Spotfin Chub
(*Erimonax monachus*)

5-Year Status Review:
Summary and Evaluation

Spawning male Spotfin Chub (Photo by Derek Wheaton)

U.S. Fish and Wildlife Service
Southeast Region
Asheville Field Office
Asheville, North Carolina

August 2024

5-YEAR STATUS REVIEW
Spotfin Chub (*Erimonax monachus*)

GENERAL INFORMATION

Current Classification: *Threatened*

Lead Field Office: Asheville Field Office, Jason Mays, (828) 747 2394

Reviewers:

Lead Regional Office: Southeast Region, Atlanta, GA; Carrie Straight

Cooperating Field Office(s):

Virginia Field Office, Jordan Richard

Tennessee Field Office, Andy Ford

Cooperating Regional Office: Northeast Region, Hadley, MA: Martin Miller and Sarah Furtak

Date of original listing: October 11, 1977 (42 FR 45526; September 9, 1977)

Critical Habitat/4(d) rule/Experimental population designation rules:

1977. Critical Habitat (designated concurrently with listing) (42 FR 45526) and correction (42 FR 47840).

2002. Establishment of Nonessential Experimental Population Status and Reintroduction in Tellico River, Tennessee (67 FR 52420.

2005. Establishment of Nonessential Experimental Population Status and Reintroduction in Shoal Creek, Tennessee and Alabama (70 FR 17916).

2007. Establishment of Nonessential Experimental Population Status and Reintroduction in lower French Broad River and lower Holston River, Tennessee (72 FR 52434).

Methodology used to complete the review:

In accordance with section 4(c)(2) of the Endangered Species Act of 1973, as amended (Act), the purpose of a status review is 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 best available information about the Spotfin Chub's biology, habitat, and threats to inform this status review.

We announced initiation of this review in the Federal Register on May 11, 2023 (88 FR 30324-30328) with a 60-day comment period and received one comment from Dr. William

O. McLarney from Mainspring Conservation Trust (see Appendix A for a summary). The primary sources of information used in this analysis were the 1977 final listing rule (42 FR 45526–45530), the 1983 recovery plan, peer-reviewed reports, agency reports, unpublished survey data and reports, and personal communication with recognized experts. This review was completed by the U.S. Fish and Wildlife Service, Asheville Ecological Services Field Office (AFO), Asheville, North Carolina. All literature and documents used for this review are on file at the AFO. All recommendations resulting from this review are the result of thoroughly reviewing the best available information on the Spotfin Chub. A completed draft of this 5-year review was sent to other affected Service offices in the species' range for review and comment. All comments received were evaluated and incorporated into this final document as appropriate. All recommendations resulting from this review are the result of thoroughly reviewing the best available information on the Spotfin Chub.

FR Notice citation announcing the species is under active review:
May 11, 2023 (88 FR 30324-30328)

Species' Recovery Priority Number at start of 5-year review (48 FR 43098):
11. Spotfin Chub is a species with a moderate degree of threat and low recovery potential.

Review History:
A previous 5-year review recommending no change in status was published on June 27, 2019 (Service 2019).

REVIEW ANALYSIS

Listed Entity

Taxonomy and nomenclature:
Spotfin Chub was originally listed in 1977 (42 FR 45526) as *Hybopsis monacha* and other rules referenced the species as *Cyprinella* (=*Hybopsis*) *monacha.* In 2005 (70 FR 17916) the Service published a taxonomic revision of this species changing the nomenclature to *Erimonax monachus* in accordance with taxonomic revisions published by the American Fisheries Society (Nelson et al. 2004).

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
U.S. Fish and Wildlife Service. 1983. Recovery Plan [for the] Spotfin Chub (*Hybopsis monacha* [=*Erimonax monachus*]). Atlanta, Georgia. 46 pp.

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).

1. **Through protection of existing populations and/or by introductions and/or discoveries of new populations there exist viable populations in the Buffalo River System, Upper Little Tennessee River, Emory River System, and Lower North Fork Holston River of the following magnitudes.**

   a. **Buffalo River System, Tennessee: The species persists in the Buffalo River in the area of Grinders Creek and/or some other river section.**

      Recent collections of Spotfin Chub were recorded in the Buffalo River by Conservation Fisheries Incorporated (CFI) located in Knoxville TN. On November 11, 2022, a total of 29 Spotfin Chubs were observed in an effort of four seine hauls in the Buffalo River near the mouth of Grinders Creek. The observed individuals represented at least two age classes with a total of 21 adults and 8 young of year fish observed (M. Petty, CFI, pers. comm. 2024). The available data for the Buffalo River is not sufficient to determine the viability of this population over a significant reach, but the low amount of effort and high yield observed in 2022 suggest that Spotfin Chubs are abundant in the local area and the observation of reproduction suggests that the population in this reach likely extends further along the Buffalo River. Due to lack of information regarding the wider distribution of this population, the recovery criteria have not yet been met for this species. Genetic data derived from individuals collected from the area around Grinders Creek suggests that the population is genetically healthy and is likely distributed further along the Buffalo River than is presently known. Dedicated survey efforts over a larger area within Buffalo River may be able to determine this in the future.

   b. **Upper Little Tennessee River, North Carolina: The species occupies its preferred habitat throughout the approximately 32.5 kilometer (km) [20.2 river miles (RMs)] river reach from the head of Fontana Reservoir to near Franklin Dam. This can be measured by determining that the species exists at a minimum of 10 locations along this river reach.**

      Regular snorkel survey efforts are conducted by the North Carolina Wildlife Resources Commission (NCWRC) in the Little Tennessee River. Published results of long-term monitoring conducted between 2007 and 2016 found that Spotfin Chubs are distributed throughout the entire reach where habitat is appropriate and although numbers observed vary year to year based on water clarity and seasonal rainfall, the overall trend shows a robust and stable population over the period of observation (Doll et al. 2020a). Survey efforts between 2016 and the present continue to observe that Spotfin Chub are common in the Little Tennessee River in areas with appropriate bedrock-dominated habitat and that multiple year classes are present (L. Etchison, NCWRC, pers. comm. 2024). Based on

substantial survey effort in the Little Tennessee River, we believe the recovery criteria have been met for this population.

c. Emory River System, Tennessee: The species occupies its preferred habitat in the Emory River from its confluence with the Obed River to Watts Bar Reservoir, in Clear Creek from its confluence with White Creek downstream to its confluence with the Obed River, and Daddy's Creek from river kilometer (RKM) 5.6 [RM 3.5] downstream to its confluence with the Obed River. This can be measured by determining that the species exists at a minimum of eight locations in the Emory River section, five locations in the Clear Creek sections, and five locations in the Daddy's Creek section.

Biennial monitoring by the Tennessee Valley Authority (TVA) is conducted in the Emory River near the mouth of White Oak Creek. Spotfin Chubs have been observed in each sampling event since 2015 (D. Matthews, TVA, pers. comm. 2024). Individuals observed ranged from a low of 2 in 2023 and a high of 22 in 2021 with no clear pattern to suggest any trend other than normal fluctuation in sampling method. CFI also collected Spotfin Chubs from this location in 2018 and 2023, observing 35 and 30, respectively. This indicates that this single site has remained continuously occupied over the last decade but does not supply any information about the population in the rest of the Emory River, Obed River, or Clear Creek. No other survey data is available to assess the population in the greater watershed, but continuous occupancy at this site in the middle of the watershed likely indicates that no large systemic problems have taken place in recent years, and it is likely that the population has also remained stable both up and downstream from this observed site, but no data exists to verify occupancy elsewhere. The recovery criteria have not been met for this population.

d. North Fork Holston River, Tennessee and Virginia: The species occupies its preferred habitat throughout the river reach from its mouth upstream 72 kms [44.7 RMs]. This can be measured by determining that the species exists at a minimum of 15 locations along this river reach.

Records obtained from the Virginia Department of Wildlife Resources (VDWR) and TVA indicate that since 2015, Spotfin Chub has been observed in the North Fork Holston River at 15 locations covering a length of about 132 km (M. Cogar, VDWR, pers. comm. 2023). The Virginia dataset provided no information on number of individuals observed or if multiple year classes were observed. The TVA dataset indicated low numbers of Spotfin Chubs were observed but this does not necessarily mean that they are rare in the Tennessee portion of the river (D. Matthews, TVA, pers. comm. 2024). Limited access in the North Fork Holston River makes observation along the entire length difficult; however, given the significant length of occupied area observed and frequent observations it is likely that this species is well distributed throughout the reach and would likely meet the recovery criteria. Additional surveys conducted by paddling and surveying longer stretches of the river could confirm this.

2. Through introductions and/or discovery of two new populations there exist viable populations in two other rivers. [*Viable populations* – Population monitoring over a ten-year period (biannual samples) indicates that the species is reproducing (at least two year classes each year sampled) and that the population is either stable or expanding.]

To improve redundancy for Spotfin Chub, reintroduction has been attempted in four locations. Reintroduction with stock from the Little Tennessee River population has been attempted in three locations: Abrams Creek and Tellico River in Tennessee, and the Cheoah River in North Carolina. Efforts to reintroduce the species to Abrams Creek between 1994 and 2009 were unsuccessful and efforts have been suspended since 2009.

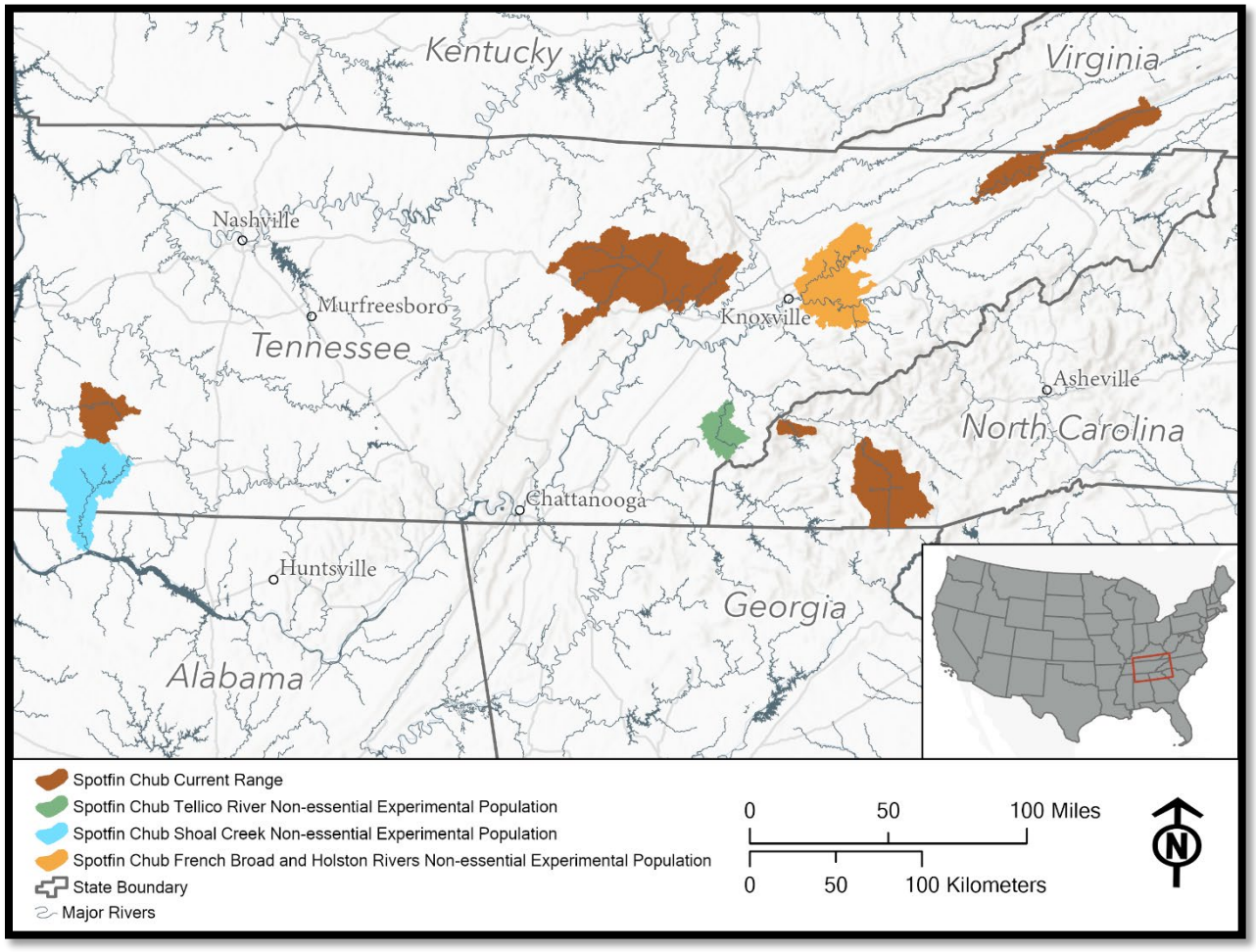
Portions of the Tellico River were designated as a Non-Essential Experimental Population (NEP) in 2002 (67 FR 2420-52428). The Tellico River is a tributary of the Little Tennessee River, but it is isolated from the Spotfin Chub population in the Little Tennessee River by several dams constructed on the Little Tennessee River mainstem. Reintroduction into the Tellico River population appears to be successful. Since 2015 CFI has stocked 16,103 Spotfin Chubs in Tellico River and 35,197 dating back to 2002. In 2022 and 2023, stocking was put on hold to monitor the population and results suggest that the Tellico River population is reproducing and likely doesn't require additional stocking from propagation; however, long-term addition of translocated individuals from the Little Tennessee River is suggested to increase genetic diversity. This population meets the definition of viable in the recovery plan.

In 2007 NCWRC began stocking propagated individuals into the Cheoah River. The Cheoah River is a tributary of the Little Tennessee River, but the two rivers have been separated since 1919 by Cheoah Lake on the mainstem of the Little Tennessee River. The Spotfin Chub population on the Cheoah River has become well established and is now distributed throughout the 14 km free flowing reach of the Cheoah River from Santeetlah Dam downstream to the mouth of the Cheoah River where it flows into Calderwood Reservoir on the Little Tennessee River. Frequent surveys in this reach demonstrate that Spotfin Chubs are abundant in the upper reaches of the river where there is more suitable habitat. Multiple age classes are frequently observed, and the population is estimated to contain 13,905 (95% CI = 11,620-22,181) individuals (Doll et al. 2020b). Based on recent surveys and ongoing efforts to manage a diverse genetic population in the Cheoah River with emigration of adult individuals from the Little Tennessee River, this population meets the definition of viable.

Portions of Shoal Creek were designated as an NEP (70 FR 17916–17927) in 2005. Shoal Creek is a tributary of the Tennessee River that begins in Tennessee and flows south into Alabama. Initial stocking of Shoal Creek began in 2007, but by 2018 no live individuals were seen in survey efforts. It was hypothesized that taking stock from the Emory River, which has different habitat than Shoal Creek, may have contributed to this failure. In 2019, it was decided to switch to stocking individuals propagated from the nearby Buffalo River, which is closer geographically and could potentially have genetic variation more suited to the habitat in Shoal Creek. In 2022 and 2023, CFI released 7,800 and 10,543, respectively,

Spotfin Chubs propagated from the Buffalo River into multiple locations in Shoal Creek. Subsequent survey efforts were able to observe Spotfin Chubs at some of the stocking locations which demonstrates early survival of stocked individuals. It is too early to assess the likelihood that these individuals will reproduce and become permanently established but observations of live individuals after stocking is encouraging.

Biology and Habitat Summary



Populations and Distribution

A detailed description of Spotfin Chub life history and behavior is available in the previous 5-year review (Service 2019). The recovery plan recognized four extant populations of Spotfin Chub: Buffalo, Little Tennessee, Emory, and North Fork Holston River. Since the previous 5-year review, all populations have been demonstrated to still be present within these reaches, but the quality of data in some of the reaches is insufficient to determine present extent with certainty.

Spotfin Chub appears to have remained extant within the four known populations. We summarize the condition of those four populations below. The reintroduction effort into the

Cheoah River has led to a population that is reproducing and stable. Likewise, the introduced population in the Tellico appears to have become well established and is reproducing. An additional effort to establish a population in Shoal Creek is ongoing and the success of that effort will be assessed in the coming years.

Buffalo River
Recent collections (2020, 2021, 2022, and 2023) by the University of Tennessee, CFI and TVA from the Buffalo River in the area of Grinders Creek indicate that the species is locally abundant and there is evidence of recent reproduction including collection of juveniles, subadults, and adults. Considering the relatively low amount of effort, the high yield and frequent observations, it is likely that the Spotfin Chub population in this area is relatively robust. There is no available information about the extent of this population beyond the area around Grinders Creek, but the persistence of Spotfin Chubs at this location makes it likely the population extends further in the Buffalo River.

Upper Little Tennessee River
Spotfin Chubs have been documented from 2014 to current in an approximately 23 river miles (37 km) stretch of the Little Tennessee River (Service 2019). Extensive survey work performed by the NCWRC has demonstrated that Spotfin Chubs continue to be abundant in areas of appropriate habitat throughout the free-flowing reach of the river between Emory Dam in Franklin, NC and Fontana Reservoir near Bryson City, NC (L. Etchison, pers. comm. 2024). Systematic repeat sampling at 10 locations between 2006 and 2017 found the population to be stable over the period of observation (Doll et al. 2020a). Since 2016, less monitoring has taken place, but Spotfin Chubs have been observed at 13 sites distributed throughout the occupied reach and observations suggest that populations have remained stable in the Little Tennessee River.

Emory River
Since the previous 5-year review, there has been very little survey work in the Emory River that is available to assess the population trend in the majority of the occupied reach. A TVA long-term biomonitoring site on the Emory River downstream of Deermont Road near the mouth of Hall Branch has been surveyed annually or biennially dating back to 1986. Spotfin Chub has been observed at this site during every survey with the most recent occurrence in 2023. No additional survey information was available for other areas in the Emory River, making inference about occupancy and demographic trends difficult for this population.

Russ (2006) found Spotfin Chubs to be broadly distributed throughout the Emory River, including the Obed, Upper Emory River and Clear Creek during sampling in 2004 and 2005. The frequency of observation at TVA's long term monitoring site indicates that the population is stable at least locally.

Genetic information collected in 2022 suggested that the Emory River population has levels of genetic diversity and inbreeding consistent with a stable population that is more widely distributed than what would be expected if large scale population decline had happened in the intervening years (Hannah and Whelan 2024). Available data suggests that the Emory River

population has remained stable, additional survey efforts in the Obed and Emory Rivers are necessary to assess the population with better accuracy.

North Fork Holston River

As described in the 2019 5-year review, the species range has expanded in the North Fork Holston since the early 1980s (Service 2019). Since the previous 5-year review, the distribution and abundance of Spotfin Chub in the North Fork Holston River has been found to be greater than previously believed. Survey efforts conducted by VDWR, TVA, and CFI observed that Spotfin Chubs are present from the area of Hwy 80 in Virginia down to near the confluence with the South Fork Holston River, a distance of around 82 miles (132 km). However, there is a long stretch of the North Fork Holston River with very limited access where recent survey data is lacking. There is only one recent observation from this section of the middle portion of the North Fork Holston; a record from 2014 where CFI observed Spotfin Chubs. There are multiple records from this area that date back to the 1980s. The frequency of records both upstream and downstream of this under surveyed middle reach make it likely that Spotfin Chubs are still present throughout the lower North Fork Holston River, but additional survey efforts are needed to confirm this.

Genetics, genetic variation, or trends in genetic variation

In 2023, the USFWS Southeast Conservation Genetics Lab at Auburn University completed a range-wide genetic investigation of Spotfin Chub. The results of the study found that each of the four remaining populations were distinct genetic clusters with low levels of admixture between them. Genetic diversity was highest in the North Fork Holston population and lowest in the Little Tennessee population. All populations were found to have low-moderate levels of genetic diversity when compared to common and widespread fish, but higher genetic diversity than some other imperiled fish. This level of genetic diversity coupled with low levels of inbreeding within the populations makes it likely that the populations are stable and perhaps more widespread in the Buffalo and Emory River systems than what can be determined based on limited survey data. In general, the available genetic data is positive in that despite past range contraction and barriers to gene flow that are present between populations, the level of genetic diversity being presently maintained indicates that Spotfin Chub populations are relatively genetically fit within their present range and there is sufficient genetic diversity remaining to support reintroduction of the species into additional rivers within its historic range (Hannah and Whelan 2024). The observed genetic diversity within the remaining populations suggests that this species may be close to meeting the definition of viability necessary for downlisting.

Captive Propagation and Reintroductions

Recent improvements in propagation of Spotfin Chubs and successful reintroduction into the Cheoah and Tellico rivers have shown that this species has high potential for recovery through the creation of additional populations. The distribution of the remaining populations in proximity to reservoirs limits the opportunity for natural expansion, but there are many free-flowing river systems within the historic range that may be suitable for reintroduction.

The Cheoah and Tellico populations are daughter populations of the Little Tennessee River population and are sufficiently well established that a long-term emigration strategy can be implemented to maintain long term genetic diversity. The Shoal Creek population is a daughter

of the Buffalo River population and is likely to need several more years of stocking from propagation before we would expect to see natural reproduction. After the species becomes established and reproducing, the genetic health of the population can be managed by direct translocation of adults from Buffalo River. There are no present propagation efforts for the North Fork Holston or the Emory River populations.

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. A summary of this assessment is detailed below.

Factor A. Present or threatened destruction, modification or curtailment of its habitat or range

The Recovery Plan included impoundments, cold tailwaters, channelization, siltation/coal fines, and pollution as having affected Spotfin Chub populations (Service 1983). Since the time of listing, the Spotfin Chub has been largely confined to the four reaches of river described above. The initial range contraction of this species was primarily related to the creation of large reservoirs during the 20th century and widespread effects to water quality from industrial and agricultural sources (Perkin et al. 2019). Although these threats persist, they are likely to have been reduced due to modern regulations governing the discharges and the construction of large impoundments. Additionally, the successful reintroductions of Spotfin Chubs to areas within their historical range demonstrates that these areas likely had conditions unfavorable to their persistence in the past, but that the conditions have improved through time. Within the currently occupied areas, Spotfin Chub populations appear to be stable, but could still be affected by land use practices, such as agriculture, mining, urban development and unprotected riparian areas. Any land use that increases the turbidity and siltation of instream habitat has the potential to affect all life stages of Spotfin Chubs and could prohibit reproduction by fouling feeding and spawning habitat.

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

The Spotfin Chub is not believed to be utilized for commercial, recreational, or educational purposes, so overutilization is not a significant threat to the species.

Factor C. Disease or predation

We are not aware of any information indicating that disease or predation is a significant factor affecting the Spotfin Chub.

Factor D. Inadequacy of existing regulatory mechanisms

The inadequacy of existing regulatory mechanisms was not specifically considered to be a limiting factor in the Recovery Plan (Service 1983). Regulations that encourage the use of best management practices to reduce erosion have a significant benefit to Spotfin Chub by improving water clarity, preventing the fouling of their spawning habitat, and improving recruitment (Sutherland and Meyer 2007). The Clean Water Act (CWA) generally regulates the intentional discharge of fill material into waterways, but the existing regulations do not eliminate all sources of discharge and large amounts of soil erosion into waterways come from non-point sources that are only minimally regulated.

The discharge of pollutants into streams is regulated under the CWA by the National Pollutant Discharge Elimination System (NPDES) which sets allowable concentrations for pollutants based on toxicity testing for representative aquatic species. Some pollutants, such as copper and ammonia, are especially toxic to stream creatures and currently allowable levels may not be protective of more sensitive species like the Spotfin Chub (Besser et al. 2005, Dwyer et al. 2005). Additional safety factors and further testing is necessary to ensure that levels are safe for species like Spotfin Chub.

Regulations that prevent the cutting of vegetation from the buffer areas of streams are lacking in many jurisdictions. Loss of vegetative buffer typically leads to bank wasting and an increase of instream fouling of habitat with fine sediments and causes alteration to the physical habitat and typically results in increased stream temperature affecting the diversity of fish species (Duehr et al. 2006). Streams in the range of the Spotfin Chub are typically not highly urbanized, but agricultural practices that remove buffer along waterways draining into occupied streams have high potential to degrade habitat and may negatively affect populations of Spotfin Chub.

Kanno et al. (2012) suggested that unregulated water withdrawals in the Emory could have a negative effect on Spotfin Chubs by altering availability of habitat types. Spotfin Chubs choose habitat types based on water depth and velocity, with preferences changing by season. In North Carolina and Tennessee water withdrawal is largely unregulated. In Tennessee, water users must register if they withdraw more than 10,000 gallons per day. North Carolina requires agricultural water users withdrawing more than one million gallons of water per day to register their withdrawals with the state. Non-agricultural users must register if withdrawing more than one hundred thousand gallons of water per day. Neither state limits total withdrawal under normal circumstances. During times of drought conditions, water withdrawal could limit the amount of habitat available to Spotfin Chubs by lowering water levels to a level that some habitats become unsuitable. There is no indication that this factor is limiting populations presently, but the effects of climate change are expected to increase the frequency and intensity of droughts which may cause more pressure on water use in the future (IPCC 2021).

Factor E. Other natural or manmade factors affecting its continued existence

The remaining populations of Spotfin Chub are isolated to moderate length free flowing river systems by barriers. Spotfin Chubs are also limited to some habitats by the stream order, meaning that they may not be able to move further upstream, even when unimpeded, due to the gradients and temperatures present in the upper reaches of the rivers they inhabit (Perkin et al. 2019). This isolation makes them more susceptible to climate alterations in the future. Most climate change models predict an increase in extreme weather events, such as droughts and heavy precipitation (IPCC 2021). Kanno et al. (2012) described seasonal use of microhabitat in the Emory River population of Spotfin Chub. The results show that Spotfin Chubs used higher velocity run-type habitat over bedrock and boulders from spring to fall but retreat to slower velocity and deeper habitat types in the cooler months. Their behavior is likely related to needs to spawn, conserve energy, and avoid predators. Availability of certain habitat could be altered by changes in water temperatures, changes in timing and levels of precipitation, or severity and frequency of floods and droughts. It is presently unknown exactly how Spotfin Chubs will respond to the complex alterations that may happen in the future. Within the four remaining populations there is presently access to tens of kilometers of free-flowing river and tributary

habitat with substantial habitat complexity. It is possible that these reaches are substantial enough that Spotfin Chubs will have sufficient access to refugia from extreme events that they will be able to persist even with the changes brought on by climate change. In most of the occupied reaches Spotfin Chubs have access to tributary streams that may provide additional refugia. One of the primary benefits of the reintroduction of Spotfin Chubs to additional stream reaches is to improve the chance that they can expand and adapt to a changing environment and continued reintroduction may be the best strategy to overcome the uncertainty of how populations will react to habitat changes in the future.

Synthesis

The Spotfin Chub is a minnow in the Cyprinidae family native to the Tennessee River drainage. Despite significant range contraction due to the construction of reservoirs and pollution during the 20th century, Spotfin Chub has maintained significant populations in four independent river systems: Buffalo, North Fork Holston, Emory and Little Tennessee rivers. Within each of these occupied river systems there appears to be sufficient habitat for a population to remain viable as long as current conditions remain stable or improve through time. Currently, the data necessary to determine long term viability are lacking in some of the river systems, but what data are available suggests that the populations have remained stable or have improved in the previous few decades. Available genetic information suggests that Spotfin Chubs have less genetic diversity than very common and widespread species, but when compared to other imperiled species their genetic diversity is relatively high and markers of inbreeding are comparatively low. This level of genetic diversity suggests that the remaining populations are presently stable, but no data exists to evaluate population extent or trends in the Buffalo and Emory rivers. Additional surveys to determine the extent of populations in the Emory and Buffalo Rivers are needed to validate assumptions about population stability in these locations. Many of the threats that led to the decline and listing of this species have been largely eliminated (e.g., dam construction), or reduced (e.g., pollution), but some threats, like the effects of erosion from upland disturbance and water withdrawals, are still present and may have an effect on the population and may be exacerbated by climate change. Even though it may not be possible to eliminate all threats to the species, propagation and reintroduction have proven effective and can mitigate remaining threats by spreading the species into additional habitats where they have greater capacity to adapt and thrive. Two populations have been introduced in the Cheoah and Tellico rivers. Both populations are derived from broodstock from the Little Tennessee River and additional reintroductions from the other populations would further increase the genetic representation of the species. Given the present uncertainty over the extent and viability of the populations Spotfin Chub in the Buffalo and Emory rivers, and the persistence of some remaining threats, this species still meets the definition of a threatened species.

RECOMMENDED FUTURE ACTIVITIES

Surveys. To meet the delisting criteria, additional survey efforts are necessary to determine the species extent and viability in all of the populations, with emphasis on the Emory and Buffalo rivers populations. Due to limited access in these areas, these surveys would be best conducted by paddle craft covering long reaches of the occupied rivers with periodic snorkel surveys conducted either at regular intervals or wherever appropriate bedrock and boulder habitat is

present during the warmer months. Surveys conducted in this manner will serve to meet the extent requirements and the number of occupied location requirements in the recovery criteria.

Reintroductions. Having additional populations in more diverse locations allows the species to be more resilient to unforeseen circumstances that could have an effect on a population confined to a single reach of river. The creation of new populations from each of the existing populations will increase the probability that the maximum genetic diversity is preserved and that the species has opportunities to adapt and thrive into the future. It is recommended that at least one reintroduced population from each of the four existing populations be established to minimize the risk of extirpation of the remaining genetic units.

Propagation. Propagation activities have previously been carried out by CFI with support from state and federal hatcheries. To implement a larger program of reintroduction, it will be necessary to produce more propagated Spotfin Chub than can be produced by CFI alone. It is recommended that partners develop additional capacity in other hatchery settings to produce sufficient numbers to support simultaneous reintroduction efforts. Erwin National Fish Hatchery in Erwin, TN has expressed interest in producing or holding Spotfin Chubs to increase production rates. The NC Conservation Aquaculture Center in Marion, NC is also available to participate in production of Spotfin Chubs. It is likely that other hatchery resources can be included to operate as a mutually supporting network to increase production efficiency to meet the needs of a robust reintroduction strategy. As stated above, additional effort is needed to provide better survey data in the existing populations. The Service should work with state partners to fund and implement robust survey efforts that can reliably determine the extent and density of occupation of Spotfin Chubs in the occupied reaches.

Genetic Monitoring. Genetic monitoring of species population health is a new and quickly evolving tool that can provide insights into population viability that is not possible with other methods. The Service should fund additional efforts to assess population health with this method. Genetic tools are also vital to the establishment and maintenance of reintroduced populations. The goal of reintroduction is to represent as much genetic diversity from the source population as possible. This goal can be optimized by using best management practices for reintroduction, but genetic evaluation is necessary to verify that the intended goal is being met.

Habitat Use Research. We received a public comment suggesting the importance of tributary streams as seasonal refugia for Spotfin Chubs should be further studied. This goal could be accomplished by additional survey work during the colder months to identify key refugia for the species.

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RESULTS / SIGNATURES

U.S. Fish and Wildlife Service
Status Review of Spotfin Chub

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
____ Uplist to Endangered
____ 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

New Recovery Priority Number (48 FR 43098):

14. The recovery priority number at the start of this review was an 11 indicating Spotfin Chub was a species with a moderate degree of threat and low recovery potential. Based on the information gathered in this review, we are changing the recovery priority number to 14 indicating a species with a low degree of threat and a high recovery potential. We believe that the successful abatement of significant past threats, like water quality and the construction of impoundments, indicate that threats have been alleviated in reaches to allow recovery. Also, our partner's (CFI, TVA, NCWRC, TWRA, VDWR) successes in captive propagation and reintroduction, show that we understand the biological and ecological needs of the species and we can overcome past extirpations and population reductions through a known recovery tool.

FIELD OFFICE APPROVAL:

Field Supervisor, Asheville Ecological Services Field Office, Fish and Wildlife Service

Approve JANET MIZZI Digitally signed by JANET MIZZI Date: 2024.08.22 14:33:35 -04'00' _____

COOPERATING REGIONAL OFFICE APPROVAL:

We emailed this 5-year review to the Northeast Regional Office for their concurrence prior to finalizing the document. We will retain any comments that we received, as well as verification of concurrence from other regions, in the administrative record for this 5-year review.

APPENDIX A. SUMMARY OF PUBLIC COMMENTS

I. Public Comments

A. Summary of Public Comments: We received one public comment from Dr. William O. McLarney, Director of the Upper Little Tennessee Watershed Stream Biomonitoring Program, administered by Mainspring Conservation Trust. Dr. McLarney commented on data collected showing that Spotfin Chubs are seasonally dependent on tributary streams during the fall. He suggested that we consider the following recommendations:

1. Designations or mechanisms to protect tributaries to the Little Tennessee River between Porters Bend and Fontana Reservoir, recognizing the importance of this habitat to *E. monachus*.

2. Further study aimed at better understanding the magnitude and purpose of the fall migration by *E. monachus* and *C. galactura* into tributaries of the Little Tennessee River.

B. Response to Public Comments: We concur with Dr. McLarney's assertion that the tributary streams represent important habitat for Spotfin Chub. We note in this review that buffer regulations on stream draining into habitat for Spotfin Chub are inadequate for the protection of the species. Operationally, we extend our boundaries for Section 7 review under the Act to include all tributary streams that flow into Spotfin Chub habitat and generally require surveys to complete that review. We recommend that action agencies maintain vegetated buffer where possible. We also agree that further study of the importance of tributary streams is warranted and will prioritize that as funds are available.