our analysis, and the draft SSA report was independently peer reviewed and reviewed by partners. The results of the independent peer review of the draft SSA report are available online on the Service's Science Peer Review webpage (<https://www.fws.gov/mountain-prairie/science/peerreview.php>). We incorporated the results of the peer and partner review into our SSA report. The SSA report is available online at <https://ecos.fws.gov/ecp/species/4122>.

The SSA report provides the best available biological information to inform our recommendation on the status of the Topeka shiner under this 5-year status review. This includes resource needs and current and future conditions, which we describe in terms of the conservation biology principles of resiliency, redundancy, and representation (Shaffer and Stein 2000, pp. 307–310; Wolf *et al.* 2015, entire; Smith *et al.* 2018, entire; Service 2018, entire). The SSA therefore provides the scientific analysis for the 5-year status review. We also used a supplemental analysis of specific threats that were not analyzed in the SSA (Service 2020, entire). The following discussion presents a summary of the results and conclusions of the SSA report (Service 2018, entire).

For this SSA, we defined viability as the ability of the Topeka shiner to sustain populations in natural ecosystems over a biologically meaningful timeframe, which, in this case, we defined as 10 to 20 years into the future. This timeframe is a period that captures approximately three to six generations of the Topeka shiner (Service 2018, entire). This timeframe is also a period that allows us to reasonably project conservation efforts, actions, and the potential effects of various stressors (Service 2018, entire).

To assess the viability of the Topeka shiner, we used the three conservation biology principles of resiliency, redundancy, and representation, collectively known as the 3Rs (Shaffer and Stein 2000, pp. 307–310; Wolf *et al.* 2015, entire; Smith *et al.* 2018, entire; Service 2018, entire). In short:

- Resiliency is the ability for populations to persist in the face of stochastic events, or for populations to recover from years with low reproduction or reduced survival, and is associated with population size, growth rate, and the quality and quantity of habitats;

- Redundancy is the ability for the species to withstand catastrophic events, for which adaptation is unlikely, and is associated with the number and distribution of populations; and
- Representation is the ability of a species to adapt to changes in the environment and is associated with its diversity, whether ecological, genetic, behavioral, or morphological.

For our analysis, we identified the Topeka shiner's ecological requirements for survival and reproduction at the individual, population, and species levels, and described the factors, both positive and negative, that influence the viability of the Topeka shiner, currently and into the future. We then evaluated the species' current levels of resiliency, redundancy, and representation, and projected plausible changes to these 3Rs into the future; considered together, the current and future levels of resiliency, redundancy, and representation characterize the viability of the Topeka shiner (Service 2018, entire).

Updated Information and Species Status

Background:

The Topeka shiner is a small minnow, or cyprinid in the Cyprinidae family, that lives and breeds in graveled pools of low-order prairie streams in the Great Plains states of South Dakota, Minnesota, Nebraska, Iowa, Kansas, and Missouri. The Topeka shiner was listed as endangered under the Endangered Species Act (Act) in 1998 (effective in January 1999) because we thought at the time there had been significant population declines due primarily to alteration of prairie stream hydrology and habitat degradation (63 FR 69008, December 15, 1998). The Service also designated critical habitat for the Topeka shiner in 2004 in Minnesota, Nebraska, and Iowa; the States of South Dakota, Missouri and Kansas were exempt from the designation of critical habitat due to the existence of management plans (69 FR 44736, July 27, 2004).

At the time of listing in 1998, the Topeka shiner's known occupied range was thought to have declined by approximately 80 percent, with about 50 percent of that loss occurring rapidly within the previous 25 years. This population decline was due primarily to anthropogenic factors, particularly agricultural activities, which negatively affected the quality of prairie stream habitats since Europeans settled the prairie (Service 2018, p. 7). At the time of listing we knew of approximately 57 occupied stream sites (63 FR 69008). However, surveys for the species conducted after 1998 revealed a significantly broader distribution of the Topeka shiner than was known at the time of listing, primarily within South Dakota and Minnesota. These surveys indicated that the species' range had not significantly declined from prior known boundaries in those states, but that population losses continued in the southern portions of the species' range. The States of South Dakota and Minnesota are now estimated to support 70 percent of the Topeka shiner's range, but in 1998, these areas were previously thought to contain only 20 percent of the estimated range (Service 2018, p. 7).

Since 1999, the Topeka shiner has been documented within 223 small to mid-size streams, which encompass 87 populations (Hydrologic Unit Code (HUC) 10 watersheds), 13 population complexes (groups of hydrologically connected HUC10 watersheds), and 6 states (Service 2018, p. 1). Most Topeka shiners are found within the northern populations in South Dakota,

Minnesota, and Iowa, where the species has persisted despite threats occurring on the landscape (Service 2018, p. 1). The southern populations within the Topeka shiner's range in Nebraska, Kansas, and Missouri were not covered by the most recent glacial advances (unlike the northern populations) and have experienced greater population losses. The north-south differences in glaciation effects to groundwater input and landscape drainage patterns could be a significant factor determining the species' current persistence pattern with relatively well drained hydrologic systems in the south contributing to species declines in these areas (Service 2018, p. 1). There are exceptions to the general trend of declines in the southern populations, such as the Flint Hills area of Kansas, which has fared better than other areas, likely due to the relative lack of habitat alterations that have occurred since Europeans settled the Great Plains.

Within the Topeka shiner's current, six-state distribution, habitats are generally patchy and isolated, particularly in the southern populations (Service 2018, p. 1). Many of the Topeka shiner's populations and population complexes are isolated, separated by insurmountable distances, impassible structures, and unsuitable habitats. Genetic variability in the species exists at a population scale, such that adjacent populations that are seemingly well-connected and barrier-free, may exhibit genetic differences that are more indicative of long-term isolation. This may be partly due to the species' typical association with relatively small streams.

While the Topeka shiner occupies similar habitat types across its range, which are generally characterized by small, low-flowing prairie streams, with sand, gravel, and cobble pools, the species' six-state overall range provides some local variation of geophysical conditions.

Summary of Species Needs

To assess the viability of the Topeka shiner, we used the conservation biology principles of resiliency, redundancy, and representation. Specifically, we considered the ecological needs of the Topeka shiner at the individual, population, and species levels, and described the stressors that influence the viability of the species (Service 2018, entire).

For resiliency to withstand stochastic events, Topeka shiner populations need low-order prairie streams with pools, low flows, floodplain connectivity, gravel, and presence of sunfish (Service 2018, Table 1). Also, populations need connectivity within and among HUC10 and HUC12 watersheds to allow for recolonization and access to refugia (Service 2018, Table 1). At the species level, for redundancy, the Topeka shiner needs numerous resilient populations and population complexes in a majority of states within the range of the species to withstand catastrophic events (Service 2018, Table 1). For representation, the species needs to occupy a range of ecologically diverse drainages and ecoregions and retention of current genetic diversity in order to ensure genetic and ecological diversity needed to maintain adaptive potential (Service 2018, Table 1).

Summary of Stressors Influencing Viability

Numerous anthropogenic stressors affect the hydrology, morphology, and biological aspects of prairie streams that the Topeka shiner inhabits (Service 2018, p. 89). These stressors have resulted in the loss of suitable habitat, refugia, and connectivity that support the resiliency of

Topeka shiner populations. These stressors have extirpated populations and recolonization has not occurred, such that the overall range of the species has contracted significantly (Service 2018, p. 90). When listed in 1998, we described the threat factors known to affect the Topeka shiner (63 FR 69008, December 15, 1998), and these factors still affect the species today. Topeka shiner populations continue to experience habitat destruction, degradation, modification, and fragmentation, resulting from siltation, reduced water quality, stream impoundment, stream channelization, and stream dewatering, caused primarily by agricultural practices (63 FR 69008, December 15, 1998). The listing rule also noted that introduced predatory fishes may affect the species (63 FR 69008, December 15, 1998).

Our previous 5-year status review for the Topeka shiner not only evaluated the threat factors that we originally evaluated in 1998, but also evaluated updated information regarding stressors to the Topeka shiner and its prairie stream habitats, including climate change and agricultural tiling (Service 2010, entire). The previous 5-year status review also identified “hydrologic changes” as a catch-all category for the agricultural-caused habitat modifications that have occurred to prairie streams, noting that maintaining natural hydrology in the northern populations is critical to sustaining existing Topeka shiner populations, while altered hydrology has severely impacted the southern populations. With the exception of climate change, our previous 5-year status review characterized threats in the northern populations, primarily in South Dakota and Minnesota, as not exceeding a “moderate” overall threat level, meaning that the threat requires action to remedy, but the remedy need is not immediate nor essential to species survival (Service 2010, entire). Conversely, in the southern populations, threats associated with row-crop agriculture/grassland conversion, urbanization, dams/stream hydrology, dredging/gravel mining, predation, population fragmentation/drought, and/or climate change were deemed to have overall threat levels of moderate to high, meaning respectively that “action is needed” and “immediate action is needed” to address the threat (Service 2010, entire). The reduced magnitude of threats in the northern populations in South Dakota, Minnesota, and parts of Iowa, may be the result of their more recent glaciation (compared to the southern populations), resulting in a hydrological regime that may be a key to the persistence of Topeka shiners in these areas despite threats occurring on the landscape (Service 2018, p. 1 and 90). Southern states within the species’ range (Nebraska, Kansas, and Missouri) with older glacial records and relatively well drained hydrologic systems have experienced greater Topeka shiner population losses (Service 2018, p. 1). Additionally, the northern populations may have a greater prevalence of vegetated stream buffers (Service 2018, p. 90) that provide protections for instream habitat. In short, the most pervasive stressors causing the species to decline in some areas can be lumped under the umbrella of altered hydrology (hydrologic changes) (Service 2018, p. 91).

Following the completion of our SSA report, concerns regarding the current and potential future conversion of native, prairie landscapes into row-crop agriculture and tiling, which could potentially negatively affect the Topeka shiner, prompted additional analysis. In addition, we also recognized the need to examine potential issues resulting from elevated selenium on lotic communities within the species’ range, as selenium has been documented as having significant negative effects on certain cyprinid (minnow) species. Therefore, to best inform this 5-year status review, we sought additional information on the scope and scale of some threats to the species that were not fully characterized in the SSA report. We summarized this new information on threats in a supplementary report (Service 2020, entire), which we summarize

below.

Cropland conversion is one of the major sources of changes to stream hydrology that may affect the Topeka shiner. Minimal land area has been converted to “non-cropland” and the vast majority of the watersheds that support the Topeka shiner are predominantly classified as “cropland,” except for the watershed located in the Flint Hills region of Kansas (Lark *et al.* 2015, entire). The majority of watersheds that support the Topeka shiner were converted to croplands before 2008, such as in Iowa where the watersheds were almost entirely completely cropland prior to 2008. However, cropland conversions have occurred more recently (after 2008) in eastern South Dakota, the potential core or stronghold of the Topeka shiner range. Recent and substantial cropland conversions in the northern populations are concerning, given that these populations are some of the most resilient across the species’ range (Service 2020, entire).

While most of the areas with a high probability of conversion have already been converted to croplands, there are some high probability areas that have not yet been converted. For example, a large area in South Dakota has a high risk of conversion from its current non-cropland condition to cropland (Service 2020, entire). Given this high probability, if economic forces encourage agricultural practices to expand, the northern populations could experience increased rates of habitat loss and fragmentation in the future.

The expansion of tiling throughout the Topeka shiner’s range could also affect the species by reducing stream habitat and increasing water contamination. We attempted to map the spatial extent of tiling, however, the data does not exist that would allow us to assess this risk. However, the cropland analysis shows the significant extent of current cropland throughout the Topeka shiner’s range and highlights areas that could be converted to cropland in the future. As a result, it is reasonable to conclude that most areas throughout the Topeka shiner’s range may be subject to impacts from the expansion of cropland tile drainage, except for the Flint Hills in Kansas.

Most of the watersheds with Topeka shiner populations, except for those in Kansas, occur in areas with naturally occurring selenium geology (Service 2020, entire). Streams in South Dakota with extensive selenium geology and tile drainage have shown increased selenium levels. The potential effects of selenium on the Topeka shiner are currently not known, but the literature on other cyprinid fish species indicate it could negatively affect individual fitness and reproductive health. The past, current and future use of tile drainage in agriculture fields could exacerbate the harmful effects of selenium on the Topeka shiner. Toxicity research is needed to fully assess how selenium may affect the species.

Summary of Current Condition

To assess population resiliency for the Topeka shiner, we created a resiliency model that was applied to populations throughout the species current range (Service 2018, pp. 114–124). In general, we found the resiliency of the northern populations in Iowa, Minnesota, and South Dakota, to be higher than the resiliency for populations in the southern part of the species’ range in Kansas, Missouri, and Nebraska (Service 2018, Table 1). Ongoing threats continue to degrade habitat and reduce resiliency, particularly in the southern states. Conservation actions have

occurred or are occurring in parts of the range to increase population resiliency, including off-channel habitat creation in Minnesota and Iowa, reintroductions in Missouri, and general habitat improvement programs in other states.

To assess redundancy, we looked at the number, distribution, and resiliency of the populations across the species' range (Service 2018, pp. 124–129). There are currently 223 occupied streams with (defined as streams with occurrence records between 1999 and 2017), composing 87 HUC10 watersheds/populations within 13 population complexes distributed among 6 states (Service 2018, Table 1). We found that 72 out of the 87 populations ranked in the three middle resiliency ranking categories. There are 67 northern populations and 20 southern populations, and our analysis revealed that the northern populations and population complexes have greater resiliency (Service 2018, Table 1).

To assess representation, we explored genetic and ecological diversity in the SSA report (Service 2018, pp. 48–57). In terms of representation, some genetic variation may have been lost with the extirpation of populations. However, genetic variation does continue to exist within current populations and between populations and among population complexes and the species retains a breadth of ecological diversity due to distribution within six states with varied ecological conditions (Service 2018, pp. 48–57). This allows the species to maintain adaptive potential in the face of future stressors.

Summary of Future Conditions

In the Topeka shiner SSA report, we discuss 4 future scenarios (with varying levels of conservation efforts) that project species resiliency, redundancy, and representation over the next 10 to 20 years. Because some of the scenarios are somewhat aspirational in nature and assume higher levels of conservation efforts than are currently occurring and there is uncertainty regarding if and when higher levels of conservation may occur, we focus our discussion here on Scenario A. This scenario assumes that conservation actions continue at current levels with no additional conservation strategies implemented (Service 2018, pp. 144–147).

Under future Scenario A, little would change in terms of conservation activities designed to promote viability of the Topeka shiner. This scenario assumes the continuation of ongoing conservation actions without additional conservation measures being implemented. At present, ongoing conservation actions specifically for the Topeka shiner include construction of off-channel habitats in Iowa and Minnesota, and captive rearing of the Topeka shiner in Kansas and Missouri, with reintroductions occurring in Missouri. While these are important conservation actions, which have been successful to date, they are limited to a few areas and are not occurring across the species' range. Some non-targeted actions, such as Minnesota's Buffer Law (that requires perennial vegetation buffers with an average width of 50 feet (15 meters) and a minimum width of 30 feet (9 meters) along rivers and streams), likely will afford benefits to the species' habitat, but such laws do not exist in the other 5 states of the Topeka shiner's range.

Scenario A does not project new conservation actions for the Topeka shiner in any state, thus benefits to the species as a whole are minimal due to the small scale of these efforts, and we do not expect these conservation efforts to offset the effects of ongoing threats at the species level,

although they may benefit local areas. While current conservation actions may move local populations toward improved resiliency, we expect the species' overall resiliency to decline. Additional conservation efforts would be needed to substantially maintain and improve the viability of the Topeka shiner.

Areas without current conservation actions may shrink, or even be extirpated, as populations within them are lost, particularly in southern areas that are currently small and harbor few individuals such as Nebraska populations or Sugar Creek in Missouri. Benefits gained in the few areas currently implementing conservation actions (as described above) could also potentially be overridden by threats to the species not addressed by these measures, and/or declines in resiliency and redundancy of populations where conservation actions are not occurring. The current actions must continue, must be successful, and the benefits realized must be greater than current impacts at a population complex level in order to improve the viability of the species and reduce continued declines, particularly in southern areas. This seems unlikely without additional conservation actions and involvement of additional states. Importantly, the species is not expected to be lost entirely from all southern populations currently in existence within the timeframe of this analysis (10–20 years into the future); however, greater reliance on northern populations could result if current tenuous southern population complexes are not bolstered and southern declines are not halted. Our analysis in the SSA indicates that the species will continue to have occupied populations throughout its current range in 10–20 years, although at potentially reduced overall viability.

Summary of Viability

The overall range of the Topeka shiner was thought to be very limited at the time of its listing under the Act in 1998, but additional surveys completed after listing identified occupied watersheds that were previously unknown to support the species. Currently, the Topeka shiner occupies over 223 streams in 13 population complexes distributed across 6 states. The species retains a breadth of geographic and ecological diversity due to its distribution across these six states, although population losses over time likely reduced diversity of the species. Currently, population complexes in the northern portion of the species' range in Minnesota and South Dakota have higher levels of resiliency than those in southern portions of the range. The species is expected to continue to be adversely affected by various stressors into the future under a variety of conservation scenarios that project the species' condition 10 to 20 years into the future (Service 2018, pp. 138–151). If conservation efforts continue at current levels 10 to 20 years into the future as described under Scenario A, we expect the species to maintain populations and population complexes throughout its range, but with reductions to resiliency, redundancy, and representation (Service 2018, pp. 138–151). Without additional conservation actions to ameliorate or reduce threats to the species, we project further future reductions to resiliency, redundancy, and representation, and as a result, potential reductions to the species' overall viability (Service 2018, pp. 138–151).

STATUS RECOMMENDATION

Standard for Review

Section 4 of the Act (16 U.S.C. Section 1533) and its implementing regulations (50 CFR part 424) set forth the procedures for determining whether a species meets the definition of “endangered species” or “threatened species.” The Act defines an “endangered species” as a species that is “in danger of extinction throughout all or a significant portion of its range,” and a “threatened species” as a species that is “likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.” The Act requires that we determine whether a species meets the definition of an “endangered species” or a “threatened species” because of any of the following factors:

- (A) The present or threatened destruction, modification, or curtailment of its habitat or range;
- (B) Overutilization for commercial, recreational, scientific, or educational purposes;
- (C) Disease or predation;
- (D) The inadequacy of existing regulatory mechanisms; or
- (E) Other natural or manmade factors affecting its continued existence.

These factors represent broad categories of natural or human-caused actions or conditions that could have an effect on the species’ continued existence. In evaluating these actions and conditions, we look for those that may have a negative effect on the Topeka shiner, as well as other actions or conditions that may ameliorate any negative effects or may have positive effects.

We use the term “threat” to refer in general to actions or conditions that are known to or are reasonably likely to negatively affect individuals of a species. The term “threat” includes actions or conditions that have a direct impact on individuals, as well as those that affect individuals through alteration of their habitat or required resources. The term “threat” may encompass, either together or separately, the source of the action or condition, or the action or condition itself.

However, the mere identification of any threat(s) does not necessarily mean that the species meets the Act’s definition of an “endangered species” or a “threatened species.” In assessing whether a species meets either definition, we must evaluate all identified threats by considering the effects of the threats and the expected response of the species in light of those actions and conditions that will ameliorate the threats on an individual, population, or species level. We evaluate each threat and its expected effects on the species, then analyze the cumulative effect of all of the threats on the species as a whole. We also consider the cumulative effect of the threats in light of those actions and conditions that will have positive effects on the species such as any existing regulatory mechanisms or conservation efforts. The Service recommends whether the species meets the definition of an “endangered species” or a “threatened species” only after conducting this cumulative analysis and describing the expected effect on the species now and in the foreseeable future.

In our status recommendation, we correlate the threats acting on the Topeka shiner to the factors in section 4(a)(1) of the Act. We summarize our 5-year status review for the Topeka shiner below.

Summary of Analysis

The biological information we reviewed and analyzed as the basis for our findings is documented in the SSA report (Service 2018, entire) and our supplemental assessment of threats (Service 2020, entire), a summary of which is provided above. The projections for the future condition of the Topeka shiner are based on our expectations of the potential stressors that may affect the species. When we listed the Topeka shiner as an endangered species on December 15, 1998, we identified the assumed, significant population declines due primarily to alteration of prairie stream hydrology and habitat degradation from agricultural activities (Factor A) as the primary threat (63 FR 69008, December 15, 1998).

In our SSA report, we evaluated a number of stressors that influence the viability of the Topeka shiner. Altered hydrology of prairie streams (Factor A) occupied by the Topeka shiner is the biggest factor contributing to the decline of the species (Service 2018, p. 113; Table 1 and Table 2 below). The anthropogenic landscape-level changes incurred to prairie streams since European settlement of the Great Plains have severely altered the physical, chemical, biological, and ecological processes to which the Topeka shiner has adapted (Service 2018, p. 113). Habitats have been negatively affected to such an extent as to permanently extirpate entire populations/population complexes where recolonization by the Topeka shiner is physically precluded. Agriculture and its associated activities are the primary drivers of these hydrological changes across the entire range of the species, although other landscape-scale human development activities, such as dams and road crossings, have also contributed significantly to the species' decline (Service 2018, p. 113) (Factor A). Our SSA report provides our full analysis of stressors on the Topeka shiner (Service 2018, pp. 89–113).

We note that by using the SSA framework to guide our analysis of the scientific information documented in the SSA report, we have analyzed individual effects of stressors on individuals, populations, and the Topeka shiner as a species, as well as their potential cumulative effects (Service 2018, pp. 89–113). We incorporate the cumulative effects into our analysis when we characterize the current and future condition of the Topeka shiner. Our current and future condition assessment is iterative because it accumulates and evaluates the effects of all the factors that may be influencing the Topeka shiner, including negative influences from stressors and positive influences from conservation efforts. We evaluate potential effects from these influences consistently across the same subset of habitat and demographic needs for the Topeka shiner, both currently and into the future. Because the SSA framework considers not just the presence of the factors, but also the degree to which they collectively influence risk to the entire species, our assessment integrates the cumulative effects of the five factors and replaces a standalone cumulative effects analysis.

Concerns regarding current and future conversion from native landscapes into row crop agriculture, tiling, selenium contamination and the potential negative impacts to the Topeka shiner prompted further analysis, beyond what was considered in the SSA report. The majority

of areas within the range that have a high probability of cropland conversion have already been converted. The conversion of remaining high probability areas (e.g., South Dakota) will be driven by market forces. It could be assumed that most areas throughout the range may be subject to impacts from the expansion of cropland tile drainage with related increases in stream contamination, particularly in areas of selenium geology.

The Topeka shiner is expected to remain in multiple populations and population complexes throughout the range within a biologically meaningful timeframe for our analysis, or 10 to 20 years into the future. However, southern population declines are expected to continue if population complexes are not bolstered. We determined that the Topeka shiner will continue to have occupied populations throughout its current range 10 to 20 years into the future, although at potentially reduced overall viability (Service 2018, p. 147).

Application of Analysis to the Status Recommendation

The SSA describes the current and future viability of the Topeka shiner in terms of the 3Rs, which characterize risk to the species in the context of stochasticity (resiliency), catastrophes (redundancy), and long-term environmental change (representation) (Service 2018, entire). This analysis and our additional threats analysis (Service 2020, entire), form the basis for our recommendation under the Act. Because of uncertainties regarding the implementation of conservation efforts examined in some of the scenarios in the SSA report, we focused our analysis in this 5-year status review on Scenario A, which considers a continuation of current conservation levels. The fundamental question before the Service is whether the projections of extinction risk for the Topeka shiner meets the definition of an endangered or threatened species under the Act. Theoretically, if the abundance (resiliency), distribution (redundancy), and diversity (representation) of the Topeka shiner decreases, thereby decreasing overall viability, the extinction risk of the Topeka shiner would correspondingly increase.

As described below, we first evaluate whether the Topeka shiner is in danger of extinction throughout its range now. We then evaluate whether the Topeka shiner is likely to become in danger of extinction throughout its range in the foreseeable future. We finally consider whether the Topeka shiner is in danger of extinction in a significant portion of its range (SPR).

Evaluation of Status: In Danger of Extinction Throughout its Range

Under the Act, an endangered species is any species that is “in danger of extinction throughout all or a significant portion of its range” (16 U.S.C. Section 1532(6)). For this 5-year status review, we evaluate the best available scientific information about the species’ current levels of demographic and habitat factors (in terms of resiliency, redundancy, and representation) to describe the viability of the Topeka shiner (Service 2018, entire; Service 2020, entire). We compare our evaluation of the species’ current risk of extinction against the definition of an endangered species.

When we listed the Topeka shiner as an endangered species in 1998, we knew the species to only occupy a small portion of its historical range. With additional surveys and data, we now know that the extent of the species’ range decline is not as severe as we previously understood and the

vulnerability of many of the remaining populations is substantially lower than we thought at the time of listing.

In our SSA analysis, we found that 72 of the 87 populations ranked in the three middle resiliency ranking categories (Service 2018, Table 1). There are currently 67 northern populations and 20 southern populations, with the northern populations and population complexes exhibiting greater resiliency than those in the south (Service 2018, Table 1). In terms of representation, these populations are spread across the species range, thereby reducing extinction risk from catastrophic events. The species also exhibits genetic and ecological diversity that can influence adaptive potential. Ongoing threats continue to degrade habitat and reduce resiliency, particularly in the southern populations. Conservation actions have occurred or are occurring in parts of the range to increase population resiliency, however, conservation efforts are not occurring at a scale that greatly influences the overall viability of the Topeka shiner.

Given the high number of currently occupied streams (223) compared to when the species was listed (approximately 57), the current levels of resiliency found within populations, the spread of populations and population complexes around the six-state range, the genetic and ecological diversity observed, and the lack of significant, imminent stressors, we believe that the Topeka shiner currently has sufficient ability to withstand stochastic and catastrophic events and to adapt to environmental changes. Therefore, we conclude that the current risk of extinction is low, such that the Topeka shiner is not currently in danger of extinction throughout all of its range.

Having found that the Topeka shiner is not in danger of extinction throughout its range, we next evaluated whether the species is likely to become an endangered species within the foreseeable future throughout all of its range.

Evaluation of Status: Likely to Become Endangered Throughout its Range

Under the Act, a threatened species is any species that is “likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range” (16 U.S.C. Section 1532(20)). The term foreseeable future extends only so far into the future as the Service can reasonably determine that both the future threats and the species’ responses to those threats are likely (50 C.F.R. 424.11(d)). The Service describes the foreseeable future on a case-by-case basis, using the best available data and taking into account considerations such as the species’ life history characteristics, threat-projection timeframes, and environmental variability (50 C.F.R. 424.11(d)). The key statutory difference between a threatened species and an endangered species is the timing of when a species may be in danger of extinction, either now (endangered species) or in the foreseeable future (threatened species).

For the purposes of our analysis, we defined the foreseeable future for the Topeka shiner as 10 to 20 years into the future. This is a biologically meaningful timeframe that captures approximately three to six generations of the Topeka shiner and for us to reasonably measure and observe significant conservation gains for the species (Service 2018, p. 140). Additionally, it is a timeframe during which we can reasonably project both future threats and the species’ response.

To assist us in evaluating the status of the Topeka shiner in the foreseeable future over the next 10 to 20 years, we evaluated the future condition for the species under plausible future scenarios. For this 5-year status review, we focused on a plausible future where conservation actions would continue at their current levels and effectiveness (Service 2018, pp. 144-147), as summarized above. Over the next 10 to 20 years under this conservation continuation scenario, we project that the species will continue to occupy populations and population complexes throughout the current range, both in the northern and southern portions of the range. However, without additional conservation efforts, we expect reduced population resiliency and potentially local extirpations, particularly in the southern states of Kansas, Missouri, and Nebraska. We also expect a corresponding reduction in redundancy and representation. Our recent analysis of cropland conversion, tiling, and selenium contamination (Service 2020, entire) indicate additional potential risks to the species beyond what was considered in the SSA report. To summarize, under the plausible future conditions and threats considered, the Topeka shiner as a whole would be less likely to withstand plausible stochastic events, catastrophic events, or retain sufficient adaptive capacity to withstand environmental change 10 to 20 years into the future without additional range-wide conservation efforts. Therefore, after assessing the best available information, we conclude that the Topeka shiner is likely to become in danger of extinction throughout all of its range in the foreseeable future.

Evaluation of Status Throughout a Significant Portion of its Range

Having determined that the Topeka shiner is not in danger of extinction, but is likely to become so in the foreseeable future throughout all of its range, we now consider whether the species may be in danger of extinction in a significant portion of its range, that is, whether there is any portion of the species' range for which it is true that both (1) the portion is significant; and, (2) the species is in danger of extinction now in that portion. We can choose to address either question first; if we reach a negative answer with respect to the first question that we address, we do not need to evaluate the other question for that portion of the species' range.

In undertaking this analysis for the Topeka shiner, we choose to address the status question first. We considered information pertaining to the geographic distribution of both the species and the threats that the species faces to identify any portions of the range where the Topeka shiner may be endangered.

For the Topeka shiner, we considered whether threats are geographically concentrated in any portion of the species' range at a biologically meaningful scale. As summarized above and documented in our SSA report, we evaluated a variety of stressors, the most concerning of which are threats related to changes in stream hydrology (Service 2018, pp. 89–113). Overall, we did not identify any concentrations of threats across the six states. The threats are generally evenly distributed throughout the species' range with no concentration of threats at a biologically meaningful scale. Therefore, no portion of the Topeka shiner's range can provide a basis for determining that the species is in danger of extinction now or in a significant portion of its range, and we find that the Topeka shiner is not in danger of extinction now in any significant portion of its range. This is consistent with the courts' holdings in *Desert Survivors v. Department of the Interior*, 336 F.Supp.3d 1131 (N.D. Cal. Aug. 24, 2018) and *Center for Biological Diversity v. Jewell*, 248 F. Supp. 3d 946 (D. Ariz. 2017).

Summary of Evaluation and Recommendation

Our review of the best available scientific and commercial information indicates that the Topeka shiner does not meet the definition of an endangered species, but does meet the definition of a threatened species in accordance with Section 3(6) and 3(20) of the Act. Therefore, with this 5-year status review, we recommend that the Topeka shiner be downlisted to a threatened species under the Act. We base this decision primarily on the species' current vulnerability in the southern part of the range and the potential long-term impacts to the hydrology in the northern part of the range.

TABLE 1. Five Listing Factors Threats Assessment Summary Table: Minnesota and South Dakota

Listing FACTOR under the Act	MINNESOTA			SOUTH DAKOTA		
	Immed	Intens	Overall Threat	Immed	Intens	Overall Threat
Factor A: The present or threatened destruction, modification, or curtailment of its habitat or range						
Row crop Agriculture/Grassland Conversion	Ongoing	Mod	Mod	Ongoing	Mod	Mod
Livestock Grazing	Ongoing	Low-Mod	Low-Mod	Ongoing	Low-Mod	Low-Mod
Confined Animal Feeding Operations	Ongoing	Mod	Mod	Ongoing	Low-Mod	Low-Mod
Groundwater Withdrawal Stream Hydrology	Ongoing	Low-Mod	Mod	Future	Low-Mod	Mod
Road and Bridge Construction	Ongoing	Mod	Mod	Ongoing	Low-Mod	Low
Urbanization	Ongoing	Low	Low	Ongoing	Low-Mod	Low
Dams/Stream Hydrology	Ongoing	Low	Low	Ongoing	Low	Low
Dredging/Gravel Mining	n/a	n/a	n/a	n/a	n/a	n/a
Factor B: Overutilization for Commercial or Scientific Purposes						
Bait Harvest	n/a	n/a	n/a	n/a	n/a	n/a
Factor C: Disease or predation						
Disease and Parasites	Not Known	Not Known	Not Known	Not Known	Not Known	Not Known
Predation	Low	Low	Low	Low	Low	Low
Factor D: The inadequacy of existing regulatory mechanisms						
No Federal Nexus/ Regulatory Changes	Ongoing	Not Known	Not Known	Ongoing	Not Known	Not Known
Factor E: Other natural or manmade factors affecting its survival						
Population Fragmentation/Drought	Future	Not Known	Not Known	Future	Not Known	Not Known
Climate Change	Ongoing	Mod	Mod-High	Ongoing	Mod	Mod-High

*Immediacy:

1. Future (future effects anticipated)
2. Ongoing (effects imminent)
3. Historic (effects realized, but restorative action necessary)

**Intensity (strength of stressor):

1. Low
2. Moderate
3. High

Overall Threat Level:

1. Low (no action needed at this time)
2. Moderate (action is needed)
3. High (immediate action needed)
4. Severe (action essential for survival of species)

TABLE 2. Five Listing Factors Threats Assessment Summary Table: Iowa, Kansas, Missouri, and Nebraska

Listing FACTOR under the Act	IOWA			KANSAS			MISSOURI			NEBRASKA		
	Immed	Intens	Overall Threat	Immed	Intens	Overall Threat	Immed	Intens	Overall Threat	Immed	Intens	Overall Threat
Factor A: The present or threatened destruction, modification, or curtailment of its habitat or range												
Row crop Agriculture – Grassland Conversion	Ongoing	Mod-High	Mod-High	Ongoing	Mod-High	Mod-High	Ongoing	Mod-High	Mod-High	Ongoing	Mod-High	Mod-High
Livestock Grazing	Ongoing	Low	Low-Mod	Ongoing	Low-Mod	Low-Mod	Ongoing	Low-Mod	Low-Mod	Ongoing	Low	Low
Confined Animal Feeding Operations	Ongoing	Mod	Mod	Ongoing	Mod	Mod	Ongoing	Mod	Mod	Ongoing	Mod	Mod
Groundwater Withdrawal Stream Hydrology	Future	Not Know	Not Known	Future	Not Know	Not Known	Future	Not Know	Not Known	Ongoing	Mod	Mod
Road and Bridge Construction	Ongoing	Low-Mod	Low-Mod	Ongoing	Mod	Mod	Ongoing	Mod	Mod	Ongoing	Low	Low
Urbanization	n/a	n/a	n/a	Ongoing	Mod	Mod-High	Ongoing	Mod	Mod-High	n/a	n/a	n/a
Dams/Stream Hydrology	Ongoing	Mod	Mod	Ongoing	Mod	Mod-High	Ongoing	Mod	Mod-High	n/a	n/a	n/a
Dredging/Gravel Mining	Ongoing	Low	Low-Mod	Ongoing	Mod	Mod-High	Ongoing	Mod	Mod-High	Ongoing	Low	Mod
FACTOR B: Overutilization for Commercial or Scientific Purposes												
Bait Harvest	Ongoing	Low	Low	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
FACTOR C: Disease or predation												
Disease and Parasites	Not Known	Not Known	Not Known	Ongoing	Not Known	Not Known	Ongoing	Not Known	Not Known	Not Known	Not Known	Not Known
Predation	Ongoing	Low	Low	Ongoing	Mod-High	Mod-High	Ongoing	Mod-High	Mod-High	Not Known	Not Known	Not Known
FACTOR D: The inadequacy of existing regulatory mechanisms												
No Federal Nexus/Regulatory Changes	Future	Not Known	Not Known	Future	Not Known	Not Known	Future	Not Known	Not Known	Future	Not Known	Not Known
FACTOR E: Other natural or manmade factors affecting its survival												
Population Fragmentation/Drought	Ongoing	Not Known	Not Known	Ongoing	Mod-High	Mod-High	Ongoing	Mod-High	Mod-High	Ongoing	Mod-High	Mod-High
Climate Change	Ongoing	Mod	Mod-High	Ongoing	Mod	Mod-High	Ongoing	Mod	Mod-High	Ongoing	Mod	Mod-High

*Immediacy:

1. Future (future effects anticipated)
2. Ongoing (effects imminent)
3. Historic (effects realized, but restorative action necessary)

**Intensity (strength of stressor):

1. Low
2. Moderate
3. High

Overall Threat Level:

1. Low (no action needed at this time)
2. Moderate (action is needed)
3. High (immediate action needed)
4. Severe (action essential for survival of species)

RECOMMENDATIONS FOR FUTURE ACTIONS

- Work with partner agencies and organizations to implement the Topeka Shiner Recovery Plan (Service 2021, entire).
- Coordinate with States to complete Recovery Implementation Strategies (RIS) that provide geographically appropriate recovery actions to effectively meet the delisting criteria identified in the recovery plan.
- Forecast/model land conversion from prairie to row crop agriculture and resulting increase in drainage tiling and potential increases in naturally occurring selenium levels in streams. It is currently not known how sensitive individual Topeka shiners are to elevated selenium levels; a future toxicity study would provide information about the risk from increasing selenium levels in Topeka shiner habitat.

**U.S. FISH AND WILDLIFE SERVICE
5-YEAR STATUS REVIEW
TOPEKA SHINER (*Notropis topeka*)**

CURRENT CLASSIFICATION: Endangered

RECOMMENDATION RESULTING FROM THE 5-YEAR STATUS REVIEW:

- Downlist to Threatened, throughout all of its range
 Uplist to Endangered
 Delist:
 Extinction
 Recovery
 Original data for classification in error
 No change is needed

APPROPRIATE LISTING/RECLASSIFICATION PRIORITY NUMBER, IF APPLICABLE: 4

Review Conducted By: Kansas Ecological Services Field Office, U.S. Fish and Wildlife Service

REGIONAL OFFICE APPROVAL:

Approved by: _____ **Date** _____
Anna Muñoz
U.S. Fish and Wildlife Service
Acting Deputy Regional Director
Interior Regions 5 and 7

REFERENCES CITED

63 FR 69008. Endangered and Threatened Wildlife and Plants; Final Rule To List the Topeka Shiner as Endangered. December 15, 1998.

69 FR 44736. Endangered and Threatened Wildlife and Plants; Final Designation of Critical Habitat for the Topeka Shiner. July 27, 2004.

Lark T.J., Salmon J.M., and H.K. Gibbs. 2015. Cropland expansion outpaces agricultural and biofuel policies in the United States. *Environ. Res. Lett.* 10:044003, pp 1–11.

U.S. Fish and Wildlife Service. 2010. Topeka shiner (*Notropis topeka*) 5-Year Review: Summary and Evaluation. Kansas Ecological Services Field Office, Manhattan, Kansas. 43 pp.

U.S. Fish and Wildlife Service. 2016. USFWS species status assessment framework. Version 3.4.

U.S. Fish and Wildlife Service. 2018. Species Status Assessment report for Topeka shiner (*Notropis topeka*). (Version 1.0). Legacy Region 6, Interior Regions 5 and 7; Denver, Colorado. 281 pp.

U.S. Fish and Wildlife Service. 2020. Investigation of additional risk factors to Topeka Shiner watersheds to help inform a listing decision and 5-year review. Legacy Region 6, Interior Regions 5 and 7; Lakewood, Colorado. 17 pp.

U.S. Fish and Wildlife Service (Service). 2021. Recovery Plan for the Topeka shiner (*Notropis topeka*). March 25, 2021. U.S. Fish and Wildlife Service, Mountain-Prairie Region, Manhattan, Kansas. 50 pages.