Conasauga Logperch

Five-Year Review: Summary and Evaluation

(Photo by Conservation Fisheries, Inc.)

U.S. Fish and Wildlife Service
Southeast Region
Georgia Ecological Services Field Office
Athens, Georgia

5-YEAR REVIEW
Conasauga Logperch (*Percina jenkinsi* Thompson 1985)

I. GENERAL INFORMATION

A. Methodology used to complete the review:

Staff from the Georgia Ecological Services Field Office, U.S. Fish and Wildlife Service (Service), prepared this five-year review based on the final rule listing this species under the Endangered Species Act, the Recovery Plan, peer-reviewed scientific literature, unpublished reports, and field observation notes in our files. We announced initiation of this review and requested information in a published *Federal Register* notice with a 60-day comment period (70 FR 43171). We received no public comments from this notice. We also shared this review to peer reviewers (see Appendix A). Comments received were evaluated and incorporated as appropriate. We held five Coosa/Conasauga River Summits for interested stakeholders between 2000 and 2008 to disseminate and discuss new data on the basins' aquatic species overall, and solicited information from knowledgeable individuals in academia, state and Federal agencies, and other conservation groups. In addition, we funded a study in 2008 to evaluate the Conasauga logperch's population status, which was published and its results are incorporated into this report (Hagler et al. 2011). We also funded several studies to evaluate threats to Conasauga River aquatic communities. Interim results from the studies are incorporated where applicable (Evaluation of the source and amount of agricultural chemicals and stormwater runoff in the Conasauga River; Evaluation of best management practices to reduce agricultural stormwater runoff into the Conasauga River; Evaluation of genetic factors affecting Conasauga logperch mating selection; and Evaluation of threats to Conasauga logperch and other rare fishes in the Conasauga River).

B. Reviewers:

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C. Background

Federal Register Notice citation announcing review initiation: 70 FR 43171; July 26, 2005

Species status: Uncertain (2011 Recovery Data Call) Conasauga logperch generally are found so infrequently that assessing a yearly trend is impossible -- only 14 fish were found this year, compared to 13 last year. Hagler et al. (2011) recently evaluated the species' long-term population trends, using repeat-observation sampling of 17 historically-occupied shoals in summer 2008, combined with an analysis of University of Georgia museum records of snorkel and seine collections in the Conasauga from 1988-2008 (total of 308 surveys in the

historic data). No Conasauga logperch were collected in the downstream third of the species range during the 2008 surveys, and the best supported model Hagler et al. developed based on these data concluded that the probability of encountering a Conasauga logperch in the downstream third of the species' range declined over the past two decades.

Recovery achieved: 1 (1=0-25% recovery objectives achieved)

Listing history:
Original Listing
Federal Register notice: 50 FR 31597
Date listed: August 5, 1985
Entity listed: species
Classification: endangered

Review history
Recovery Data Call – 2011-1998
Recovery Plan – 2000 and 1986
5-year review – November 6, 1991

In the 1991 five-year review (56 FR 56882), different species were simultaneously evaluated with no species-specific, in-depth assessment of the five factors as they pertained to the different species' recovery. In particular, no changes were proposed for the status of this fish in the review.

Species' Recovery Priority Number at start of review (48 FR 43098): 5, which indicates a species with a high degree of threat and low recovery potential.

Recovery plan

Recovery plan for Mobile River Basin aquatic ecosystem. U.S. Fish and Wildlife Service, Southeast Region. November 17, 2000. (This plan did not replace the 1986 plan rather provided an updated addendum to it.)

Recovery plan for Conasauga logperch (*Percina jenkinsi*) Thompson and amber darter (*Percina antesella*) Williams and Etnier, U.S. Fish and Wildlife Service, Southeast Region, June 20, 1986

II. REVIEW ANALYSIS

A. Application of the 1996 Distinct Population Segment (DPS) policy: The species is not listed as a DPS and there is no relevant new information that would support classification of this species as a DPS.

B. Recovery Plan and Criteria: Does the species have a final, approved recovery plan containing objective, measurable criteria? No. The 1986 recovery plan states that (1) the Conasauga logperch's distribution is so restricted that a single catastrophic event could result in species' extinction and (2) it is unlikely the present population could be sufficiently protected to allow removing the species from the Act's protection unless other populations were found or some extirpated populations were reestablished.

C. Updated Information and Current Species Status

1. Biology and Habitat

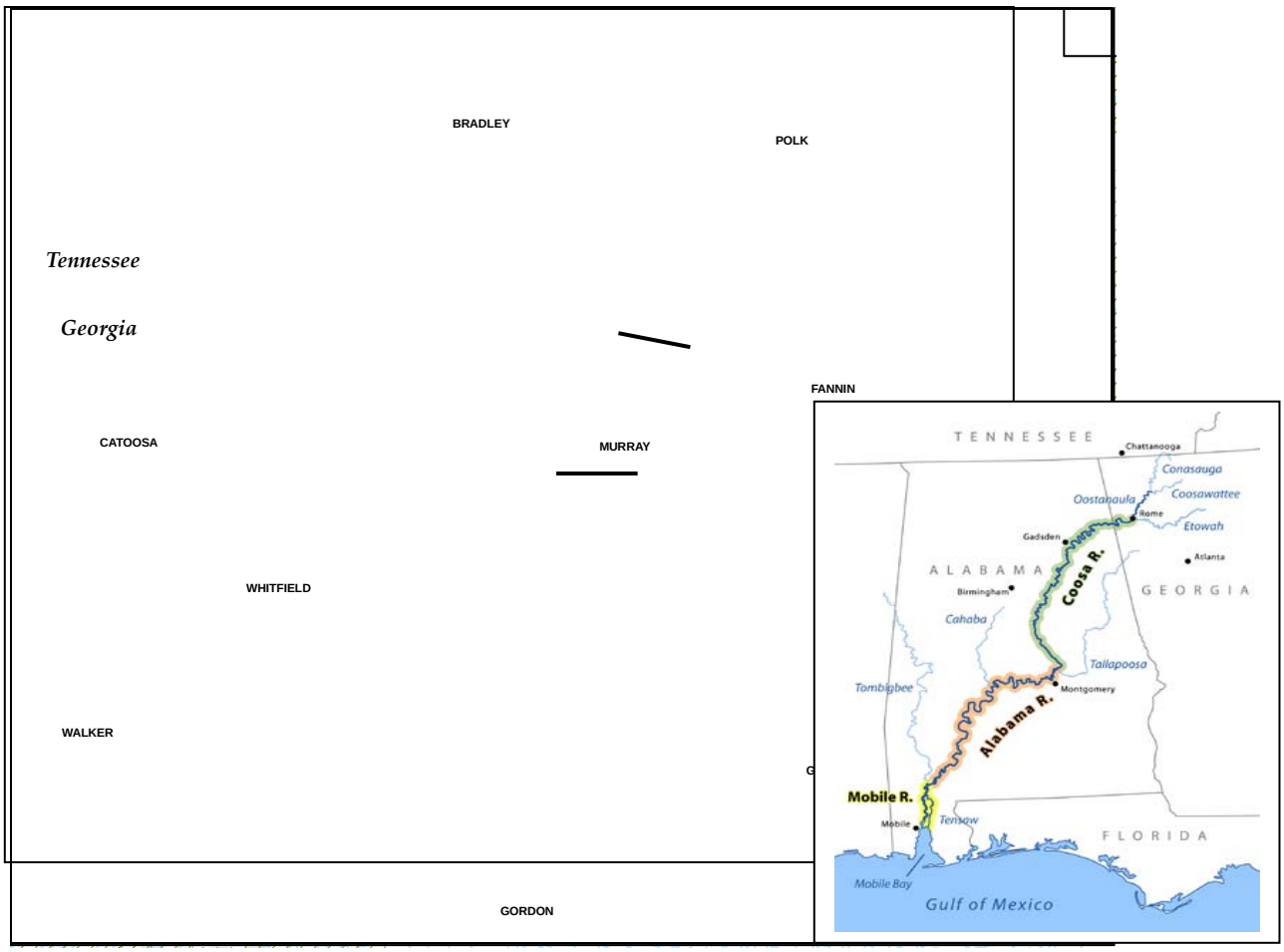
Current and Historic Spatial Distribution: When the Conasauga logperch recovery plan was completed in 1986, the species was known to occur only in a 30-km reach of the Conasauga River, from just upstream of the Minnewauga Creek confluence in Polk County, Tennessee, downstream to the GA Hwy 2 bridge near Beaverdale, Murray County, Georgia. This reach was designated critical habitat when the species was listed (Fig. 1) (note: both the 1986 and 2000 recovery plan incorrectly state this reach was 18 km, or 11 miles, long). Surveys after 1986 extended the species' known range from the confluence of the Conasauga and Jacks Rivers, Polk County, Tennessee downstream to Mitchell Bridge, Murray County, Georgia (55 km; Freeman 1989, 1990a, 1990b, Johnston and Damon 1996; Rakes and Shute 2005, 2006, B. Albanese, GADNR, pers. comm., May 2006) (Fig. 1). Within this 55-km known range, Conasauga logperch have been observed at only 29 shoals since 1988. Individuals have been detected only once at 16 of these sites, and only two or three times at seven of the sites. At the other six sites (three upstream of the mouth of Perry Creek, one site between the mouths of Perry and Sumac Creeks, and two sites downstream of the mouth of Sumac Creek), the species has been detected on 4–10 occasions (Hagler et al. 2011).

Scientists at the University of Georgia developed a Conasauga watershed prioritization map, based on presence/absence data, potential ranges for protected fish and mussel species, and environmental factors such as watershed area, total impervious area, and forest cover (Fig. 2) (Freeman et al. 2008) -- the known range of the Conasauga logperch lies entirely within the highest priority sub-watersheds. The Service and partners currently are evaluating methods to protect and restore habitat for the Conasauga logperch and other listed and rare aquatic species in these reaches.

Abundance and Population Trends: The Conasauga logperch is one of the rarest darters in North America. Hagler et al. (2011) recently evaluated the species' population trends, using repeat-observation sampling of 17 historically-occupied shoals in summer 2008, combined with an analysis of University of Georgia museum records of snorkel and seine collections in the Conasauga from 1988-2008 (total of 308 surveys in the historic data). No Conasauga logperch were collected in the downstream third of the species range during the 2008 surveys (Fig. 3), and the best supported model Hagler et al. (2011) developed based on these data concluded that the probability of encountering a Conasauga logperch in the downstream third of the species' range declined over the past two decades.

Hagler et al. (2011) did not observe a similar trend for the more common, sympatric Mobile logperch (*Percina kathae*) in the Conasauga River. However, population declines in several unlisted, often previously-common fishes, including the riffle minnow (*Phenacobius catostomus*), tricolor shiner (*Cyprinella trichroistia*), Coosa chub (*Macrhybopsis* sp. cf. M. *aestivalis*), and Coosa madtom (*Noturus sp. cf. N. munitus*) have been documented in the Conasauga over the past decade (Freeman et al. 2007, Golder Associates 2008, M. Hagler, Univ. Georgia, pers. comm., Nov. 2007). Similar declines were not observed in the Etowah River, which also supports populations of the Coosa chub, Coosa madtom and amber darter (M. Freeman, USGS, pers. comm., 2007). The trend in the Conasauga corresponded with observed declines in riverweed (*Podostemum ceratophyllum*) in the lower river reach; riverweed is a submerged aquatic plant found in riffle areas with relatively high stream velocity, and is associated with increased production and biomass of aquatic invertebrates and higher abundance of shoal-dependent fish species (Argentina et al. 2010).

Figure 1. Conasauga logperch range (solid red) and critical habitat (broken red) in the Conasauga River basin, 2011. Hatched areas are existing protected lands. Inset shows the location of the Conasauga and other headwater tributaries to the Coosa River. Black bars delineate the upstream, midstream, and downstream reaches of the fish's range, as used in this review.



The Conasauga logperch generally is observed only at low densities, if at all, in suitable shoal habitat. Hagler et al. (2011), in a review of 340 fish surveys conducted in the upper Conasauga from 1988-2008, determined that Conasauga logperch were observed during only 80 of those surveys (23.5%). In 65 of these surveys, 1-2 individuals were observed, and in the remaining 15 surveys, an average of 5 individuals was observed (range = 3–12; see Figure 4 for example survey data). Hagler et al. (2011) saw only 8 Conasauga logperch during their 2008 survey of 17 shoals that were repeat-sampled. The largest single observation of Conasauga logperch at a single shoal was in August 2010, when Conservation Fisheries, Inc. biologists observed 13-14 Conasauga logperch up- and downstream of the US 411 bridge; most of these individuals were collected for captive propagation studies (see below) (Petty et al. 2010).

Figure 2. Conasauga sub-watershed prioritization (Freeman et al. 2008). Reaches that scored 80-100 (bright green) were highest priority.

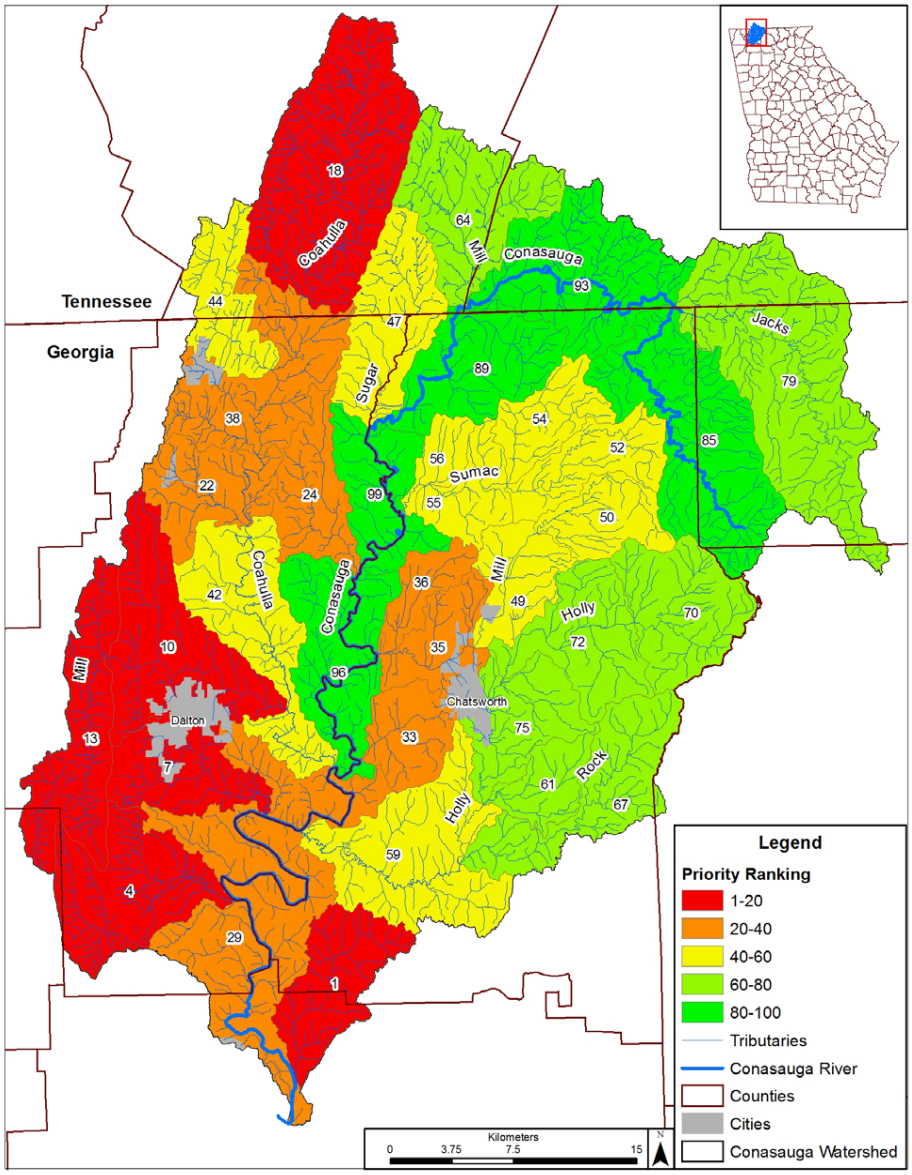


Figure 3. Percent of surveys with (a) Mobile logperch and (b) Conasauga logperch detected, by year range and river reach. The number of surveys where each species was observed (black) or not observed (grey) is noted in each column (from Hagler et al. 2001).

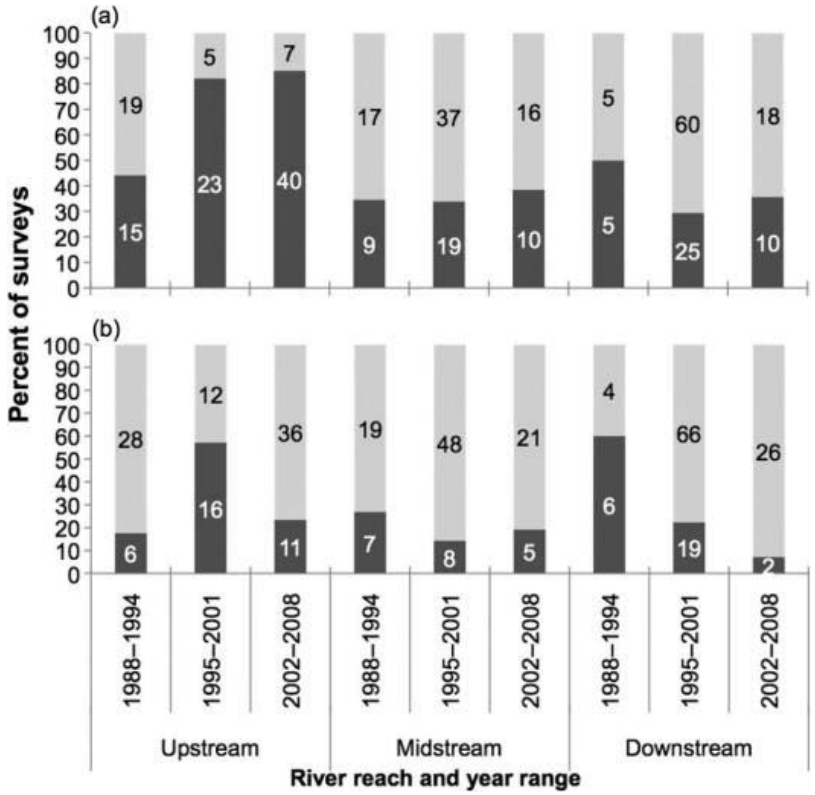
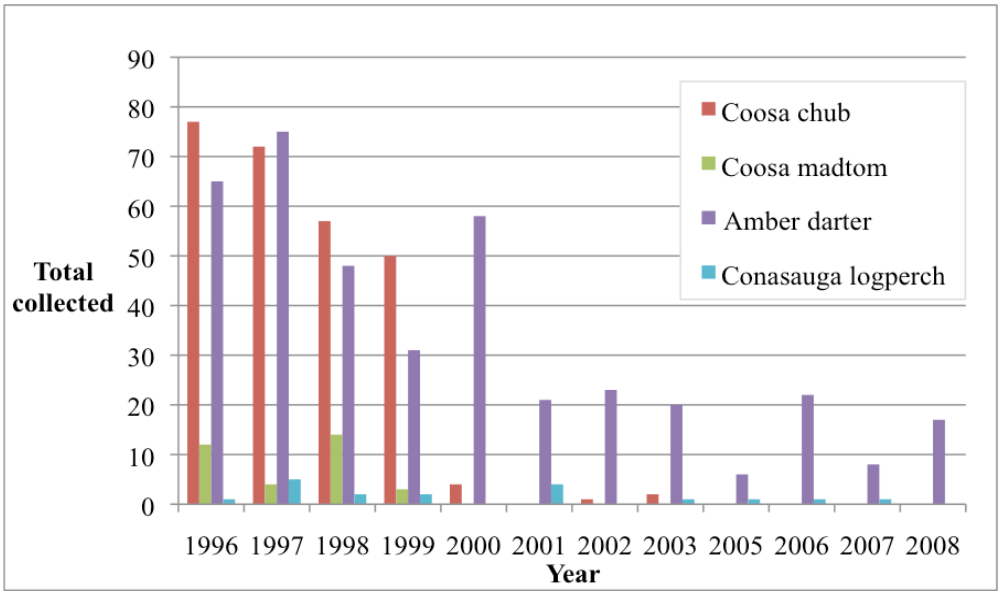


Figure 4. Number of Conasauga logperch and other fishes collected during annual fall surveys at seven permanent stations in the Conasauga River between GA Hwy 2 and SR 52/76, 1995-2008 (except 2004). (data from Golder Associates 2002, Freeman et al. 2007, Golder Associates 2008, and M. Hagler, Univ. Georgia, pers. comm., Nov. 2007).



Catch per unit effort estimates conducted in the mid-2000's estimated the Conasauga logperch population at less than 200 adults (Anna George, Tennessee Aquarium Conservation Institute, pers. comm., Nov. 2008). However, population size estimates often are biased when there is a low probability of detecting a fish, even if present in a given shoal (Table 1).

Table 1. Probability of detecting a Conasauga logperch using three different survey methods: snorkeling, a single kick-seine (approx. 3.5 square-meter sample area), and kick-seining replicated over an average-sized shoal (data from Hagler et al. 2011).

Survey Method	Probability of Detection if Present (95% credible interval)
Snorkel (1-person hour)	13.2% (3.2-31.8%)
Seine (1 effort)	0.3% (0-1.0%)
Seine (scaled to 67 efforts)	15.6% (2.3-48.5%)

Conservation Fisheries, Inc. successfully bred Conasauga logperch in captivity in 2011. Juveniles from their captive population were used to establish a second captive, but non-breeding, population at the Georgia Aquarium in July 2011 (Pat Rakes, CFI, pers. comm. 2011).

Life History: Little is known of the Conasauga logperch's life history, although it is assumed to be similar to other logperch (Etnier and Starnes 1993, Mettee et al. 1996, Freeman et al. 2007). The species most often is encountered in deep gravel runs or pools with small stones and sandy bottoms (Etnier and Starnes 1993) and frequently is found in the same shoals as amber darter, blue shiner, and/or holiday darter (*Etheostoma* sp. cf. E. *brevirostrum*) (Freeman 1989, Johnson and Damon 1996, Golder Associates 2002). Captive mortality in Conasauga logperch suggests maximum lifespan is four years (Rakes and Shute 2005). Logperches feed on aquatic insect larvae and have an interesting habit of flipping stones with their snouts to expose prey underneath (Mettee et al. 1996, Freeman 1999). Freeman (1990a) observed individuals actively foraging, often in close proximity to each other and usually in moderately deep areas with swift currents.

No data are available on the age at which Conasauga logperch mature, but captive propagation studies on the closely related blotchside logperch (*P. burtoni*) suggest that these fish do not spawn until two years of age (Rakes and Shute 2005).

Juvenile Conasauga logperch rarely have been found during collections (Freeman 1990b, Rakes and Shute 2005) and may use different habitat than adults. Spatial variation in habitat use between age classes has been observed in the endangered Roanoke logperch (*Percina rex*), with adults and subadults found in run and riffle habitat, and young-of-year in shallow, stagnant backwaters and secondary channels (Rosenberger and Angermeier 2003).

Genetic Variation: Genetic studies on nine Conasauga logperch specimens in the mid-2000's identified surprisingly high levels of genetic variation, with a bimodal distribution of characteristics between two sympatric clades of haplotypes. The high

nucleotide diversity, combined with other genetic measurements, suggests a recent population reduction (i.e., a population bottleneck), collapse of two divergent populations into one, or balancing selection (i.e., a process of natural selection where heterozygous individuals are more adaptive than either of the two types of homozygous individuals). Geneticists at the Tennessee Aquarium Conservation Institute currently are examining mitochondrial gene sequences from 17 Conasauga logperch and monitoring mate choices to determine if sexual balancing selection occurs (George et al. 2010; George 2010).

Taxonomic Classification or Changes in Nomenclature: None

Habitat or Ecosystem Conditions: Land use in the upper basin has changed little over the past decade -- the dominant land covers remain agriculture and forestry, and the headwaters of the basin are protected by extensive U.S. Forest Service land. Low density urban development has increased throughout the basin, but dense urban sprawl is concentrated downstream of known areas of high aquatic diversity. The only major land use changes Service biologists and partners have identified in the basin over the past decade have been (C. Askew, NRCS, pers. comm., June 2008):

- **A largescale shift to use of Roundup-ready seed for major row-crop products**: Roundup's active ingredient is glyphosate, which impedes photosynthesis. Roundup Ready soybean and corn seeds, which are genetically modified to allow seedlings to survive direct application of Roundup, were introduced in 1996 and 1998 -- as of 2005, less than 10 years after introduction, the USDA estimated that 87% of U.S. soybean fields were planted to glyphosate-resistant varieties. Roundup-resistant wheat seed soon will be available. Much of the cropland in the Conasauga basin is planted in corn, soybeans, and wheat using no-till farming methods. NRCS personnel in the basin estimate that farmers in the Conasauga began using Roundup Ready soybean and corn seeds extensively 6-7 years ago (C. Askew, NRCS, pers. comm. June 2008). Glyphosate is non-toxic to slightly toxic to most fish, although toxicity appears to be higher in several important sport or food fish, including brown trout, rainbow trout, channel catfish, bluegill, and tilapia (Ayoola 2008; Pesticide Action Network Pesticide database, http://www.pesticideinfo.org). In Roundup, glyphosate commonly is used in salt form (isopropylamine salt). This salt, as well as the surfactant normally found in Roundup (polyethoxylated tallowamine; POEA) and/or other 'inert' ingredients in the formulation appear more toxic to fish and mussels than glyphosate alone, causing both death of mussel glochidia (Bringolf et al. 2007) and fish (Mitchell et al. 1987) and subcellular changes that may affect survival (Szarek et al. 2000, Cavalcante et al. 2008, Langiano and Martinez 2008). Temperature, pH, suspended sediment, and other water quality parameters may affect glyphosate and Roundup's effects on aquatic species.

- **Greater use of chicken litter to fertilize pastures and row crops**: The poultry industry is a major economic force in the Conasauga basin. In 2007, the State of Georgia recorded over 630 broiler, layer, and pullet houses in Murray and Whitfield Counties, where the majority of the upper Conasauga basin is located (http://www.georgiastats.uga.edu/; Tennessee data not available); each house is estimated to produce up to 100 tons of litter per year. Poultry litter is a mixture of chicken manure, feathers, spilled food, and bedding material that frequently is used to fertilize pastureland or row crops. Surface-spreading of litter allows runoff from heavy rains to carry nutrients from manure into nearby streams. Repeated and/or over application of chicken litter, in addition, can result in phosphorus buildup in the soil (Sharpley et al. 2007). Excess phosphorus and nitrogen in stream systems increase blue-green algae and undesirable aquatic plants that rob water of oxygen, causing fish kills and odor and taste problems in municipal water supplies. In addition to heavy loads of nitrogen and phosphorus, litter can contain arsenic (Stolz et al. 2007), fecal coliforms and other pathogens, other heavy metals, pesticides and larvicides used to control flies and litter beetles, sex hormones, particularly estrogens, and excess carbon, which can deplete dissolved oxygen in surface waters (Moore 1997).

The Service funded a four-year contaminants study in the Conasauga in 2010 to evaluate potential threats to aquatic communities in the basin. Sediment samples were collected in July 2010 from eight sites above and below major tributaries, and sediment toxicity was evaluated with two, 28-day exposures using amphipods, *Hyalella azteca*, and juvenile freshwater mussels, *Lampsilis fasciola*. Surface water samples were collected during November 2010 baseflow conditions and after a major rain event in May 2011 from 11 sites in the mainstem and tributaries. Analytical results from Year 1 are incomplete, but preliminary analyses of sediment samples indicate elevated concentrations of glyphosate (e.g., Roundup), metals, estrogen compounds, testosterone, and nutrients below several major tributaries (Lasier et al. 2011, P. Lasier, USGS, pers. comm., July 2011).

Shute and Rakes (2005), during fall 2004 surveys in the upper Conasauga, after Hurricane Ivan, found extensive channel scour and loss of aquatic and marginal vegetation in areas that received the highest rain and floodwaters. No Conasauga logperch were observed in the Conasauga River on National Forest lands, and darters that previously were common in this reach were rare; larger redhorse suckers showed damaged fins, missing scales, and contusions, likely from debris washed down the river during the floods (Shute and Rakes 2005). The following year, overall fish abundance remained low in these reaches, and some fish that were observed appeared emaciated and in poor condition (Rakes and Shute 2006). However, fine-grained particles had begun to reaccumulate in the scoured reaches, riverweed coverage was increasing, and small amounts of woody debris were appearing. No Conasauga logperch were positively identified in the study reach, but other benthic fish had recolonized; recolonization rates likely vary depending on the speed of habitat

recovery and each species' life history, fecundity, and dispersal rate (Rakes and Shute 2006).

2. Five-Factor Analysis

a) Present or threatened destruction, modification or curtailment of its habitat or range:

Threats to Conasauga logperch habitat or range, at the time the species was listed, focused on three factors: the species' restricted range, potential reservoir projects in Conasauga logperch habitat, and changes in land use in the Conasauga basin.

Conasauga Logperch Restricted Range: The Conasauga logperch was known only from a short reach of the Conasauga River when it was listed. Recent surveys have expanded the species' known range to include additional reaches of the Conasauga River mainstem and the Jacks River near its confluence with the Conasauga. However, the Conasauga logperch remains highly vulnerable to extinction and/or habitat destruction/degradation due to stochastic or human-induced events that degrade its habitat, including floods, drought, chemical spills, point-source contaminants, sewage spills, herbicides and pesticides, heavy metals, excess hormones and/or nutrients, and other factors. Development of successful Conasauga logperch captive propagation methods in 2011, coupled with the establishment of an ark population at Conservation Fisheries, Inc., reduces the likelihood of imminent extinction in the event of a catastrophic loss of the wild population, but is not a substitute for continued habitat protection and restoration.

Reservoir Projects: The Dalton Lake and the Jacks River reservoirs identified in the listing document have not been built. Dalton Lake no longer was considered a viable water supply option when the final listing document was published. The Jacks River project was authorized for study by Congress in 1945 but not for further planning. A third reservoir, the River Road Reservoir, was constructed by Dalton Utilities off-stream, in uplands adjacent to the middle portion of the Conasauga River in the late 1990s; it began withdrawing water from the Conasauga River to maintain reservoir water elevations, then releasing water during low flow periods for downstream withdrawal in 1999-2000. Dalton Utilities monitored aquatic communities and water quality from 1995 to 2006 to comply with their Corps of Engineers' Section 404 permit – these data did not indicate that reservoir operation, at least during the first few years post-construction, significantly impacted fish populations in shoals downstream of the reservoir, when compared to upstream reaches or to baseline conditions. The report, however, specifically excluded Conasauga logperch from impact conclusions due to the limited number of individuals collected during the study (Golder Associates 2008).

No new drinking-water or industrial-use reservoirs in the Conasauga basin currently are under Federal review. However, a 2008 inventory of feasible sites for water supply reservoirs in Georgia included the upper Conasauga River, in Conasauga logperch habitat, as a possible reservoir location (MACTEC 2008).

Changes in Land Use: Changes in land use, particularly on private lands, which comprise 75% of the basin, could benefit or harm the Conasauga logperch, depending on the new land use. Currently, the river's 100-year floodplain downstream of the Cherokee and Chattahoochee National Forests is dominated by agriculture, although areas between ridgetops and floodplain still predominantly are forested. Replanting cropped fields, livestock pastures, and chicken farms with native vegetation to create riparian buffers and forested floodplains likely would reduce sedimentation, increase large woody debris, moderate water temperature, and reduce transport of agricultural and urban chemicals into the Conasauga and its tributaries. Conversely, increased silviculture, road and bridge construction, stream channel modification, and conversion of agricultural lands to urban use could significantly affect the logperch and its habitat due to increased stormwater runoff from impervious surfaces, greater water turbidity and sedimentation, higher contaminant loads, and other changes in water quality and timing/magnitude of stream flows.

Ongoing Conservation Efforts in the Basin: Multiple partners are working to reduce these threats to the Conasauga River system and restore degraded habitat and rare species. A major step was the 1995 formation of the Conasauga River Alliance by the Limestone Valley Resource Conservation and Development Council, funded by a NRCS grant. The Alliance is a partnership of local citizens, businesses, conservation groups, and government agencies with a primary objective to identify threats to the river and develop cooperative solutions.

In the Conasauga basin, NRCS, The Nature Conservancy, Conasauga River Alliance, Limestone Valley RC&D, the Service, and other partners are actively working with local farmers and other landowners to implement conservation provisions of the Farm Bill, Partners for Fish and Wildlife projects, and other stream protection and restoration programs. On-the-ground conservation activities on private and Federal lands that have been completed in recent years include

- Promoting and funding best management practices on agricultural lands.
- Bank stabilization and riparian vegetation restoration on the river and high priority tributaries.
- Replacing culverted stream crossings with bridges to reduce sedimentation and improve fish passage.
- Providing chicken composters and litter storage facilities for poultry operations.
- Purchasing or acquiring conservation easements on high priority lands.
- Reducing nutrient input into stream systems from septic tanks.

The Nature Conservancy, Coosa River Basin Initiative, Conasauga River Alliance, US Forest Service, Georgia Aquarium, and other organizations educate citizens and promote conservation in this diverse river basin. Other partners, such as USGS, University of Georgia, Conservation Fisheries, Inc., Tennessee Aquarium Conservation Institute, and GDNR conduct needed research and monitoring in the basin, including studies on the historical and current status and trends of fish and mussel species, Conasauga River instream and riparian habitats, captive propagation methods and

Conasauga logperch genetics, fish sampling methods, manmade structures that impede fish passage, and toxic pollutants in the river's waters and sediments.

These efforts, at current levels, however, have not been sufficient to prevent apparent declines in Conasauga logperch and other aquatic species populations, including once common fishes. Limited data from studies initiated in 2010 suggest a range of potential man-made stressors, including elevated levels of glyphosate (e.g., Roundup), metals, estrogen compounds, testosterone, and nutrients in the river's sediments (Lasier et al. 2011, P. Lasier, USGS, pers. comm., July 2011). Study and evaluation of these stressors will continue, and results could allow prioritization and implementation of actions needed to protect the Conasauga logperch.

b) Overutilization for commercial, recreational, scientific, or educational purposes:

We do not believe this is currently a threat to this species.

c) Disease or predation:

We do not have data or evidence indicating that this is a threat to this species.

d) Inadequacy of existing regulatory mechanisms:

The Conasauga logperch and its habitat are afforded limited protection from water quality degradation under the Federal Clean Water Act and the State of Georgia Erosion and Sedimentation Act. Forestry and agriculture, however, are exempt from these laws -- forestry and agriculture best management practices, including maintenance of a protected streamside management zone, are voluntary, and implementation is inadequate to protect Conasauga water quality and aquatic communities.

e) Other natural or manmade factors affecting its continued existence:

The Conasauga logperch is highly vulnerable to extinction due to stochastic or human-induced events, since it occurs only in small numbers in a short reach of a single river system. Stressors resulting from land use changes are likely to increase as the Cities of Atlanta and Chattanooga continue to expand northward and southward, respectively, into the Conasauga Basin.

D. Synthesis

Given the low population numbers and geographically limited range of the Conasauga logperch, a wide range of events, both natural and human-induced, alone or in combination, could cause species' extinction. Localized drought, chemical spills, floods that significantly alter habitat, or other catastrophic events could affect all or part of the logperch's limited range. Long-term, chronic threats include changes in land use that result in excess siltation of channel bottoms, reduced water quality, altered hydrology, loss of riparian buffers, and/or increased contaminant loads. Catch per unit effort estimates conducted in the mid-2000's estimated the Conasauga logperch population at less than 200 adults (Anna George, Tennessee Aquarium

Conservation Institute, pers. comm., Nov. 2008). Within this 55-km known range, Conasauga logperch have been observed at only 29 shoals since 1988. Individuals have been detected only once at 16 of these sites, and only two or three times at seven of the sites. At the other six sites (three upstream of the mouth of Perry Creek, one site between the mouths of Perry and Sumac Creeks, and two sites downstream of the mouth of Sumac Creek), the species has been detected on 4–10 occasions (Hagler et al. 2011). No Conasauga logperch were collected in the downstream third of the species' range during the 2008 surveys, and the best supported model Hagler et al. (2011) developed based on these data concluded that the probability of encountering a Conasauga logperch in the downstream third of the species' range declined over the past two decades. Based on review and evaluation, we believe the Consauga logperch continues to meet the definition of an endangered species under the Endangered Species Act.

III. RESULTS

A. Recommended Classification:

_X_ No change is needed

IV. RECOMMENDATIONS FOR FUTURE ACTIONS

1. Continue ongoing work to implement agricultural best management practices, riparian vegetation restoration, and streambank stabilization work on the Conasauga mainstem and Holly Creek, and expand actions to include priority tributaries.
2. Continue monitoring Conasauga logperch populations and fish communities at benchmarked sites to evaluate population trends, changes in community structure, and habitat alterations.
3. Continue Conasauga logperch genetic and propagation studies and provide funds for long-term support of at least one ark population in captivity.
4. Continue studies to determine contaminant loads and sources in the basin.
5. Conduct Conasauga logperch life history research, including characterizing juvenile habitat and evaluating patterns of population structure and connectivity.
6. Work with local governments, business, industry, and others to develop a Conasauga Basin Regional Aquatic Habitat Conservation Plan to minimize adverse effects of future urban development on Conasauga logperch (e.g., stormwater runoff).
7. Identify areas of suitable, unoccupied Conasauga logperch habitat within the species historic range and determine if translocation of captive-bred specimens is appropriate. If so, develop release techniques and work with landowners to reestablish populations in these reaches.
8. Work with local officials to develop county- and city-wide ordinances to minimize the impact of stormwater runoff, sediment and erosion, road and utility stream crossings, and other urban stressors on Conasauga logperch and other rare basin species.
9. Develop and implement programs and materials to communicate to government officials and the public on the need and benefits of ecosystem management and to involve them in watershed stewardship for these and other aquatic species.
10. Work with State and local governments, as well as private landowners in these basins, to identify and implement best management and conservation practices to improve water quality and water

quantity issues

11. Continue to hold periodic Conasauga and/or Coosa Summits to bring together researchers, land managers, environmental groups, local government officials, and others to discuss recent Conasauga/Coosa research results, new threats, and needed management actions. Continue to meet in smaller committees, as needed, to discuss management actions to address stressors.

REFERENCES

Argentina, J.E., M.C. Freeman, and B.J. Freeman. 2010. The response of stream fish to local and reach-scale variation in the occurrence of a benthic aquatic macrophyte. Freshw. Biol. 55:643-653.

Ayoola, S.O. 2008. Toxicity of glyyphosate herbicide on Nile tilapia (Oreochromis niloticus) juvenile. African Journal of Agricultural Research Vol. 3 (12), pp. 825-834.

Bringolf, R.B., W.G. Cope, S. Mosher, M.C. Barnhart, and D. Shea. 2007. Acute and chronic toxicity of glyphosate compounds to glochidia and juveniles of Lampsilis sililquoidea (Unionidae). Environmental Toxicology and Chemistry 26(10):2094-2100.

Cavalcante, D.G.S.M., C.B.R. Martinez, and S.H. Sofia. 2008. Genotoxic effects of Roundup on the fish Prochilodus lineatus. Mutation Research-Genetic toxicology and Environmental Mutagenesis 655:41-46

Etnier, D.A., and W.C. Starnes. 1993. The fishes of Tennessee. Univ. Tennessee Press, Knoxville. 681 pp.

Freeman, B.J. 1989. Life history studies on the amber darter (*Percina antesella*) and the Conasauga logperch (*Percina jenkinsi*) in the Conasauga River in Georgia and Tennessee. Annual report September 1989. Unpublished manuscript in the files of Georgia Ecological Services, Athens, GA. 20 pp.

Freeman, B.J. 1990a. Life history studies on the amber darter (*Percina antesella*) and the Conasauga logperch (*Percina jenkinsi*) in the Conasauga River in Georgia and Tennessee. Progress Report July 1990. Unpublished manuscript in the files of Georgia Ecological Services, Athens, GA. 11 pp.

Freeman, B.J. 1990b. Life history studies on the amber darter (*Percina antesella*) and the Conasauga logperch (*Percina jenkinsi*) in the Conasauga River in Georgia and Tennessee. Summary Report October 1990. Unpublished manuscript in the files of Georgia Ecological Services, Athens, GA. 21 pp.

Freeman, B.J. 1999. Identification and mapping of critical habitats in the Coansauga River corridor of Georgia and Tennessee. Annual Report Fall 1999. Unpublished manuscript in the files of Georgia Ecological Services, Athens, GA. 39 pp.

Freeman, B. J., M. Hagler, S. Wenger, G. Anderson, and R. Katz. 2007. Identification and mapping of critical habitats in the Conasauga River corridor of Georgia and Tennessee. 2006Annual report to the Georgia Department of Natural Resources, Atlanta.

Freeman, B. J., M.M. Hagler, S. J. Wenger, G. B. Anderson, and R. A. Katz. 2008. Identification and mapping of critical habitats in the Conasauga River corridor of Georgia and Tennessee. 2007Annual report to the Georgia Department of Natural Resources, Atlanta.

George, A.L. 2010. Preventing extinction of the endangered Conasauga logperch, *Percina jenkinsi*: the role of mate selection in successful captive propagation of this rare species. Addendum to the Second Interim Report. Unpublished manuscript in the files of Georgia Ecological Services, Athens, GA. 4 pp.

George, A.L., D.A. Neely, and R.L. Mayden. 2010. Comparative conservation genetics of two endangered darters, *Percina rex* and *Percina jenkinsi*. Proc. SE Fishes Council 52:1-12.

Golder Associates, Inc. 2002. Evaluation of the biological community in the Conasauga River from 1995 to 2001. Final Report June 2002. Unpublished manuscript in the files of Georgia Ecological Services, Athens, GA. 126 pp.

Golder Associates, Inc. 2008. Comprehensive report. Assessemnt of potential impacts on protected fish and mussel species from River Road Reservoir releases. 1995-2006. Final Report Feb. 2008. Unpublished manuscript in the files of Georgia Ecological Services, Athens, GA.

Hagler, M.M., M.C. Freeman, S.J. Wenger, B.J. Freeman, P.L. Rakes, and J.R. Shute. 2011. Use of recent and historical records to estimate status and trends of a rare and imperiled stream fish, *Percina jenkinsi* (Percidae). Can. J. Fish. Aquat. Sci. 68:739-748.

Johnston, C.E., and K.B. Damon. 1996. Long-term monitoring of rare fishes in the Conasauga River, Georgia and Tennessee. Interim Report December 1996. Unpublished manuscript in the files of Georgia Ecological Services, Athens, GA. 20 pp.

Langiano, V.C., and C.B. Martinez. 2008. Toxicity and effects of a glyphosate-based herbicide on the Neotropical fish, *Prochilodus lineatus*. Comp. Biochem. Physiol. C. toxicol. Pharmacol. 147:222-231.

Lasier, P.J., R.B. Bringolf, and S.M. Hassan. 2011. Agricultural chemicals and stormwater runoff: potential impacts on rare and threatened aquatic species in the upper Conasauga River. Progress Report July 2011. Unpublished manuscript in the files of Georgia Ecological Services, Athens, GA. 9 pp.

MACTEC. 2008. Georgia inventory and survey of feasible sites for water supply reservoirs. Project No. 6110-08-0257. Georgia Environmental Facilities Authority http://pmdb.gefa.org/Index.aspx?page=465

Mettee, M.F., P.E. O'Neil, and J. M. Pierson. 1996. Fishes of Alabama. Oxmoor House, Birmingham. 819 pp.

Mitchell, D.G., P.M. Chapman, and T.J. Long. 1987. Acute toxicity of Roundup and rodeo herbicides to rainbow trout, chinook, and coho. Bulletin of Environmental Contamination and Toxicology 39:1028-35.

Moore, P.A. 1997. Best management practices for poultry manure utilization that enhance agricultural productivity and reduce pollution. Pp. 89-117 in J.L. Hatfield and B.A.Stewart. Eds. Animal Waste Utilization: Effective Use of Manure as a Soil Resource. Lewis Publishers, Inc.

Petty, M.A., P.L. Rakes, and J.R. Shute. 2010. Preventing extinction of the endangered Conasauga logperch, *Percina jenkinsi*: the role of mate selection in successful captive propagation of this rare species. Second Interim Report. Unpublished manuscript in the files of Georgia Ecological Services, Athens, GA. 5 pp.

Rakes, P.L., and J.R. Shute. 2005. Propagtion of the endangered Etowah darter, *Etheostoma etowahae*, and the endangered Conasauga logperch, *Percina jenkinsi*. Final Report August 2005. Unpublished manuscript in the files of Georgia Ecological Services, Athens, GA. 13 pp.

Rakes, P.L., and J.R. Shute. 2006. Population monitoring of rare southeastern fishes in the Conasauga River and Hiwassee River Drainage: 2005. Final Report for 2005 field season. Unpublished manuscript in the files of Georgia Ecological Services, Athens, GA. 13 pp.

Rosenberger, A., and P.L. Angermeier. 2003. Otogenetic shifts in habitat use by the endangered Roanoke logperch (*Percina rex*). Freshwater Biology 48:1563-1577.

Sharpley, A.N., S. Herron, and T. Daniel. 2007. Overcoming the challenges of phosphorus-based management in poultry farming. J. Soil and Water Conserv. 62:375-389.

Shute, J.R., and P.L. Rakes. 2005. Fish surveys of selected streams of the Chattahoochee National Forest to monitor effects of Hurricane Ivan on imperiled species: 2005 – interim report December 2005. Unpublished manuscript in the files of Georgia Ecological Services, Athens, GA. 13 pp.

Stolz, J.F., E. Perera, B. Kilonzo, B. Kail, B. Crable, E. Fisher, M. Ranganathan, L. Wormer, and P. Basu. 2007. Biotransformation of 3-Nitro-4-hydroxybenzene arsonic acid (Roxarsone) and release of inorganic arsenic by Clostridium species. Environ. Sci. Technol. 41:818-823.

Szarek, J., A. Siwicki, A. Andrzejewska, E. Terech-Majewska and T. Banaszkiewicz. 2000. Effects of the herbicide Roundup™ on the ultrastructural pattern of hepatocytes in carp (Cyprinus carpio). Marine Environmental Research 50:263-266.

U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW OF CONASAUGA LOGPERCH

Current Classification: Endangered

Recommendation resulting from the 5-Year Review

_X_ No change is needed

Review Conducted By Robin B. Goodloe, Ph.D.
Supervisory Fish and Wildlife Biologist
Georgia Ecological Services

FIELD OFFICE APPROVAL:

Lead Field Supervisor, Fish and Wildlife Service

Approve Sandra S. Tucker Date 5/29/12
Sandra S. Tucker, Field Supervisor
Georgia Ecological Services

REGIONAL OFFICE APPROVAL:

Lead Regional Director, Fish and Wildlife Service

Approve Cynthia Dohner Date 12/16/11
Cynthia Dohner
Director, Southeast Region

APPENDIX A: Summary of peer review for the 5-year review of the Conasauga logperch (*Percina jenkinsi*)

A. **Peer Review Method:** The draft 5-year review document was reviewed by the following aquatic scientists with expertise in Conasauga River species, and the Service prepared a final draft based on their comments:
Megan Hagler, University of Georgia Riverbasin Center.
Dr. Brett Albanese, Georgia Department of Natural Resources, Natural Heritage Program
Dr. Noel M. Burkhead, USGS Florida Integrated Science Center
Dr. Byron J. Freeman, University of Georgia Institute of Ecology
Dr. Mary C. Freeman, USGS Patuxent Wildlife Research Center

B. **Peer Review Charge:** Reviewers were charged with providing a review of the document including any other comments and/or additions appropriate to include. Reviewers were not asked to comment on the legal status of the species.

C. **Summary of Peer Review Comments/Report:** The reviewers provided comments on the status of the species, and current threats and editorial comments.

D. **Response to Peer Review:** We evaluated comments received and incorporated them as appropriate.