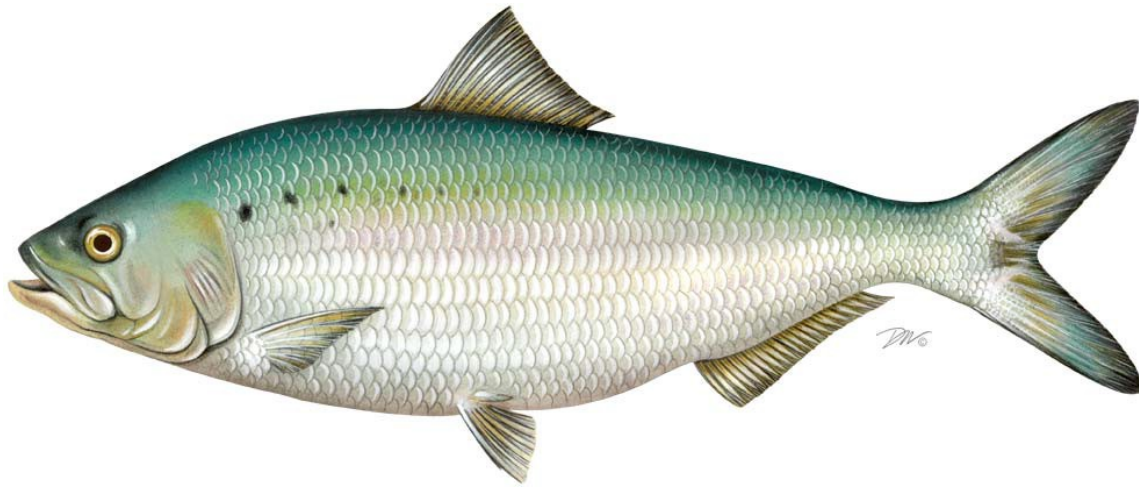


American Shad Habitat Plan for Georgia



Prepared by:
Georgia Department of Natural Resources

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Altamaha River

Habitat Assessment

The Altamaha River is formed by the confluence of the Ocmulgee and Oconee rivers and flows approximately 220 km before emptying into the Atlantic Ocean near Darien, GA. Including its longest tributary (the Ocmulgee River), the Altamaha River runs for approximately 756 km, making it the seventh longest river in the U.S. that is entirely within one state. The Altamaha River drainage basin covers an area of approximately 36,000 km², with its headwaters arising near Atlanta, GA for the Ocmulgee River and near Athens, GA for the Oconee River. There are no dams directly on the Altamaha, though there are dams on both the Oconee and the Ocmulgee rivers. With no barriers directly on the Altamaha all historical estuarine habitat remains available to juvenile and migrating adult shad.

Historical evidence suggests that American shad once occurred in the Altamaha Basin at least as far upstream as the vicinity of Covington, GA in the Ocmulgee River Basin and near the city of Athens, GA in the Oconee River Basin [Bryson 1826; Baird 1884; Bill Frazier, U. S. Fish and Wildlife Service (retired), 2001, personal communication; Elizabeth Reitz, University of Georgia, 2007, personal communication]. However, the construction of dams has limited their migrations. Most of these structures are still in place and continue to serve as barriers to nearly 6,000 acres of potential riverine shad habitat.

American shad currently occur from the mouth of the Altamaha River to the East Juliette Hydroelectric Dam on the Ocmulgee River (approximately river km 570) and Sinclair Dam on the Oconee River (approximately river km 446). Approximately 70% of the historical riverine habitat currently remains available to migrating adult American shad.

Threats Assessment

- 1. Migration Barriers-** Full utilization of all potential spawning habitat in the Altamaha River Basin could entail modification of several dams in the Oconee, Ocmulgee, and Ochopee Basins, to facilitate fish passage.

Action 1: Develop a plan for establishing fish passage at barriers in the Altamaha River system.

Regulatory Agencies/Contacts: USFWS, NMFS, FERC, USACE, Georgia Department of Natural Resources (GA DNR), dam owners/operators, and federal and state legislators.

Goal/Target: Establish fish passage at all dams in the Altamaha basin, where passage is determined to be feasible.

Progress: GA DNR has developed an American shad restoration plan for the Altamaha River Basin, which includes the implementation of fishways as a restoration strategy. The

plan calls for utilizing Section 18 of the Federal Power Act, which provides the U.S. Departments of Commerce and Interior mandatory conditioning authority to prescribe fish passage during the Federal Energy Regulation Commission (FERC) licensing process for hydroelectric facilities. The FERC-licensed hydroelectric facilities in the Altamaha Basin that are within the historic range of the American shad should have fish passage provisions included in their upcoming licenses, when passage is determined to be feasible.

For FERC-licensed facilities that already have a spawning population directly below them (e.g., East Juliette Hydroelectric Dam, Sinclair Dam), fish passage should be evaluated and implemented as soon as feasible (or upon FERC relicensing). For all other FERC-licensed facilities, fish passage should be provided in a stepwise fashion upon the establishment of spawning runs directly below these structures (upon fish passage at all downstream structures).

For non-FERC-licensed dams, resource agencies should work with owners to explore passage opportunities such as fishways, breaching, or removal. Where feasible, obsolete or non-functioning barriers to migration should be removed or breached.

Progress has been made in recent years regarding re-establishing fish passage and improving habitat. One such example is the removal of the White Dam on the Middle Oconee River near Athens, GA in 2018.

East Juliette Hydroelectric Dam

A fish passage prescription for East Juliette Hydroelectric dam has been completed. However, negotiations between the Services and project operator are still ongoing and construction of the fishway has not been initiated.

Cost: Unknown

Timeline: Unknown

Action 2: Potentially conduct experimental trap and transport operations.

Regulatory Agencies/Contacts: GA DNR, ASMFC, USFWS, NMFS, FERC, USACE, dam owners and operators, and federal and state legislators.

Goal/Target: Assess of upstream migratory behavior and level of passage at partial barriers and to provide access to additional spawning habitat that may be more suitable than that available below downstream barriers.

Progress: Experimental trap and transport operations are listed as a potential method for assessing migratory behavior, partial barrier passage, and allow for potential spawning at previously unavailable habitat. GA DNR has no immediate plans to initiate trap and transport activities at this time.

Cost: Unknown

Timeline: Unknown

- 2. Dissolved Oxygen-** Though no dissolved oxygen issues have been identified within the Altamaha River itself, segments of tributary rivers and streams have been identified as not having sufficient assimilative capacity to maintain dissolved oxygen levels of 5mg/L or greater at maximum permitted discharge levels under low flow conditions.

Action 1: Develop a regional water plan that recommends appropriate water management practices to ensure healthy aquatic ecosystems.

Regulatory Agencies/Contacts: GA DNR-Environmental Protection Division (EPD), Wildlife Resources Division (WRD), and Coastal Resources Division (CRD), state legislators, and local municipalities

Goal/Target: Ensure water quantity remains adequate to support all life stages of American shad and other aquatic organisms in the Altamaha River.

Progress: In 2008, the Georgia General Assembly, as part of the Statewide Comprehensive Water Management Plan, established 10 regional water planning councils that encompassed the 14 major river systems within Georgia. With technical guidance from GA EPD, these councils were tasked with developing regional water plans that outlined management practices to meet future water needs for both water quantity and water quality through 2050. In November 2011, the ten regional water plans were officially adopted by GA EPD.

The Altamaha Council recommended a suite of surface water quality management practices in a phased approach to address water quality issues, including stream segments with limited localized dissolved oxygen assimilative capacity and insufficient wastewater permit capacity (GA EPD 2011a). These recommendations include such practices as the additional sustainable development of groundwater and surface water in areas with sufficient water supply; best management practices for water quality issues such as non-point source runoff, nutrient loadings, and TMDLs in the region; and additional educational and ordinance practices.

For the Altamaha Region, 75 impaired stream reaches (total impaired length of 915 miles) and 2 impaired lakes (total impaired area of 390 acres) have been identified. The majority of impairments are due to low dissolved oxygen and fecal coliform. Total maximum daily loads have been completed for 71 of the impaired stream reaches and for both of the impaired lakes.

Cost: Unknown

Timeline: Regional water plan extends through 2050

- 3. Competition and Predation by Invasive Species-** Flathead catfish and blue catfish have been introduced into that Altamaha River system through unauthorized stockings. A significant portion of both flathead catfish and blue catfish diets are comprised of fish, and due to their large adult size (>60 lbs) they have the potential to consume both adult and juvenile American shad. Flathead catfish were first documented in the Ocmulgee River in the early-1970's and have now colonized the entire Altamaha River system. Abundance of flathead catfish rapidly expanded from approximately 1980 through the late-1990's. Electrofishing catch rates by weight peaked at 274 kg/hr in 1993 and by number at 108 fish/hr in 2004. Since 2000, electrofishing catch rates have ranged from 43-135 fish/hr, having a CPUE of 111.97 fish/hr in 2020. The average size of the flathead catfish in the Altamaha River peaked at approximately 3.5 kg in the mid-1990's and has since decreased to approximately 1 kg. A diet analysis of flathead catfish was completed during the months of June-September of 1997 and found the dominant prey items to be centrarchid spp. and ictalurid spp (Weller and Robbins, 2001). No *Alosa* spp. were identified in the stomach of flathead catfish during this study, but consumed juvenile American and/or hickory shad could have been unidentifiable due to extensive digestion.

Blue catfish were first detected in the Altamaha River in 2006 and their abundance has steadily increased. In 2011, blue catfish electrofishing CPUE was 29 fish/hr, and in 2020 blue catfish CPUE was 63 fish/hr. It is expected that the abundance of this species will continue to increase for several more years. Stomach contents of 257 blue catfish were analyzed in the summer of 2010 and it was found that *Alosa* spp. comprised 0.4% by number of prey items consumed (Bonvechio et al. 2012). The majority of the blue catfish in this study were relatively small (59.5% < 300 mm) so as larger blue catfish become more abundant utilization of *Alosa* spp as a prey item may increase.

Action 1: Management of invasive catfish species.

Regulatory Agencies/Contacts: GA DNR

Progress: GA DNR completed experimental electrofishing removals of flathead catfish from the Altamaha River system during the 1990s in an effort to restore native fish redbreast sunfish and bullhead *spp* populations that had been adversely impacted. These efforts were discontinued due to the large nature of the river, budget reductions, and shifts in angler attitudes.

Cost: Unknown

Timeline: Discontinued

Ogeechee River

Habitat Assessment

The Ogeechee River originates in the Georgia piedmont and flows for approximately 425 km while crossing the fall line, sandhill region, and the coast plain before emptying into the Atlantic Ocean in Ossabaw Sound. The Ogeechee River watershed encompasses approximately 14,300 km². Tidal influence typically extends to rkm 72 and the fresh/saltwater interface occurs approximately 56 km upstream from the mouth of the river. No manmade barriers are present the entire length of the Ogeechee River, so all historical riverine and estuarine habitats remain available to juvenile and migrating adult American shad.

Threats Assessment

- 1. Instream Flow-** The Georgia Environmental Protection Division (EPD) conducted resource assessments to predict resource conditions based on projection population growth and resulting water demands through 2050. Based on these predictions peak season agricultural irrigation may result in potential in-stream flow shortages in the Ogeechee Basin (GA EPD 2011b). The stream flow may fall below the in-stream flow target during summer low flow periods after meeting upstream irrigation needs.

Action 1: Develop a regional water plan that recommends appropriate water management practices to ensure healthy aquatic ecosystems.

Regulatory Agencies/Contacts: GA DNR-EPD/WRD/CRD, USFWS, NMFS, FERC, US EPD, USACE, federal and state legislators, and local municipalities.

Goal/Target: Ensure water quantity remains adequate to support all life stages of American shad and other aquatic organisms in the Ogeechee River.

Progress: In 2008, the Georgia General Assembly, as part of the Statewide Comprehensive Water Management Plan, established 10 regional water planning councils that encompassed the 14 major river systems within Georgia. With technical guidance from GA EPD, these councils were tasked with developing regional water plans that outlined management practices to meet future water needs for both water quantity and water quality through 2050. In November 2011, the ten regional water plans were officially adopted by GA EPD.

To prevent potential shortages in meeting in-stream flow needs, the plan encompassing the Ogeechee River calls for more aggressive water conservation practices and development of drought management practices for the agricultural users/permittees in the Upper Ogeechee River Basin (GA EPD 2011b). The Council also recommends in-stream flow studies (to determine what flow levels are appropriate for protecting aquatic life) and additional stream flow monitoring in the Ogeechee River Basin (to confirm the frequency and magnitude of predicted in-stream flow shortages).

Cost: Unknown

Timeline: Regional water plan extends through 2050

- 2. Point Source Discharges-** In May 2011, the Ogeechee River experienced a large-scale fish kill that affected multiple species including American shad. The upper extent of the kill was below the only industrial discharge above the kill area.

Action 1: Develop and implement permits and monitoring to avoid future fish kills.

Regulatory Agencies/Contacts: GA DNR-EPD/WRD, US EPD, and appropriate private industrial operators.

Goal/Target: Ensure water quality remains adequate to support all life stages of American shad and other aquatic organisms in the Ogeechee River.

Progress: After the 2011 fish kill, GA EPD reviewed and revised the existing discharge permit for King America Finishing in attempt to prevent future fish kills related to their discharge. GA EPD has since closely monitored water quality in this area of the Ogeechee River.

Cost: Unknown

Timeline: Currently ongoing

Satilla River

Habitat Assessment

The Satilla River originates in Ben Hill County near the town of Fitzgerald, GA and flows for approximately 378 km before emptying into the Atlantic Ocean in St. Andrews Sound. The Satilla River watershed encompasses approximately 10,000 km² of Georgia's coastal plain. Tidal influence typically extends to rkm 93 and the fresh/saltwater interface occurs approximately 32 km upstream from the mouth of the river. No manmade barriers are present the entire length of the Satilla River, so all historical riverine and estuarine habitats remain available to juvenile and migrating adult American shad.

Threats Assessment

- 1. Competition and Predation by Invasive Species-** Flathead catfish were introduced into that Satilla River system through unauthorized stockings in the mid-1990s and blue catfish were collected by GA DNR in 2012. A significant portion of flathead catfish diets

are comprised of fish, and due to their potential large adult size (>100 lbs) they have the potential to consume both adult and juvenile American shad.

Action 1: Management of invasive catfish species.

Regulatory Agencies/Contacts: GA DNR

Progress: GA DNR initiated electrofishing removals of flathead catfish from the Satilla River in 1996 with existing manpower and funding in an effort to preserve native fish species, specifically redbreast sunfish and bullhead spp. Flathead abundance continued to increase despite these efforts, which were limited due to manpower and fiscal limitations. Native fish populations were also showing early signs of decline. In 2006, Georgia's legislature appropriated funding for dedicated positions and equipment to conduct extensive flathead catfish removal efforts on the Satilla River. Since 2007, approximately 82,000 flathead catfish weighing over 163,000 lbs have been removed from the Satilla River. Over time, these efforts have resulted in a significant reduction in the flathead catfish biomass and appear to be preserving the abundance of native species.

Blue catfish were first observed in the river in 2010, with only a few individuals being collected in the first few years. In 2016, abundance dramatically rose when 224 blue catfish were captured during electrofishing efforts. Subsequent years (2017=397; 2018=58; 2019=663; 2020=187) continued to produce several fish. GA DNR suspects that these fish may have colonized the Satilla River from the Altamaha River via the intercostal water way during a high flow period, due to their relatively high tolerance to brackish water.

Cost: Unknown

Timeline: Ongoing

- 2. Dissolved Oxygen-** Dissolved oxygen levels below 3 mg/L occur during low flow events in the months of July-September in an approximately a 30 km segment of the tidally influenced portion of the Satilla River. The Satilla River naturally has a low assimilative capacity and resulting low DO levels during summer low flow periods, therefore it may not be possible to maintain DO levels above 3 mg/L at all times. However, the actions listed below will still be beneficial.

Action 1: Develop a TMDL implementation plan.

Regulatory Agencies/Contacts: GA DNR-EPD/WRD/CRD, state legislators, and local municipalities

Goal/Target: Reduce organic loads to sustain acceptable DO levels.

Progress: GA DNR worked with representatives of local municipalities and conservation groups and developed a TMDL implementation plan that included a suite of

management measure to reduce organic carbon, Total Nitrogen, and Total Phosphorous inputs in order to improve dissolved oxygen levels in the Satilla River.

Cost: Unknown

Timeline: Unknown

Action 2: Develop a regional water plan that recommends appropriate water management practices to ensure healthy aquatic ecosystems.

Regulatory Agencies/Contacts: GA DNR-EPD/WRD/CRD, USFWS, NMFS, FERC, US EPD, USACE, federal and state legislators, and local municipalities.

Goal/Target: Ensure water quantity remains adequate to support all life stages of American shad and other aquatic organisms in the Satilla River.

Progress: In 2008, the Georgia General Assembly, as part of the Statewide Comprehensive Water Management Plan, established 10 regional water planning councils that encompassed the 14 major river systems within Georgia. With technical guidance from GA EPD, these councils were tasked with developing regional water plans that outlined management practices to meet future water needs for both water quantity and water quality through 2050. In November 2011, the ten regional water plans were officially adopted by GA EPD.

The Suwannee-Satilla-St Mary's Council recommended a suite of surface water quality management practices in a phased approach to address water quality gaps, including stream segments with limited localized dissolved oxygen assimilative capacity and insufficient wastewater permit capacity (GA EPD 2011c). Specific actions to add/improve infrastructure and improve flow and water quality conditions were identified and recommended. These include such practices as the additional sustainable development of groundwater and surface water in areas with sufficient water supply; best management practices for water quality issues such as non-point source runoff, nutrient loadings, and TMDLs in the region; and additional educational and ordinance practices.

Cost: Unknown

Timeline: Regional water plan extends through 2050

- 3. Instream Flow-** The Georgia EPD conducted resource assessments on current and predicted resource conditions based on projected population growth and resulting water demands through 2050. These assessments concluded that instream flow shortages were present under current and future demands in portions of the Satilla Basin.

Action 1: Develop a regional water plan that recommends appropriate water management practices to ensure healthy aquatic ecosystems.

Regulatory Agencies/Contacts: GA DNR-EPD/WRD/CRD, USFWS, NMFS, FERC, US EPD, USACE, federal and state legislators, and local municipalities.

Goal/Target: Ensure water quantity remains adequate to support all life stages of American shad and other aquatic organisms in the Satilla River.

Progress: The Satilla River water management plan was officially adopted by GA EPD in November 2011 and recommended a suite of management practices, including those that reduce net consumption, replace surface water use with groundwater use, and improve data on frequency and magnitude of gaps (GA EPD 2011c).

Cost: Unknown

Timeline: Regional water plan extends through 2050

St. Mary's River

Habitat Assessment

The St. Mary's River originates in the Okefenokee Swamp and flows for approximately 203 km before emptying into the Atlantic Ocean in Cumberland Sound while forming the eastern portion of the border between Florida and Georgia. The St. Mary's watershed encompasses approximately 3,350 km² of which 59% is in Georgia and 41% in Florida. Tidal influence typically extends to rkm 88 and the fresh/saltwater interface occurs approximately 33 km upstream from the mouth of the river. No manmade barriers are present the entire length of the St. Mary's River, so all historical riverine and estuarine habitats remain available to juvenile and migrating adult American shad.

Threats Assessment

- 1. Dissolved Oxygen-** Dissolved oxygen levels below 3 mg/L occur during low flow events in the months of July-September months of July-September in an approximately a 40 km segment of the tidally influenced portion of the St. Mary's River. The St Mary's River naturally has a low assimilative capacity and resulting low DO levels during summer low flow periods, therefore it may not be possible to maintain DO levels above 3 mg/L at all times. However, the actions listed below will still be beneficial.

Action 1: Develop a TMDL implementation plan.

Regulatory Agencies/Contacts: Georgia Department of Natural Resources (GA DNR)-Environmental Protection Division (EPD), Wildlife Resources Division (WRD), and Coastal Resources Division (CRD), FL FWC, FL DEP, St. Johns Water Management District, state legislators, and local municipalities

Goal/Target: Reduce organic loads to sustain acceptable DO levels.

Progress: GA DNR worked with representatives of local municipalities and conservation groups and developed a TMDL implementation plan that included a suite of management measure to reduce organic inputs in order to improve dissolved oxygen levels in the St. Mary's River.

Cost: Unknown

Timeline: Unknown

Action 2: Develop a regional water plan that recommends appropriate water management practices to ensure healthy aquatic ecosystems.

Regulatory Agencies/Contacts: GA DNR-EPD/WRD/CRD, USFWS, NMFS, FERC, US EPD, USACE, federal and state legislators, and local municipalities.

Goal/Target: Ensure water quantity remains adequate to support all life stages of American shad and other aquatic organisms in the St. Mary's River.

Progress: In 2008, the Georgia General Assembly, as part of the Statewide Comprehensive Water Management Plan, established 10 regional water planning councils that encompassed the 14 major river systems within Georgia. With technical guidance from GA EPD, these councils were tasked with developing regional water plans that outlined management practices to meet future water needs for both water quantity and water quality through 2050. All 10 regional water plans were officially adopted in 2011.

The Suwannee-Satilla-St Mary's Council recommended a suite of surface water quality management practices in a phased approach to address water quality gaps, including stream segments with limited localized dissolved oxygen assimilative capacity and insufficient wastewater permit capacity (GA EPD 2011c). Specific actions to add/improve infrastructure and improve flow and water quality conditions were identified and recommended. These include such practices as the additional sustainable development of groundwater and surface water in areas with sufficient water supply; best management practices for water quality issues such as non-point source runoff, nutrient loadings, and TMDLs in the region; and additional educational and ordinance practices.

Cost: Unknown

Timeline: Regional water plan extends through 2050

Final Thoughts (As Recommended and Supported by the TC)

The 2020 Atlantic States Marine Fisheries Commission's American Shad Stock Assessment and Peer Review Report provides an extensive review of available literature and discussion on the topic of fish passage (ASMFC 2020). Specifically, it highlights the issues with lack of evaluation and performance from decades-old approaches, facilities designs/operations that are not effective, and therefore cannot reasonably be expected to achieve management and restoration goals without significant changes. The Assessment Report also provides an important quantitative modeling approach examining shad habitat and passage barriers, and the need to address status quo fish passage performance. The impacts of these barriers and status quo passage are described and also modeled as effects on spawner population size under three scenarios, 1) no barriers, 2) first barrier with no passage, and 3) realistic fish passage performance measures applied to barriers (e.g., upstream passage efficiency of 50%).

The Assessment Report used standardized data and modelling approaches that quantified the impacts of barriers and fish passage as significant in all three management areas examined based on shad life history and habitat (New England, Mid-Atlantic, and South Atlantic). The assessment determined that overall, dams completely or partly block nearly 40% of the total habitat once used by American Shad. The model results of the "no barriers" scenario yielded an estimated spawner production potential 1.7 times greater than that yielded by the scenario assuming no passage at the first barrier: 72.8 million versus 42.8 million fish. The results of the third model scenario, which applies "realistic" (i.e., current) fish passage efficiencies, resulted in a gain of less than 3 million fish. Conclusions include "losses in (spawner production) potential are significant in each state and region." The Assessment Report provides a strong justification for the need and benefits of requiring improved fish passage performance measures. Additionally, meeting such improved passage performance standards is now an achievable goal given the current state of knowledge on fish behavior, swimming performance, and fish passage engineering expertise.

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