Atlantic States Marine Fisheries Commission

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MEMORANDUM

TO: **Shad and River Herring Management Board**

FROM: **Caitlin Starks, FMP Coordinator**

DATE: **October 3, 2017**

SUBJECT: **Summary of Technical Committee review of shad SFMPs and recommendations to the Board for approval of SFMPs**

Technical Committee Members:
Robert Adams (NY DEC), Mike Bailey (USFWS), Jacque Benway Roberts (CT DEEP), Brad Chase (Chair, MA DMF), Joe Cimino (VMRC)*, Ellen Cosby (PRFC), Mike Dionne (NH F&GD), Phil Edwards (RI DEM), Don Harrison (GA)*, Ruth Haas-Castro (NOAA/NMFS), Eric Hilton (VIMS)*, Chad Holbrook (SC)*, Reid Hyle (FL FWC), Wilson Laney (USFWS), Jeremy McCargo (NC WRC), Genine McClair (MD DNR), Brian Neilan (NJ DF&W), Jim Page (GA)*, Bill Post (SC)*, Ken Sprankle (USFWS), Josh Tryninewski (PA FBC), Holly White (NC DMF)
**Some TC members were only present on one of the two calls to review SFMP updates*

ASMFC Staff: Kirby Rootes-Murdy, Caitlin Starks, Jeff Kipp

The Shad and River Herring Technical Committee met via two conference calls to review the following sustainable fishery management plans (SFMPs) for American shad. On September 11, 2017 the TC reviewed the plan updates for North Carolina, Potomac River Fisheries Commission, Connecticut and a limited bycatch allowance proposal from Virginia. On October 3, 2017, the TC reviewed plan updates from South Carolina and Georgia. Each plan was presented by the respective state's TC member. The presentations were to include the following information: structure of the plan, definition of sustainability, sustainability targets, timeframes for achieving targets, monitoring of the stocks to be conducted, and data to be used for evaluation.

1) Updated North Carolina SFMP
The presentation was given by Holly White. The plan is very similar to NC's previously approved SFMP for shad, with a few changes. The first change is that under the updated plan relative fishing mortality (relative *F*) will be calculated by dividing commercial landings by a hind cast 3-year average of a survey index instead of a centered 3-year average. The second change is that the 25th and 75th percentiles used for sustainability thresholds will remain set for the next 5-year management period. North Carolina requests having recreational and commercial fisheries in all coastal rivers and will use management measures outlined in the plan to maintain fishery sustainability.

The TC expressed concern with the fact that the plan does not include fishery independent monitoring of two coastal rivers (New and White Oak rivers), yet harvest is still allowed to occur in these systems.

The TC recommends that the board approve NC's SFMP, with the following revisions:

- *Include a table summarizing management measures*
- *Alter language in section 3.1 to imply that one or more of the listed potential management measures will be used when management triggers are reached*
- *Add language to show that there are not significant fisheries occurring in unmonitored rivers*

The TC discussed the need for the Board task to task the TC with developing a better protocol for managing river systems that allow harvest without river-specific sustainability parameters, and defining these systems beyond the language in Amendment 3. This seems to be a point of discussion for several states with unmonitored rivers where a fishery may still occur, and may need to be addressed in future plan updates.

The plan was revised and returned to ASMFC staff by September 19th.

2) Updated Potomac River Fisheries Commission SFMP

The presentation was given by Ellen Cosby. The updated SFMP is similar to the previously approved plan. PRFC requests a continued limited commercial by-catch allowance of American shad in the section of the Potomac River under PRFC jurisdiction. The benchmark goal identified in the 2007 Stock Assessment was approved as a restoration target and has been exceeded each year since 2011.

The TC suggested that the plan would need to provide more clarity on the sustainability triggers that would lead to management action, and what measures would be taken in the case that these triggers were reached. Suggestions included using the restoration target as a biomass threshold, where if biomass fell below the threshold for 3 consecutive years a management response would be triggered.

The TC recommends Board approval of this plan contingent on these additions. The plan was revised and returned to ASMFC staff by September 19th.

3) Updated Connecticut SFMP

The presentation was given by Jacque Benway Roberts. The Connecticut SFMP is only for the American shad fishery in the Connecticut River. The plan clearly defines the sustainability metrics and targets, management measures, monitoring program, and data to be used.

Similar to the other plans, the TC recommends that a table summarizing management measures be added to the plan. The TC also recommends language be added to better define what management responses will occur if a trigger is reached.

The plan was revised and returned to ASMFC staff by September 19th.

4) VA limited commercial bycatch proposal

The proposal was presented by Joe Cimino, Virginia Marine Resources Commission (VMRC). The VMRC requests a limited bycatch allowance of American shad. The same conservation measures currently in place will be used for 2018-2022. The VMRC has capped the number of bycatch allowance permits at 30 to control harvest. Permittees must allow biological sampling of their catch to provide data to the Virginia Institute of Marine Science (VIMS).

The TC recommends approval of the plan with the following addition:

- *Add language that indicates that permittees are monitored to ensure they are not targeting shad, and that measures will be taken to prevent permittees from abusing the permit.*

The proposal was revised and returned to ASMFC staff by September 19th.

5) South Carolina updated shad SFMP

The plan was presented by Chad Holbrook, SC Department of Natural Resources. South Carolina's SFMP includes open fisheries for the Pee Dee River Run and the Black, Santee-Cooper, Edisto, Combahee and Savannah Rivers; all other shad fisheries will remain closed. The plan presents sustainability benchmarks, season dates, bag limits and gear specifications for each river. The Black and Combahee Rivers CPUE data are confidential but the CPUE has remained above the benchmark in recent years, along with the other rivers in the plan. Several conservation measures are proposed for various rivers to reduce bycatch of both sturgeon species and shad exploitation. These include stricter commercial and recreational gear restrictions, procedural changes, shifted and/or shortened seasons, reduced bag limits, and license caps.

The TC recommends approval of the SC SFMP with the following changes:

- *Add bullets for future objectives and consideration:*
    - *Consider joint coordination with NC on the Great Pee Dee River similar to what is occurring on the Savannah River (GA)*
    - *Consider ways to develop current juvenile indices to perhaps be used in future updates to the plan.*
    - *Begin discussions with GA to develop consistent management measures for the Savannah River in the event that either state falls below the sustainability benchmark for 3 consecutive years.*
    - *For the next plan review, evaluate potential biological metrics derived from ongoing shad sampling for use as plan benchmarks*
- *Add a column to Table 1 with type of benchmark (fishery-dependent or independent*

The plan was revised and returned to ASMFC staff by October 5th.

6) Georgia updated shad SFMP

The plan was presented to the TC by Don Harrison, GA Department of Natural Resources. The plan requests commercial and recreational fisheries on the Altamaha and Savannah Rivers, and a recreational fishery only on the Ogeechee River. CPUE benchmarks are in place for each river,

and if CPUE falls below a benchmark for 3 consecutive years, GA DNR will establish conservation measures to ensure fishery sustainability. The Satilla and St. Marys are technically open to recreational harvest of shad with the 8 fish bag limit for the state, but shad have not been observed in angler harvest during creel surveys from 2006-2014 on the Satilla, and there is no recreational survey on the St. Marys. Electrofishing surveys for sportfish indicate low abundance of shad on both rivers and thus a recreational fishery on these rivers is not thought to impact the stock.

The TC is concerned with these recreational fisheries, as they do not technically follow the sustainability metric and monitoring requirements of Amendment 3, and the TC feels it should apply the Amendment consistently to all rivers. The TC suggested that GA could specify that these fisheries are catch and release only, however, this would require a change in DNR rules and the state managers feel it is unnecessary as the change would provide no conservation benefit. The TC agreed to address this issue with the Board, but recommends this plan be approved considering the precedent set when other plans were approved regardless of presenting similar inconsistencies with Amendment 3.

The TC recommends approval of GA's SFMP with only the following additions:

- *Add a section for future objectives, including plans for evaluating the addition of biological metrics related to length and age data, and juvenile indices to the next plan update.*
- The GA SFMP was revised and returned to ASMFC staff by October 5th.

7) Other Discussions

Regarding the issue of inconsistency between SFMPs and Amendment 3 requirements, the TC discussed the need to develop language to address rivers where shad and river herring harvest is allowed to occur, but monitoring and sustainability measures are not in place. The TC recognized that as this was the first review of original shad SFMPs following Amendment 3 the opportunity should be taken to address uncertainties in Amendment 3 directives and to consider standardized improvements in the plans.

Commission staff also brought up concern about the current mismatch between SFMPs use of sustainability benchmarks that are not directly tied to the total mortality estimates from either species' benchmark stock assessments or the recent river herring stock assessment update. This disconnect between the stock assessment information and the SFMPs further highlights the need to revamp how SFMPs are evaluated and the standards against which they are reviewed by the TC.

The TC and ASMFC staff will prepare a memo for the Board on these issues, requesting that the TC be tasked with continuing to work on this issue, among other improvements to the management documents. These included incorporating new shad assessment information into Amendments and SFMPs, standardizing metrics, management actions and reporting, clarifying *de minimis* requirements relating to SFMPs, and clarifying data requirements for demonstrating sustainability.

American Shad Sustainable Fishing Plan Update for South Carolina

Prepared by

Bill Post and Chad Holbrook

August 30, 2017

South Carolina Dept. of Natural Resources

Wildlife and Freshwater Fisheries and Office of Fisheries Management

Updated-ASMFC American Shad Sustainable Fishing Plan for South Carolina

Introduction:

The purpose of this sustainable fisheries management plan is to allow existing shad fisheries that are productive and cause no threat to future stock production and recruitment to remain in place and close all others. Excerpts from the ASMFC 2007 stock assessment for SC's American shad were used in this document (ASMFC 2007). The assessment, which was prepared and submitted to the ASMFC shad and river herring board by SCDNR and the Stock Assessment Subcommittee (SASC), summarizes SC's fisheries for American shad.

American shad (*Alosa sapidissima*) are found in at least 19 rivers of South Carolina (Waccamaw, Great Pee Dee, Little Pee Dee, Lynches, Black, Sampit, Bull Creek, Santee, Cooper, Wateree, Congaree, Broad, Wando, Ashley, Ashepoo, Combahee, Edisto, Coosawhatchie, and Savannah rivers). Many have historically supported a commercial fishery, a recreational fishery, or both, including the Winyah Bay system (primarily the Waccamaw and Pee Dee rivers), the Santee-Cooper system, Ashley, Edisto, Ashepoo, Combahee, Coosawhatchie, and Savannah Rivers (Figure 1).

Figure 1. Map of major South Carolina drainage basins and river systems with American shad (*Alosa sapidissima*) fisheries or historical American shad runs.

Currently, commercial fisheries exist in Winyah Bay, Waccamaw River, Pee Dee, Black, Santee, Edisto, Combahee, and Savannah rivers, while the Sampit, Ashepoo, Ashley, and Cooper rivers no longer support commercial fisheries. With the closure of the ocean-intercept fishery beginning in 2005, the Santee River and Winyah Bay complex comprise the largest commercial shad fisheries in South Carolina. Recreational

fisheries exist in the Cooper, Savannah, Edisto, and Combahee rivers, as well as the Santee River Rediversion Canal.

Data for American shad are available to assess trends in fishery and stock status for the following river systems in South Carolina: the Pee Dee run (consisting of Winyah Bay, Waccamaw and Great Pee Dee rivers), Santee River, Cooper River, Edisto River, Combahee River, and Savannah River. Additional data for the Savannah River are provided by Georgia Department of Natural Resources (GADNR).

The South Carolina Department of Natural Resources (SCDNR) manages American shad populations and collects fishery-independent and fishery-dependent data for the major shad rivers in the state. SCDNR has collected voluntary landings data by river system since 1979 and instituted mandatory catch and effort reporting in 1998. There are still some gaps in these data, but they provide the broadest temporal and spatial view of American shad stocks in South Carolina. As part of fishery independent sampling, SCDNR also conducted tag-return studies in the gill-net fisheries for several rivers, but these were not used to determine stock status, because in recent years, fishers have grown skeptical that providing tag returns to SCDNR led to new more restrictive changes in the fishery and may lead to future closures. In the past, these studies rotated among rivers and ran 2 to 5 years per river before moving to a different river. However, due to growing concern for the species, SCDNR began conducting this monitoring in multiple "reference" rivers during the shad season. During these studies, SCDNR collected biological information to support other studies (e.g., age, repeat spawning, length and weight data). In some systems, SCDNR also conducted creel surveys (Cooper River and Savannah River), fish counts (Santee River), and young of the year (YOY) sampling (Santee-Cooper system, Pee Dee River, Edisto River, and Savannah River).

This plan primarily draws upon investigations conducted by the SCDNR's Marine Resources Division and Division of Wildlife and Freshwater Fisheries to provide a river-specific assessment of relative stock status for American shad. The general approach to this document was to (1) characterize fisheries by the magnitude and trend of landings data (Catch Per Unit Effort=CPUE) and note if the system still supports a viable fishery and (2) review supporting fishery-dependent and fishery-independent data sets and conduct analyses for each river system when applicable.

Current Regulations:

South Carolina manages its shad fisheries using a combination of seasons, gear restrictions, and catch limits (Appendix 1.) implemented over several management units: Winyah Bay and Tributaries (Waccamaw, Great Pee Dee, Little Pee Dee, Lynches, Black and Sampit rivers); Santee River; Charleston Harbor (Wando, Cooper & Ashley rivers); Edisto River; Ashepoo River; Combahee River; Coosawhatchie River; Savannah River within South Carolina; Ocean Waters; and Lake Moultrie, Lake Marion, Diversion Canal, Intake Canal of Rediversion Canal and all tributaries and distributaries.

The first river-specific commercial regulations for American shad in South Carolina were enacted in 1993 for the Edisto River in response to SCDNR's studies that identified overfishing as a major contributor to a perceived trend of population decline [Act # 343 of the 1992 South Carolina General Assembly].

Beginning with the 1998 commercial shad-netting season, all licensed fishermen are required to report their daily catch and effort to the SCDNR. In 2000, Act #245 of the 2000 South Carolina General Assembly was passed in response to the perceived population status of shad populations in each of the state's river systems supporting an American shad fishery. This Act led to the closure of the commercial gill-net fishery on the Coosawhatchie River and a substantial reduction in potential gill-net fishery effort for other systems supporting small American shad stocks in South Carolina, including the Combahee, Ashepoo, and Ashley rivers (www.dnr.sc.gov).

Significant changes in shad and herring regulations became effective in 2001 with the passage of the Marine Resources Act of 2000, which gave the SCDNR authority to implement a permit program for the State's shad and herring fisheries. All commercial shad and herring fishery license holders were issued permits that could be used to "restrict the number of nets for taking shad…in any body of water where the number of nets or fishermen must be limited…to prevent congestion of nets or watercraft, or for conservation purposes". The number and conditions of permits can be controlled "to designate areas, size and take limits, hours, type and amount of equipment, and catch reporting requirements," and enabled SCDNR to phase out the ocean-intercept fishery by 2005. In addition, a recreational aggregate creel limit of 10 American and hickory shad per person was implemented in all state waters, except for the Santee River in which a 20 fish creel limit was set.

Further proposed restrictions in the previous SFMP document, to address sustainability, were implemented in 2013 and were the first changes in SC's shad fishery since the closure of the ocean-intercept fishery in 2005. These changes (Appendix 3), in concert with changes required by the National Marine Fisheries Service (NMFS) to account for by-catch of sturgeon (Appendix 2), without a doubt, far exceeded by a wide margin, any restrictions imposed on SC's shad fishery to date.

Brief description – Current status of the stocks:

a) Landings:

South Carolina has monitored commercial fisheries for American shad within state waters since 1979. The NMFS landings data before 1979 were collected from major wholesale outlets located near the coast; therefore, it is likely that inland landings were not completely accounted for in these years, since many shad fishermen claim not to sell their catch and keep it for personal consumption. No landings were attributed to the South Carolina ocean-intercept fishery before 1979. SCDNR has landings by system since 1979 for the Atlantic Ocean (i.e., the ocean-intercept fishery), Winyah Bay, Waccamaw River, Pee Dee River, and Santee River. These data were used in the 2007 shad stock assessment by SC and ASMFC. Data collected since 1979 generally include inland landings and should be considered as a separate time series. Those time series begin in 1998 when the mandatory reporting requirement was instituted for the statewide fishery.

There are some discrepancies between SCDNR and NMFS American shad landings. One reason for this is that NMFS uses dealer landings reports for their records; however, many shad fishermen claim not to sell their catch and keep it for personal consumption.

The Cooper River supports an active recreational fishery below the Pinopolis Dam tailrace in the late winter to early spring. SCDNR has conducted a creel survey from 2001 to 2015 to estimate exploitation and catch-per-effort in this recreational fishery. SCDNR also conducted sportfishing creel surveys on the Cooper and Santee Rivers from 1981 to 1982 and 1991 to 1993 in order to evaluate the impact of the Rediversion Canal on these rivers' recreational fisheries (Cooke and Chappelear 1994). These surveys examine the total recreational fisheries on each river for each study period.

Recreational creel surveys were conducted on the Savannah River in the late 1990s by GADNR (1997) and SCDNR (1998 and 1999). Estimates of catch from these surveys varied from year to year largely due to dramatically different flow conditions, as 1998 was a "flood" year and 1999 a "drought" year. Catch estimates from each of these creel surveys are available in Boltin (1999); however, the year-to-year estimates were highly dependent on the impacts of the river flow on the recreational fishery. In 1997, no additional information on the flow was reported. Due to requirements of Amendment 3 to ASMFC's shad and river herring fishery management plan, SCDNR conducted creel surveys beginning in 2011, however, due to the deteriorating wing wall at the New Savannah Bluff Lock and Dam, recreational fishing is no longer permitted at this location.

b) Fishery Independent Indices:

Spawning stock:

Fishery-independent CPUE data were collected using 12.7 cm stretch mesh drift gill nets for the years 1994 - 2015. In the past, as approved by Amendment 1 of ASMFC's shad and river herring fishery management plan (FMP), these studies rotated among rivers and ran 2 to 5 years per river before changing river systems. However, due to growing concern for the species, SCDNR began conducting this monitoring on multiple "reference" rivers during the season. During these studies, SCDNR collected biological information to support other studies (e.g., age, repeat spawning, length and weight data).

Juvenile Surveys:

Trawl sampling studies were conducted for juvenile American shad in the fall of 1985 in the Edisto River and Winyah Bay using 4.9 and 7.6 m otter trawls. Sampling in the Edisto River occurred from September through November with 32 trawls that caught two American shad. Winyah Bay sampling took place October and November. Nineteen trawls over five stations yielded three American shad. Data were also collected from another SCDNR trawl project in the Santee River where 15 juvenile American shad and 30 juvenile blueback herring were collected. These programs were discontinued after a single sampling season. However, due to growing concerns to prove sustainability, SCDNR began yearly sampling for YOY in 2009 in some systems and 2010 in others. In addition, YOY sampling in the Santee Cooper Lake System occurred as part of yet another SCDNR study in 2008.

c) Fishery Dependent Indices:

Historical commercial shad landings from NMFS are available for South Carolina back to 1880 with the highest reported landings occurring in 1896 (304,819 kg). NMFS reporting agents compiled landings recorded before 1979. Landings data are available for 11 years between 1880 and 1926 with a range of 94,349 to 304,819 kg and a mean of 188,615 kg. Beginning in 1927, a continuous data stream of landings is available to the present, except for the 1940s (WWII). Landings generally declined from the late 1800s throughout the twentieth century reaching a low in the 1970s, with annual landings averaging 16,477 kg from 1973 to 1976.

With the onset of mandatory reporting in 1998, South Carolina shad fishermen were required to report effort and landings data. In 2000, 2,727 commercial shad fishing trips were reported to SCDNR. The number of reported trips generally decreased from 2000 to 2015 with 1,281 trips taken in 2015. Nearly all fishermen (>95%) have submitted at least one monthly report since 2000, while only 60 to 70 percent report some catch (SCDNR records). It is likely that the ocean-intercept fishery closure in 2005 contributed to the decrease in landings from the 2004 amount of 170,212 kg.

With the closing of the ocean-intercept fishery in 2005, the Santee River and Winyah Bay now constitute the largest remaining commercial shad fisheries in South Carolina with Santee River landings comprising 58 percent and Winyah Bay landings 38 percent of the 2005 statewide total. In 2015, shad trips in Winyah Bay complex and Santee River accounted for 35 percent and 46 percent of the total shad trips, respectively.

d) Other: none

e) Fisheries Closed in the previous plan

a. Waccamaw River (Bull Creek to North Carolina border)
b. Ashley River
c. Charleston Harbor
d. Wando River
e. Ashepoo River

Fisheries requested to be Open (Commercial and Recreational):

a. Pee Dee River run (Winyah Bay, Waccamaw, and Pee Dee River)
b. Black River
c. Santee Cooper System
d. Edisto River
e. Combahee River
f. Savannah River

f) Sustainability

Systems with "sustainable fisheries" are defined as those that demonstrate shad stocks could support a commercial and / or recreational fishery that will not diminish potential future stock reproduction and recruitment. Data used, in most cases, are landings (CPUE) that occurred since the 2007 stock assessment (i.e. after 2004). Sustainability for SC rivers is determined by catch trends (both using fishery-independent and fishery-dependent data), and in some cases, juvenile abundance. In addition to these, as part of requirements of Amendment 3, SC already imposed several gear restrictions, cap limits, and changes to the legal fishing season. Furthermore, in response to the National Marine Fisheries Service (NMFS), SC further restricted the fishery to account for and limit the by-catch of sturgeon in the shad fishery. In 2013, statewide gear restrictions were implemented (Appendix 2). These restrictions, while resulting in an 88% reduction of by-catch of Atlantic and shortnose sturgeon, also no doubt led to more protection for adult shad during spawning runs. Sustainability targets have been developed by using fishery-dependent data (landings/CPUE) and/or fishery-independent data collected since the last year of data included in the stock assessment and using the 25th percentile of the annual mean (Table 1).

Pee-Dee River Run (Winyah Bay, Waccamaw to Bull Creek, and Pee Dee River)

In order for American shad to enter the Pee Dee River, they must first swim through the Winyah Bay and the lower most portion of the Waccamaw River. Therefore, SCDNR will refer to this as the Pee Dee River Run of shad. There is little doubt some shad continue up the Sampit and Waccamaw Rivers, but those rivers/river segments are not being considered in this sustainability option and were closed to fishing in 2013 (Figure 2).

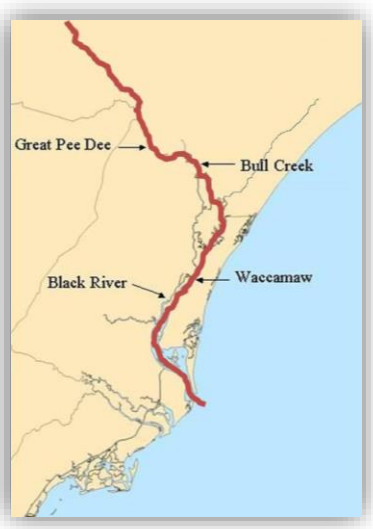

Figure 2. Map of the Winyah Bay system highlighting the "Pee Dee run" of shad

SCDNR uses both fishery-independent and fishery-dependent data to justify the continued existence of this fishery. The 2007 stock assessment concluded "that, overall, these shad stocks have remained stable or increased slightly since the late 1970s." More recent catch rates (kilogram of shad captured in a 92m. net fished for one hour) also indicate a stable trend (Figure 3). In fact, during the 2011 fishing season, fisheries were suspended twice for two weeks at a time, due to the excess of shad at the local fish markets. SCDNR also conducts fishery-independent sampling in the Waccamaw River using gear comparable gear (92m. floating/drift gill net with 12.7 cm. stretch mesh) and observed similar catch rates (CPUE=kg. of shad/92m. net/1 hr.). SCDNR will continue this sampling on an annual basis.

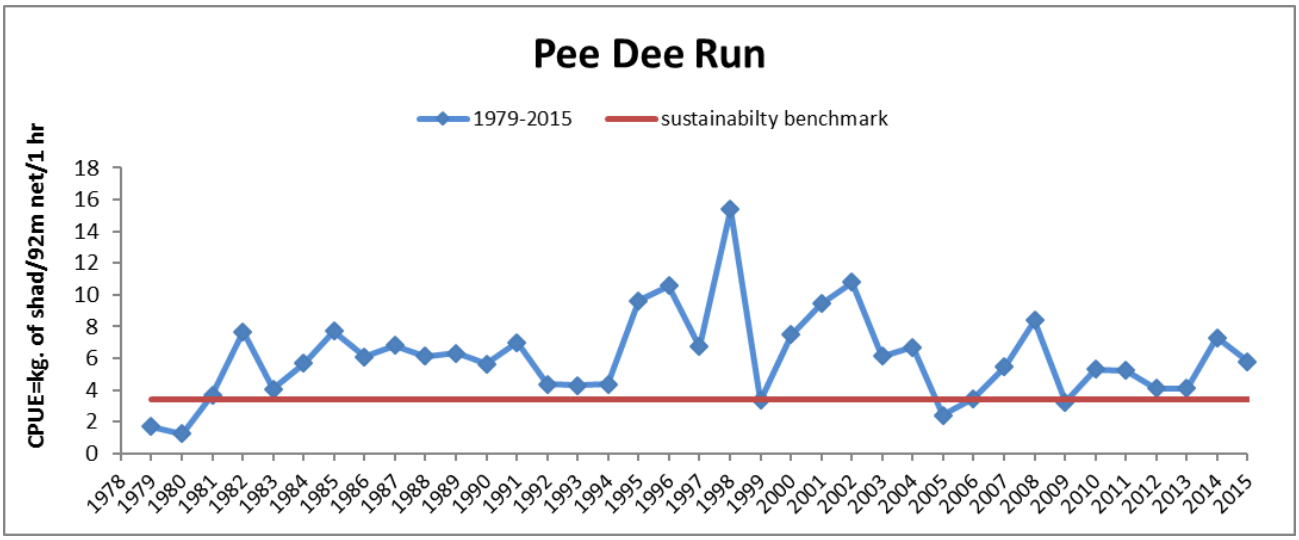

Figure 3. Commercial catch per unit effort (kg. fish per 92-m net hr) of American shad and sustainability target for the Pee Dee run

Beginning in 2010, SCDNR also collected YOY shad from this system during the summer outmigration. Shad with lengths ranging from 77-137mm were collected using electro-fishing gear. Catch rates (CPUE=number of shad caught per hour) were equal to 31.28. This was also somewhat comparable to efforts from another SCDNR survey conducted in 2008 which yielded a CPUE of 47 for American shad. However, during this study, more sites were used over a broader reach of river during this project and unfortunately, due to ongoing budget cuts, sampling for this project was discontinued. However, YOY sampling is consistent with results from 2010 and will continue on an annual basis.

SC requests to maintain this fishery at current levels with annual monitoring to occur as mentioned. The Pee Dee run is considered by SCDNR to be sustainable at current levels and with newly passed regulation changes, migrating shad should receive additional protection which will only help the sustainability of the species. The approved sustainability benchmark of 3.41 was developed by using the 25th percentile of the annual mean for CPUE's for the last ten years. If the CPUE's fall below the sustainability target for three consecutive years, management action will be taken. Potential management actions are gear restrictions, season changes, catch limits, or closure.

Black River

The 2007 stock assessment concluded "This relatively small river is perceived to have undergone significant American shad stock declines over the past 25 years." More recent CPUE (kg. of shad captured in a 92m. net fished for one hour) data (2000-2015) suggest that while catches are low, they remain consistent and, given the low effort, appear to be stable in more recent years. Currently, the Black River commercial shad fishery consists of only 2 fishermen and neither fisherman depends on their catch for commercial purposes. Because the number of fishers decreased since 2011, landings data for this river are confidential are not provided in this plan. However, it should be noted, catch rates for this river did not fall below the approved sustainability benchmark. Additionally, the Black River remains an undammed river with low flow rates which pale in comparison with those from the dammed Santee River (5912 cfs) or Pee Dee River (11,267 cfs) for the same time series.

SC requests to maintain this fishery at reduced levels. The Black River run of shad is considered by SCDNR to be sustainable at lower levels and with newly passed regulations, migrating shad should also receive additional protection. If catch rates (CPUE= kg. of shad/ 92m net fished for 1 hr.) for the Black River run commercial fishery fall below 0.97 three consecutive years, changes by SCDNR to the commercial regulations will be implemented. This sustainability benchmark was developed by using the 25^{th} percentile of the annual mean for CPUE's for the last ten years. Potential management actions could be gear restrictions, season changes, catch limits, or closure.

Regulatory changes mentioned earlier, greatly affected fishing effort and gear used in the Winyah Bay System Rivers. These changes may be responsible for the perceived increase in catch rates in recent years. In any event, SC believes current restrictions (shortened season, allowable nets reduced by 90%, restrictions on recreational netters gear, 50% reduction for recreational anglers limit, and ultimately capping the fishery at current levels) in combination with those required statewide by NMFS for the incidental by-catch of sturgeon, will provide adequate protection for spawning shad for years to come.

Santee Cooper System

Santee River

SCDNR has both fishery-independent and fishery-dependent data to justify the continued existence of this fishery. The 2007 stock assessment concluded "that the Santee River American shad stock in the Santee River benefited greatly from the Rediversion project." Catch rates (CPUE), used in the assessment, indicated a stable if not increasing trend. More recent CPUE (kg. of shad captured in a 92m. net fished for one hour) data suggest that those trends continue (Figure 4). As mentioned earlier, during the 2011 fishing season, fisheries were suspended twice for two weeks at a time, due to the excess of shad at the local fish markets.

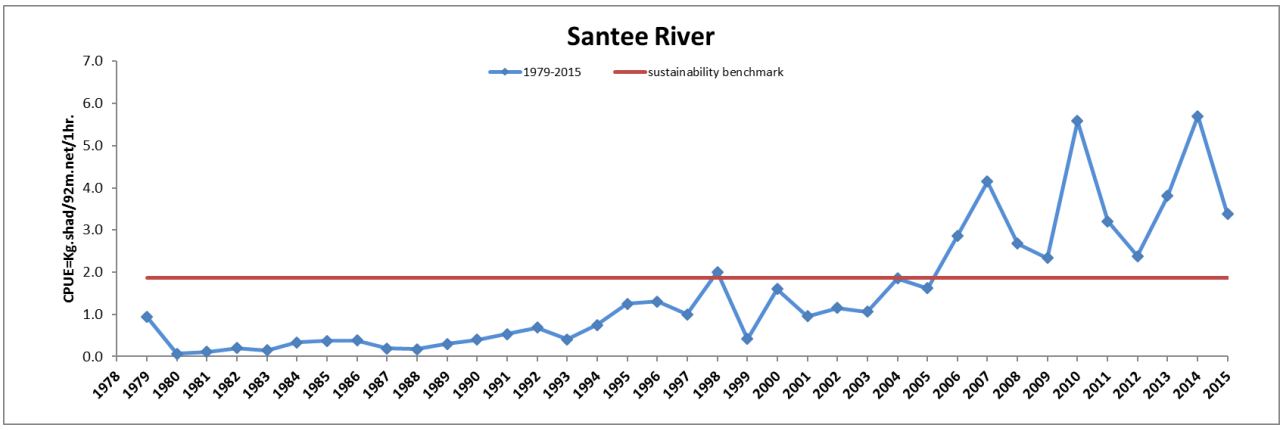

Figure 4. Commercial catch per unit effort (kg. fish per 92-m net hr) of American shad and sustainability target for the Santee River.

SCDNR also conducts fishery-independent sampling in the Santee River using comparable gear (92m. floating/drift gill net with 12.7 cm stretch mesh) to provide trends of abundance for the spawning stock. Catch rate (CPUE=# of shad/92m. net/1 hr.) data for this sampling (2008-2015) is included in Figure 5.

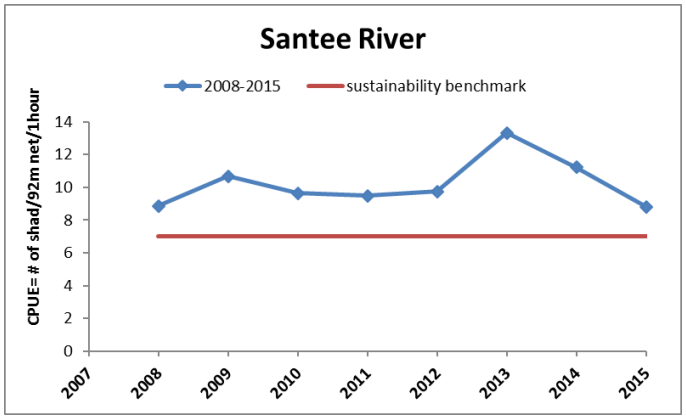

Figure 5. Fishery-independent catch per unit effort (kg. fish per 92-m net hr) of American shad and sustainability target for the Santee River.

SC requests to maintain the Santee River fishery at current levels with annual monitoring to occur as mentioned. This run is considered by SCDNR to be sustainable at current levels and with new regulations, migrating shad should receive additional protection. SC proposes that a catch rate sustainability benchmark of 1.8 (kg. of shad/92m net fished for 1 hr.) be used to manage the Santee River commercial shad fishery. In addition, fishery-independent sampling catch rates (CPUE) for the Santee River must not fall below 7. These sustainability benchmarks were developed by using the 25th percentile of the annual mean for CPUE's for the last ten years or in the case for the fishery independent data all available data. If catch rates or CPUE's fall below the sustainability targets for three consecutive years, management action will be taken. Potential management actions could be gear restrictions, season changes, catch limits, or closure.

Cooper River

No commercial fisheries exist on the Cooper River by SC regulation. However, there is a recreational fishery that exists below Pinopolis Dam. SCDNR conducts annual creel surveys to assess catch rates in this fishery. The Cooper River fishery is concentrated near Pinopolis Dam from the sanctuary line (0.2 km downstream of the dam) to about one km downstream of the dam. Since the fishery season is relatively short (about two months) effort and catch-per-unit-effort were estimated daily to increase precision. Data collection, consisting of either angler surveys, effort estimates, or both were conducted for virtually all days during each year's study period, which was defined subjectively by angler presence and manpower availability. During survey periods, a creel clerk interviews shad fishermen as they land their boats. An average of 6 hours of survey periods are conducted during daylight hours. Creels take place during these time periods because it was determined these were times when the most effort was being exhibited. Effort estimates consists of counting boats in the fishery, which is virtually entirely visible from the Pinopolis Dam, several times daily; this estimate assumes that the maximum daily count equals total daily effort. Catch rate (CPUE=#shad caught in 1 hour) data from these surveys has been collected, beginning in 2000, and is used to manage the fishery. CPUE for 2015 equaled 2.09, this is consistent with previous 4 years (Figure 6).

SC requests to maintain this fishery at current levels with annual monitoring to occur as mentioned. The Cooper River run is considered by SCDNR to be sustainable at current levels. SC proposes that an sustainability CPUE benchmark of .66 (25th percentile of the annual mean of CPUEs for all years) be used to manage the Cooper River recreational shad fishery. If CPUEs for Cooper River recreational fishery fall below .66, three consecutive years, changes by SCDNR to the recreational regulations will be considered. Potential management actions could be gear restrictions, season changes, catch limits, or closure.

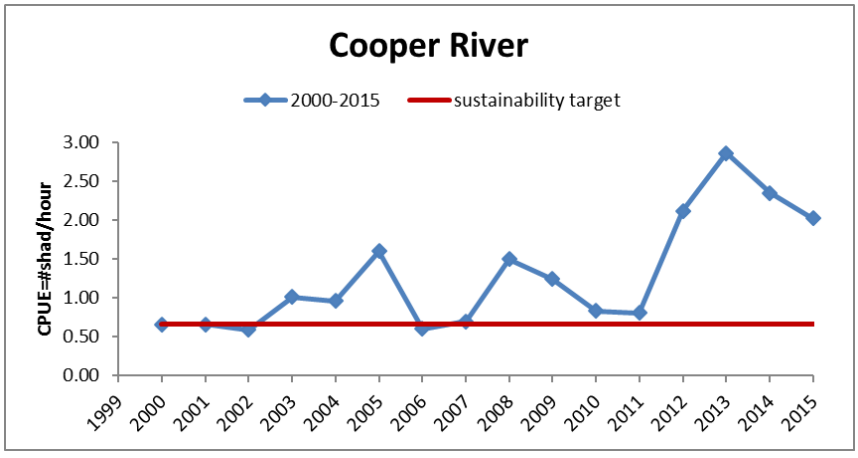

Figure 6. Annual catch per unit effort (# of shad per hr.) and sustainability target for the Cooper River recreational shad fishery.

Edisto River

The 2007 stock assessment concluded "that recent estimates of commercial CPUE have been very low for the Edisto River for time series (1979 to 2005) and average for 13 of the last 15 years, but have rebounded a bit since 1997." More recent CPUE (kg. of shad captured in a 92m. net fished for one hour) data suggest that while catches are low, they remain consistent (Figure 7). In addition, the ACE Basin Rivers (Ashepoo, Combahee, and Edisto) have been under "drought" conditions for the majority of recent years. In fact, the average flow during those years was 1453 cfs. This is extremely low considering in "normal" years, flows are ~ 4,500 cfs. Also, the Edisto River is SC's longest undammed river and flows are considerable lower from those of the Santee River (5912 cfs) or Pee Dee River (11,267 cfs) for the same time series.

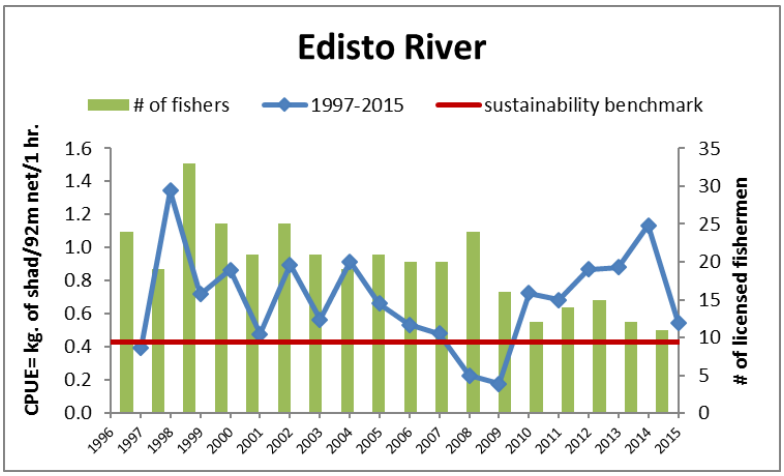

Figure 7. Commercial catch per unit effort (kg. fish per 92-m net hr) of American shad and sustainability target for the Edisto River.

SCDNR collected fishery-independent data only for the years for years 1994-1998. During these years, shad were captured using a 92m. floating/drift gill net with 12.7 stretch mesh. Catch rates (CPUE=kg. of shad/92m. net/1 hr.) remained relatively consistent for these years. SCDNR tried to duplicate this effort in 2006 and 2007. Unfortunately, due to copious incidental catches of Longnose gar (*Lepisosteus oseus*), sampling was discontinued. These fish were encountered during each sampling trip which made catching shad problematic. When numerous gar became entangled, the net became very inefficient at catching shad. The average catch rate for gar for the sampling periods was 4.86 fish per 92 m net per hour.

SC requests to maintain this fishery at reduced levels with annual monitoring to occur as mentioned. The Edisto River run of shad is considered by SCDNR to be sustainable at lower levels in combination with new regulation changes, migrating shad should receive additional protection. If catch rates (CPUE= kg. of shad/ 92m net fished for 1 hr.) for the Edisto River run commercial fishery fall below 0.43 three consecutive years, changes by SCDNR to the commercial regulations will be implemented. This sustainability benchmark was developed by using the 25th percentile of the annual mean for CPUE's for the last ten years. Potential management actions could be gear restrictions, season changes, catch limits, or closure.

Regulatory changes in 1993 and 2000 mentioned earlier greatly affected fishing effort and gear used in the ACE Basin (Ashepoo, Combahee, and Edisto) rivers. These changes may be responsible for the perceived increase in catch rates in recent years. In any event, SC believes current restrictions coupled with 2013 regulatory changes (shortening the season, cutting allowable nets by 80%, restrictions on recreational netters gear, reducing the recreational anglers limit by 50%, and ultimately capping the fishery at current levels) and in combination with those required statewide by NMFS for the incidental by-catch of sturgeon, will provide adequate protection for spawning shad for years to come.

Combahee River

The 2007 stock assessment concluded "This relatively small river is perceived to have undergone significant American shad stock declines over the past 25 years." More recent CPUE (kg. of shad captured in a 92m. net fished for one hour) data suggest that while caches are low, they remain consistent in the most recent years (Figure 10). Currently, the Combahee commercial shad fishery consists of only 1 fisherman and he doesn't use the catch for commercial purposes. Because the number of fishers decreased since 2011, landings data for this river are confidential are not provided in this plan. However, it should be noted, catch rates for this river did not fall below the approved sustainability benchmark. In addition, the ACE Basin Rivers (Ashepoo, Combahee, and Edisto) have been under "drought" conditions for the majority of recent years. In fact, the average flow during those years was 182 cfs. This is extremely low considering in "normal" years, flows are ~ 600 cfs. Also, the Combahee River remains an undammed river and flows are extremely low compared with those from the Santee River (5912 cfs) or Pee Dee River (11,267 cfs) for the same time series.

SCDNR collected fishery-independent data for the years for years 1993and 1999. During these years, shad were captured using a 92m. floating/drift gill net with 12.7 stretch mesh. Catch rates (CPUE=kg. of shad/92m. net/1 hr.) were .27 for 1993 and 0.21 in 1999. Like the Edisto River sampling, copious incidental catches of Longnose gar (*Lepisosteus oseus*), led to the termination of sampling efforts. These fish were encountered during each sampling trip which made catching shad extremely problematic. When numerous gar became entangled, the net became very inefficient for catching shad.

SC requests to maintain this fishery at reduced levels. The Combahee River run of shad is considered by SCDNR to be sustainable at lower levels and with new regulations, migrating shad should receive additional protection. If catch rates (CPUE= kg. of shad/ 92m net fished for 1 hr.) for the Combahee River run commercial fishery fall below 0.53 three consecutive years, changes by SCDNR to the commercial regulations will be implemented. This sustainability benchmark was developed by using the 25^{th} percentile of the annual mean for CPUE's for the last ten years. Potential management actions could be gear restrictions, season changes, catch limits, or closure.

Regulatory changes in 1993 and 2000, mentioned earlier, greatly affected fishing effort and gear used in the ACE Basin (Ashepoo, Combahee, and Edisto) rivers. These changes may be responsible for the perceived increase in catch rates in recent years. In any event, SC believes current restrictions coupled with 2013 changes (shortening the season, cutting allowable nets by 90%, restrictions on recreational netters gear, reducing the recreational anglers limit by 50%, and ultimately capping the fishery at current

levels) and in combination with those required statewide by NMFS for the incidental by-catch of sturgeon, will provide adequate protection for spawning shad for years to come.

Savannah River

Because the Savannah River occurs in both SC and GA and as part of new ASMFC mandates required in Amendment 3 to the shad and river herring fishery management plan, annual shad monitoring for this system is a cooperative effort between SCDNR and GADNR. Combined, fishery-independent and fishery-dependent data are available to justify the continued existence of this fishery. The 2007 stock assessment concluded "Over the past century, the magnitude of shad landings from the Savannah River has declined tenfold although the CPUE data available since 1979 indicates some stability in the current level of exploitation at a level much reduced compared to historical production." Catch rates (CPUE), used in the assessment, indicated a stable trend. More recent CPUE (kg. of shad captured in a 92m. net fished for one hour) data from SC suggest that those trends continue (Figure 8). Catch rates for GA fishermen are available, but due to confidentiality agreements, are not supplied in this document. However, between the years 2001-2015, fishermen caught no fewer than 25kg of shad per trip.

During the 2010-2015 seasons, GADNR conducted fishery-independent sampling for adult American shad in the Savannah River at the New Savannah Bluff Lock and Dam (NSBL&D), near Augusta, GA (~RKM 302). Shad were collected during their spawning migration (March, April, and May) using electro-fishing gear. Catch rates (CPUE= # of shad/hour) for 2015 were 480.6. This is an increase from CPUE's of 269.5 that were observed in 2010. This sampling will continue on an annual basis to better assess the abundance of spawning stocks in the Savannah River.

SCDNR also conducted a creel survey of recreational fishermen, at NSBL&D in 2011, 2012, 2013. Sampling was structured similarly to the Pinopolis Dam creel on the Cooper River, SC. However, due to logistical problems, staff was unable to start the creel until well into the shad season. This, unfortunately, led to incomplete angler catch data for those seasons. Creel sampling continued on an annual basis, however, due to the deteriorating wing wall at the NSBL&D, recreational fishing is no longer permitted at this location.

SC and GA request to maintain this fishery at current levels with annual monitoring to occur as mentioned. The Savannah River run is considered by SCDNR and GADNR to be sustainable at current levels and with imposed regulation changes in 2013 taking hold, migrating shad should receive additional protection, which will only help the sustainability. Additionally, before the 2011 season, GA implemented new regulations to protect spawning shortnose sturgeon. This regulation moved the upper commercial boundary downstream approximately 103 rkm. In an effort to protect sturgeon and also remain consistent in a shared border river, SC passed similar regulations. These regulations provide ~136 more river kilometers of additional spawning habitat for shad unobstructed by commercial gear.

SC proposes that a sustainability benchmark for CPUE (kg. shad/92m. net/fished for 1 hr.) of 1.1 be used to manage the Savannah River shad fishery. GA proposes that a sustainability benchmark for CPUE (Kg. shad/trip) of 25.5 be used to manage the Savannah River shad fishery. If either SC or GA falls below the

proposed benchmark three consecutive years, changes by SCDNR and GADNR commercial regulations will be considered. These sustainability benchmarks were developed by using the 25th percentile of the annual mean for CPUE's for the last ten years, or in GA's case, all available data. Potential management actions could be gear restrictions, season changes, catch limits, or closure.

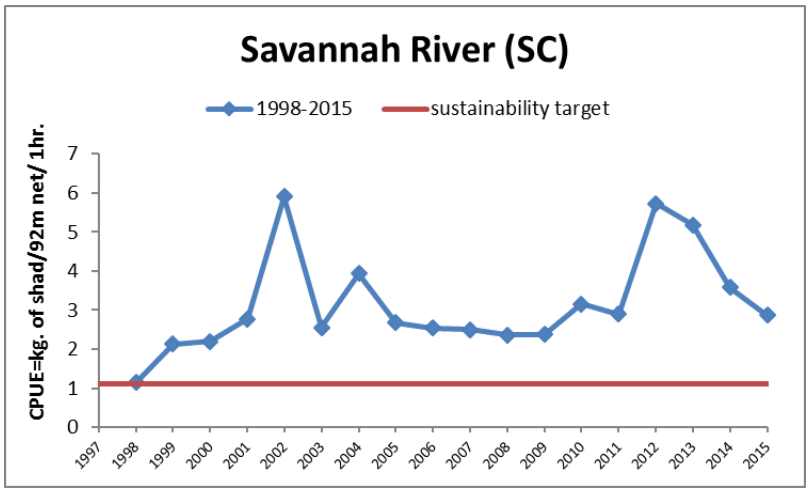

Figure 8. SC's annual commercial catch-per-unit-effort (CPUE) of American shad and sustainability target for the Savannah River.

Table 1. Sustainability values and triggers.

Index	Survey	Benchmark Value	Years included in index	Management trigger
Pee Dee River Run	Fishery dependent	3.41 kg/ 92 m net/hr.	1979-2015	3 consecutive years below benchmark
Black River	Fishery dependent	0.97 kg/ 92 m net/hr.	2000-2015	3 consecutive years below benchmark
Santee-Cooper Rivers Complex	Fishery dependent	1.8 kg/ 92 m net/hr.	1979-2015	3 consecutive years below benchmark
Santee-Cooper Rivers Complex	Fishery independent	7.0 shad/ 92 m net/hr.	2008-2015	3 consecutive years below benchmark
Santee-Cooper Rivers Complex	Fishery dependent	0.66 shad/hr.	2000-2015	3 consecutive years below benchmark
Edisto River	Fishery dependent	0.43 kg/ 92 m net/hr.	1997-2015	3 consecutive years below benchmark
Combahee River	Fishery dependent	0.53 kg/ 92 m net/hr.	1998-2015	3 consecutive years below benchmark
Savannah River	Fishery dependent	1.1 kg/ 92 m net/hr.	1998-2015	3 consecutive years below benchmark

g) Adaptive Management

SCDNR will continue to monitor fish passage, commercial fisheries, and recreational landings in SC rivers. In addition, fishery independent sampling to assess spawning adults and juvenile abundance will continue annually.

If collected data indicates changes in exploitation or decreasing abundance in juveniles, action will be taken by SCDNR. These actions may include increasing days for escapement, limiting seasons, etc. In the event these actions are not successful in reversing negative trends, SCDNR would then be forced to close those fisheries.

Several recommendations were included for SC as part of the stock assessment for American shad. They are highlighted in the following:

Commercial Landings and Effort

1. Increase compliance with mandatory catch and effort reporting from commercial fishery, particularly in the Santee River, Winyah Bay system, Savannah River, and Edisto River

2. Continue the "volunteer CPUE" series to compare with CPUE series developed from comprehensive mandatory reporting database

3. Input volunteer commercial catch and effort from field reports into digital format so raw data are available for future analysis

4. Collect age, length, weight, and spawning history information from shad caught in commercial fisheries in the Santee River, Winyah Bay system, Savannah River, and Edisto River

5. Age validation study of American shad from South Carolina rivers (especially, Santee River, Winyah Bay system, Savannah River, and Edisto River)

Tagging

1. Continue monitoring of river systems (Santee River, Waccamaw River and Edisto River) on rotating basis (yearly rather than a three year schedule)

2. Improve tagging study design (e.g., develop high-reward design, telemetry studies to get estimates of migration abortion, double tagging study to estimate tag loss, and tag-mortality study) to improve relative exploitation estimates

3. Conduct tagging studies for duration of shad migration and continue to collect effort information from sampling collections (e.g., soak time, net length, and mesh size) to permit development of CPUE calculations

Creel Surveys

1. Continue to conduct creel surveys in rivers with notable recreational fisheries (Savannah River and Cooper River); if necessary, conduct creel surveys on a rotating basis

Fish Passage

1. Develop species specific upstream and downstream passage efficiency at all rivers with priority given to Santee-Cooper system dams

2. Develop species specific counts at Pinopolis fish lock on the Cooper River

Juvenile Abundance Index

1. Investigate juvenile abundance on at least one river (e.g., Santee River, Waccamaw River, or Edisto River)

General

1. Collect environmental covariates (tidal stage, flood stage, flow rate, water temperature, cloud cover, water clarity, annual precipitation, etc.) to aid development of CPUE indices

SC has since implemented all suggested recommendations and in some cases exceeded them, with the exception of those at the Pinopolis fish lock. A fish counter system will be installed at that site by spring 2018. Nevertheless, SC continues sampling as part of ASMFC/ACFCMA funded work or by utilizing other SCDNR funding sources. Furthermore, with the dissolution of Anadromous Fish Conservation Act funds, SCDNR was forced to be creative in order to meet requirements of Amendment 3. To complete all mandated goals annually, personnel from other areas and funding sources have been used. Once these funds expire it is anticipated SCDNR will simply not have adequate personnel to complete this work. Additionally, to date SCDNR has had ~60% cut from the operating budget and is expecting future cuts. If a reduction in force (RIF) is implemented and project personnel are affected, SCDNR will not be able to meet these requirements.

Additional recommendations

Several recommendations were suggested and added to this plan by the Shad and river herring Technical Committee, these include:

- Consider joint coordination with NC on the Great Pee Dee River similar to what is occurring on the Savannah River (GA).
- Consider ways to develop current juvenile indices to perhaps be used in future updates to the plan.
- Consider discussions with GA to develop consistent management measures for the Savannah River in the event that either state falls below the sustainability benchmark for 3 consecutive years.
- In the future, consider using biological metrics, where available, as an additional benchmark for all State indices.

References

ASMFC (Atlantic States Marin Fisheries Commission). 2007. American shad stock assessment peer review report. Washington, D.C.

Appendix 1.
Summary of South Carolina Shad Laws by Water or Fishery Area

SECTION 50-5-1506. Zones, seasons, times catch limits, size limits, methods, and equipment for taking shad.

In addition to other provisions of law, the following provisions govern seasons, times, methods, equipment, size limits, and take limits in commercial fishing for shad in the waters of this State specified below:

(a) Black River, Great Pee Dee River, Little Pee Dee River, Lynches River, Waccamaw River from Big Bull Creek to Winyah Bay, Winyah Bay, and all tributaries and distributaries thereto as follows:

(i) Pee Dee River and tributaries above U.S. Highway 701 and Black River:

(1) Season: January 15 through April 15;

(2) Times: noon Monday through noon Saturday;

(3) Methods and equipment: Any lawful method and equipment;

(4) Size and take limits: No limits.

(ii) Remainder of Winyah Bay system including all of Big Bull Creek and Waccamaw River with tributaries below the entrance of Big Bull Creek:

(1) Season: January 15 through April 1;

(2) Times: Monday noon to Saturday noon, local time;

(3) Methods and equipment: No restriction provided drift nets of not more than nine hundred feet in length are allowed in Waccamaw River between Butler Island and U.S. Highway 17 during lawful times;

(4) Size and take limits: No limits.

(b) Santee River below Wilson Dam including the Rediversion Canal below St. Stephen Dam, North Santee River and Bay, South Santee River, and all tributaries and distributaries thereto as follows:

(i) Rediversion Canal from St. Stephen Dam seaward to the seaward terminus of the northern dike of the Rediversion Canal:

Season: No open season;

(ii) Rediversion Canal from the seaward terminus of the northern dike of the Rediversion Canal seaward to Santee River:

(1) Season: January 15 through April 15;

(2) Times: 7:00 a.m. to 7:00 p.m. local time, Tuesday and Thursday;

(3) Methods and equipment: Any lawful method and equipment;

(4) Size and take limits: No limits.

(iii) Wilson Dam seaward to U.S. Highway 52 bridge:

Season: No open season.

(iv) U.S. Highway 52 bridge seaward to S.C. Highway 41 bridge:

(1) Season: January 15 through April 15;

(2) Times: 7:00 a.m. to 7:00 p.m. local time, Tuesday and Thursday;

(3) Methods and equipment: Any lawful method and equipment;

(4) Size and take limits: No limits.

(v) S.C. Highway 41 bridge seaward:

(1) Season: January 15 through March 15;

(2) Times: Monday noon to Saturday noon, local time;

(3) Methods and equipment: Any lawful method and equipment;

(4) Size and take limits: No limits.

(c) Wando River and Cooper River seaward to the U.S. Highway 17 bridges, Charleston Harbor, Ashley River, and all tributaries and distributaries thereto as follows:

(i) Tailrace Canal from Wadboo Creek to the Jefferies Power Plant:

Season: No open season.

(ii) Cooper River from Wadboo Creek to U.S. Highway 17:

Season: No open season.

(iii) Ashley River seaward to its confluence with Popper Dam Creek:

(1) Season: No open season;

(2) Reserved

(3) Reserved

(4) Reserved

(iv) Remainder of the Charleston Harbor system:

(1) Season: No open season;

(2) Reserved

(3) Reserved

(4) Reserved

(d) Edisto River Estuary, Edisto River, North and South Branches (Forks) of the Edisto River, and all tributaries and distributaries thereto as follows:

(i) Above U.S. Highway 15 bridge:

(1) Season: February 1 through March 30;

(2) Times: Tuesday noon to Saturday noon, local time;

(3) Methods and equipment: Any lawful method and equipment;

(4) Size and take limits: No limits.

(ii) Seaward of U.S. Highway 15 bridge and above U.S. Highway 17 bridge:

(1) Season: February 1 through March 30;

(2) Times: Tuesday noon to Saturday noon, local time;

(3) Methods and equipment: Any lawful method and equipment;

(4) Size and take limits: No limits.

(iii) Seaward of U.S. Highway 17 bridge:

(1) Season: February 1 through March 30;

(2) Times: Wednesday noon to Friday midnight, local time;

(3) Methods and equipment: Any lawful method and equipment;

(4) Size and take limits: No limits.

(e) Ashepoo River and all tributaries and distributaries thereto as follows:

(1) Season: No open season;

(2) Reserved

(3) Reserved

(4) Reserved

(f) Combahee River and all tributaries and distributaries thereto as follows:

(i) Tributaries and distributaries, except main stems of Salkehatchie Rivers:

Season: No open season.

(ii) Main river including main stems of Salkehatchie Rivers:

(1) Season: February 1 through March 15;

(2) Times: For anchored nets, Tuesday noon to Friday noon, local time; for driftnets, Monday noon to Saturday noon, local time;

(3) Methods and equipment: Any lawful method and equipment;

(4) Size and take limits: No limits.

(g) Coosawhatchie River and all tributaries and distributaries thereto as follows:

Season: No open season.

(h) South Carolina portions of Savannah River and all tributaries and distributaries thereto as follows:

(i) Main river below U. S. Highway 301 and above U. S. Interstate Highway 95:

(1) Season: January 1 through April 15;

(2) Times: 7:00 a.m. Wednesday to 7:00 p.m. Saturday, local time;

(3) Methods and equipment: Any lawful method and equipment;

(4) Size and take limits: No limits.

(ii) Tributaries and distributaries above U.S. Interstate Highway 95 bridge:

Season: No open season.

(iii) Seaward of U.S. Interstate Highway 95 bridge.

(1) Season: January 1 through March 31. Taking or attempting to take shad with anchored nets is prohibited at all times in the Savannah River's Little Back River, Back River and the north channel of the Savannah River downstream from the New Savannah Cut;

(2) Times: 7:00 a.m. Tuesday to 7:00 p.m. Friday, local time;

(3) Methods and equipment: Any lawful method and equipment;

(4) Size and take limits: No limits.

(i) Atlantic Ocean territorial sea as follows:

(1) Season: No open season;

(2) Reserved

(3) Reserved

(4) Reserved

Appendix 2. Proposed statewide changes to SC's shad fishery to account for by-catch of sturgeon

	Existing regulation	Proposed change	Benefit
Recreational			
Gear restrictions			
Gill nets	1 net w/ lengths up to 300yds	1 net w/ length not exceeding 100 ft.	Limits the length of net a recreational angler using commercial gear can use.
Commercial			
Gear restrictions			
All rivers	10 nets per licensee allowed	5 nets per licensee allowed	Cuts available nets by 50%
*Edisto River	10 nets per licensee allowed	2 nets per licensee allowed	Cuts available nets by 80%
*Combahee River	10 nets per licensee allowed	1 nets per licensee allowed	Cuts available nets by 90%
Procedure change			
All rivers	Must check each net once every 24 hrs.	Must check each net **twice** during 24hrs.	Reduces risk of potential mortality for captured sturgeon.
Area restrictions			
Savannah River	Fishing allowed I-95 to spirit creek	Fishing allowed I-95 to Hwy 301	Restricts fishing on ~110 rkm of potential sturgeon spawning habitat.
Season changes			
Winyah Bay and Tributaries (includes Waccamaw and Great Pee Dee Rivers)			Moves the legal season up two weeks, allowing for fewer nets during the sturgeon spawning migration.
Pee Dee River and tributaries above Hwy. 701, Waccamaw River and tributaries above entrance of Big Bull Creek	Feb. 1 - Apr. 30	Jan. 15 - Apr. 15	
Remainder of Winyah Bay system	Feb. 1 – Apr. 15	Jan. 15 - Apr. 1	
Santee River			Moves the legal season up two weeks, allowing for fewer nets during the sturgeon spawning migration.
Hwy. 52 bridge seaward to Hwy. 41 bridge	Feb. 1 - Apr. 30	Jan 15 - Apr 15	
Hwy. 41 bridge seaward	Feb. 1 - Mar. 31	Jan 15 - Mar 15	
Edisto River			Restrictions as a result of ASMFC's shad sustainability plan will shorten the season to 6 weeks.
Above U.S. Hwy. 17 bridge	Jan. 15 - Apr. 15	Feb. 1 - Mar. 15	
Seaward of U.S. Hwy. 17	Jan. 15 - Mar. 31	Feb. 1 - Mar. 15	
Combahee River			Restrictions as a result of ASMFC's shad sustainability plan will shorten the season to 6 weeks.
Main river, including main stems of Salkehatchie Rivers	Jan. 15 - Mar. 31	Feb. 1 - Mar. 15	

*** Restrictions as a result of ASMFC's state sustainability plan.**

Appendix 3. Proposed changes to shad fisheries in the Edisto and Combahee Rivers.

	Existing regulation	Proposed change	Benefit
Recreational			
Gear restrictions			
Edisto River			
Gill nets	1 net w/ lengths up to 300yds	1 net w/ length not exceeding 100 ft.	Limits the length of net a recreational angler using commercial gear can use.
Hook and line	10 shad per day creel	5 shad per day creel	Decreases the amount of shad legally kept by 50%.
Combahee River			
Gill nets	1 net w/ lengths up to 300yds	1 net w/ length not exceeding 100 ft.	Limits the length of net a recreational angler using commercial gear can use.
Hook and line	10 shad per day creel	5 shad per day creel	Decreases the amount of shad legally kept by 50%.
Commercial			
Gear restrictions			
Edisto River	10 nets per licensee allowed	2 nets per licensee allowed	Cuts available nets by 80%
Combahee River	10 nets per licensee allowed	1 nets per licensee allowed	Cuts available nets by 90%
License cap			
Edisto River	No limit	Only licensees that purchased a license during the last 5 years will be eligible to remain in the fishery with no new licenses issued	Allows current fishermen to fish, does not allow for additional exploitation, and caps the fishery.
Combahee River	No limit	Only licensees that purchased a license during the last 5 years will be eligible to remain in the fishery with no new licenses issued	Allows current fishermen to fish, does not allow for additional exploitation, and caps the fishery.
Season changes			
Edisto River			
Above U.S. Hwy. 17 bridge	Jan. 15 - Apr. 15	Feb. 1 - Mar. 15	Shortens the season to 6 weeks
Seaward of U.S. Hwy. 17	Jan. 15 - Mar. 31	Feb. 1 - Mar. 15	Shortens the season to 6 weeks
Combahee River			
Main river, including main stems of Salkehatchie Rivers	Jan. 15 - Mar. 31	Feb. 1 - Mar. 15	Shortens the season to 6 weeks

ASMFC American Shad Sustainable Fishing Plan for Georgia

Submitted by

Georgia Department of Natural Resources
Wildlife Resources Division
P.O. Box 2089, 108 Darling Avenue
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Introduction:

The purpose of Georgia's sustainable fisheries management plan for American shad is to allow the continuation of existing American shad fisheries in Georgia rivers where it has been determined continuation of fishing will not adversely impact the Atlantic Coast American shad stock. This plan is submitted to fulfill requirements of Amendment 3 to the Interstate Fishery Management Plan for Shad and River Herring (American Shad Management).

Management of American shad in Georgia is shared between the Georgia Department of Natural Resources' (GADNR) Wildlife Resources Division's Fisheries Management Section (FMS) and GADNR's Coastal Resources Division (CRD). The river complex utilized by fish stocks defines Georgia's management units. Historically, all of Georgia's Atlantic-slope rivers supported a commercial fishery for American shad (Fig. 1). However, in recent years, commercial landings of American shad have been reported from only two (Altamaha and Savannah) of these five rivers. Recreational shad fisheries exist only at the New Savannah Bluff lock and dam (NSBL&D) on the Savannah River and in the Ogeechee River. However, in 2014 the Army Corps of Engineers closed public access to the NSBL&D due to safety concerns. This closure greatly reduced the bank fishery for American shad on the Georgia side of the river, which was by far the largest portion of the fishery. There have been no reports of commercial landings from the Satilla or St. Marys rivers since 1989.

During 2010, the Georgia Board of Natural Resources adopted new commercial shad fishing rules based on a recommendation from GADNR. These changes modified the temporal and spatial components of the commercial shad fishing efforts along Georgia's Atlantic-slope rivers, both to provide the basis for American shad sustainability plans and to address shortnose sturgeon bycatch issues. Following these changes, the St. Marys and Satilla rivers were officially closed to commercial shad fishing. The Ogeechee River commercial shad fishery was also closed prior to the 2014 commercial shad season due to lack of participation during the 2012 and 2013 seasons and to reduce concerns of potential sturgeon bycatch issues. These three rivers will remain closed to commercial American shad fishing.

Georgia's Commercial American Shad Fisheries

The commercial shad (American and hickory) season is open each year from January 1 to March 31. Drift and set gill nets with mesh sizes of at least 4-½ inches (stretch mesh) are legal gear in the Altamaha and Savannah Rivers. Shad fishermen are required to possess a letter of authorization (LOA) in conjunction with a commercial fishing license to fish in Georgia's commercial shad fishery. These LOA's were adopted in 2015 because Georgia has a general commercial fishing license that doesn't specify the targeted fishery. Since inception, the LOA's have increased information about participation in Georgia's commercial shad fishery.

The Altamaha River is open to commercial shad fishing from the U.S. Hwy 1 Bridge (rkm 183) downstream to the Atlantic Ocean (Fig. 1). Including the waters of its major tributaries, this is an area approximately 347 rkm, or 65% smaller than previously open to commercial shad fishing. The Altamaha River is open Monday through Friday below and Tuesday through Saturday above the Seaboard Railroad bridge crossing (Fig. 1). The Altamaha River supports the state's largest commercial shad fishery and is Georgia's largest watershed, draining 37,192 km2. The Altamaha is formed by the confluence of the Oconee and Ocmulgee rivers and flows for approximately 220 kilometers to the Atlantic Ocean. The main stem Altamaha is free of dams for the entire length of the river; however, dams are located upriver on both tributaries. Drift and set gill nets are the gear types used to commercially fish for shad throughout the river. Most full-time commercial fishermen focus their efforts in the lower 60 kilometers of the river. Drift nets are the most prevalent gear type in the lower river, whereas set nets are the more prevalent gear type in the upper river (upstream of the City of Jesup).

The Savannah River is open to commercial shad fishing from the U.S. Hwy 301 Bridge (rkm 192) downstream to the Atlantic Ocean, an area approximately 103 rkm or 35% smaller than previously open to commercial shad fishing (Fig. 1). The Savannah River is open from Tuesday through Friday east of the I-95 Bridge and Wednesday through Saturday west of the I-95 Bridge (Fig. 1). The Savannah River drains a watershed of approximately 17,022 km2 and forms the boundary between Georgia and South Carolina. The first barrier to upstream migration on the Savannah River is the NSBL&D located at river km 301, just south of Augusta, Georgia. American shad once passed through this dam via lockage, but in recent years the U.S. Army Corps of Engineers (USACE) has declared the facility unsafe to operate, so fish are not being passed through the lock at this time. The NSBL&D is now a true migration barrier and is the uppermost reach of the American shad migration in the Savannah River. The USACE is currently overseeing the Savannah Harbor Expansion Project which has mitigation plans to install a migratory fish passage at the NSBL&D. After installing this migratory fish passage, the NSBL&D will not be a migratory barrier to the American shad run and American shad will be able to access further upriver habitats above the NSBL&D. The upper commercial fishing boundary is approximately 109 rkm below the NSBL&D, thus fish reaching this point have escaped the commercial fishery. Above the NSBL&D are three dams located from river km 333 to river km 355. Both drift and set gill nets are used to commercially fish for shad throughout

the river. Most of the commercial activity takes place in the lower reach of the river and drift gill nets are the primary commercial gear used east of the I-95 Bridge. A recreational fishery does exist in the tail waters of the NSBL&D. However, the USACE's closing public access to the locks outer wall, significantly decreased the recreational fishery at this site.

Georgia's Recreational American Shad Fisheries

Small-scale recreational fisheries for American shad still exist in the Savannah and Ogeechee rivers. Georgia has a statewide 8 shad (American and/or hickory) recreational daily creel limit. Recreational shad fisheries exist only at the NSBL&D on the Savannah River and in the Ogeechee River. However, in 2014 the Army Corps of Engineers closed public access to the NSBL&D due to safety concerns. This closure eliminated the bank fishery for American shad on the Georgia side of the river, which was by far the largest portion of the fishery. Georgia has periodically conducted recreational creel surveys on the Ogeechee River specifically targeting the recreational shad fishery. The most recent of those was completed in 2015. The creel survey estimated that 463 American shad were harvested with a total harvest weight of 473 Kg. Anglers also released 27 American shad and zero hickory shad were harvested by anglers.

Numerous recreational creel surveys have been conducted on the Altamaha and Satilla rivers in recent years and American shad have never been observed in angler harvest. While the GADNR does not have any recreation creel survey data for the St. Marys River, there has never been any evidence or reports of anglers incidentally capturing American shad.

Landings

Reported commercial landings of American shad are available from the National Marine Fisheries Service and the State of Georgia through CRD, which has recorded river-specific landings since 1962. In 2001, Georgia instituted a mandatory reporting system that requires an individual record (trip-ticket) to be completed at the time of sale for each catch sold to a seafood dealer. Data collected includes the river of capture, type of gear, total net soak time, etc. Numbers of wholesale dealers processing shad have declined over time, and from 2010 to 2013 there were less than 3 dealers that purchased shad from commercial fishermen. Due to the low number of dealers and corresponding confidentiality agreements, commercial landings data obtained from trip-tickets on the Altamaha and Savannah rivers during 2010-2013, along with the 2014 Savannah River commercial landings data, must be excluded from reports (Fig. 2).

The GADNR has conducted periodic recreational creel surveys on the Ogeechee River since 1986 to estimate harvest and catch-per-unit-effort (CPUE). The number of American shad caught per hour of fishing time has varied from a low of 0.2 shad/hour in 1986 and 2010 to a high of 0.75 fish/hour in 2015. It is important to note that flow conditions can have a significant

impact on angler catch rates in this fishery. Total effort and fish harvested has ranged from a high of 2,210-angler hrs and 1,053 shad harvested in 1996 to a low of 620-angler hrs in 2015 and a low of 10 shad harvested in 2000. Effort data from the last five creel surveys has averaged 1,148-angler hrs and total shad harvested has averaged 424 fish.

Recreational creel surveys were conducted on the Savannah River in the late 1990s by the GADNR (1997) and South Carolina Department of Natural Resources (1998 and 1999). Estimates of catch from these surveys varied from year to year, largely due to dramatically different flow conditions. Catch estimates from each of these creel surveys were provided by Boltin (1999).

Fishery Dependent Indices

Reported American shad landings from the Altamaha River reached a high of 471,700 lbs in 1968 and then declined for several years. Landings averaged approximately 299,000 lbs during 1962-1969 and approximately 130,000 lbs during 1970-1979. Reported Altamaha River shad landings peaked in 1987 at 193,469 lbs and again in 1995 at 121,811 lbs (Fig. 2). During 1980-2000, total reported shad landings averaged 89,739 lbs. Since 2000, total reported shad landings have averaged around 34,776 lbs. Landings for the last ten years have averaged approximately 37,437 lbs. Savannah River landings data was supplied to the SCDNR and will be combined with their landings data and reported in the South Carolina sustainability plan.

Since 2000, commercial shad fishing effort has been quantified based on total number of reported commercial trips. The highest recorded statewide effort was 860 commercial fishing trips for the Altamaha River in 2000 (Fig. 3). During 2000-2005, commercial fishermen averaged approximately 420 trips/yr in the Altamaha River, while during the 2006-2015 period commercial fishermen averaged approximately 264 trips/yr. Effort data for the Savannah River was supplied to SCDNR and will be combined with their effort data and reported in the South Carolina sustainability plan.

Fishery Independent Indices

GADNR has utilized gill net surveys to generate population size and exploitation rate estimates for American shad through mark and recapture efforts in the Altamaha River since 1982 and CPUE since 1986. The American shad population was also estimated in 1967.

Adult shad electrofishing surveys were initiated in 2010 on the Ogeechee (Fig. 4) and Savannah (Fig. 5) rivers in preparation for future monitoring under the sustainability plans to be submitted pursuant to requirements of Amendment 3 to the Interstate Fishery Management Plan for Shad and River Herring (Shad and River Herring ISFMP). GADNR staff conducts these surveys twice a month for three months during the spawning immigration. Since 2010, the Ogeechee River adult shad electrofishing surveys have averaged around 15 shad per hour, and the Savannah River adult shad electrofishing surveys have averaged around 300 shad per hour. The reason that the Savannah River electrofishing catch rates are much higher than the

Ogeechee River catch rates is because the electrofishing samples on the Savannah River are concentrated immediately below the NSBL&D. The Ogeechee River is undammed and electrofishing samples are not concentrated below a migration barrier so efforts are much less effective.

GADNR estimated juvenile American shad abundance from trawl surveys on the Altamaha River during 1982-1991 and the Ogeechee River during 1982-1985. Juvenile catch rates could not be correlated to estimated spawning populations nor future adult spawning return rates, so juvenile sampling ceased after 1991. However, GADNR reinstated a juvenile sampling program utilizing a 50-ft seine in 2010 on the Altamaha, Ogeechee, and Savannah rivers in preparation for future monitoring under the sustainability plans to be submitted pursuant to requirements of Amendment 3 to the Shad and River Herring ISFMP. Seine mesh size and site locations are standardized. GADNR staff annually sample 3-6 sites/river twice a month from July-September. Since 2011, the Altamaha, Ogeechee, and Savannah River juvenile shad geometric means have averaged around 24.2, 7.9, and 7.6 shad per seine haul, respectively (Fig. 6). No juvenile sampling was completed in 2013 due to high water. The decrease in juvenile shad sampled on the Ogeechee and Savannah Rivers from 2014 to 2015 should be attributed to water level issues and changes in manpower of the monitoring staff, and not a true depiction of a decrease in juvenile shad abundances.

Sustainable Fisheries

Table 1. Management Benchmarks and Triggers

River System	Index	Years Included in Index	Benchmark Value	Benchmark Level	Management Trigger
Altamaha (commercial & recreational)	Gillnet CPUE Index	1983-2015	1.11 shad/ft-hr	25th percentile	3 consecutive years below the benchmark
Savannah (commercial & recreational)	Commercial Gillnet CPUE Index	2001-2015	9.03 kg shad/trip	25th percentile	3 consecutive years below the benchmark
Ogeechee (recreational)	Electrofishing CPUE Index	2010-2015	3.7 shad/hr	25th percentile	3 consecutive years below the benchmark

Altamaha River

GADNR has produced annual Lincoln-Peterson population estimates and exploitation rates from a tagging study that was initiated in 1982. Adult American shad are captured via gill nets in the lower section of the Altamaha River and tagged with a T-bar anchor tag produced by Floy Tag & Mfg, Inc. Tagging efforts are conducted on Saturday, Sunday, or Monday each week of the commercial shad season that runs from January 1 through March 31. These days were chosen because the commercial fishery is closed in different portions of the river on these days, thus allowing the fish to naturally disperse before potential recapture by commercial fishermen. Before the start of the season, 500 tags are randomly assigned values of $4, $10, $50, or $100. Two percent of the tags receive a $100 value, 3% are $50, 20% are worth $10, and 75% worth $4. Tag values are not printed on the tag. Upon capturing a tagged fish, commercial fishermen are required to remove tags and mail them into GADNR to receive the monetary award. GADNR keeps record of the number of fish tagged (M) and recaptured (R) and then utilizes reported commercial landings data to produce the total number of fish captured (C). In an effort to account for non-reported commercial landings and produce a more accurate estimate of "C", GADNR conducted a roaming creel survey from 1982-1992. After the 10-year creel survey was completed, GADNR staff developed a statistically based formula to account for non-reporting. From 1993 to present, "C" is calculated by entering the total reported commercial drift net landings into the formula "C"=(2.322x10-6+0.214/Reported Landings)-1.

From 1982 to present, the estimated size of the adult American shad population in the Altamaha River has ranged from a low of 70,396 shad in 1990 to a high of 560,023 fish in 2014

(Fig. 7). After 1996, estimated shad abundance declined for six consecutive years, through 2002, before showing a moderate rebound through 2006. The population estimates decreased again through 2010. However, the 2011 mark and recapture efforts revealed a sharp increase in American shad abundance with a population estimate of 277,824 fish. This upward trend peaked in 2014 at 560,023 which is the highest population estimate in the time series. Population estimates have averaged around 236,000 American shad in the Altamaha River American shad run for the last ten years.

Trends in GADNR tagging CPUE data appear to be like those observed in GADNR's mark and recapture population estimates (Fig. 8) and have ranged from a low of 0.59 shad/ft-hr in 2005 to a high of 3.66 shad/ft-hr in 1998 (Fig. 9). CPUE, for the last ten years, has averaged 2.4 shad/ft-hr in the Altamaha River American shad run.

From 1982 through 1992, exploitation rates estimated from recaptures of tagged fish averaged 43.63%, which was often above the previous 40% maximum sustainable yield recommended by ASMFC in the Addendum to Amendment 1, before declining to present levels (Fig. 7). Since 1990, the exploitation rates have been below ASMFC's recommended 40% maximum sustainable yield. From 1993-2003, exploitation of American shad averaged 26.1%, ranging from 17.7% to 33%. From 2004-2010, exploitation of American shad averaged 19.7%, ranging from 13.7% to 23.6%. On January 1, 2011, new commercial regulations went into effect that closed approximately 65% of the Altamaha River system. This change resulted in a decrease in exploitation rates. Following these new regulations, from 2011-2015, exploitation of American shad averaged 11.5%, ranging from 8.6% to 12.7%. Total exploitation has averaged around 16%, for the last ten years, for the Altamaha River American shad run. As an additional measure to ensure the conservation of this stock, an American shad stocking program was initiated in 2014. American shad are annually stocked above migration barriers in an attempt to re-establish shad in section of the Oconee and Ocmulgee rivers.

Juvenile sampling on the Altamaha River was initiated in 2010, and 291 juvenile shad were collected in 12 seine hauls utilizing a combination of two 50-ft bag seines (one with ½-inch mesh and one with 3/8-inch mesh). The resulting geometric mean was 14.6 shad/haul. However, staff observed juvenile shad escaping through both of these nets. Therefore, catch rates would have been higher if a smaller mesh seine had been utilized. Since 2011, GADNR has utilized a 50ft bag seine with ¼-inch mesh to sample juvenile shad. During July 2011, 1,282 juvenile shad were captured in 20 seine hauls with a resulting geometric mean of 26.8 shad/haul. During July 1968, Godwin and Adams (1969) utilized a similar seine to collect juvenile shad and reported an arithmetic mean of approximately 15 shad/haul. Therefore, the CPUE of juvenile shad observed in July 2011 seems to indicate that American shad reproduction is currently at a sufficient level to sustain the population. Since 2011, the Altamaha River juvenile American shad geometric means have averaged around 24.2 shad per seine haul (Fig. 6).

The ASMFC American Shad Stock Assessment Sub-committee (SASC) utilized CPUE data through 2005 from GADNR tagging efforts on the Altamaha River as an indicator that the Altamaha stock was in decline when the 2007 stock assessment was completed. During 2006-2015, CPUE data from GADNR's tagging efforts averaged 2.4 shad/ft-hr, which is 112.4% higher than the average of 1.13 shad/ft-hr observed from 2000-2005 (Fig. 9). This fact, along with the apparent increase in population abundance, decreased exploitation rates, and recent juvenile abundance data, supports the fact that the current fishery appears to be sustainable. In addition, GADNR believes that the changes in the 2011 regulations have allowed sufficient escapement of adults and helped ensured that fishery harvest will not adversely impact the Atlantic Coast American Shad population. Over the years, the attrition of commercial fishermen has also lessened effort and exploitation on American shad in the Altamaha River and even more so on the Savannah River. For example, there were only two commercial shad fishermen on the Savannah River in 2015, and one of these fishermen retired from shad fishing after the 2015 season.

The SASC and TC expressed concerns with utilizing population estimates and exploitation rates generated from annual tagging efforts as stock indicators since GADNR has not studied non-reporting rates, tag loss, tagging mortality, post tagging movements, or repeated the 1980's creel survey to validate the formula that accounts for non-reporting of commercial landings. Instead, the TC recommends using annual CPUE data as a benchmark. Therefore, GADNR continues to monitor the Altamaha stock through a fishery independent gill netting survey to develop annual CPUE data for use as a stock abundance indicator. GADNR utilizes a CPUE benchmark of 75% of the mean for 3 consecutive years. In the last fishery management plan, the TC asked GADNR to consider two potential CPUE benchmark means. The first would utilize the entire time series of data (1983-2011) to calculate the mean, resulting in a benchmark CPUE of 1.11 shad/ft-hr (Fig. 9). The second option was to exclude the first seven years and utilize data from 1993 through 2011 to present and would establish a CPUE benchmark of 1.29 shad/ft-hr. GADNR believes it is more appropriate to utilize the entire time series of data to establish the benchmark CPUE since it encompasses a greater degree of environmental and population variability. The Altamaha shad population has historically shown the capacity to rebound after 7 consecutive years below this benchmark, and historically a benchmark of 1.29 shad/ft-hr would not have triggered action any more frequently than a benchmark of 1.11 shad/ft-hr. If gill netting CPUEs drop below 1.11 shad/ft-hr for 3 consecutive years, GADNR will evaluate commercial fishing regulations and harvest data and consider modifications to the Altamaha fishery to ensure the fishery remains sustainable. In the future, utilization of a juvenile index of abundance may be added once GADNR has collected several years of data to establish a CPUE benchmark appropriate to the Altamaha River. When the 2007 stock assessment was completed, the SASC utilized available data as an indicator that the Altamaha stock was in decline. Since that time, GADNR's relative abundance data from 2005-2015 was 112% higher than observed relative abundance from 2000-2005. This increase, combined with

increases in population estimates, decreased exploitation rates, and JIA data all point to healthy and sustainable stock.

The Altamaha River is legally open to recreational harvest of American shad with the statewide limit of 8 fish. However, annual recreational creel surveys that have been conducted for over 20 consecutive years indicate that a recreational fishery does not exist on this river. No American shad harvest has ever been recorded in this angler harvest survey. Since the river is open to commercial fishing, GA DNR proposes utilizing the same sustainability benchmark that is used for the commercial fishery, which is a gill netting CPUE below 1.11 shad/ft-hr for 3 consecutive years.

Savannah River

Historically, the GADNR was not required to collect fishery independent data from the Savannah River. In 2010, the GADNR initiated fishery independent sampling for both adults and juveniles. Adults are sampled via electrofishing below the NSBL&D each spring. Juveniles are sampled in the lower river via seining July-September each year. The SCDNR supplements GADNR's juvenile sampling by utilizing electrofishing gear. The GADNR's fishery dependent and independent data will be combined with data collected by the SCDNR for measuring sustainability.

The Savannah River has a recreational shad fishery and harvest is controlled by a statewide regulation of 8 fish/day. However, in 2014 the Army Corps of Engineers closed public access to the NSBL&D due to safety concerns. This closure eliminated the bank fishery for American shad on the Georgia side of the river, which was by far the largest portion of the fishery.

The GADNR and SCDNR worked cooperatively to establish a joint benchmark for the Savannah River. The proposed sustainability benchmark is a commercial gillnet CPUE of 9.03 kg shad/trip for 3 consecutive years. This benchmark will be used as a sustainability measure for both the commercial and recreational fisheries.

Ogeechee

The Ogeechee River was officially closed to commercial fishing due to lack of participation and potential sturgeon interactions. There are no plans to re-open the commercial fishery on the Ogeechee River. An American shad stocking program was initiated in 2014 as an additional measure to ensure the conservation of this stock. Adult American shad are monitored via electrofishing and juveniles are sampled with a 50' bag seine.

The Ogeechee River is the second of two rivers in Georgia that has a recreational shad fishery. Recreational harvest on this river is also controlled by the statewide regulation of 8 fish/day. The GADNR initiated an electrofishing survey in 2010 for adult American shad and the CPUE has averaged 14.8 fish/hr over a 7-year period. The GADNR suggest using the 25th percentile for 3 consecutive years as a sustainability benchmark for the recreational fishery. If the adult

shad CPUE falls below 3.7 fish/hr for 3 consecutive years, the GADNR would need to establish conservation measures to ensure the sustainability of the fishery.

Satilla and St. Marys Rivers

The Satilla and St. Marys rivers are currently closed to commercial shad fishing and there are no plans to open these rivers.

Technically, the Satilla and St Marys river are open to recreational harvest of shad. However, several recreational creel surveys have been conducted on the Satilla River in recent years (2006-2014) and American shad have never been observed in angler harvest. While the GADNR does not have any recreation creel survey data for the St. Marys River, there has never been any evidence or reports of anglers incidentally capturing American shad. Additionally, annual spring electrofishing surveys targeting sportfish populations indicate that American shad abundance is extremely low in both rivers. In the last 10 years, 1 American shad has been captured in the Satilla River and 3 American shad were captured in the St. Marys River. There is very little chance of incidental angler interactions due to the low abundance of shad in these rivers.

The TC has recommended that the GADNR either develop a sustainable fishing plan for the Satilla and St. Marys rivers or take the necessary action to prohibit the recreational harvest of American shad from those rivers. GADNR disagrees with the TC recommendation. It will be impossible to develop a sustainable fishing plan with any credible metrics for two river systems where American shad are currently at such low abundance as to be functionally absent. A modification of Georgia state law to prohibit the harvest of American shad in the Satilla and St. Marys rivers will result in no demonstrable conservation benefit. Furthermore, the TC did not recommend that the State of Florida take action to prohibit the recreational harvest of American shad from those portions of the St. Marys River subject to the jurisdiction of the State of Florida. Rather than the options recommended by the TC, the GADNR proposes to continue monitoring the fish populations of the Satilla and St. Marys rivers through periodic fishery-independent and fishery-dependent surveys. If these surveys reveal that American shad numbers are increasing and exploitation by recreational fisheries is occurring, GADNR will take the necessary steps to ensure that the harvest in those rivers is not detrimental to American shad conservation efforts along the Atlantic Coast.

A. Adaptive Management

The GADNR will continue to monitor the commercial shad fishery through fishery dependent and independent sampling on the Altamaha and Savannah rivers. Data from the Savannah River will be shared with SCDNR, and the agencies will work cooperatively towards the management of this population.

If three consecutive years of data show that CPUE of adults is decreasing, and/or juvenile abundance is decreasing beyond established benchmark levels, GADNR would evaluate and identify the causes thereof and initiate appropriate actions. Potential actions may include reducing the number of fishing days, modifying season dates, or altering legal fishing gears. In the event, such actions are not successful in reversing negative trends, GADNR would then consider closing the fishery in that river system.

Future Considerations

Georgia will continue to actively pursue effective management strategies that will allow the continued sustainability of our shad fishery. In recent years, fishery managers in Georgia have seen positive trends in our shad populations, particularly in the Altamaha River, which supports our largest shad population and fishery. As previously mentioned, GADNR's relative abundance data in the Altamaha River from 2005-2015 was 112% higher than observed relative abundance from 2000-2005. This increase, combined with increases in population estimates, decreased exploitation rates, and juvenile indices data all point to a healthy and sustainable stock. In an effort to pursue effective shad management beyond traditional data collection efforts, fishery managers will continue conducting various monitoring programs conducted annually since 2010, including juvenile sampling in the Ogeechee, Altamaha, and Savannah Rivers along with conducting electrofishing surveys targeting adults in the Savannah and Ogeechee Rivers. Data from these efforts, which may include length, age, or other biological metrics, may eventually be considered with traditional management benchmarks to inform fishery managers in decision making efforts. Additionally, future considerations may include additional assessments of the impacts of a new fish passage structure at the NSBL&D, should such a structure be developed. Managers will also continue to evaluate the effectiveness of stocking efforts in the Altamaha and Ogeechee, which have been performed annually since 2014, and data from these efforts may also be considered for use in future management decisions. Finally, considerations may be given in the future for collecting genetic samples for analysis of shad stocks in Georgia to better identify and understand stock compilation.

Literature Cited

Godwin, W.F. and J.G. Adams. 1969. Young Clupeids of the Altamaha River, Georgia.

GA Game and Fish Comm., Mar. Fish. Div., Contribution. Ser. No. 15.

Figure 1. Georgia Atlantic-Slope Rivers. The larger lines are the upper boundaries to the commercial American shad fishery and the smaller lines are the boundary lines for different open days of the fishery.

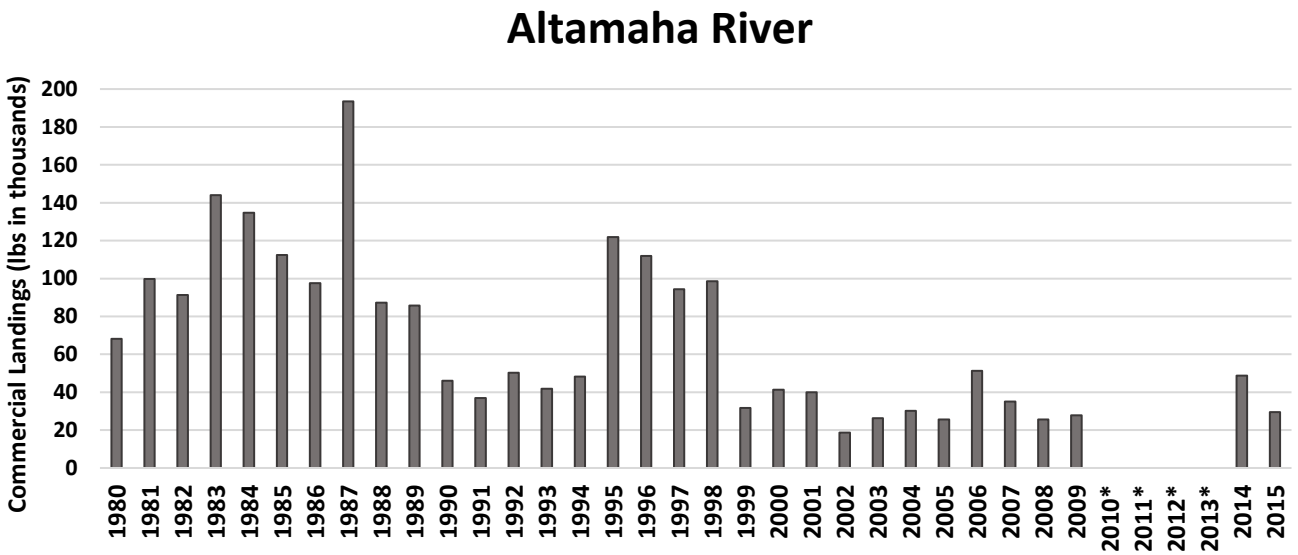

Figure 2. Reported commercial landings, reported by pounds in thousands, of American shad from the Altamaha River, Georgia. Due to confidentiality agreements, data from 2010*-2013* have been excluded.

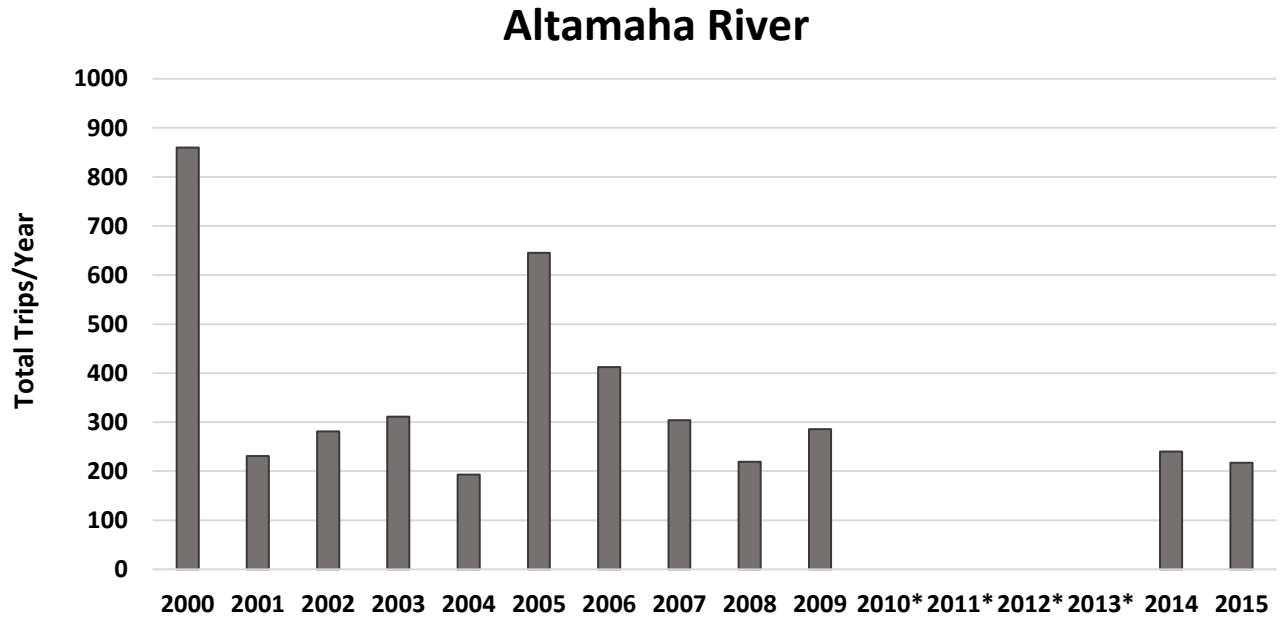

Figure 3. Total commercial fishing effort for American shad in the Altamaha River. Due to confidentiality agreements, data from 2010*-2013* have been excluded.

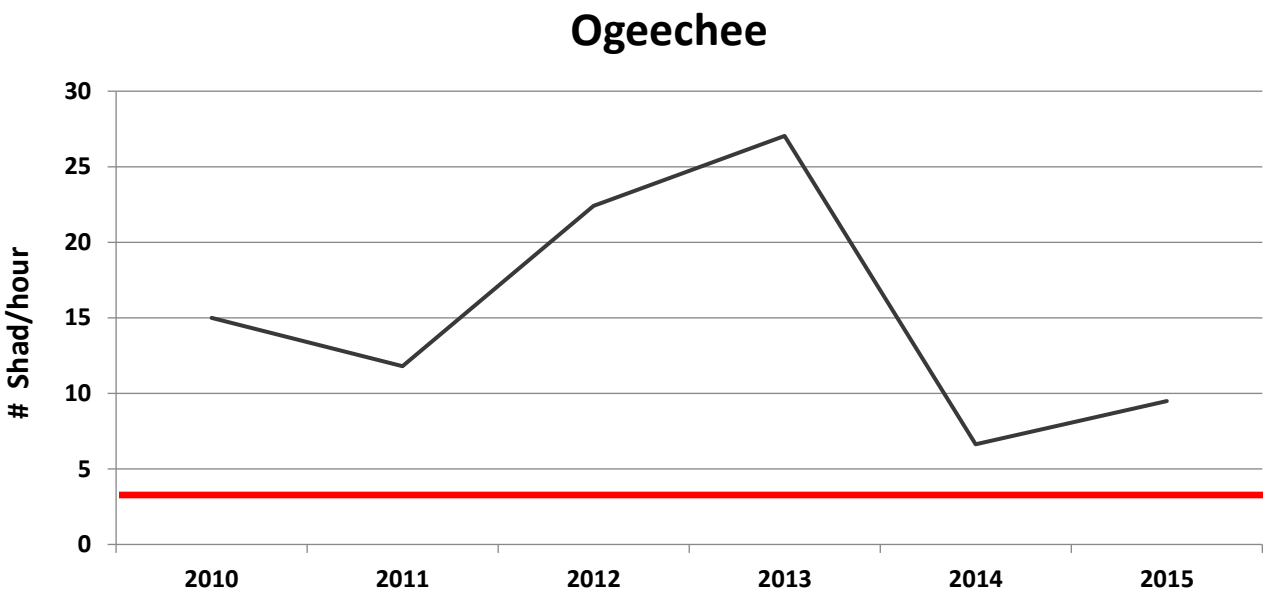

Figure 4. Ogeechee River adult American shad electrofishing CPUE's and the 3.7 shad/hr sustainability benchmark developed by GADNR.

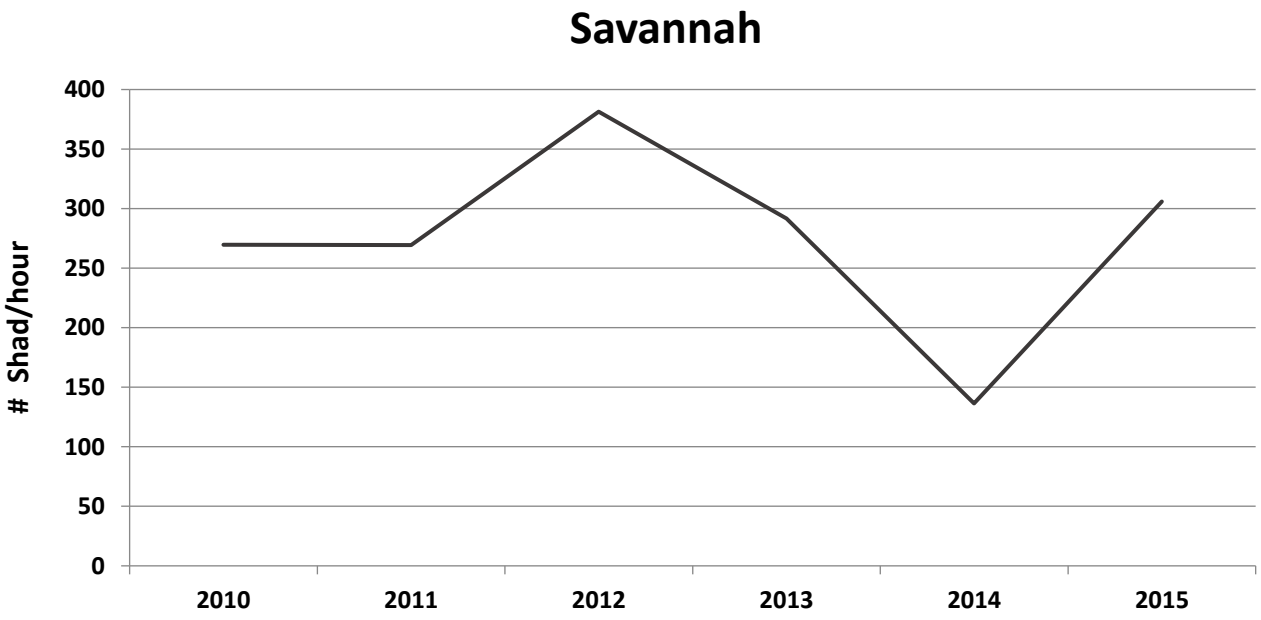

Figure 5. Savannah River adult American shad electrofishing CPUE's collected below the New Savannah Bluff Lock and Dam.

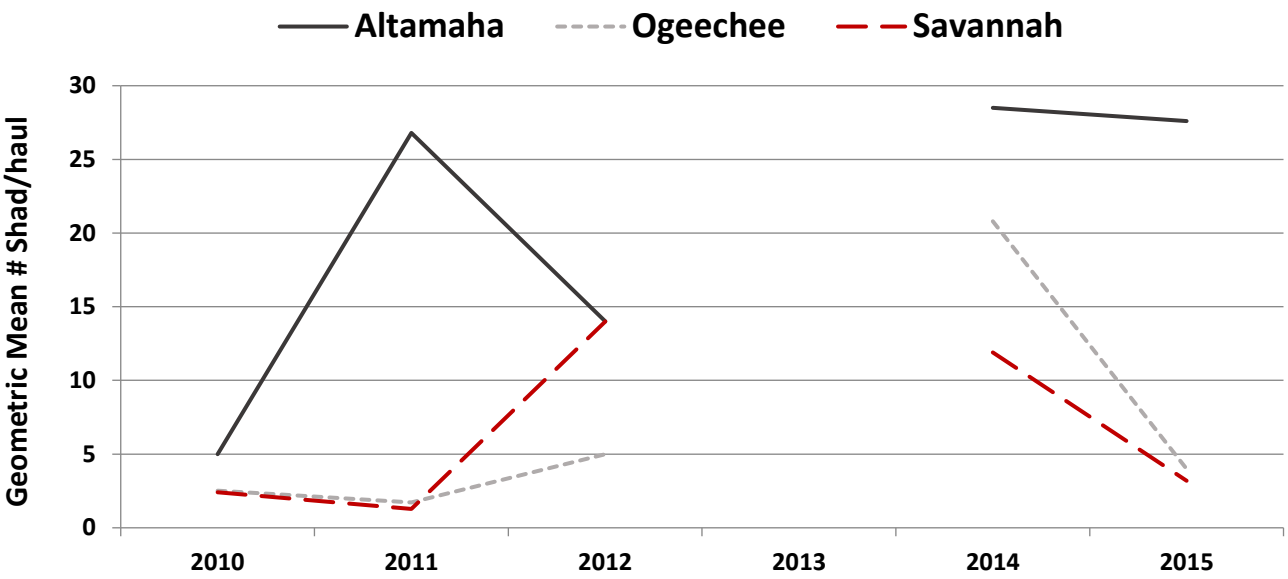

Figure 6. Juvenile American shad sampling program, initiated in 2010, utilizing a 50-ft bag seine on the Altamaha, Ogeechee, and Savannah rivers for monitoring under the sustainability plans to be submitted pursuant to requirements of Amendment 3 to the Interstate Fishery Management Plan for Shad and River Herring (American Shad Management).

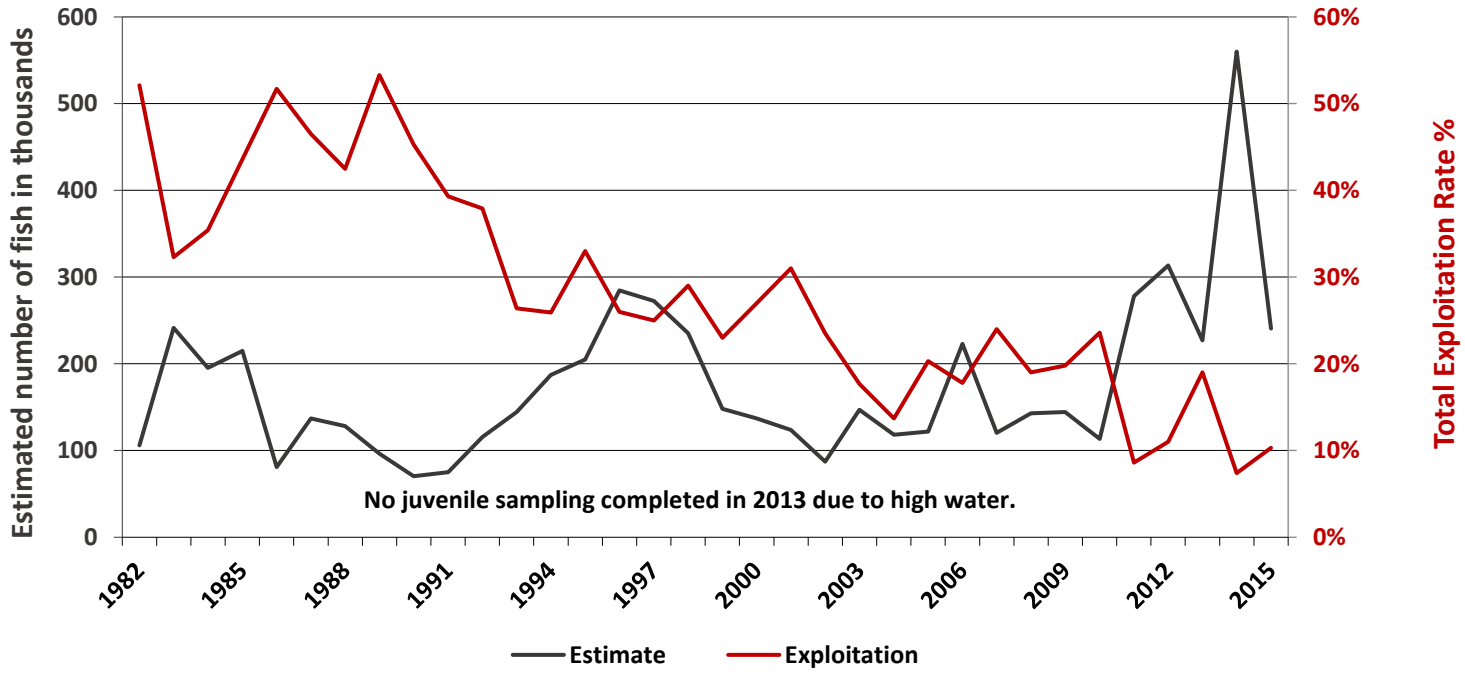

Figure 7. Population estimates and exploitation rates from the Altamaha River American shad run.

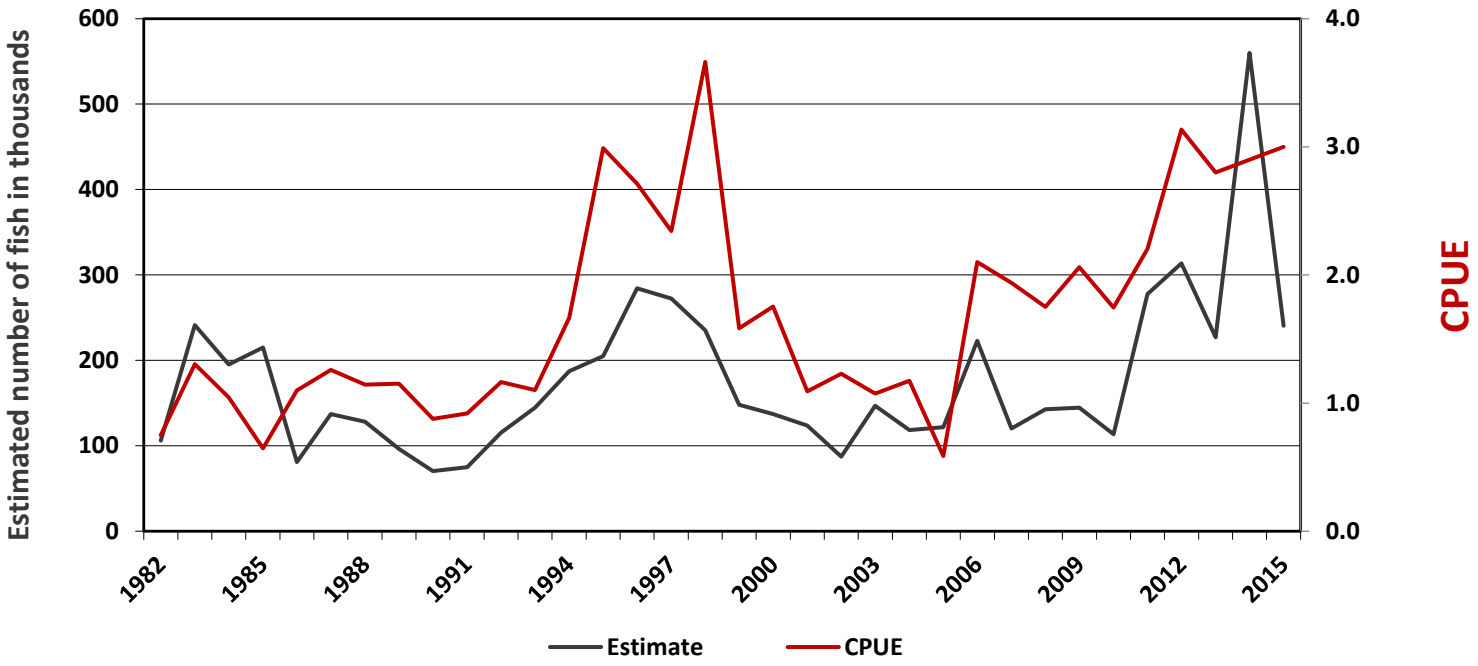

Figure 8. Altamaha River fishery-independent catch-per-unit-effort (CPUE-number caught per foot-hour) of American shad and population estimates from GADNR mark and recapture efforts.

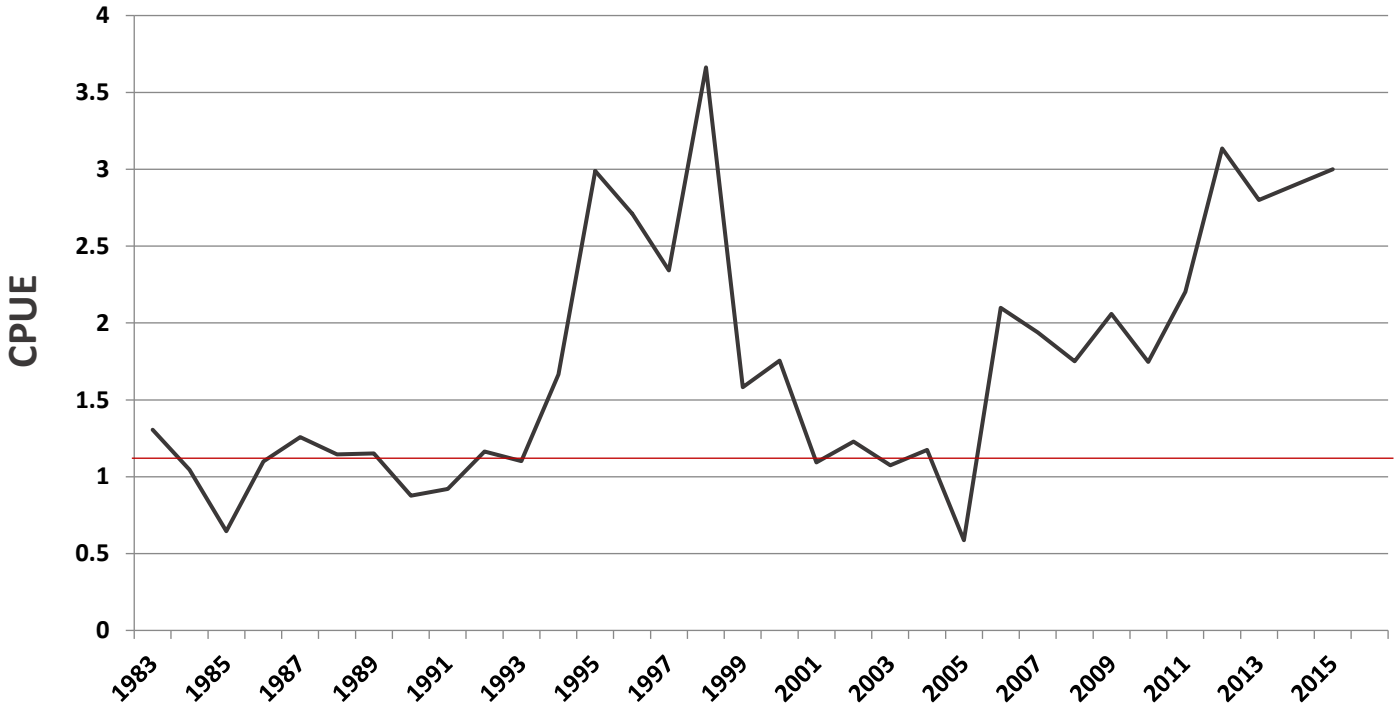

Figure 9. Altamaha River fishery-independent catch-per-unit-effort (CPUE-number caught per foot-hour) of American shad and the 1.11 shad/ft-hr benchmark developed from GADNR gill-net tagging data.

Atlantic States Marine Fisheries Commission

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MEMORANDUM

TO: **Shad and River Herring Management Board**

FROM: **Caitlin Starks, FMP Coordinator**

DATE: **September 25, 2017**

SUBJECT: **Technical Committee and Plan Review Team Comments to the Board Regarding Inconsistencies in SFMPs with Amendments 2 and 3**

During the Shad and River Herring TC's review of the SFMP updates to be presented to the Board for approval, and the PRT's development of the 2017 FMP Review, a general issue was identified by both groups regarding consistency of SFMPs with Amendment 3. In several SFMP updates that are up for approval or have already been approved by the Board, there are cases where states allow rivers to stay open to recreational harvest of shad, but the management and/or monitoring of these rivers is not consistent with the requirements outlined in Amendment 3.

For example, North Carolina's updated SFMP explains that the New and White Oak rivers are open to recreational fishing and there is a small commercial bycatch of shad, but no fishery-independent surveys for shad are conducted in these rivers. The rationale is that these are non-spawning rivers and there is no evidence of significant harvest in these areas, so an open fishery should not negatively affect the stock.

In Georgia, recreational harvest of shad is allowed in the St. Marys and Satilla rivers with the statewide 8 fish bag limit, but these rivers do not have sustainable fishing plans. Georgia's updated SFMP explains that developing a sustainable fishing plan with any credible metrics for two river systems where American shad are currently at such low abundance as to be functionally absent would be impossible, and to modify Georgia state law to prohibit the harvest of American shad in the Satilla and St. Marys rivers will result in no demonstrable conservation benefit.

Florida's updated SFMP was approved in May, but it also does not include sustainability metrics or monitoring of the St. Marys River where it falls within Florida's jurisdiction, though there is an open recreational fishery.

Amendment 3 to the Shad and River Herring FMP states: "States and jurisdictions shall submit a sustainable fisheries management plan for those systems that will remain open to recreational fishing. Catch and release fishing will be permitted on any system." The amendment also defines sustainable fisheries as "those that demonstrate their stock could support a commercial and/or recreational fishery that will not diminish the future stock reproduction and

recruitment." Under these definitions it is clear that for any river to have an open shad fishery, it must be demonstrated that the stock can support a fishery that will not diminish the future stock. The TC and PRT feel that without monitoring these fisheries cannot be proven sustainable. A majority of states have processed shad and river herring plans with this understanding of that Amendment 3 language.

The TC and PRT feel it is necessary to address the inconsistencies between the SFMPs and Amendment 3, and provide guidance on how to manage rivers without data or sustainability parameters. However, the TC did not expect that a precedent was set with the previous SFMPs that have been approved given the level of information provided in draft plans and the perceived uncertainty in Amendment 3 language. Further, the TC recommends that a clearer definition of how to approach management for rivers with low abundance and harvest should be developed prior to future updates.

In addition to the inconsistency between the SFMPs and Amendment 3 in terms of required monitoring and defined sustainability parameters, the TC also identified that the SFMPs use a wide variety of metrics to define sustainability but generally do not incorporate the recommended benchmarks in the 2007 benchmark stock assessment of American shad. The group feels that the SFMPs and the TC review process could be improved by standardizing the requirements for SFMPs and metrics used. It will also be beneficial to consider incorporating any new information coming out of the upcoming 2019 stock assessment for shad.

The TC requests that the Board task the TC with meeting in person to develop proposed improvements to Amendments 2 and 3 with regard to the following items:

- Management and monitoring of rivers with low abundance and harvest of shad and river herring
- Standardization of SFMP requirements: content, metrics, and management responses to triggers
- Incorporation of stock assessment information into SFMPs and discussion on the timeline for renewing plans
- Clarification of *de minimis* requirements as they pertain to SFMPs
- Review of the number of years of data are required before developing a SFMP

Shad and River Herring

Activity level: High

Committee Overlap Score: Moderate (American Eel TC, Atlantic Sturgeon TC, Striped Bass TC)

Committee Task List

- Benchmark Stock Assessment (due 2019)
  - TC ≈ January 15: Data Deadline
  - TC & SAS ≈ February: Data Workshop
  - SAS ≈ August: Methods Workshop
- TC – July 1: Compliance Reports Due

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