

American Shad Habitat Plan Update

State of Florida

Florida Fish and Wildlife Conservation Commission
Fish and Wildlife Research Institute
Division of Marine Fisheries Management

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Introduction

Amendment 3 to the Interstate Management Plan for Shad and River Herring cites habitat loss and degradation as major factors in the decline of and continued depression of populations of American Shad along the Atlantic coast and requires member states to develop habitat plans for American Shad in their jurisdiction. This plan is submitted to serve as the required habitat plan for the State of Florida. It outlines historic and current habitats available to American Shad in Florida and identifies known threats to those habitats as well as efforts to mitigate those threats.

The primary spawning run of American shad in Florida historically was and currently is in the St. Johns River. The only other river lying within Florida in which spawning has been documented historically (Williams and Bruger 1972) and recently (Holder et al. 2011, Dutterer et al. 2011) is the Econlockhatchee River which is a tributary to the St. Johns River. The St. Marys River is along the eastern border between Georgia and Florida historically supported a population of American Shad. This plan includes these three systems.

The Ocklawaha River is the largest tributary of the St. Johns River and is the largest Atlantic drainage river in Florida obstructed by a dam in its lower reaches. There is no record of a spawning run of American Shad in the Ocklawaha River pre-dating construction of the dam in 1968. However, the Ocklawaha River is discussed briefly at the end of this plan because advocates for removal of the dam often cite American Shad as among migratory species that would benefit from dam removal.

St. Johns River

1) Habitat Assessment

General: The St. Johns River emerges from the headwater marsh in Indian River and Brevard Counties and flows approximately 450 km north to the mouth in Jacksonville. Several broad shallow lakes lie within the run of the river. Stream gradient is small with the river bottom dropping 4 m between rkm 450 and rkm 314. The river bottom is at or below mean sea level downstream of rkm 314. American Shad spawn in the St. Johns River from January through April which corresponds to the declining flows of Florida's dry season (Kelly and Gore 2008).

a. Spawning Habitat

- i. Historic spawning grounds were documented from rkm 230 to rkm 433 near the headwaters (Williams and Bruger 1972). Of that distance 160 km can be classified as river and 43 km as lake. Primary spawning

grounds were in river habitats between rkm 275 and rkm 360 (Williams and Bruger 1972).

- ii. A weir built at the outlet of Lake Washington (rkm 415) in 1976 blocks access to approximately 14 km of potential spawning habitat in the uppermost river. Current spawning habitat identified by egg collection (Miller et al. 2012b) and telemetry (Dutterer et al. 2011) is between rkm 230 and the weir at rkm 415. Primary spawning areas are still between rkm 275 and 360. Approximately 146 kilometers of potential habitat remains available for spawning depending on water level.

b. Rearing Habitat

- i. Historical in-river and estuarine rearing habitat included 95 km of river between Lake George and Lake Harney, 260 km² of lakes within the run of the river, and 105 km of tidal freshwater estuary between Black Creek and Lake George.
- ii. All historical rearing habitats are still available.

2) Threats

a. Barriers

- i. Low head dam at rkm 415. Crest height of 3.8m NAVD 1988 is 1 m above the river surface at low stage.
 - 1. Action: None. Dam obstructs access to less than 10% of historical spawning habitat. Preferred habitat is between rkm 275 and rkm 360.
 - 2. Regulatory Contact: St. Johns River Water Management District (SJRWMD).

b. Water Withdrawals Inventory and Assessment

- i. Consumptive use permits are coordinated through the SJRWMD. There is a proposal to allow withdrawal of up to a total of 262 million gallons per day (mgd) of surface water from the basin with a total of 155 mgd from several sites along the middle and upper St. Johns River. The District completed the St. Johns River Water Supply Impact Study (WSIS) in 2012 (Lowe et al. 2012). The intent of the WSIS “was to provide a comprehensive and scientifically rigorous analysis of the potential environmental effects to the St. Johns River associated with annual average surface water withdrawals as high as 262 mgd” (155 mgd from the St. Johns River and 107mgd from a tributary). Chapter 12 focused on fishery impacts of the proposed withdrawals with special consideration given to anadromous herrings in appendix 12-C (Miller et al. 2012a and 2012b). Key findings are as follows.

1. WSIS found that impingement/entrainment of anadromous herring eggs and larvae could occur at all proposed intake sites and could be potentially significant at two locations under consideration. The WSIS recommended reducing the impingement/entrainment risk to alosines by considering: intake designs that are safer for ichthyoplankton, alternative intake locations to avoid core spawning locations of American Shad, and curtailing withdrawals on the spawning grounds during the spawning season at sites with high egg/larval abundance.
2. WSIS found that optimal spawning habitat for American Shad as delineated by depth and velocity shrinks under low flow conditions. WSIS finds that access to spawning grounds and acreage of spawning grounds will not be adversely affected by withdrawals due to offsetting effects of base flow augmentation by the Upper Basin Restoration Project. The frequency and duration of low flow events are expected to decline only slightly under modeled expected scenarios.

FWC should coordinate closely with SJRWMD after consumptive use requests for surface water withdrawals have been submitted by an applicant, to ensure the requested withdrawals will not negatively impact American Shad. In particular, withdrawals should not interfere with the ability of American Shad to reach their spawning grounds, nor should potential egg/larval entrainment be excessive. Coordination should include review of potential hydrologic impacts of the proposed withdrawals, assistance with selection of preferred withdrawal sites and assistance with intake design.

The City of Deltona secured a permit from the US Army Corp of Engineers in 2020 to construct a raw water intake on the north shore of Lake Monroe. The project consists of a 0.92 acre intake basin in the littoral zone adjoined to the Enterprise Boat Ramp (Latitude 28.862681° Longitude -81.252439°). The basin will feed a 30-inch raw-water main that will deliver water to the Alexander Avenue Water Resources Facility and Rapid Infiltration Basin. The intake is far from the run of the river and not expected to pose a risk to egg, larval, or juvenile shads. The ACOE finding was of no substantial adverse impact to EFH or federally managed fisheries. The project is intended to offset over-pumping of

ground water that adversely affects base flow from Blue Spring which discharges to the St. Johns River at river kilometer 248.

c. Water Quality

i. Nutrient loads are high in the St. Johns River Basin which results in cyanobacteria dominated algae blooms and occasional hypoxia both in freshwater reaches and in the brackish estuary near the river mouth (Hendrickson et al. 2003). Algae blooms may occur in the lower river from summer through early fall which can negatively alter zooplankton communities (Paerl et al. 2002). Reduction in DO may impact larval and juvenile American Shad nursery habitat and/or juvenile emigration corridors. Florida Department of Environmental Protection (FDEP) has established Total Maximum Daily Loads (TMDL) for nitrogen, phosphorus, and/or DO in the upper, middle, and lower St. Johns River (Gao 2006, 2009, Magley and Joyner 2008). TMDLs for nutrients and DO were created for Crescent Lake and Haw Creek (FDEP 2017 and Rhew 2020). TMDL implementation is carried out through two primary routes.

1. Nutrient reductions are being carried out following guidelines outlined in Basin Management Action Plans (BMAPs) for the lower and middle SJR as well as Lake Jesup (FDEP 2008, 2012, 2010, 2019). BMAPs were developed by committees representing state agencies as well as public and private entities. BMAPs address both point and non-point sources of nutrient loads to the St. Johns River Basin. Subsequent BMAPs have been established for three first magnitude springs in the middle SJR basin: Volusia Blue Spring, Deleon Springs, and Gemini Springs (FDEP 2018). Specific BMAP action items include tasks such as upgrades to wastewater treatment plants, wastewater reclamation, stormwater retrofits, urban structural BMPs, urban nonstructural BMPs, agricultural BMPs, environmental education, and water quality credit trading. Watershed response to BMAPs is tracked through water quality monitoring carried out by FDEP and SJRWMD. BMAP progress is subject to annual review by the TMDL Executive Committee or Basin Working Group overseeing the water body/basin of concern.
2. Florida Water Management Districts are instructed by the Surface Water Improvement and Management (SWIM) Act

to develop plans to improve the quality and management of surface water. Plans are cooperative with relevant state agencies and affected local governments participating in plan development. Plans have been developed for the upper, middle, and lower St. Johns River (SJRWMD 2002, 2007, 2008).

FWC should monitor the progress of implementation plans to ensure that water quality goals protect American Shad and communicate additional research findings as needed. Nutrient, chlorophyll, and dissolved oxygen trends have been stable to slightly improving in the main stem of the river although cyanobacteria blooms are still common in the Lower St. Johns River. (Pinto et al. 2020)

d. Channelization and Dredging

- i. Historic alterations in the non-tidal river: Navigational improvements occurred in the non-tidal portion of the river between 1884 and 1945. To enhance navigation numerous bends were cut off by excavating new channels in the river between Lake George's southern inlet (rkm 199) and Lake Monroe's outlet (rkm 265). This excavation straightened the main river channel and created numerous new oxbows. Sandbars were removed to establish a minimum depth of four meters between Palatka and Sanford. Further alteration of the non-tidal portion of the river is not planned.
- ii. Jacksonville is an active harbor for cargo. Deepening of the lower 32 km of the river from the mouth to Jacksonville Harbor is likely. US Army Corps of Engineers has prepared a project assessment including environmental impact assessment (USACE 2014). No immediate threat to shad migration or rearing is apparent from this project. Some loss of lower nursery zone could occur due to salt water intrusion. FWC Fish and Wildlife Research Institute (FWRI) Freshwater Fisheries Research section has added parts of the lower St. Johns River estuary to its list of water bodies for long term fishery monitoring. FWRI Fishery Independent Monitoring conducts monthly sampling in the lower St. Johns River from the river mouth to rkm 134.

e. Land Use

- i. The marshes of the upper basin were drained for agriculture and livestock grazing from 1900 through 1970. As much as 62 percent of the floodplain upstream of Lake Harney was drained and much water was diverted out of the basin. Following passage of the National Environmental Policy Act

focus of management of the upper basin turned towards flood control, marsh restoration and enhancement, and improved water quality. The 166,500 acre Upper St. Johns River Basin Flood Control Project consists of four water management areas, four marsh conservation areas and two marsh restoration areas managed by the St. Johns River Water Management District and the USACE (SJRWMD 2007).

- ii. Other land use impacts result primarily from urbanization and associated stormwater management challenges. These impacts and their mitigation are quantified in previously mentioned SWIM and BMAP plans as well as in flow modeling in the WSIS.
- f. Climate Change
- i. The St. Johns River, Florida hosts the southernmost spawning run of American Shad on the U.S. Atlantic Coast. Predicted global warming could shorten the spawning season by advancing the date at which temperature exceeds that suitable for spawning. The river bottom of spawning grounds between rkm 230 and 314 is below sea level. Current mean water surface height of the St. Johns River is above sea level down to rkm 230. Predicted sea level rise could impact these lower spawning reaches. Altered dry season rainfall patterns could change the quantity and quality of water available for spawning and rearing.
 - ii. Florida FWC has formed a Climate Change Team that includes a Steering Committee and four employee workgroups on adaptation, research and monitoring, communication and outreach, policy and opportunity.

Econlockhatchee River

1) Habitat Assessment

General: The Econlockhatchee River is the second largest tributary to the St. Johns River encompassing a watershed area of 700 km² with a stream length of 57 km. It discharges into the St. Johns River at rkm 317. American Shad spawning has been documented in the lower Econlockhatchee River (Williams and Bruger 1972, USACE 1973). It is not known if the Econlockhatchee River supports its own run of American Shad or if it attracts strays from the adjacent St. Johns River spawning grounds. Monitoring by FWC has found that the relative abundance of spawning American Shad can be high in the Econlockhatchee River compared to the adjacent St. Johns when flows are high in the Econ compared to the St. Johns (Hyle et al., 2019)

- a. Spawning Habitat: There are no barriers. Historical extent of spawning in the Econlockhatchee River is not confirmed but surveys in March 1969 found adult American Shad as far upstream as the confluence with the Little Econlockhatchee River. Recent

electrofishing and telemetry surveys have located adult shad from rkm 4 to rkm 14 during the spawning season (Holder et al. 2012, SJRWMD 2011).

- b. Rearing Habitat: Econlockhatchee River shares rearing habitat with the St. Johns River.

2) Threats

- a. Water Quality: Stormwater Management. Portions of the Econlockhatchee River watershed are densely developed which affects stormwater flow patterns and pollution. Management of associated run off is covered by the Middle St. Johns River Basin SWIM plan (SJRWMD 2002). Land use changes and flow augmentation by treated wastewater enhanced Econlockhatchee River base flows starting in the mid-1980s (German and Adamski 2013). Stormwater diversion and reclamation could reduce pollutant loads to the Econlockhatchee River but could also reduce base flow during the winter dry season in which American Shad spawn.

St. Marys River

The St. Marys River originates in the Okefenokee swamp and flows 203 km to the Atlantic Ocean along the eastern border between Georgia and Florida. Head of the tide extends to rkm 88 and salt water extends to rkm 30-35. The St. Marys River is managed by the Georgia Department of Natural Resources (GaDNR) and the St. Johns River Water Management District (SJRWMD) in cooperation with St. Marys River Management Committee (SMRMC). The St. Marys River Management Committee (SMRMC) is a quasi-governmental advisory panel established by Interlocal Agreement between Baker and Nassau counties in Florida and Camden and Charlton counties in Georgia. The SMRMC has five voting representatives from each county: one county commissioner and four appointed members (two riverfront landowners or representatives of corporations with riverfront property and two at-large members). One representative from the St. Johns River Water Management District (SJRWMD) and one representative from the Georgia Department of Natural Resources (GDNR) serve as non-voting members.

1) Habitat Assessment

All historic spawning and rearing habitat is still available. Neither has been quantified.

2) Threats

- a. GDNR Environmental Protection Division has identified a stretch of the lower St. Marys River with hypoxic summer conditions.
 - i. GDNR has developed a TMDL for dissolved oxygen and is working with local governments and conservation organization to implement measures to reduce organic loads and improve dissolved oxygen conditions in the affected river reach.
- b. Florida Department of Environmental Protection has developed a water quality assessment as a road map for developing plans to improve water quality in the basin (FDEP 2007).

Ocklawaha River

The Ocklawaha River is the largest tributary of the St. Johns River but it does not have a documented historical spawning run of American Shad. It flows 119 kilometers from Lake Griffin to the St. Johns River and there is a dam located at rkm 19 that was constructed in 1968 (Senator George Kirkpatrick Dam). The Ocklawaha River is mentioned in this plan because some advocates for dam removal cite American Shad among the species of migratory fish that would benefit from removal of the dam.

Habitat above and below the dam appears suitable for American Shad to spawn. However, records of a spawning run of or fishery for American Shad from the Ocklawaha River have not been found. One specimen was noted in a dissertation entitled "Fishes of the St. Johns River System" (McLane 1955). There are anecdotes from veteran commercial fishermen of American Shad present in the Ocklawaha River prior to dam construction (Jordan 1994) but no confirmation. There are modern anecdotes of shad present below the dam but recent efforts to locate spawning American Shad in the Ocklawaha River below the dam have yielded none (Holder et al. 2012). The absence of a documented historical or current run of American Shad in the Ocklawaha River precludes a need for a restoration plan. However, the prospect of dam removal may warrant further investigation into whether shad historically used or could use in the future the Ocklawaha River.

The St. Johns River Water Management District produced an updated review (to update the 1994 review) of downstream water quality/nutrient loading in 2016 (Hendrickson 2016). The preliminary finding is that additional nutrient loading from a free-flowing Ocklawaha River is not likely a disqualifying factor for dam removal when balanced against other nutrient mitigation strategies ongoing in the watershed.

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