Peer Review Report

ID 294 - Designation of Critical Habitat for the Gulf of Maine, New York Bight, and Chesapeake Bay Distinct Population Segments of Atlantic sturgeon -- Biological Information, Economic Report and 4(b)(2) Impact Analysis.

Reviewers (listed alphabetically)
Michael S. Bednarski, Ph.D., Massachusetts Division of Marine Fisheries, New Bedford, MA

Jorge Holzer, Ph.D., University of Maryland, Department of Agricultural and Resource Economics, College Park, MD

Sabrina Lovell, Ph.D., NMFS, Office of Science and Technology, Silver Spring, MD

John Musick, Ph.D., College of William and Mary, Virginia Institute of Marine Science, Gloucester Point, VA

Leslie Richardson, Ph.D., U.S. Geological Survey, Social and Economic Analysis Branch, Fort Collins Science Center, Fort Collins, CO

David Secor, Ph.D., The University of Maryland System, Center for Environmental and Estuarine Studies, Chesapeake Biological Laboratory, Solomons, MD

Gail Wippelhauser, Ph.D., Maine Department of Marine Resources, Augusta, ME

Background
We are required to designate critical habitat based on the best available scientific data and after taking into consideration the economic impact, impact on national security and any other relevant impact, of specifying any particular area as critical habitat. We compiled a single source document that described the habitat needs of Atlantic sturgeon belonging to the Gulf of Maine, New York Bight, and Chesapeake Bay distinct population segments (DPSs) in U.S. waters, including the physical and biological features essential to each DPS that may require special management, and the economic, national security and other relevant impacts of designating critical habitat for each of these Atlantic sturgeon DPSs.

We solicited review of the biological information from the Atlantic States Marine Fisheries Commission, Sturgeon Technical Committee. Four Technical Committee members provided comments. We solicited review of the economic information from three economists and all provided comments. Reviewer comments for both the biological and economic information are provided below in their entirety. Comments are grouped by reviewer number and are not in the same order as the reviewer names above.

Reviewer 1
General Comment: I have reviewed the Draft Economic Analysis prepared by King and Associates, Inc. for the Greater Atlantic Region Fisheries Office, Protected Resources Division, NMFS, dated April 23, 2014. I found the report complete, and of high quality. The challenge

with producing a draft economic analysis in this case is that little is known at this time what types of critical habitat designations may occur and how they may impact landowners, federal and state agencies, small businesses or other entities. Without knowing what new requirements or actions may be required, economists cannot begin to measure those impacts in dollar terms with any certainty. The authors have done an admirable job of laying out all the possible activities that could be impacted in qualitative terms. Where they do have more information, is possible Section 7 consultation, and they have come up with estimated costs to conduct those consultations. I found their assumptions and values reasonable based on the information they had and prior NMFS costs for such consultations. The authors were very clear to identify all the uncertainties in their estimates and in their qualitative descriptions. I don't have any specific editorial comments, as I thought the report was well-written.

Comment 1: Note that Table 3-5 printed out so that part of the table was cut off at the margin. It probably should be oriented landscape rather than portrait.

Response: *It has been corrected.*

<u>Reviewer 2</u>
General Comment: In general the document appears to be sound despite the (necessary?) legal designations and jargon, which detract from a straight forward presentation that would be more understandable by the lay public.

Comment 1: Introduction, the term HUC is used with no previous full designation. I had no clue what this is, although it is elaborated further in the text.

Response: *We agree that we should have explained the term the first time it was used. Subsequent to the peer review, we decided to not use the Hydrographic Unit Code (HUC) system as the basis for delineating boundaries of potential Atlantic sturgeon critical habitat. Therefore, the term HUC (hydrographic unit code) was removed from the Executive Summary but is explained in section 4 of the document, the first time that it is used.*

Comment 2: Line 237, states there is "likely a fall run" in the James River. There is much information now accrued to state that the fall run is the major run there, and it is far bigger than the spring run. Also it is likely that fall runs occur and likely always occurred in rivers to the south and maybe also as far as New England. See Balazik et al. 2012, Balazik and Musick in review (PlosOne).

Response: *We agree. We have revised the text including adding information from and reference to the now published article by Balazik and Musick (full citation Balazik, M.T., J.A. Musick. 2015. Dual annual spawning races in Atlantic sturgeon. PLoS ONE 10(5): e0128234.*

Comment 3: Line 489 states that adult Atlantic sturgeon leave the River and are absent from "early summer to late August." This is incorrect. The fall spawning cohort enters the James River in May and June and stages in the middle tidal freshwater section until late August when the fish move up into the spawning reaches.

Response: *The text has been corrected.*

Comment 4: Lines 538-541 are stupidly unnecessary.

Response: *For the sake of transparency and clarity we had included the language, "The Team only considered in-water habitats (e.g., below the high tide line) to be part of the geographical area occupied by each DPS since Atlantic sturgeon do not naturally occur out of water and are not known to occupy habitats above the high tide line or waterline during any part of their life cycle for any length of time." However, we agree that this text is not necessary and we have deleted this text.*

Comment 5: Lines 714-718, I agree with these conclusions.

Response: *The complete paragraph is:*
"The occurrence of subadults and adult Atlantic sturgeon in non-spawning estuarine habitats and at times not known to be associated with spawning behavior strongly suggests that such habitats contain physical or biological features essential to the conservation of the Gulf of Maine, New York Bight, and Chesapeake Bay DPSs. Likewise, the repeated use of certain marine areas strongly suggests physical or biological features essential to the DPSs occur within these areas. However, we do not currently have the information necessary to identify the physical or biological features at a scale that would allow us to identify the specific areas within the geographical area occupied by each of the Gulf of Maine, New York Bight or Chesapeake Bay DPSs. Therefore, we are not proposing to designate any critical habitat for the Gulf of Maine, New York Bight or Chesapeake Bay DPSs within marine waters, bays or sounds at this time."

The text was modified subsequent to peer review. However, the overall conclusion remained the same. We are not proposing to designate any critical habitat for the Gulf of Maine, New York Bight or Chesapeake Bay DPSs within marine waters, bays or sounds at this time.

Comment 6: Line 766, you need a citation for the use of "Hydrologic Unit Code."

Response: *We have added Seaber et al. (1987) to the text (full citation is Seaber, P.R., F.P. Kapinos, and G.L. Knapp. 1987. Hydrologic Unit Maps: U.S. Geological Survey Water-Supply Paper 2294, 63 pp.).*

Comment 7: Line 1213, the Connecticut River should be high priority, not medium. You present evidence of ongoing spawning there and then ignore it.

Response: *We received comments from several reviewers on our approach to valuing each critical habitat unit. We reconsidered our approach based on the comments received and the best available information. We concluded that there is no basis to exclude any particular area*

from the proposed critical habitat designation. We have analyzed the economic, national security, and other relevant impacts of designating critical habitat, including the conservation benefits of the designation, both to the species and to society. Our conservative identification of potential incremental economic impacts indicates that any such impacts, if they were to occur, would be very small. No impacts to national security are expected to result from the proposed designation of critical habitat. The protection of critical habitat from destruction or adverse modification may at minimum prevent loss of the benefits currently provided by the listing of species and may contribute to an increase in the benefits of these species to society in the future. While we cannot quantify nor monetize the benefits, we believe they are not negligible and would be an incremental benefit of this designation.

Comment 8: Figure 11, the Critical Habitat designation figure extends above the fall line which is the line between Trenton and Morrisville. Therefore, following your definition of critical habitat in the Delaware, HUC 020402010404 should be the last in the Critical Habitat area.

Response: *HUC 020401050911 was included in the map because a small portion of the HUC occurs below the fall line. Subsequent to peer review, we decided to not use the HUC system for delineating boundaries of potential Atlantic sturgeon critical habitat because, in some areas, the HUC units include waters that are not part of critical habitat. Instead, we are using landmarks (e.g., bridges, dams) for the upstream boundaries of each critical habitat area. For example, the upstream boundary of the Delaware River Critical Habitat Area is at the crossing of the Trenton-Morrisville Route 1 Toll Bridge. Maps of each critical habitat area are available in the proposed rule.*

Comment 9: Figure 13, I'm not sure where this is but I don't think it shows the Susquehanna. The longitudes appear off.

Response: *Due to an editing error, the map shown was not of the Susquehanna River. New maps of each proposed critical habitat area are provided in the proposed rule and the Draft Biological Information and ESA Section 4(b)(2) Source Document.*

Comment 10: In general all the critical habitat figures need more place name labels so that it's easier for the reader to become oriented.

Response: *This has been corrected.*

Comment 11:
I had no time to look at Appendix A, but throughout the summary of the Economic Impacts, I was disturbed by the lack of any information of the impacts of critical habitat designation on existing fisheries.

Response: *We do not anticipate that existing fisheries will affect the physical features for reproduction and recruitment upon which the critical habitat areas are based; therefore, we do not anticipate needing to carry out section 7 consultations on the effects of existing fisheries on critical habitat. Therefore, there would be no costs associated with existing fisheries. Also, because no effects are anticipated, there are no anticipated impacts to fisheries.*

Reviewer 3

General Comment: All information presented within the document was relevant and of the highest quality. I applaud the authors for performing such a comprehensive review of available information, knowing full well that much of the information needed to construct this document is based on ongoing research efforts, and thus, difficult to obtain.

The authors reasonably identified and characterized the uncertainties in the information presented. This was readily apparent in their discussion of critical habitats outside of river systems that supported spawning and/or rearing. They acknowledged that although nearshore oceanic habitats are extremely important to Atlantic sturgeon, existing data simply does not have the resolution needed to designate specific areas.

The authors did a commendable job presenting the rationale for proposed critical habitat in each river identified. Their approach of using the 12 digit HUC, the mouth of the river, and the first barrier to migration as the boundaries of critical habitat provides a definite boundary to the extent of protected habitats. Because spawning and rearing occur in these areas, the protection of these habitats is likely to foster recovery of the species.

The authors also did an excellent job discussing why they did not designate any critical habitats in nearshore oceanic habitats. They discussed the lack of information available and how it would be inappropriate to designate all nearshore habitats as critical habitat. The information gaps that they discussed will help to guide future Atlantic sturgeon research that could be used to designate critical habitats in nearshore oceanic waters.

Comment 1: The authors appear to have considered all river systems relevant to the Chesapeake Bay DPS (CB) in a complete, accurate manner. However, information relevant to designating critical habitats in the Gulf of Maine DPS (GOM) and the New York Bight (NYB) was lacking from the document.

Within the GOM section, the authors excluded any discussion of the St. Croix and Sheepscot Rivers, Maine. Both of these river systems are listed in the 2007 status review of Atlantic sturgeon presented to NOAA as serving as nursery habitat and possibly serving as spawning habitat. Information about both of these systems should be reviewed and incorporated into the document.

Within the New York Bight DPS (NYB), the authors did not discuss the Taunton River, Massachusetts. This system is listed in the 2007 status review as historically supporting Atlantic sturgeon spawning, not supporting existing spawning, and currently serving as nursery habitat. Information about the Taunton River should be included within the document, particularly because the Housatonic River, which does not support current spawning, was included for consideration.

I want to stress that I am not recommending that critical habitat be designated within the St. Croix, Sheepscot and Taunton Rivers, only that I am requesting these systems are discussed

within the document. It may be reasonable to exclude habitats within these systems from a critical designation as the authors did for the Union and Housatonic Rivers.

Response: *The rivers discussed in the document are those for which we have information indicating the physical features of successful spawning and recruitment are currently present and may require special management or protection. Given the vast number of rivers within the range of the Gulf of Maine, New York Bight, and Chesapeake Bay DPSs, we did not include discussion of rivers for which we either: (1) have information to conclude that the physical features that may require special management or protection are not present, or (2) do not have information on whether the physical features that may require special management or protection are present. In regard to the specific rivers mentioned in the comment, we have no information to indicate that the physical features necessary for successful spawning and recruitment are present in the St. Croix, Sheepscot or Taunton rivers.*

In response to the comment, we have added text, clarifying that other areas may meet the requirements for critical habitat designation in the future if additional information becomes available.

Comment 2: The authors effectively justified their designations and applied available information correctly for the rivers that they considered. I agree with their decision to exclude the Union and Housatonic Rivers from critical habitat designation. I also agree that the information they presented provides justification for the designation of critical habitats in the rivers considered.

Response: *We received comments from several reviewers on our approach to valuing each critical habitat unit. We revised the approach in response to the comments. As a result, the Housatonic River, from the Derby Dam downstream to where the main stem discharges at its mouth into Long Island Sound, is included in the critical habitat designation. The Union River is not included for reasons explained in the rule.*

<u>Reviewer 4</u>

Comment 1: My primary concern refers to the indistinct use throughout the document of the concepts of economic benefits & costs and economic impacts, as if they were interchangeable synonyms. Cost-benefit analysis and economic impact analysis are different approaches, seek to address different questions and imply different data requirements.

Cost-benefit analysis estimates the costs and benefits of a particular project or policy, in order to determine its economic value (benefits-costs), or its net contribution to society. By comparing net benefits of different projects and policies, it can be decided which ones should be undertaken (i.e. if the goal is efficiency). On the other hand, economic impact models trace the flow of expenditures through a region and show the distribution of impacts between industries, households and government. They can be used to describe the multiplier effects of expenditures throughout the economy. Unlike economic value, there are several potential measures of economic impact: in terms of business output, value added, personal income, and jobs.

The distinction above is relevant since there may be a trade-off between economic value and economic impact (e.g. it is possible for a project to generate lots of employment but for its costs to exceed the benefits). As currently written the report seems to attempt to do both, to look at net benefits and the potential impacts (in terms of employment) of critical habitat designation for the DPSs of Atlantic sturgeon, but at the same time, thus compromising the clarity of the document. Structuring the report so that the cost-benefit and the economic impact analyses, and the data informing each, are clearly distinguished, would significantly improve the document. Most of the information is already there, but needs to be reorganized. For example, how do the employment data for the counties in each habitat unit, provided in the "Economic Baseline" section, inform the rest of the analysis? Presumably, the idea for presenting employment data broken down by industry at the regional level is to assess job impacts associated with likely project modifications due to the critical habitat designation (i.e. consultations are unlikely to impact jobs). Thus, if information were available on the projects that would need to be modified due to the designation –and the authors do a good job in identifying the type of activities where project modifications may be expected– it would be possible to determine job impacts for the counties in the habitat unit (i.e. by tracing the modification back to the corresponding industry, and then using input-output models that capture inter-industry transactions among businesses and between businesses and final consumers in the regional economy). However, it is not clear to this reviewer how that same data would inform the cost-benefit analysis.

Response: *OMB Circular A-4 states that proper evaluation of the benefits and costs of regulations requires: (1) explaining how the actions required by the rule are linked to the expected benefits; (2) identifying an appropriate baseline; and, identifying the expected undesirable side effects and ancillary benefits of the final rule. We agree the report does provide the necessary information, and we appreciate the feedback on how that information is presented in the document. We are providing the Draft Economic Analysis for public comment, but will consider reorganizing the information for the final document once public comment has been accepted and considered.*

Comment 2: When identifying benefits (from use and non-use) associated with the critical habitat designation, it would be useful to be explicit about the likely counterfactual (i.e. the likely scenario for the distinct population segments of Atlantic Surgeon without designation of critical habitat). This is probably difficult to assess, but it should be discussed at least qualitatively. There seem to be quite a lot of redundancy in the protection of the Atlantic sturgeon habitat as provided by existing laws and regulations. Unless the designation of critical habitat translates into enhanced protection for the DPS in the future when compared with the baseline, it is not clear where the direct benefits of the designation come from. As written, it is not obvious from the report that the critical habitat designation will provide additional protection to Atlantic sturgeon.

Response: *We agree that the economic analysis does not explicitly describe the likely benefits of designating critical habitat for the Gulf of Maine, New York Bight, and Chesapeake Bay DPSs. Our approach was to provide the economics information in this document and then the assessment of what it means in terms of conservation impacts in the 4(b)(2) document and in the proposed rule (e.g., see page 33 of the Draft Biological Information and ESA Section 4(b)(2) Source Document).*

Comment 3: Regarding the costs associated with critical habitat designation, specifically the costs associated with project modifications, the report provides ranges of costs per activity type, activities that the authors have previously identified as the ones that may be subject to modifications. However, the authors then assume that the costs of project modifications are near zero. Is this done because it is difficult to anticipate the number of project modifications, or because it is really expected this number to be zero? In this latter case, without expected project modifications, where are the impacts (on jobs, sales, etc.) coming from? This should be clarified in the text. At present, only administrative costs due to consultations are included in the report. Aren't there any costs associated with the monitoring and enforcement of the designated critical habitat units?

Response: *During November 2013 through February 2014, personnel at relevant federal agencies were contacted to review and comment on preliminary projections of Section 7 consultations that were based on the ten year Section 7 consultation history. Each office was asked to answer several questions including how many and what type of project modifications resulted from past consultations, and what were their expectations regarding current, planned or proposed projects in each river unit that may require consultation and result in incremental project modifications. The federal action agencies did not identify any past project modifications that would have been necessary as a result of Atlantic sturgeon critical habitat having been designated or any incremental project modifications that are likely to result from this designation in the future. Therefore, based on the available information, the authors concluded that incremental project modifications were unlikely to occur as a result of the critical habitat designations. However, to be cautious, the authors did not discount the potential that section 7 consultation stemming from these designations may, sometime in the future, result in project modifications and associated costs. Therefore, for context, the authors included information on the project modification costs produced for section 4(b)(2) impacts analyses from critical habitat designations for west coast salmon species.*

All incremental impacts of the proposed designation consist of administrative costs of section 7 consultation. Administrative costs include the cost of time spent in meetings, preparing letters, and in some cases, developing a biological assessment and biological opinion.

Comment 4: The employment data in the counties in each habitat unit is from 2011. Are these the latest data available? Is there information on business sales per industry in the counties in each habitat unit? What about information on the number of small business per industry for the counties in the different habitat units (a table similar to Table 4-1, but broken down by industry)? Is there additional information on the trend of employment for the industries? This could be depicted by presenting employment figures for two points in time, rather than one.

Response: The employment data was what was available when the report was drafted. We are presenting the Draft Economic Analysis for public comment, but will consider the information available for the final document once public comment has been accepted and considered.

Comment 5: Is there data from previous critical habitat designations supporting the stigma impact (i.e. reduction in real estate market value)? As presented it is just a conjecture without much evidence to support it. The same applies to the case of regulatory uncertainty (p. 99).

Response: *There is no data from previous critical habitat designations supporting the stigma impact. However, in light of the paucity of data, it is informative to consider what other impacts may occur solely as a result of the critical habitat designations.*

Reviewer 5

General Comment: Researchers at the Maine Department of Marine Resources (Gail S. Wippelhauser), University of Maine (Gayle B. Zydlewski and Michael T. Kinnison), University of New England (James Sulikowski) and U.S. Geological Survey (Micah Kieffer) have been conducting acoustic telemetry studies of Atlantic sturgeon in the Gulf of Maine that began as early as 2006. We are currently working on a manuscript for publication, and have been analyzing movements of tagged Atlantic sturgeon within river systems, between river systems, along the coast within the Gulf of Maine, and along the coast to the south of the Gulf of Maine. Some of these data were not available when the draft was being developed, and are summarized below. In addition, I queried the Maine Department of Marine Resources ME-NH Inshore Trawl Survey database for captures of Atlantic sturgeon from 2000-2013. Telemetry data for the years 2006-2013 support the identification of areas of the Penobscot River as far upstream as Veazie Dam, areas of the Kennebec River as far upstream as Lockwood Dam, areas of the Androscoggin River as far upstream as Brunswick Dam, and areas of the Merrimack River as far upstream as Essex Dam (aka Lawrence Dam) as critical habitat units.

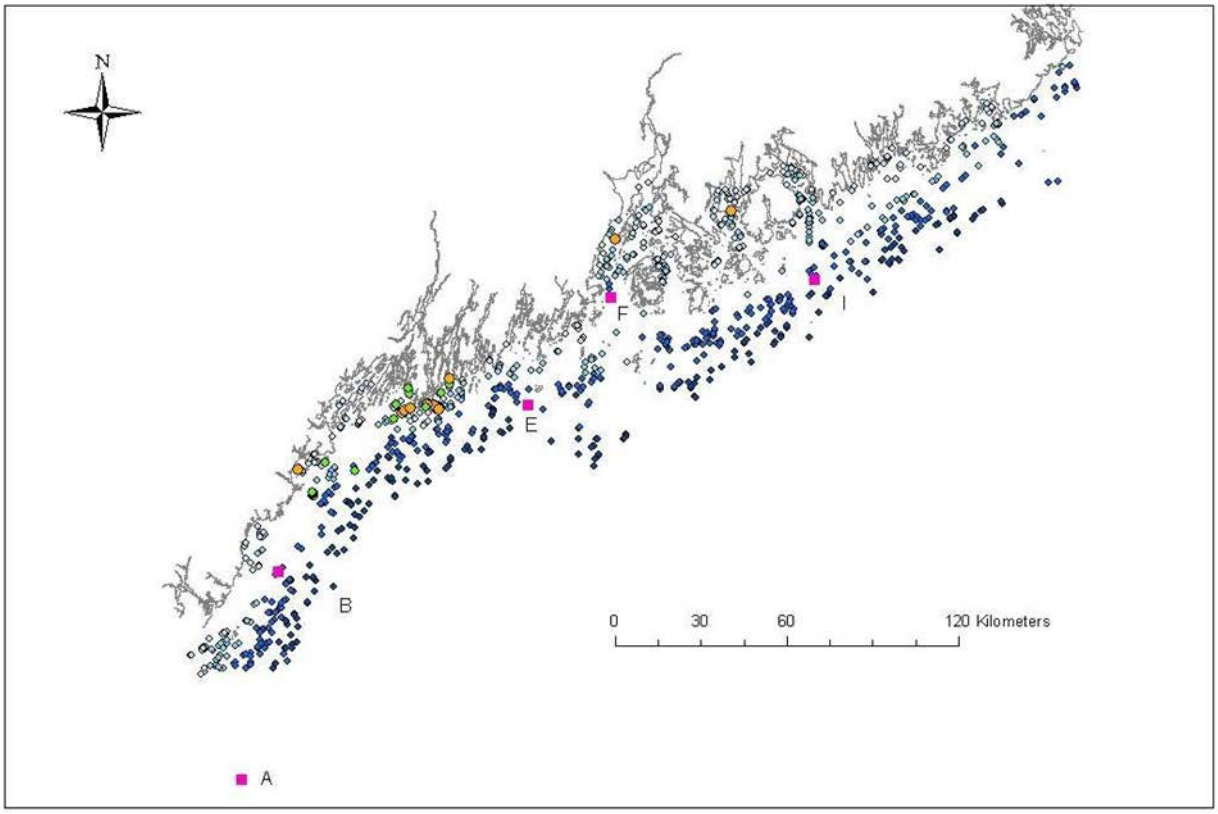
Comment 1: Veazie Dam was removed in the summer of 2013, and Atlantic sturgeon could not have occupied habitat above the dam until 2014. However, there are historical records to indicate that the species occupied habitat to the current location of the Milford Dam. Harold M. Brundage (***email address removed***) sampled in the Piscataqua River in 2014 under my permit, and may be able to provide information on the presence of Atlantic sturgeon in that river system.

Response: *This comment is consistent with the proposed critical habitat designation. The geographic area occupied by Gulf of Maine DPS Atlantic sturgeon includes the Penobscot River as far upstream as Milford Dam (the current accessible upstream limit) and the Piscataqua River throughout its length and to the lowermost dams on the Cocheco and Salmon Falls rivers, respectively. In addition, the physical features of successful spawning and recruitment that may require special management or protection occur in the Penobscot and Piscataqua Rivers. Therefore, critical habitat for the Gulf of Maine DPS includes the area of the Penobscot River from the Milford Dam downstream to where the main stem discharges at it mouth into Penobscot Bay, and includes the Piscataqua River from its confluence with the Salmon Falls and Cocheco rivers downstream to where the main stem discharges at its mouth into the Atlantic Ocean as well as upstream from the confluence to the Cocheco Falls Dam on the Cocheco River, and the Route 4 Dam on the Salmon Falls River.*

Comment 2: The reason the Union River was considered as potential critical habitat is unclear, and does not seem to stem from criteria 1 and 2. There is no historical data indicating Atlantic sturgeon spawned in this river system and similar river systems such as the St. Croix and

Machias were dismissed as potential spawning habitat by the ASSRT (2007). In addition, just one Atlantic sturgeon has been caught east of Penobscot Bay in the ME-NH Inshore Trawl Survey since 2000 (Figure 1). The five critical habitat units identified for the Gulf of Maine are large river systems that have habitat suitable for spawning and juvenile foraging and sufficient water depth and lack of barriers to allow movement between the river mouth and spawning areas.

Figure 1. Location of ME-NH Inshore Trawl Survey stations negative for Atlantic sturgeon (diamonds in shades of blue) or positive for Atlantic sturgeon in spring (green diamonds) or fall (orange diamonds). Locations of NERACOOS buoys with receivers are also shown (pink squares).



Response: *We initially identified the Union River as a potential critical habitat area for the Gulf of Maine DPS because* ***t****he Union River is part of the geographical area occupied by the Gulf of Maine DPS and the physical features of successful spawning and recruitment that may require special management or protection are present. However, we agree with the comment that there is no evidence that sturgeon are using the Union River for spawning now or that they used the Union historically for spawning. Consequently, while the physical and biological features are present in the Union River, we do not consider them to be essential to the conservation of the species and, therefore, we did not include the Union River in the critical habitat designation for the Gulf of Maine DPS.*

Comment 3: Figure 3 identifies the Sebasticook River as critical habitat, however, there are no data to support this determination. There is no historical information indicating Atlantic sturgeon used this river system, the river becomes quite shallow in places after May 31, and Benton Falls Dam is located approximately 5 miles above the confluence of the Sebasticook and the Kennebec. A receiver deployed near the mouth of the Sebasticook in 2009 did not detect any acoustically tagged fish. Is it possible that designation of the Penobscot River between Veazie and Milford and the Sebasticook River is the result of using the 12-digits HUC units to delineate critical habitat?

Response: *We are not proposing to designate any part of the Sebasticook River as critical habitat for the Atlantic sturgeon DPSs. Using the 12-digit HUC units led to the appearance of the Sebasticook River as critical habitat. Subsequent to peer review, we decided to not use the HUC system for delineating boundaries of potential Atlantic sturgeon critical habitat.*

Comment 4: We concur with designation of the Kennebec and Androscoggin as high priority areas. Between 2010 and 2014, three (9%) of 35 fish tagged in the Kennebec System, three (7%) of 43 tagged in the Penobscot River, nine (18%) of 51 tagged in the Saco River, and six (30%) of 20 tagged in the Merrimack River were detected at a spawning area in the Upper Kennebec Estuary, the restored Kennebec River, and/or the Androscoggin Estuary.

Response: *We received comments from several reviewers for our approach to valuing each critical habitat unit. We revised the approach and text in response to the comments. However, this change in approach did not change our conclusions for the Kennebec and Androscoggin critical habitat units. We are proposing to designate as critical habitat the Kennebec River main stem from the Ticonic Falls/Lockwood Dam downstream to where the main stem river discharges at its mouth into the Atlantic Ocean, and the Androscoggin River main stem from the Brunswick Dam downstream to where the main stem river drainage discharges into Merrymeeting Bay.*

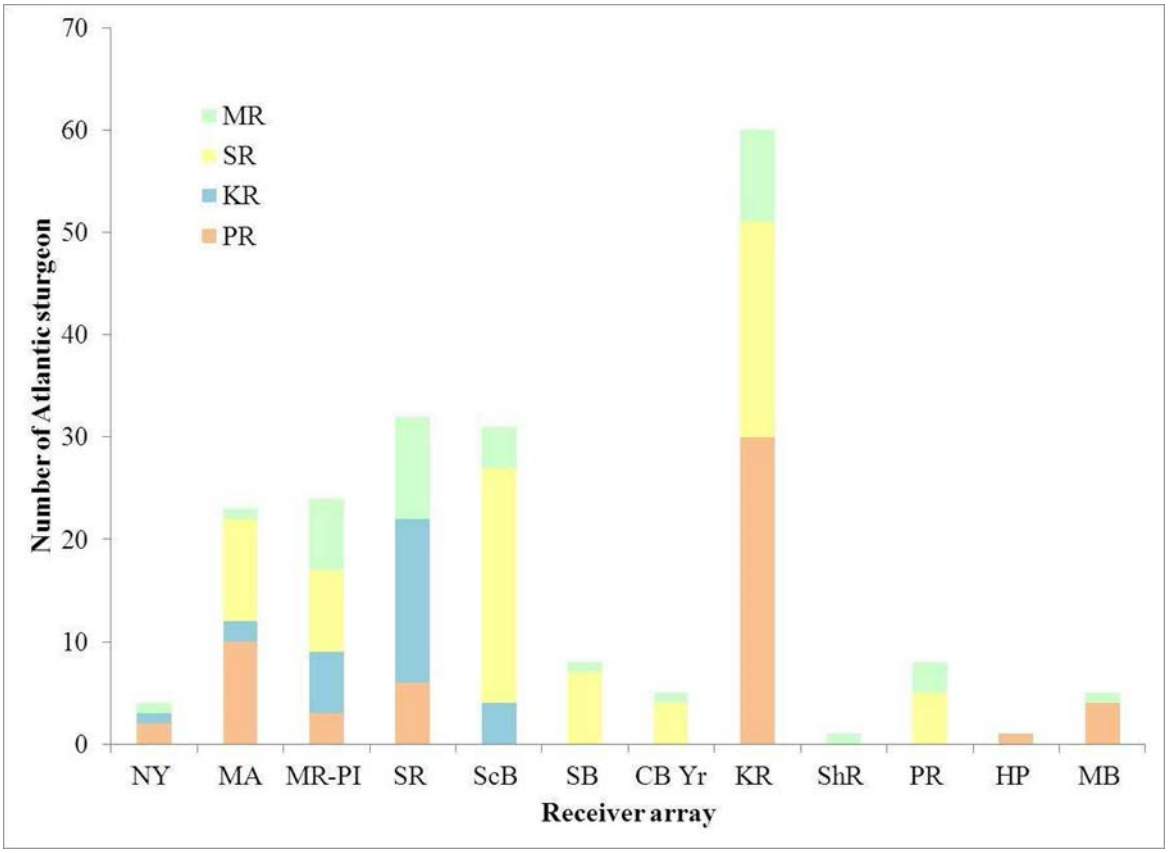
Comment 5: Critical habitat in the marine or estuarine environment that is used for activities other than spawning was not identified because existing information was confounding. Nonetheless, I provide information not available when the draft was being developed that indicates the importance of the Saco River for foraging. Gill net sampling for the years 2006-2013 clearly shows that Atlantic sturgeon occupied the Saco River before and during the time of the listing (Table 1) and telemetry data demonstrates they were Gulf of Maine DPS Atlantic sturgeon. Between 2010 and 2013, 17 adult Atlantic sturgeon caught in the four river systems and internally tagged were detected at spawning areas in the Kennebec System, including nine (19%) of 51 tagged in the Saco River, three (7%) of 43 tagged in the Penobscot River, and four (23%) of 17 tagged in the Merrimack River. Telemetry data also shows that fish tagged in the Penobscot, Kennebec, and Merrimack River systems commonly visit the Saco River (Figure 2). Critical habitat in the Saco River extends about 10km from the river mouth to the Cataract East Channel and West Channel Dams. Research conducted by Ashleigh Novak and Dr. James Sulikowski and presented at the Northeast Area Fish and Wildlife Conference in 2014 indicates this is an important foraging area.

Table 1. Summary of Atlantic sturgeon caught in four Gulf of Maine river systems from 2006-2013.

Atlantic sturgeon

River system	Disposition	2006	2007	2008	2009	2010	2011	2012	2013	Total
Penobscot	Captured	7	28	14	28	41	15	33	35	201
	Recaptured				1	6	3	2	8	20
	PIT tagged	5	28	14	27	35	12	31	27	179
	Acoustic tagged	4	5	10	11	8	5			43
	Mortalities	2			1					3
Kennebec	Captured				8	11	37	62	21	139
	Recaptured									0
	PIT tagged				3	11	36	58	20	128
	Acoustic tagged				5	8	11	16	15	55
	Mortalities									0
Saco	Captured				33	55	96	68	103	355
	Recaptured				1			8	6	15
	PIT tagged				33	54	68	66	102	323
	Acoustic tagged				21	19	3	3	5	51
	Mortalities									0
Merrimack	Captured				9	10			4	23
	Recaptured								1	1
	PIT tagged				9	10			3	22
	Acoustic tagged				7	10			3	20
	Mortalities									0

Figure 2. Number of Atlantic sturgeon detected by arrays in New York (NY) , Massachusetts (MA), Merrimack River and Plum Island (MR-PI), Saco River (SR), Scarborough Beach (ScB), Saco Bay (SB), Casco Bay (CBYr), Kennebec River (KR), Sheepscot River (ShR), Penobscot River (PR), Head Pass (HP), and Minas Basin (MB) that were caught and tagged in the Merrimack River (green), Saco River (yellow), Kennebec River (blue), and Penobscot River (salmon).



Response: *We considered the best available information for what Atlantic sturgeon subadults and adults need to successfully forage (e.g., specific foraging sites in the marine and/or estuarine environment, the type of prey, prey density, substrate type). However, while we know there are specific estuarine areas repeatedly used for foraging (e.g., the mouth of the Merrimack and Saco rivers), we could not identify what the specific features are that make these habitats important to sturgeon. Therefore, we did not identify any physical or biological features for subadult and adult foraging for the Gulf of Maine, New York Bight, and Chesapeake Bay DPSs of Atlantic sturgeon. We will consider new information as it becomes available and could designate additional critical habitat in the future.*

<u>Reviewer 6</u>

General Comment: There has been strong investment by NOAA and state/academic partners in Atlantic sturgeon research during the past 6 years. The team did a very able job in characterizing the most recent information and judiciously applying caution, where we are literally learning something new on a monthly basis. As the most recent example, USGS geneticist Tim King confirmed that the Nanticoke River/Marshyhope Creek harbors a separate Chesapeake Bay DPS

population in a report to MD DNR just this month! I think it is laudable that the team has not set arbitrary deadlines, data workshops, etc. in compiling data for this report. The team also exercised caution in not over-interpreting lower estuary and shelf movements by sturgeons, where arguably most Section 6 research investments have been made. Movements are complex and data remain under-analyzed and incomplete. I think the team did an able job trying to characterize the diversity of these movements. Still, as suggested below I think general movements from NOAA observer data sets could be used to frame these diverse coastal movements. Commendable that the team used Section 6 progress reports. Specific examples of threats are well stated and well considered in their inclusiveness in this section (lines 740-758).

Comment 1: Uncertainty was recognized but I thought uncertainty could have been treated in (1) a more systemic manner and (2) a more precautionary and adaptive framework. The principal criteria for designating HUCs as Critical Habitat centered on reproductive/early nursery habitats yet the evidence for these criteria ranged widely including collection of eggs (albeit in Roanoke outside of the three DPSs), collection of gravid adults, telemetry records of adults in up-estuary regions, collection of young-of-year (YOY) or age 1-3 year old juveniles. I think these types of evidence can easily be classified and ranked in terms of certainty that local reproduction is occurring. My ranking would be highest → lowest: egg → larva → gravid (running ripe) adult → YOY <25 cm Total Length (TL) → telemetered adult→ juvenile >25 cm TL, although I recognize there could be other rankings that might be valid emerging from team deliberations. I think that classifying levels of certainty with evidence will make the process of designating critical habitat far more transparent.

Response: *We reviewed our approach in light of comments from several reviewers. We concluded that ranking the critical habitat areas was unnecessary given that the features that form the basis of the critical habitat designation are essential to the conservation of the Gulf of Maine, New York Bight, and Chesapeake Bay DPSs of Atlantic sturgeon. The protection of critical habitat from destruction or adverse modification may at minimum prevent loss of the benefits currently provided by the listing of species and may contribute to an increase in the benefits of these species to society in the future. These are an incremental benefit of this designation. Therefore, all of the proposed critical habitat areas are beneficial, and there is no basis to exclude any particular area from the proposed critical habitat units.*

Comment 2: Secondly there is a sense of final deliberation in this document, particularly with respect to the Exclusion Analysis. If there is anything that discovery of whole new reproducing populations in the Chesapeake DPS has shown us, it is that we are very likely going to discover new reproducing populations. If there is anything that the large investment in coastal telemetry has told us it is that sturgeon are ubiquitous but exhibit unique seasonal movements. For instance, it seems likely (although not yet fully supported) that important regional fall and spring concentration and corridor habitats exist in the approaches to the Hudson, Delaware, and Chesapeake systems for instance. These regions and times intersect with substantial fisheries and navigation activities, which I thought merited additional discussion in the document, presaging a time when telemetry and other data might support more definitive classification of these regions as concentration/forage/corridor habitats. Because we are still very much in the discovery phase of conserving Atlantic sturgeon, I think this document in its conclusions should state more clearly that exclusions and application of criteria in designating critical habitats are

being made in an adaptive framework, where it highly likely that these habitat designations will need to be modified in the next five-year (or some other moderate term) time frame. I admit that I do not know how often these documents can be revisited but with the large investments in research just now coming to fruition, it would seem incautious and penny-wise/pound-foolish not to revisit these habitat designations in the near term.

Response: *The proposed critical habitat designations are based on the best available information. We will consider new information as it becomes available and consider whether to revisit the critical habitat designations. We have added text to the Executive Summary on this point.*

Comment 3: Executive summary – why list Connecticut River as critical habitat – what evidence is there that this is a sturgeon spawning river? For Chesapeake DPS, Marshyhope and Nanticoke should be listed as critical habitat. Given recent discovery of sturgeon spawning there, it is also difficult to discount the Choptank and Pocomoke as potential spawning habitat.

Response: *We believe spawning may be occurring in the Connecticut River given the small size of the juveniles captured in the River in 2014. We also have information indicating the physical features for successful spawning and recruitment are present in the Connecticut River and may require special management or protection.*

The available information (e.g., capture of adults in spawning condition) suggests spawning may be occurring in Marshyhope Creek of the Nanticoke River. However, we currently lack information on whether the physical features that may require special management or protection are present in the Nanticoke River, Marshyhope Creek or, similarly, the Choptank and Pocomoke Rivers. We will consider new information as it becomes available and could designate additional critical habitat in the future.

Comment 4: Line 218, Different DPS sturgeon also co-occur in estuaries including proposed critical areas – e.g., Hudson DPS sturgeon in Chesapeake; James DPS sturgeon in Delaware Estuary.

Response: *With respect to the sentence, "Tagging and tracking studies as well as genetic analyses have shown that Atlantic sturgeon of different DPSs or different river origin co-occur in the marine environment", we agree with the comment. The text has been revised.*

Comment 5: Line 224. Statement here seems to imply that all or a majority of sub-adults/adults ascent estuaries/rivers for spawning when this is likely not the case.

Response: *The statement, "In general, subadult and adult Atlantic sturgeon move northward along the coast in the spring to large estuaries and their associated tidal rivers", was not meant to imply all or a majority of sub-adults/adults ascend estuaries/rivers for spawning. The text has been revised.*

Comment 6: Line 237. Fall spawning more than likely given capture of egg in North Carolina system and very ripe adults. It may be the dominant spawning contingent in some rivers and merits additional emphasis.

Response: *The text, "The spawning season for Atlantic sturgeon is typically considered to be spring although there is likely a fall spawning season in some rivers as evidenced by capture or tracking of adult sturgeon in spawning condition" has been revised, adding information on the rivers in the Chesapeake where we have evidence of fall spawning.*

Comment 7: Line 250-276. Clearly we are in a discovery phase in understanding seasonal movements of Atlantic sturgeon as the team struggles to generalize these behaviors in this segment of the report. I think a topic statement should include this idea. Still fishery bycatch data does indicate strong seasonality in distribution data. I think this is a better place to start and then move onto movement data, which is clearly showing a more complex picture.

Response: *We did not include a topic statement but the movement information was revised to address uncertainty.*

Comment 8: Line 375. Discovery of age-0 juveniles is late breaking news and suggests that it is precautionary to include the Delaware. Still, age-0 size ranges has been controversial and sturgeons >30 cm can undertake coastal migrations. It would be good to list the size length and indicate uncertainty about early size-age relationship.

Response: *The text was revised in response to the comment.*

Comment 9: Line 390-394. These spawning substrates –silt and clay- are believed not to be conducive for spawning habitat indicating we don't really know where these sturgeon are spawning. Evidence comes merely from spawning adult incidence, not collection of eggs, which can be more definitively linked to spawning habitat. The key finding that no eggs have been collected associated with spawning for any Greater Atlantic DPS is worth emphasizing. (Eggs were recently sampled for Roanoke sturgeon).

Response: *We agree. We have revised the text and added additional background information and references in section 3-Biological Information.*

Comment 10: Line 418. The statement that tagged sturgeon made 20 spawning migrations in the DE River is vague. Which tagged fish undertook these migrations – how were they distributed among tagged individuals?

Response: *The statement comes from the cited document (i.e., Breece et al., 2013). We agree that the statement is vague. Since we do not have the data from the study, we have omitted the statement and, in its place, describe what Breece et al. observed (e.g., each of the tracked sturgeon spent days in low-salinity waters during the time of year when spawning is believed to occur).*

Comment 11: Line 427. As indicated above, the team should take care in how they define YOY because often times many investigators would consider these 1+ sturgeon. Here this section gives the impression of YOY movements when I think it is likely referencing the movement of age 1 and 2 year old fish. We know very little about fish <10 months of age.

Response: *The text was revised in response to the comment.*

Comment 12: Line 465. I find the statement that the NY DPS is most prevalent in Chesapeake surprising. What sample showed this? Is this sample from coastal VA/MD waters or from the Chesapeake Bay proper?

Response: *We have revised the text in the document. For background, we initially used information from King et al., 2001 (complete citation is King, T.L., B.A. Lubinski, and A.P. Spidle. 2001. Microsatellite DNA variation in Atlantic sturgeon (Acipenser oxyrinchus oxyrinchus) and cross-species amplification in the Acipenseridae. Conservation Genetics 2:103-119). King et al., provided the results of assignment tests for sub-adult Atlantic sturgeon collected in the Chesapeake Bay. Three scenarios were considered for making assignments since it was not known at that time that there were spawning populations in the area. The Chesapeake Bay collection was treated as: an independent reproducing population for scenario A; an unknown collection and forced into one of the other six populations for scenario B; and, as both an independent population and an unknown collection for scenario C. For scenarios A and C, assignments to the Chesapeake were greater than to any of the other six possible assignments but were less than the combined assignments for the Hudson and Delaware Rivers. Since the Hudson and Delaware rivers are the known spawning rivers for the New York Bight DPS, we concluded that the New York Bight DPS was the most represented DPS in the Chesapeake based on the information presented in King et al., 2001.*

We reconsidered our conclusion and interpretation of the information presented in King et al., given the extensive information that has become available since 2001. First, we know that there are spawning populations in the Chesapeake and these are a DPS. In addition, analyses for the 2007 Atlantic sturgeon status review resulted in a genetics baseline. The publications that use this baseline (Laney et al., 2007; Dunton et al., 2012; Wirgin et al., 2012; Waldman et al., 2013; O'Leary et al., 2014; Wirgin et al., 2015a; Wirgin et al., 2015b) provide the best available information.

Comment 13: Line 480. I find it unlikely that these are hatchery progeny given mixed size distribution and evidence of past incidence of adult sturgeon in the Nanticoke River (the justification for the release). Also, the Marshyhope location was outside of the frame of releases and habitat location seemed quite specific. I think sufficient evidence (more so than for CT river for instance) exists to list Marshyhope-Nanticoke as critical habitat. (Late breaking news (February 2015): Report by USGS scientist Dr. Tim King to MD DNR indicates these adults are a unique separate population most closely related to the York River population.)

Response: *As mentioned above, we believe spawning may be occurring in Marshyhope Creek given capture of adults in spawning condition. However, to designate critical habitat, we must identify specific areas that contain the features essential to conservation that may require special*

management or protection. We lack information on whether the physical features essential to conservation that may require special management or protection are present in Marshyhope Creek or, if they are present, the specific areas that contain the features. Therefore, we have not proposed to designate critical habitat in Marshyhope Creek. We will revisit this decision as new information becomes available.

Comment 14: Line 499. These conditions seem solid evidence for fall spawning. Indeed similar level of evidence does not yet exist for spring spawning contingent in James. Also this same level of evidence exists for Pamunkey and the Marshyhope. Perhaps it would be useful for the team to operationally define different certainty levels for spawning habitat designation.

Response: *We agree with the comment that solid evidence of fall spawning exists for the James River and Pamunkey River, as well as evidence of likely fall spawning in Marshyhope Creek. We have revised the text.*

Comment 15: Line 577. Care has to be given to what we don't know. Where spawning has not been verified we cannot assume it does not occur. Suggest changing this statement given evidence for increased spawning tributaries, particularly in the Chesapeake.

Response: *We agree and revised the text.*

Comment 16: Line 615. Kynard has called attention to importance of refuge habitat for YOY sturgeons. This should be considered here – availability of structured juvenile habitat.

Response: *We considered the available information and revised the text to include the need for habitat providing refuge.*

Comment 17: Line 625. The principal recovery objective of increasing first year survival is strongly supported by life table analysis – Gross et al. 2000.
Gross, M. R., J. Repka, C. T. Robertson, D. H. Secor and W. Van Winkle. 2002. Sturgeon conservation: insights from elasticity analysis. Am. Fish. Soc. Sympos. 28: 3 10.

Response: *This document focuses on the habitat needs and does not repeat or further discuss the status of each DPS that was previously described in the listing rules. However, we appreciate the feedback on the literature and modeling that supports our identified conservation objective.*

Comment 18: Line 643-646. In that YOY are caught in littoral zones suggests that shallow turbid and SAV could play a role as predation refuge absent hard substrate, which is rare in some of the natal habitats, particularly for Chesapeake DPS.

Response: *We agree that the presence of young-of-year in littoral zones suggests those habitats are essential to the age class. However, we do not currently have information that shallow turbid and submerged aquatic vegetation provides refuge for young-of-year. Therefore, we have not used these as physical or biological features to identify critical habitat.*

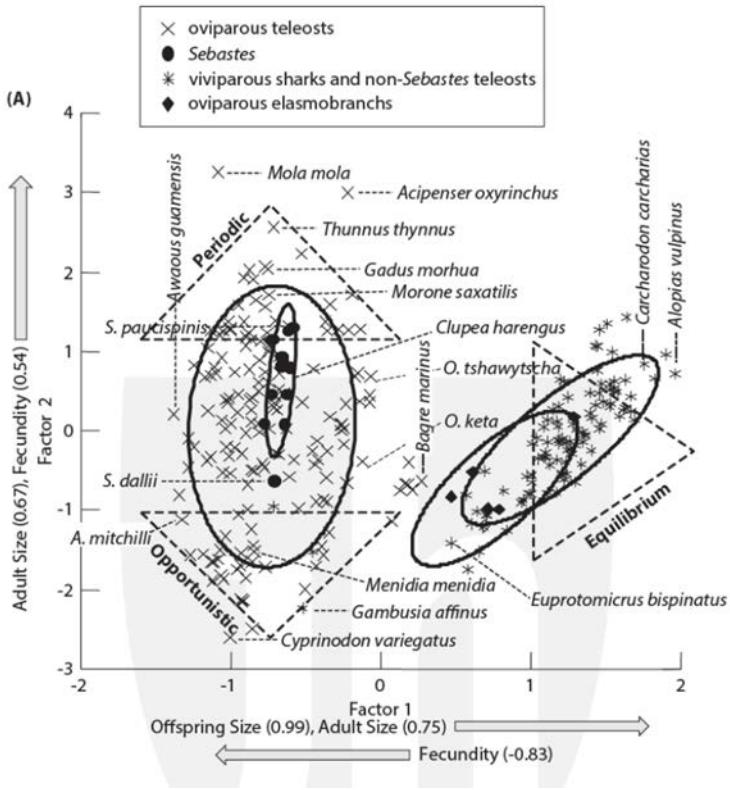
Comment 19: Line 657. This seems strange – allowing sturgeon to spawn once but preferably more. Everything about their periodic life history indicates that they can only recover if allowed to spawn multiple times to sample early survival conditions that only infrequently support strong recruitments – Gross et al. 2000; Secor and Waldman 1999, Secor 2015.

Secor, D. H. and J. R. Waldman. 1999. Historical abundance of Delaware Bay Atlantic sturgeon and potential rate of recovery. Am. Fish. Soc. Symp. 23:203-216.

Secor, D.H. 2015. Migration Ecology of Marine Fishes. Johns Hopkins Univ. Press. 304 p. http://tinyurl.com/pf8lp7y

Excerpted figure from Migration Ecology of Marine Fishes showing that Atlantic sturgeon epitomize fish with periodic life history strategies, requiring repeated spawning for replacement.

Figure 4.10. Life history trait associations for teleosts and elasmobranchs. (A) Factor analysis of adult size, offspring size, and batch fecundity for 288 species of teleosts and elasmobranchs. Loadings for each factor are presented for Factor 1 (*x* axis) and Factor 2 (*y* axis). End-member trait associations—periodic, opportunistic, and equilibrium—follow those of Winemiller and Rose (1992). For different reproductive groups, 67% confidence ellipses are shown. (B) Factor loadings (F1 and F2) are shown for separate reproductive groups (see fig. 3.3). Example species include *Mola mola* (ocean sunfish), *Acipenser oxyrinchus* (Atlantic sturgeon), *Thunnus thynnus* (Atlantic bluefin tuna), *Gadus morhua* (Atlantic cod), *Morone saxatilis* (striped bass), *Clupea harengus* (Atlantic herring), *Oncorhynchus tshawytscha* (Chinook salmon), *Oncorhynchus keta* (sockeye salmon), *Sebastes paucispinis* (Bocaccio), *Sebastes dallii* (calico rockfish), *Anchoa mitchilli* (Bay anchovy), *Menidia menidia* (Atlantic silverside), *Gambusia affinus* (mosquitofish), *Cyprinodon variegatus* (sheepshead minnow), *Awaous guamensis* (o'opu nakea [freshwater goby]), *Bagre marinus* (gafftopsail catfish), *Euprotomicrus bispinatus* (pygmy shark), *Carcharodon carcharias* (white shark), and *Alopias vulpinus* (common thresher shark). See figure 3.3 for data sources.



Response: *We agree and have revised the text.*

Comment 20: Line 693. I think this previous paragraph accurately conveys level of understanding and uncertainty given period of sturgeon discovery.

Response: *The paragraph describes the available information for foraging habitat and Atlantic sturgeon use of marine habitat. Given the paucity of data, we could not identify the physical or biological features of estuaries or the marine environment that are essential to the conservation of the DPSs.*

Comment 21: Line 717. Not proposing regions within shelf regions may be justified as we are likely to have much better information on this in the next several years. However, this statement is not precautionary and could be meant to imply such areas will not ever be included. I would restate this – "Therefore, we are not yet proposing…"

Response: *We agree and have revised the text.*

Comment 22: Line 794-798. As stated above I remain a bit skeptical about Connecticut River (based on issues on how we define YOY and how we rank their incidence as evidence of reproduction), but see no reason to include Housatonic River – Indeed in the Executive Summary, we read, that this River is being excluded as on line 1407. For all presumed spawning tributaries, I think tabulated evidence of spawning is justified, as well as some sort of uncertainty ranking scheme.

Response: *The draft document provided for peer review included discussion of the exclusion analysis. Subsequent to peer review, we reconsidered whether to conduct the exclusion analysis. We considered the relevant impacts of designating each proposed critical habitat area and concluded that we would not conduct an exclusion analysis. Therefore, we are proposing to designate critical habitat in the Housatonic River.*

The draft document for peer review also provided information for excluding the Union River critical habitat unit. As stated above, subsequent to peer review, we decided to not conduct an exclusion analysis. Although we initially identified areas in the Union River as meeting the definition of critical habitat for the Gulf of Maine DPS, we are not proposing to designate any part of the Union River. There is no evidence that sturgeon are using the Union River for spawning now or that they used the Union historically for spawning. Consequently, while the physical and biological features are present in the Union River, we do not consider them to be essential to the conservation of the species, and we will therefore, not include the Union River in the critical habitat designation for the Gulf of Maine DPS.

Comment 23: Line 806 and Lines 1413-1421. Chesapeake DPS HUCs. Based on recent genetic findings the Nanticoke, Marshyhope and Broad Creek all must be included here. By extension, sturgeon are likely to be spawning in other eastern shore estuaries, including the Choptank and Pocomoke Rivers, could support sturgeon reproduction. Juveniles have been reported in both of these systems. There is a similar level of support for protecting these systems as exists for the Rappahannock River, which is included.

Response: *Within the geographical area occupied by the species, critical habitat is the specific areas that contain the features essential to conservation that may require special management or protection. We currently lack information on whether the physical features essential to conservation that may require special management or protection are present in the Nanticoke River, Marshyhope Creek, and Broad Creek or, if they are present, the specific areas that contain the features. Therefore, we have not proposed to designate critical habitat in the Nanticoke River, Marshyhope Creek, and Broad Creek. We will revisit this decision as new information becomes available.*

Reviewer 7

General Comment: I have completed my review of the draft economic impact analysis and find the data considered to be accurate and comprehensive. The report provides a balanced perspective of the potential benefits and costs associated with the critical habitat designation, taking into consideration the considerable amount of future uncertainty regarding the possible economic effects of this designation.

I appreciate that the report outlines data, such as project modification costs, that may be relevant in future analyses, even though it is unlikely that future consultations will result in project modifications. In addition, nonmarket economic values and other conservation benefits are an important component of any economic analysis involving critical habitat. The report does a good job describing these possible values, with comprehensive examples from the literature, and clearly explaining why they cannot be valued in this current analysis. Section 5 provides a nice overview as to how a cost benefit analysis could be conducted and used in this critical habitat designation context, but provides justification as to why it is not possible at this time to quantify or monetize various designation benefits.

Overall, processes involving data identification and collection are clearly identified, and uncertainties and assumptions are well laid out. I do not have any major concerns with the data used in the report. My minor comments are outlined below.

Comment 1: Table ES-1 – consider specifying the year that costs are in (2013?)

Response: *The table title has been revised to include the year that costs are in (2013).*

Comment 2: Page 7, fourth paragraph – says the critical habitat designation encompasses state-owned lands in eleven states, but should instead say ten states and the District of Columbia.

Response: *This has been corrected.*

Comment 3: Section 2.1 – in some subsections, such as 2.1.1.1, the authors discuss the county population change in 2012 and compare this to the national population growth rate of 1.7%, whereas in other subsections, such as 2.1.1.6, the authors discuss the county population change between 2010 and 2012 and compare this to the national population growth rate of 1.7%. This should be reconciled, as it is not clear as to whether the 1.7% national growth rate is referring to the period during 2012 or from 2010 to 2012.

Response: *This has been corrected*

Comment 4: Section 2.1 – in some subsections, the population growth period from July 2000 to April 2010 is referred to as a 10–year period, whereas in other sections, it is referred to as an 11-year period.

Response: *The three entries as 10-year period were corrected to 11-year period.*

Comment 5: Figure 2-1 – the map on the bottom left of the figure has VT listed where NH should be.

Response: *This has been corrected.*

Comment 6: Subsection 2.1.3.5 – it appears that this section does not include data for York County, which is listed in Table 2-1 as a 9th county included in the James critical habitat unit.

Response: *Since the economic analysis is for each DPS, and the York River and James River critical habitat units are in the same DPS, we avoided double counting economic data by assigning a county to only one critical habitat unit. Information for York County is, therefore, discussed relative to the York Critical Habitat Unit.*

Comment 7: Beginning in subsection 3.1.1.2, the report refers to the 'Services' and 'Service.' If this is referencing the NMFS, consider changing for consistency.

Response: "*Services" refers to the NMFS and the U.S. Fish and Wildlife Service.*

Comment 8: Page 128 – the citation 'Richardson and Looming, 2009' should be 'Richardson and Loomis, 2009.

Response: *This has been corrected.*