Cape Fear Shiner
(*Notropis mekistocholas*)

Status Review:
Summary and Evaluation

Cape Fear shiners. Photo by J.R. Shute, Conservation Fisheries, Inc.

U.S. Fish and Wildlife Service
Southeast Region
Raleigh Ecological Services Field Office
Raleigh, North Carolina

September 2022

STATUS REVIEW
Cape Fear Shiner (*Notropis mekistocholas*)

GENERAL INFORMATION

Current Classification: Endangered

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Reviewers:
Lead Regional Office: Atlanta Regional Office, Carrie Straight, (404) 679-7226

Date of original listing: September 25, 1987 (52 FR 36034)

Methodology used to complete the review: In accordance with section 4(c)(2) of the Endangered Species Act of 1973, as amended (Act), status reviews are to assess each threatened species or endangered species to determine whether its status has changed and if it should be classified differently or removed from the Lists of Threatened and Endangered Wildlife and Plants (50 CFR 424.11). The U.S. Fish and Wildlife Service (Service) evaluated the biology, habitat, and threats of the Cape Fear shiner to inform this status review.

In conducting this 5-year review, the Service relied on the best available information pertaining to historical and current distributions, life history, ecology, and habitat of this species. Much of the information contained herein is taken from a Species Status Assessment (SSA, Service 2022) that was developed to inform a recommendation team considering the species' status, this 5-year review, and other documents associated with the Act. In addition to the Service, the core team responsible for the SSA included experts from the U.S. Geological Survey and North Carolina Wildlife Resources Commission. The SSA represents our evaluation of the best available scientific information, including the resource needs and the current and future condition of the species. Independent peer reviewers and partner representatives reviewed the SSA. Other sources for this status review include the final listing rule, published and unpublished reports and field observations, and personal communications from recognized experts in the field. We published an announcement in the Federal Register requesting information on this species on July 14, 2021 (86 FR 37178), and a 60-day comment period was opened. In response, we received two sets of public comments (from the Southern Environmental Law Center, and the National Council for Air and Stream Improvement, Inc.) which we considered in this review.

The SSA (Service 2022) is a peer-reviewed document that represents our evaluation of the best available scientific information regarding the biology, life history, and condition of the species. Because we have not received significant new information since the SSA was written, the level of public interest is low and non-controversial, no peer review on this 5-year review was conducted.

FR Notice citation announcing the species is under active review: July 14, 2021 (86 FR 37178)

Species' Recovery Priority Number at start of 5-year review (48 FR 43098): 5. At the time of listing, the Cape Fear shiner was determined to be a species with a high degree of threat and a low recovery potential.

Review History: A previous 5-year review recommending no change in status was published on August 21, 2017 (Service 2017). The Service conducted a 5-year review in 1991 (56 FR 56882) which indicated no change in the fish's listing classification.

REVIEW ANALYSIS

Listed Entity

Taxonomy and nomenclature
The Cape Fear shiner is recognized as a valid taxon in the Integrated Taxonomic Information System (ITIS) database (ITIS 2022). We are not aware of any changes to the taxonomy of this entity, and it is still considered valid by the Service.

Distinct Population Segment (DPS) (61 FR 4722)
The Act defines species as including any subspecies of fish or wildlife or plants, and any distinct population segment of any species of vertebrate wildlife. This species was not listed as a DPS, and we have no new information that would indicate the species should be listed as a DPS under the Service's 1996 DPS Policy.

Recovery Criteria

Recovery Plan

Cape Fear Shiner Recovery Plan, October 7, 1988 (Service 1988)

Recovery plans are not regulatory documents and are intended to provide guidance to the Service, States, and other partners on methods of minimizing threats to listed species and on criteria that may be used to determine when recovery is achieved. If the recovery criteria defined in the plan are still valid, meeting recovery criteria can indicate that the species no longer requires protections under the Act. However, when recommending whether a listed species should be delisted, the Service must apply the factors in section 4(a) of the Act (84 FR 45020).

The recovery plan has these four recovery objectives:

1. Through protection of existing populations and successful establishment of reintroduced populations or discovery of additional populations, a total of six distinct viable populations exist in the Cape Fear River Basin.

2. Studies of the fish's biological and ecological requirements have been completed and the implementation of management strategies developed from those studies have been or are likely to be successful.

3. No foreseeable threats exist that would likely threaten survival of any of these six populations.

4. Noticeable improvements in water and substrate quality have occurred to the species' habitat and the species has responded through natural means or with human assistance to successfully recolonize other streams and stream reaches within the Cape Fear River basin.

Recovery objective #2 has been met with extensive life history and habitat research. The Service has helped fund 16 Cape Fear shiner research or monitoring studies (Service 2017, 2022). However, from that research and experience with conservation projects, it appears that recovery criteria #1 and #3 do not adequately represent our current state of knowledge. Rather than striving for more distinct populations of Cape Fear shiner as envisioned in 1988, the goal now is to connect existing subpopulations through habitat improvements (i.e., dam removals) and species restoration (i.e., propagation and augmentation). Recovery objective #4 is partially met with successful population augmentations and reconnection of subpopulations after dam removals. These recovery actions have only occurred in part of the range, so the objective is only partially met. Overall, recovery goals for the Cape Fear shiner are partially met, and new knowledge indicates connected subpopulations is a better recovery approach than managing several small, isolated subpopulations.

Biology and Habitat Summary

The Cape Fear shiner is a minnow native to five counties in the upper Cape Fear River Basin in central North Carolina. It is a narrow endemic, with a single population comprised of three subpopulations based on river subbasins – the Haw, Rocky-Deep, and Cape Fear. The species is most often found in rocky pools and runs adjacent to riffles in wide, shallow segments of rivers with gravel, cobble and/or boulder substrates with forested banks and abundant water willow (*Justicia americana*), riverweed (*Podostemum ceratophyllum*), stream mosses, and filamentous green algae. It was listed as an endangered species due to its small population size and threats to its habitat from dams and pollution.

Figure 1 shows the most recent confirmed distribution of Cape Fear shiners following a 2020 range-wide survey by the North Carolina Wildlife Resources Commission. There were 56 sites surveyed including all of those visited during a 2007 range-wide survey, plus new tributaries and localities with suitable habitat. There were 416 Cape Fear shiners observed within the Rocky and Deep River systems. No individuals were observed in the Haw or Cape Fear River systems. The survey data and analyses were used as a foundation for the recent SSA (Service 2022).

The 2022 SSA identified one Cape Fear shiner population, with three subpopulations in the Haw, Rocky-Deep, and upper Cape Fear River basins. Each subpopulation was further divided into eight management units (MUs), with two MUs in the Haw, four MUs in the Rocky-Deep, and two MUs in the Cape Fear. The current condition of each MU was assessed by examining

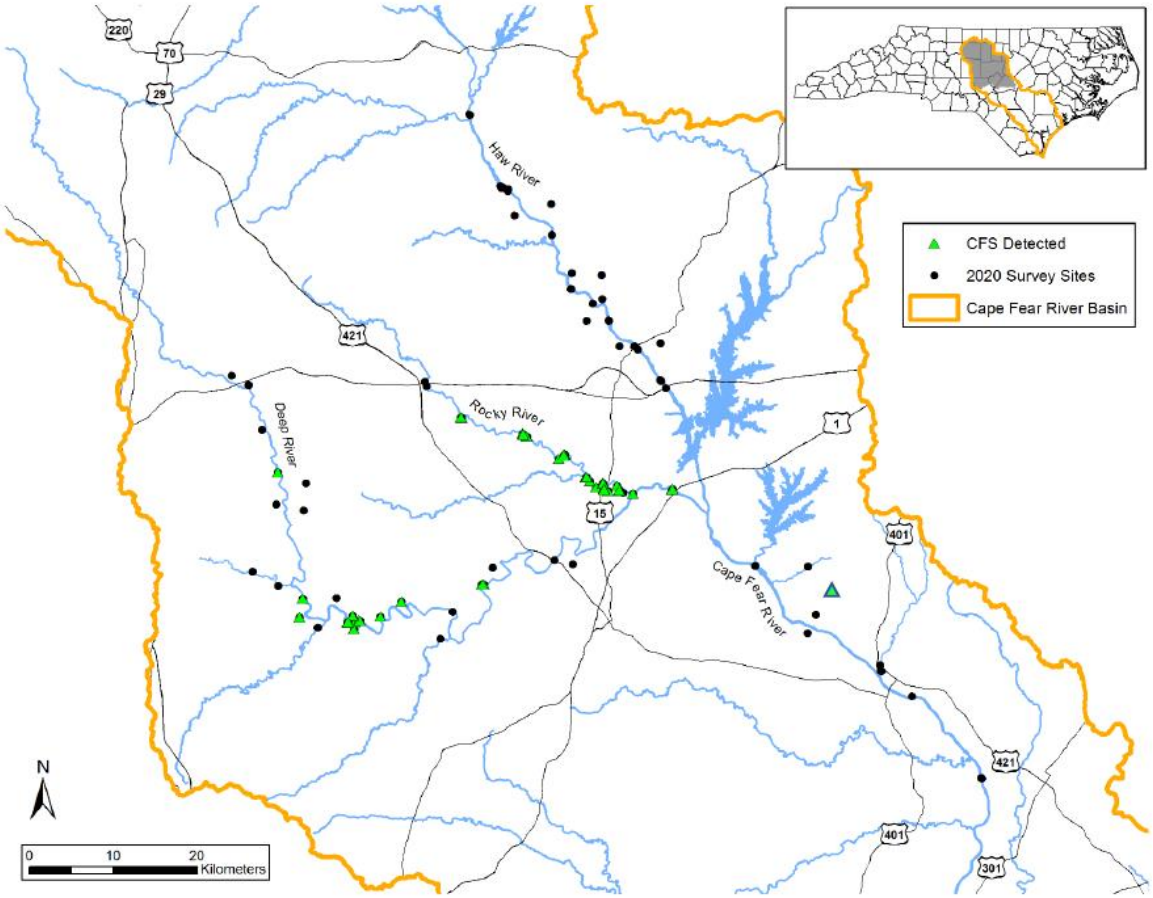

Figure 1. Survey locations and sites where Cape Fear shiners were detected during 2020 surveys with one added July 2021 observation in Neills Creek (Service 2022). The surveyed area approximates the known historic range of the species.

population and habitat factors. The analysis resulted in a condition score for each Cape Fear shiner MU that was used to evaluate the species based on three aspects of population ecology:

Resiliency was assessed at the MU level and describes the ability of a species to withstand stochastic disturbance. Resilient populations are better able to withstand disturbances, such as random fluctuations in birth rates (demographic stochasticity), variations in rainfall (environmental stochasticity), or the effects of anthropogenic activities. The SSA evaluated Cape Fear shiner abundance, evidence of recruitment, and extent of occupied habitat to develop a resiliency score for each MU. Only three of eight MUs were considered to have moderate to healthy resiliency (Figure 2; Service 2022); these three contiguous MUs in the Rocky-Deep subpopulation include 90 connected river miles of Cape Fear shiner habitat.

Redundancy describes the ability of a species to withstand catastrophic events (a rare destructive natural event or episode involving several populations or subpopulations). For a narrow ranging endemic species, redundancy is best achieved by having multiple subpopulations connected throughout the historical range. The SSA used number of healthy

(highly resilient) MUs within subpopulations as a measure of redundancy. Of the three subpopulations, only the Rocky-Deep subpopulation has multiple resilient MUs. Thus, the Cape Fear shiner has very limited redundancy (Service 2022).

Representation describes the adaptive capacity, or ability of a species to adapt to changing environmental conditions over time and is characterized by the breadth of genetic and environmental diversity within and among populations. The more representation a species has, the more it is capable of coping with or adjusting to large-scale changes, such as climatic changes. The SSA evaluated 12 attributes of adaptive capacity to conclude the Cape Fear shiner exhibits high levels of adaptive capacity attributable to its diet breadth, and moderate levels of capacity based on reproductive phenology, life span, habitat generalization, and high genetic diversity.

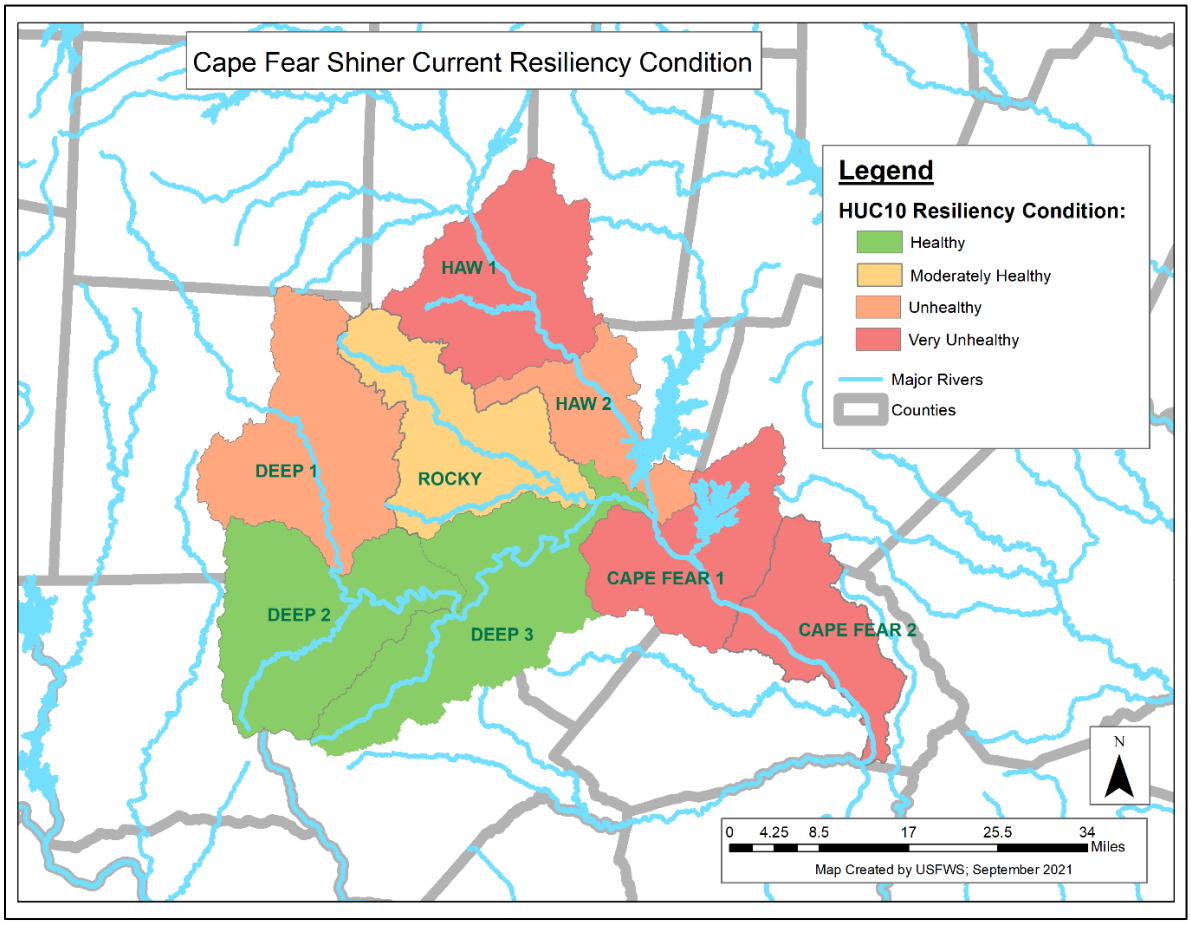

Figure 2. Map of current Cape Fear shiner management unit resiliency (Healthy = Deep 2 and Deep 3; Moderately Healthy = Rocky; Unhealthy = Deep 1 and Haw 2; Very Unhealthy = Haw 1, Cape Fear 1, and Cape Fear 2).

Novel information in the SSA was the modeling of Cape Fear shiner abundance versus landscape variables. Cape Fear shiner abundance was statistically-significantly negatively influenced by the number dams nearby, positively related to pervious surface, and positively related to natural cover in floodplain. These three factors merit special attention in management and recovery.

Threats (Five-Factor Analysis) Summary

The status of a species is determined from an assessment of factors specified in section 4 (a)(1) of the Act, including: Factor A: the present or threatened destruction, modification, or curtailment of its habitat or range; Factor B: overutilization for commercial, recreational, scientific, or educational purposes; Factor C: disease or predation; Factor D: the inadequacy of existing regulatory mechanisms; Factor E: other natural or manmade factors affecting its continued existence. A summary of this assessment is detailed below.

Habitat loss and degradation (Factor A) remains the most significant limiting factor for the Cape Fear shiner. More than 20 dams segment the species' small range, and these have turned portions of rivers and streams into reservoirs which are unsuitable for the species. Presence of dams is negatively correlated to Cape Fear shiner abundance as is the amount of impervious surface and the loss of natural vegetative cover on the floodplain (Service 2022). Excess sedimentation, that clogs gravel needed for spawning and emergent vegetation beds used as nursery areas and for cover, is a concern as is water quality degradation.

We have no indication that overutilization for commercial, recreational, scientific, or educational purposes (Factor B) or disease and predation (Factor C) pose a significant threat for the species. The recent SSA (Service 2022) contains a thorough review and assessment of threats to the Cape Fear shiner and offers additional detail on the magnitude, scope, and severity of limiting factors.

For factor D, the recent SSA (Service 2022) contains a review of the state and federal laws and regulations which are most-relevant to the Cape Fear shiner and its habitat. The North Carolina Endangered Species Act allows the state to identify, document, and protect any animal species that is considered rare or in danger of extinction, but it has no mechanisms for recovery, consultation, or critical habitat designation other than where recommendations can be made for lands to be protected or acquired.

Impacts to baseline and extreme flow events from climate change were cited as a Factor E concern in the previous 5-year review for the species (Service 2017). The recent SSA (Service 2022) used USEPA's Integrated Climate and Land Use Scenarios projections to explore future changes in the range of the Cape Fear shiner. The analyses indicated climate change influences did not rise to a level of concern for the species over the next 40 years.

Synthesis

The Cape Fear shiner is a minnow native to five counties in the upper Cape Fear River Basin in central North Carolina. It is a narrow endemic, with a single population comprised of three subpopulations based on river subbasins – the Haw, Rocky-Deep, and Cape Fear. Each subpopulation can be divided into management units (MUs), with two MUs in the Haw, four MUs in the Rocky-Deep, and two MUs in the Cape Fear.

Translocation and two dam removals to restore suitable habitat have benefitted the species since its listing under the Act. These recovery and management actions have improved habitat mostly within the Rocky-Deep River subbasin, and the subpopulation there now has redundant, resilient MUs. However, there no resilient MUs in the Haw and Cape Fear River subpopulations – these subpopulations are not resilient because of low Cape Fear shiner numbers and no evidence of

recruitment. Those subpopulations remain isolated from each other and the Rocky-Deep subpopulation by dams. This makes the species vulnerable to a catastrophic event and potential extirpation of the smaller subpopulations during severe events. The opportunity to improve conditions are almost entirely related to human intervention through additional dam removals to connect and restore habitat and population augmentation to bolster low numbers in the Haw and Cape Fear subpopulations.

Habitat loss and degradation, primarily from dams and sedimentation, remain. Because of ongoing threats and the current condition of the Cape Fear shiner, this species continues to meet the definition of an endangered species. Cape Fear shiner abundance was statistically-significantly negatively influenced by the number dams nearby, positively related to pervious surface, and positively related to natural cover in floodplain. These three factors merit special attention in management and recovery.

RECOMMENDED FUTURE ACTIVITIES

A detailed discussion of recovery actions and criteria are presented in the recovery plan (Service 1988). The Cape Fear shiner's current ability to sustain populations in the wild, while improved since the time of listing, may not currently be sufficient for the species to overcome stochastic events into the future. Improved viability in the future will be reliant on human intervention – by reconnection of habitats via dam removals or passage, through species restoration efforts via captive propagation and augmentation, as well as maintaining adequate water quality and constant vigilance against the spread of invasive species.

Dam construction along the upper Cape Fear, Deep, and Haw rivers as well as their tributaries has probably had the most serious impact on the Cape Fear shiner. The recent SSA (Service 2022) has a section on the relative benefit of various dam removal scenarios which can help prioritize river restoration for the species. Gaining an understanding of why the species is in such low numbers on the Haw and Cape Fear subpopulations is a priority given that the habitat conditions appear adequate (Service 2022).

RESULTS / SIGNATURES

U.S. Fish and Wildlife Service
Status Review of Cape Fear Shiner

Status Recommendation:

On the basis of this review, we recommend the following status for this species. A 5-year review presents a recommendation of the species status. Any change to the status requires a separate rulemaking process that includes public review and comment, as defined in the Act.

____ Downlist to Threatened
____ Delist:
____ *The species is extinct*
____ *The species does not meet the definition of an endangered or threatened species*
____ *The listed entity does not meet the statutory definition of a species*
_X__ No change needed

Recommendation Team Meeting Information:

A recommendation team meeting (RTM) was held on March 1 and 2, 2022. The recommendation of the meeting, to maintain the current status of the Cape Fear shiner, was the result of the following rationale – of the three subpopulations, two are considered not viable with low resiliency (as measured by considering shiner abundance, reproduction, and percent occupied habitat) making the species vulnerable to a catastrophic event. Also, there is a lack of knowledge on why there are so few Cape Fear shiners in two of the three subpopulations (usually minnows are numerous).

New Recovery Priority Number (48 FR 43098):

The Cape Fear shiner's original recovery number was 5, indicating a species with a high degree of threat and a low recovery potential. The SSA (Service 2022) documents success with captive propagation, translocation, and population augmentation, and reoccupation of areas following dam removal to restore habitat. We also have a better understanding of the major threats (dams, conversion of natural watershed area to impervious surfaces, and incursions into the riparian area). Therefore, the recovery priority number has been changed to 8 – a species with a moderate degree of threat and a high recovery potential.

FIELD OFFICE APPROVAL:

Acting Field Supervisor, Raleigh Ecological Services Field Office, Fish and Wildlife Service

Approve THOMAS AUGSPURGER Digitally signed by THOMAS AUGSPURGER Date: 2022.09.21 15:25:53 -04'00' _____

* Since 2014, Field Supervisors in the Region have been delegated authority to approve 5-year reviews that do not recommend a status change.

REFERENCES

Integrated Taxonomic Information System (ITIS). 2022. *Notropis mekistocholas* Snelson, 1971 https://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=163455#null. Accessed August 31, 2022.

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U.S. Fish and Wildlife Service. 2022. Species Status Assessment Report for the Cape Fear Shiner (*Notropis mekistocholas*), Version 1.0. February 2022. Raleigh, NC.