Atlantic States Marine Fisheries Commission

Shad and River Herring Management Board

May 6, 2015
2:30 – 3:30 p.m.
Alexandria, Virginia

Draft Agenda

The times listed are approximate; the order in which these items will be taken is subject to change; other items may be added as necessary.

1. Welcome/Call to Order (T. Stockwell) 2:30 p.m.

2. Board Consent 2:30 p.m.
   • Approval of Agenda
   • Approval of Proceedings from February 2015

3. Public Comment 2:35 p.m.


   • Recommendations for Assessment Schedule and River Herring Data Standardization

6. Other Business/Adjourn 3:30 p.m.
MEETING OVERVIEW

Shad & River Herring Management Board Meeting
Wednesday, May 6, 2015
2:30 – 3:30 p.m.
Alexandria, Virginia

<table>
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<tr>
<th>Chair: Terry Stockwell (ME)</th>
<th>Technical Committee Chair: Claire Enterline (ME)</th>
<th>Law Enforcement Committee Representative: Larry Furlong (PA)</th>
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<td>Assumed Chairmanship: 01/14</td>
<td>Vice Chair: Bill Goldsborough (MD)</td>
<td>Previous Board Meeting: February 5, 2015</td>
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<td>Advisory Panel Chair: Pam Lyons Gromen</td>
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Voting Members: ME, NH, MA, RI, CT, NY, NJ, PA, DE, MD, DC, PRFC, VA, NC, SC, GA, FL, NMFS, USFWS (19 votes)

2. Board Consent
   • Approval of Agenda
   • Approval of Proceedings from February 5, 2015

3. Public Comment – At the beginning of the meeting public comment will be taken on items not on the agenda. Individuals that wish to speak at this time must sign-in at the beginning of the meeting. For agenda items that have already gone out for public hearing and/or have had a public comment period that has closed, the Board Chair may determine that additional public comment will not provide additional information. In this circumstance, the Chair will not allow additional public comment on an issue. For agenda items that the public has not had a chance to provide input, the Board Chair may allow limited opportunity for comment. The Board Chair has the discretion to limit the number of speakers and/or the length of each comment.

4. Review the River Herring Technical Expert Working Group (TEWG) Conservation Plan (2:45 - 3:05 p.m.)

   Background
   • In 2013, NOAA and ASMFC established the TEWG to compile and provide information for the development of a dynamic conservation plan to restore coastal river herring populations.
   • The TEWG and associated subgroups have met via conference call over the last year to identify important conservation efforts, data gaps, and monitoring programs.
   • The TEWG Conservation Plan was shared with the Board to receive comments and feedback. (Briefing Materials)

   Presentations
   • Overview of TEWG Conservation Plan by K. Rootes-Murdy

   Board actions for consideration at this meeting
   • Provide comments and edits on the TEWG Conservation Plan

5. Technical Committee Report (3:05 -3:20 p.m.) Action

   Background
   • The Technical Committee met via conference call in November 2014 and April 2015 to discuss assessment timelines for American shad and river herring.
The Technical Committee recommended that American shad be added to the assessment schedule for an assessment update in 2017, and a river herring assessment updated in 2018.

To facilitate these two assessments, the Technical Committee recommends a meeting on data collection and standardization.

**Presentations**
- Technical Committee Report by K. Drew

**Board actions for consideration at this meeting**
- Consider tasking Technical Committee with conducting a meeting on data collection and standardization

6. Other Business/Adjourn
DRAFT PROCEEDINGS OF THE

ATLANTIC STATES MARINE FISHERIES COMMISSION

SHAD AND RIVER HERRING MANAGEMENT BOARD

The Westin Alexandria Hotel
Alexandria, Virginia
February 5, 2015
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These minutes are draft and subject to approval by the Shad and River Herring Management Board. The Board will review the minutes during its next meeting.
INDEX OF MOTIONS

1. Approval of Agenda by Consent (Page 1)

2. Approval of Proceedings of February, 2014 by Consent (Page 1)

3. Move to approve the 2014 FMP Review and de minimis status for shad for the states of Maine, New Hampshire, and Massachusetts; and de minimis status for river herring for the states of New Hampshire and Massachusetts for the 2015 fishery (Page 1). Motion by Pat Augustine; second by Rick Bellavance. Motion carried. (Page 2).

4. Move to approve the proposal from New Hampshire to discontinue monitoring on the Taylor River (Page 2). Motion by Pat Augustine; second by Doug Grout. Motion carried (Page 3).

5. Move to adjourn by Consent (Page 6).
ATTENDANCE

Board Members

Terry Stockwell, ME, proxy for P. Keliher (AA)        John Clark, DE, proxy for D. Saveikis (AA)
Doug Grout, NH (AA)                                  Tom O’Connell, MD (AA)
Mark Gibson, RI, proxy for B. Ballou (AA)           Wilson Laney, USFWS
Rick Bellavance, RI, proxy for Rep. Martin (LA)     Steve Meyers, NMFS
James Gilmore, NY (AA)                               Bryan King, DC
Pat Augustine, NY, proxy for Sen. Boyle (LA)        
Leroy Young, PA, proxy for J. Arway (AA)

(AA = Administrative Appointee; GA = Governor Appointee; LA = Legislative Appointee)

Ex-Officio Members

Claire Enterline, Technical Committee Chair

Staff

Bob Beal
Toni Kerns
Marin Hawk

Guests

Jason Didden, MAFMC

NOTE: SIGN-IN SHEET NOT DISTRIBUTED
The Shad and River Herring Management Board of the Atlantic States Marine Fisheries Commission convened in the Edison Ballroom of the Westin Hotel, Alexandria, Virginia, February 5, 2015, and was called to order at 2:15 o’clock p.m. by Chairman Terry Stockwell.

**CALL TO ORDER**

CHAIRMAN TERRY STOCKWELL: Good afternoon, everyone. I will convene the Shad and River Herring Board for the last meeting of the week. Thank you, skeleton crew, for being here. I want to begin by introducing our new Technical Committee Chair Claire Enterline. She is from the Maine DMR staff and it is her first meeting here.

**APPROVAL OF AGENDA**

CHAIRMAN STOCKWELL: Is there any other business to come before the board to add? Seeing none; are there any changes or additions to the agenda? Seeing none; we will consider the agenda approved.

**APPROVAL OF PROCEEDINGS**

CHAIRMAN STOCKWELL: The proceedings from February 2014; are there any changes or additions? Seeing none; we will consider the proceedings approved.

**PUBLIC COMMENT**

CHAIRMAN STOCKWELL: Is there any public comment? Seeing none; we’re going to move right into the 2014 FMP Review and State Compliance. Marin.

**2014 FMP REVIEW AND STATE COMPLIANCE**

MS. MARIN HAWK: This will be very brief. This is the 2014 Shad and River Herring Compliance and FMP Review. For the 2013 fishing season, landings have been steadily decreasing over time due to the moratorium that was implemented from Amendments 2 and 3. States with shad commercial landings were New Jersey, Virginia, North Carolina, South Carolina and Georgia.

State with river herring commercial landings were Maine, New Hampshire, New York, Maryland, North Carolina and South Carolina. In terms of coast-wide stocking, it is occurring in Maine, Massachusetts, Pennsylvania, North Carolina and South Carolina. For shad about 18 million fish were stocked and for alewife it was 300,000.

In terms of sturgeon interactions, 294 interactions were reported in Rhode Island, Connecticut, New Jersey, Virginia and North Carolina. All were released alive with the exception of one fatality. For de minimis, it is less than 1 percent of coast-wide landings. For shad, Maine, New Hampshire and Massachusetts have requested de minimis; and New Hampshire and Massachusetts have also requested de minimis for river herring. The PRT recommends granting all requests for de minimis. Thank you.

CHAIRMAN STOCKWELL: Thank you, Marin. Are there any questions for Marin? Roy.

MR. ROY MILLER: Those states like Delaware that are closed for river herring; I guess they don’t need a de minimis classification; is that correct?

MS. HAWK: That is correct.

CHAIRMAN STOCKWELL: Are there any other questions? I would be looking then for a motion. Pat.

MR. PATRICK AUGUSTINE: Okay, move to approve the 2014 FMP Review and de minimis requests as presented today. Is that good enough?

CHAIRMAN STOCKWELL: You’re going to include the states, Pat?

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MR. AUGUSTINE: Do you want me to name the states?

CHAIRMAN STOCKWELL: Yes.

MR. AUGUSTINE: For shad, Maine, New Hampshire and Massachusetts; for river herring, New Hampshire and Massachusetts for 2015. All of these states were granted de minimis in the past and meet the requirements for this year.

CHAIRMAN STOCKWELL: Motion made by Pat and seconded by Rick Bellavance. Are there any comments? Seeing none; are there any objections? Seeing none; the motion carries. Mr. Grout.

**NEW HAMPSHIRE TAYLOR RIVER MONITORING PROPOSAL**

MR. DOUGLAS E. GROUT: The state of New Hampshire is requesting that the Taylor River in New Hampshire be removed from our monitoring requirements. We have a fish ladder there that has been in operation for well over 30 years. We have an electronic counting tube that we have there. However, the last time we saw herring at that fishway was 2008; and that is the last time we’ve been able to provide any kind of biological information.

The major cause of the decline in river herring there has eutrophication of the impoundment behind this dam. The New Hampshire DOT owns the dam and has been looking at the possibility of dam removal on it; but at this point they’re not moving very quickly.

We are asking for relief from this because under our monitoring we have to go out there every day during the spawning run; and it seems like it is a very efficient use of our time to go out there and see nothing going through there. We’re asking to have the Taylor River removed from our monitoring requirement.

Just to be aware, there are several other rivers that are part of our state fishery’s plan for river herring where we have much better runs; and we do spend a lot of time monitoring those rivers. What we’re asking, again, is to have this removed from our compliance requirements. There is a letter in your briefing describing this.

CHAIRMAN STOCKWELL: I’m going to turn to Claire for a technical committee report.

**TECHNICAL COMMITTEE REPORT**

MS. CLAIRE L. ENTERLINE: The technical committee agreed with removing the Taylor River. There were a lot of questions about if a commercial fishery or recreational fishery still exists below the Taylor River. It does not; recreational fishing is not allowed on the Taylor River and neither is commercial. The rivers where there is both fish and commercial and recreational fishing; those all are monitored. The technical committee also had concern about what would happen if the dam was removed.

The DOT owns it but there is maybe some movement happening on that. If that were removed, we requested that we maybe revisit or update. We asked the staff still continue not necessarily as often as they were, but just checking it every once in a while; and if fish were to show up, that they would take biological samples and we would discuss adding it back.

CHAIRMAN STOCKWELL: Are there any questions for Doug or Claire? Pat.

MR. AUGUSTINE: So you do approve?

MS. ENTERLINE: Yes, we approved it.

MR. AUGUSTINE: When you’re ready for a motion, Mr. Chairman.

CHAIRMAN STOCKWELL: Yes, sir.

**These minutes are draft and subject to approval by the Shad and River Herring Management Board. The Board will review the minutes during its next meeting.**
MR. AUGUSTINE: **Move to approve the proposal as presented by New Hampshire to remove the monitoring on the Taylor River.**

CHAIRMAN STOCKWELL: Seconded by Doug Grout. Are there any comments from the board? Mark.

MR. MARK GIBSON: It has been a while, but if I remember was this one of the rivers that was part of the monitoring group or the index group that was part of your plan?

MR. GROUT: No, Mark.

MR. GIBSON: Okay, so it doesn’t affect computation of the monitoring index or standards of performance?

MR. GROUT: No.

CHAIRMAN STOCKWELL: Are there any other questions or comments? **Are there any objections to the motion on the board? Seeing none; consider the motion approved.** Jason.

**UPDATE ON NEFMC AND MAFMC ACTIONS**

MR. JASON DIDDEN: Mr. Chairman, I’m going to provide an update on river herring and shad actions for the New England and Mid-Atlantic Fishery Management Councils. I’m on the staff of the Mid-Atlantic Council and the plan coordinator for the Mackerel, Squid, Butterfish FMP and also staff our River Herring and Shad Committee.

My update from the New England perspective is done kind of in advisement with Lori Steele, my colleague from up there, but obviously I have better familiarity with what is going on in the Mid-Atlantic than New England. I’ll start with New England. The first thing is the stock-in-the-fishery question just came up at their last meeting.

They’re basically taking a similar approach to the Mid-Atlantic Council that they’re going to continue working with the TEWG. Lori Steele is on the fisheries subgroup of the TEWG that I chair. Mary Beth Tooley is the co-chair of that. They’re already very integrated into the TEWG. They will continue working on their caps and related observer issues and also revisit the stock-in-the-fishery question in three years; so a very similar approach as the Mid-Atlantic.

They also have a slippage framework that they passed a while back. That is kind of in the environmental assessment and development phase, working on document perfection with NMFS. The third is both the Mid-Atlantic and New England are working on a joint omnibus action, looking to find ways to allow industry to fund observer coverage of really kind of any fleet, in general a framework, but then specifically in the action add coverage for the Atlantic herring and Atlantic mackerel fisheries.

That has proven to be a very challenging issue because of a wide variety of legal constraints and funding constraints that NMFS has. The original intent had been to pass last week out of New England and next week with the Mid-Atlantic a draft amendment for public hearings. However, a variety of kind of things have been identified with the current draft.

New England also added some options for – it was primarily looking at how could industry fund observer coverage. We still never got around this issue that it costs about eight hundred bucks a day for the at-sea portion and about $400 a day for the NMFS management side of things, very expensive.

They added in an option where they were going to try to have like essentially a monitor that would really be focused on discards and slippage documentation. They want to develop that more in order to kind of compare the cost of these full observers versus these kinds of slippage monitors.

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They requested additional development of that; also kind of adding in some more development in the document and trying to provide a way to move eventually to portside side monitoring of these fisheries – they retain almost all their catch – coupled with some electronic monitoring to make sure that they’re retaining almost all their catch; so that you can move to portside monitoring of these fisheries.

The various technical groups have said for a long time as long as you can account for the at-sea discards, really the way to monitor these fisheries is portside because of their high-volume nature. Then also a variety of issues with some of the economic analyses were identified; and they sent that back wanting more work.

That is going to be picked up at the Mid-Atlantic Council next week. I don’t know exactly what the Mid-Atlantic Council will do with it. However, it is a joint amendment so what New England kind of did will influence – and I’m not even sure if the Mid-Atlantic could move forward with it since New England is not in the joint, but that will be a topic of discussion next week, and we will kind of figure that out.

I anticipate that if the Mid-Atlantic Council follows suit, the additional analyses and development will probably result in it coming back to the councils maybe in the June time frame; that they would then move out for public hearings after that. It is in a little bit of state of flux. It depends what the Mid-Atlantic Council does next week; but that is the summary there.

The last thing is they do have caps for river herring and shad in place for the Atlantic herring fishery for 2015; and later this year they will be setting their caps for that moving forward. It is being tracked right now. If you type NMFS quotas in the google, it will go to their quota monitoring webpage and you can kind of go see – whether it is on the mackerel fishery or the herring fishery, it is by gear type and area; and you can actually see how the quotas are tracking.

I think several of theirs are fairly low. The Southern New England Bottom Trawl one kind of spiked up pretty quickly. I think they’re watching that pretty closely and just kind of have to see how – you know, it is really dependent on both the ratios of bycatch and the total catch in the fishery, and we’ll just kind of have to see how that plays out.

With the Mid-Atlantic, again fairly similar. We have the same kind of TEWG participation and coming down to the commission and trying to keep people involved and apprised of what is going on. We had the same three-year revisiting the stock-in-the-fishery question for us. It will be October 2016 where the council comes back and revisit that.

There is a variety of legal actions related to that stock-in-the-fishery question that has not been resolved yet; so it kind of remains to be seen exactly what happens with that; but for the time being we’re kind of in this participate with the TEWG, work collaboratively with management partners and revisit the question and the council will take another look at it in October 2016 is the current plan.

We have the slippage framework; the same thing, working on a few document perfections. That should be moving to a proposed rule in the relatively near future with us. We have the Omnibus Observer Amendment that both councils are working on that I just described. Like New England, we have a river herring and shad cap in place on the mackerel fishery.

We do have major concerns because of the new standardized bycatch reporting methodology that has been implemented, being implemented. It is essentially zeroing out coverage for the Mid-Atlantic Midwater Trawl Fishery and really drastically reducing the
observer coverage that we’ve had in recent years for the New England Midwater Trawl Fishery.

Actually there will be more coverage for the small-mesh bottom trawl; so we’ll get some coverage in the mackerel fishery through that, hopefully, but there is a lot less observer coverage coming up than we’ve had in recent years and less observer coverage will mean more erratic estimates in these caps.

That’s a major concern, but it is kind of what SBRM, the Standardized Bycatch Reporting Methodology, and the lack of flexibility that it has to have because of the related lawsuits it has kind of pinned us into. Again, that’s why the councils are working on some of these ways to alternatively fund observer coverage. Those are some of the similarities.

A few things that are different; we do have a River Herring and Shad Committee; and it has the terms of reference – if you go on our website, it should pop up pretty easily, but there are terms of reference that it has vetted out. I just highlighted a few. One is it really wants to engage our SSC in helping set the river herring and shad caps. We will start that process in March.

We’ve basically set the caps on kind of some historic catch rates applied to the mackerel quota so far. The council wants to move to setting that on something that is more biologically based in river herring and shad and not just on recent catch. That will be an ongoing process. We have these kinds of caps that are operating at the same time for Atlantic herring in Southern New England and some other Atlantic herring in New England and then the mackerel cap that spans the whole mackerel fishery.

There is overlap between them; and I think based on how they’re set, it is okay. However, it probably makes more sense given the overlapping of the mackerel and Atlantic herring fisheries to have them integrated. I don’t know if that is going to be able to happen or not; but we’re trying to see is there a way to have kind of one cap that was on both the fisheries, especially for Southern New England, as an ongoing thing.

That committee is kind of tracking how technical staff might be able to make that happen. The other is they’ve identified essentially a report that I’ll create and present to them every June that is essentially a progress review; is the council making some progress on the river herring and shad question.

Even though they decided to not go down the Stock-in-the-Fishery FMP approach, they still want progress to be made in a variety of ways. Essentially it is a list of questions that they want me to kind of address and flag how is progress being made in terms of what has the cap done, what has recent catch been, what observer coverage levels are, was the cap set, what the cap based on just catch or have we moved to more a biologically meaningful cap, is there new information on river herring and shad abundances since whenever the last assessment was.

The alignment issue; just a summary of coordination that has been going on. Obviously, we’re heavily involved in the TEWG, also. I won’t get into that detail today. Marin, you’re going to talk a little bit about the TEWG. You know, has the SSC gotten involved and given some recommendations on setting the cap and just anything else.

I’ll be working on that kind of review and those are the questions that they wanted me to try to take whack at; and I’ll be doing that for the first time and presenting that to the River Herring and Shad Committee for June. And then I imagine some additional actions may be requested by the committee at that point. That is my quick overview.

These minutes are draft and subject to approval by the Shad and River Herring Management Board.
The Board will review the minutes during its next meeting.
CHAIRMAN STOCKWELL: Questions for Jason? Okay, we’re going to move on to the update on the TEWG from Marin.

**UPDATE ON THE TECHNICAL EXPERT WORKING GROUP ACTIVITIES**

MS. HAWK: As you all know, the River Herring Technical Expert Working Group is moving forward and they will be finalizing their conservation plan, which will be complete this March. The board can review that at the next subsequent Shad and River Herring Meeting. In the meantime, the TEWG has funded two projects to fill in data gaps and help with conservation.

Massachusetts DMF, UC-Santa Cruz and a couple of other partners will collect biological samples and conduct genetic analysis on river herring that are caught in the mackerel and herring fisheries. The focus on that research is at-sea and early life stage mortality.

The second project that was funded is with the Barnegat Bay Partnership and Rutgers University; and that research will improve understanding of historic and current distribution of river herring spawning habitat in New Jersey. That is my TEWG update.

CHAIRMAN STOCKWELL: Are there any questions for Marin? Seeing none; is there any further business to come before the board? Doug.

MR. GROUT: I don’t know if I’m going to jump anybody’s gun here but I heard that this is going to be Marin’s last meeting here. I would like offer our sorrow that you’re leaving but know that you’re moving on to something that is going to be fantastic working with Marine Stewards Council. I thank her for the great work that she has done over the years she has been with the commission. (Applause)

MS. HAWK: Thank you, everyone. I’m not much for words but I’ll definitely miss all of you. I’ll be back and see you; don’t worry.

**ADJOURNMENT**

CHAIRMAN STOCKWELL: Doug, you stole my thunder, but thank you, Marin. This meeting is adjourned.

(Whereupon, the meeting was adjourned at 2:35 o’clock p.m., February 5, 2015.)

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River Herring Conservation Plan

The River Herring Conservation Plan is a strategy, including implementation, to increase public awareness about river herring, stimulate cooperative research, and inform efforts to help restore river herring (alewife and blueback herring) throughout much of their Atlantic coastal range. The plan builds upon the many previous and ongoing efforts to further river herring conservation, coordinates ongoing activities and incorporates information provided by the River Herring Technical Expert Working Group (TEWG). The River Herring Conservation Plan is provided in a web-based format so that it can be dynamic and easily updated. The plan will be continually evaluated and updated as actions are taken to achieve the following goals:

1. Increase coordination of river herring research and conservation
2. Identify key research needs for assessment and conservation
3. Identify conservation actions to address threats
4. Cultivate research groups to address key topics
5. Identify funding sources for river herring research and conservation
6. Further conservation efforts to address threats
7. Improve information to be used in the next assessment
8. Improve information used in conservation efforts
9. Increase outreach about river herring

Since initiation of our partnership in August 2013 to develop the plan, NMFS and ASMFC, working collaboratively with our partners, have made important progress on each of these goals. An overview of some of the successes highlighted in the River Herring Conservation Plan include:

- Increased coordination with partners through establishment of the TEWG, including six subgroups and one integration committee.
- Funded two projects through a River Herring Request for Proposals to further information on river herring populations ($243,659).
- Developed this initial River Herring Conservation Plan which is intended to be dynamic, easily updated and comprehensive. The plan considers the information compiled by the TEWG, and will be further refined based on TEWG and public input.
- NMFS Greater Atlantic Region funded a Northeast Fisheries Science Center (NEFSC) project to develop a river herring/Atlantic herring overlap forecast tool for use by the Atlantic herring fishery to minimize incidental river herring catches.
- NMFS (through ASMFC) and the U.S. Fish and Wildlife Service (USFWS) provided funding to the Atlantic Salmon Federation to continue river herring counts at the Milltown Dam fishway in the St. Croix watershed.
- NOAA conducted a coastwide social science survey to document fishermen’s observations of river herring in commercial, recreational, and subsistence fisheries.
- NOAA selected the Penobscot River in Maine and the Choptank River in Maryland as Habitat Focus Areas under NOAA’s Habitat Blueprint, targeting financial resources and technical assistance to support habitat conservation and restoration efforts in these high-priority watersheds including removing passage barriers and restoring unimpeded river herring passage and spawning and rearing habitats.
- Incorporated information provided by the Passamaquoddy Tribe, Pleasant Point, on the cultural importance of river herring to the Tribe into this conservation plan.
- NMFS began work towards the development of a life history-based model that can inform the setting of quantitative-supported performance standards for American shad and river herring for hydropower projects.
NMFS and ASMFC are continuing to work with our partners on climate change assessments related to river herring.

NMFS is working with our partners to study to the long-term benefits of restoring riverine habitat along the Atlantic Coast.

Find additional information on “Ongoing Management and Monitoring,” “Research/Conservation Needs and Ongoing Efforts,” and “Conclusions & Looking Forward” under the relevant tabs.

Partnerships

NOAA Fisheries and ASMFC committed to work collaboratively with our partners to implement a coordinated coastwide effort to proactively conserve river herring and address data gaps. The Technical Expert Working Group (TEWG), composed of individuals with expertise related to river herring, threats to their survival, and/or methods for assessing human and non-human impacts to river herring populations, was developed for river herring throughout both species’ range from Canada to Florida, to provide information for use in the development of this conservation plan. A goal of the initiative is to include input from technical experts from the following categories: Federal government agencies (NOAA, U.S. Fish and Wildlife Service, Environmental Protection Agency, Federal Energy Regulatory Commission, U.S. Geological Survey, U.S. Army Corps of Engineers, etc.), East Coast Native American Tribes and First Nations, ASMFC, the Regional Fishery Management Councils, state fish/wildlife agencies, environmental/conservation groups, scientific/academic representatives, industry (e.g., hydroelectric and fishing), and recreational interests. More information on partnerships can be found in the Background section of this plan.

Seeking Comments

While this conservation planning initiative is a long-term effort, your input is welcome on this initial River Herring Conservation Plan. Please send your comments on the structure and contents of the plan to [insert e-mail address] by [insert date].
(River Herring Conservation tab)

**Background**

River herring are an anadromous (meaning that they migrate from saltwater to freshwater to spawn), highly migratory, pelagic, schooling species, with seasonal spawning migrations that vary with latitude. River herring can be found along the Atlantic coast of North America, from the maritime provinces of Canada to Florida. The coastal ranges of the two species overlap, with blueback herring found in a greater and more southerly distribution ranging from Nova Scotia down to the St. John’s River, Florida; and alewife found in a more northerly distribution ranging from Labrador and Newfoundland to as far south as South Carolina, though less common in the extreme southern range. Recent genetic studies indicate that hybridization may be occurring in some instances among alewife and blueback herring where populations overlap. Landlocked populations of alewives and blueback herring also exist, but this conservation effort for river herring pertains to the coastal anadromous forms. If there are any interactions or relevant effects from landlocked populations on the anadromous forms, they will be considered.

**Historical Perspective**

River herring have long represented an important fishery in North America because they were a highly abundant species that could easily be obtained by weirs, traps and nets. River herring were used both as fertilizer for crops and as food as they could easily be preserved by smoking, drying or brining for later consumption. The historic commercial and recreational fishery for river herring likely contributed to the historical decline in abundance of both blueback and alewife populations. Commercial landings peaked in the late 1960s at nearly 140 million pounds, and has been less than 4 million pounds since 2000. Since the 1970’s, regulations have been enacted on the directed harvest of river herring in an attempt to halt or reverse their decline. For example, since 2005, many states placed a moratoria on river herring fisheries, meaning that no catch was allowed.

Dams and other man-made barriers have also contributed to historic and current declines in abundance of both blueback and alewife populations. While estimates of habitat loss over the entire range of river herring are not available, estimates from studies in Maine show that less than 5% of lake spawning habitat and 20% of river habitat remains accessible for river herring. Water quality (including land use change, water withdrawals and discharge) and channelization and dredging have also likely contributed to overall declines in abundance for both species.

**Current Initiatives and Partnerships**

In August 2013, after conducting a review of the status of river herring throughout their range, NMFS determined that listing alewife or blueback herring under the Endangered Species Act was not warranted. This decision was made after reviewing the ASMFC 2012 river herring stock assessment, the peer reviewed reports from the 2012 NMFS Stock Structure, Extinction Risk, and Climate Change Workshops, the population modeling results from NEFSC (2013), and other available scientific and commercial information. Several significant research gaps (e.g., marine migration patterns and the effects of climate change on both species) and uncertainty associated with some datasets were identified as important issues. NMFS committed to working with ASMFC and others to further river herring issues.
NMFS and ASMFC committed to work collaboratively with our partners to implement a coordinated coastwide effort to proactively conserve river herring and address data gaps. The Technical Expert Working Group (TEWG), composed of individuals with expertise related to river herring, threats to their survival, and/or methods for assessing human and non-human impacts to river herring populations, was developed for river herring throughout both species’ range from Canada to Florida, to provide information for use in the development of this conservation plan. A goal of the initiative is to include input from technical experts from the following categories: Federal government agencies (NOAA, U.S. Fish and Wildlife Service, Environmental Protection Agency, Federal Energy Regulatory Commission, U.S. Geological Survey, U.S. Army Corps of Engineers, etc.), East Coast Native American Tribes and First Nations, ASMFC, the Fishery Management Councils, state fish/wildlife agencies, environmental/conservation groups, scientific/academic representatives, industry (e.g., hydroelectric and fishing), and recreational interests.

Internal and external partnerships to NMFS and ASMFC are critical. NMFS’s Greater Atlantic Region (e.g., Sustainable Fisheries, Habitat Restoration and Conservation, Protected Resources, and Operations and Budget Divisions), Northeast Fisheries Science Center (e.g., Populations Dynamic Branch, Oceanography Branch and Northeast Cooperative Research Program), Southeast Regional Office (Protected Resources and Habitat Conservation Divisions), and Office of Protected Resources work together to protect and restore river herring and their habitat. NMFS and ASMFC also coordinate with and build upon the many previous and ongoing efforts to further river herring conservation, including fisheries work by the Mid-Atlantic Fishery Management Council (MAFMC) and the New England Fishery Management Council (NEFMC), habitat restoration by the Atlantic Coastal Fish Habitat Partnership and The Nature Conservancy, and conservation efforts by the U.S. Fish and Wildlife Service. There is also ongoing coordination with the Department of Fisheries and Oceans Canada and other Canadian partners.
(Coastwide Perspective tab)

**Coastwide Perspective**

Conservation of river herring must be holistic given their riverine and coastal distribution, and the many threats that they face.

*Alewife range* from Newfoundland to North Carolina. *Blueback herring* have a more southern distribution, ranging from Nova Scotia to the St. John’s River in Florida.

River herring occur in freshwater, estuarine, and marine systems. There are many systems throughout their range, but some broad systems include Canada freshwater, Northeast freshwater, Mid-Atlantic freshwater, Southeast Freshwater and marine (including Northeast U.S. Shelf and Southeast U.S. Shelf).

**A Geographic Perspective of Threats to River Herring**

Alewives and blueback herring can be found along much of the coast and many of the rivers in streams along much of the Eastern Seaboard of the U.S. and Canada (see species range above). Given their extensive geographic distribution they also tend to face many threats. The greatest of these threats include climate change, dams that block or impede access to spawning and nursery habitats, poor water quality, overfishing, and predation.

*Map* of U.S. freshwater distribution of some anadromous species.
Climate change affects river herring in both the marine environment and in freshwater. In freshwater, river herring spawn when water temperatures are between 50 and 60 degrees Fahrenheit. In the southern portion of their range temperatures sufficient for spawning may be observed as soon as early February, whereas in the northern portion of their range, water temperatures may not be suitable until early to mid-July. Climate change that results in warming can have two effects on river herring spawning. Higher temperatures can shift the time window in which river herring are accustomed to spawning or it can shorten the window of opportunity in which spawning is effective. The consequences of warming water temperatures could include a northward shift in the species range, and/or a decline in the species abundance; especially in the southern portions of the species range as higher temperatures constrict the time in which fish can spawn successfully. In the marine environment, climate change can also affect sea surface temperatures where river herring are accustomed to feeding. Increases in sea surface temperatures may result in a change or shift in the zooplankton communities that river herring feed on. A change in the size or types of zooplankton could prevent river herring from feeding successfully that could result in smaller fish or higher rates of marine mortality. A shift in the location of zooplankton could have similar effects as a shift in the zooplankton types or size.

Dams pose one of the greatest threats to river herring because they often block or significantly impede a river herring’s ability to access freshwater habitats that they need for spawning and juvenile rearing. Every dam that prevents passage lowers the ceiling on the overall productive capacity of the species. Dams are ubiquitous across the landscape where river herring live, but impacts are greatest in the regions from the mid-Atlantic north into Canada.

Water quality issues that are of greatest concern to river herring are the discharge of pollutants that reduce the dissolved oxygen content below a level in which river herring can survive. These pollutants often originate from residential, municipal and agricultural waste, or fertilizers used on lawns or crops. Areas where water quality is of greatest concern to river herring are in the mid and south Atlantic regions of the U.S. Water quality can also be an issue in terms of allowing up/down stream passage.

Fishing impacts can occur in both freshwater and marine areas where river herring live. In the marine environment, river herring are incidentally caught in commercial fisheries targeting other species. In the freshwater, weirs and nets are primarily used to capture river herring. Dams can also be used as a tool to capture river herring. If not properly managed, these techniques can harvest a significant portion of the spawning run leaving very few herring to contribute to the next generation. Fishing restrictions across the range of the species has significantly reduced the impacts that fishing has had on populations. Where directed fishing has continued in freshwater systems, there are tight controls limiting the impact that the directed fishery can have on river herring, including moratoria. One area where impacts on river herring may still be occurring and management is continuing to be discussed is where they are caught incidentally in marine commercial fisheries for other species in New England and the mid-Atlantic.

River herring are a highly desirable prey items for a host of predators. When river herring populations are robust, predation likely poses an insignificant threat to the species. But when populations are low, the impacts of predation can be severe, especially in...
rivers with dams that enable predators to use the dam to their advantage. Predation has been identified as possibly having significant impact on river herring particularly in areas south of Maine. Throughout Southern New England, the Mid-Atlantic, and South Atlantic, striped bass are highly effective at preying on river herring in estuaries and bays. In the mid-Atlantic and South Atlantic regions, introduced blue catfish and fathead catfish are also known to prey heavily on river herring.

This plan is intended to help provide a coastwide perspective on river herring, including the threats they face, the ongoing efforts to restore them, and any additional research/conservation needs. Additional information on each of these can be found under "Ongoing Management and Monitoring," "Research/Conservation Needs and Ongoing Efforts," and "Conclusions & Looking Forward."
(Ongoing Management and Monitoring tab)

Ongoing Management and Monitoring

Once abundant along the East Coast, populations of river herring (alewife and blueback herring) have declined compared to historical levels due to various factors. Governmental agencies, non-profit organizations, tribal groups, academia, industry, and others are currently engaged in numerous efforts to further river herring conservation. The below includes a summary of some management and monitoring efforts underway to conserve and learn more about river herring.

Management

**Federal statutes** for the protection and conservation of public trust resources such as river herring are an important aspect to these ongoing efforts to conserve river herring. These include the Fish and Wildlife Coordination Act, Atlantic Coastal Fisheries Cooperative Management Act, National Environmental Policy Act, Magnuson-Stevens Fishery Conservation and Management Act, Federal Power Act, Anadromous Fish Conservation Act, Federal Water Pollution Control Act, Rivers and Harbors Act of 1899, Coastal Zone Management Act and Estuarine Areas Act, Fisheries Act, Federal Land Management and other protective designations, Marine Protection, Research and Sanctuaries Act of 1972, Titles I and III and the Shore Protection Act of 1988. For more information, please visit the [Overview of Federal Statutes page](#).

Canada and the U.S. both have a variety of management efforts that help protect river herring and promote species awareness. Examples of management initiatives underway to conserve river herring related to some of the statutes can be found below.

**U.S. Atlantic Coastal Management**

River Herring are managed by the Atlantic States Marine Fisheries Commission (ASMFC) and the 15 Atlantic coast states through Amendment 2 to the Interstate Fishery Management Plan for Shad and River Herring. The ASMFC manages river herring stocks under the authority of section 803(b) of the Atlantic Coastal Fisheries Cooperative Management Act (ACFCMA - 16 U.S.C. 5101-5108).

Amendment 2 prohibits state waters commercial and recreational fisheries beginning January 1, 2012, unless a state or jurisdiction has a sustainable management plan reviewed by the Technical Committee and approved by the Management Board (see below for links to the approved plans). The Amendment defines a sustainable fishery as “a commercial and/or recreational fishery that will not diminish potential future stock reproduction and recruitment.” As a result, prohibitions on harvest (commercial or recreational) were extended to the following states/jurisdictions: Massachusetts, Rhode Island, Connecticut, New Jersey, Delaware, Pennsylvania, Maryland, DC, Virginia (for all waters), Potomac River Fisheries Commission, Georgia and Florida.

States with approved River Herring Sustainable Fishery Management Plans are the following:

- Maine
- New Hampshire
- New York
- North Carolina
- South Carolina
For further information see ASMFC’s Shad and River Herring Management Page.

**Federal Management**

Commercial fisheries which incidentally catch river herring in Federal waters are managed by the New England and Mid-Atlantic Fishery Management Councils (NEFMC and MAFMC, respectively) and the NMFS through the Magnuson-Stevens Act. Several management measures intended to reduce commercial fisheries interactions with river herring and shad in Federal waters are currently in place or are being developed. These management measures have been developed by the NEFMC, the MAFMC, the Greater Atlantic Regional Fisheries Office of NMFS, and the Northeast Fisheries Science Center (NEFSC), and promulgated through Federal fishery management plans for Atlantic Herring and Atlantic Mackerel, Squid, and Butterfish. Because the seasonal and inter-annual distribution of river herring and shad are highly variable, the Councils, NMFS and ASMFC believe that the most effective measures to address river herring and shad catch are those that increase accounting of incidental catch, limit the Atlantic herring and mackerel fisheries when appropriate, and promote cooperative efforts with the industry to minimize incidental catch.

The types of management measures currently in place or being considered fall into five general categories:

1. Limitations on total river herring and shad catch;
2. improvements to at-sea sampling by fisheries observers in Atlantic herring and mackerel fisheries;
3. increased monitoring of Atlantic herring and mackerel fisheries;
4. river herring avoidance program; and
5. including river herring in a Federal fishery management plan.

**Canadian Management**

“Coming Soon”

**Monitoring**

There are numerous ongoing efforts conducted by and/or funded by NMFS, ASMFC and other partners to understand more about river herring populations in watersheds and marine environment. Some of these efforts are described on the Conservation Plan Monitoring page.
Monitoring

There are numerous ongoing efforts conducted by and/or funded by NMFS, ASMFC and other partners to understand more about river herring populations in watersheds and marine environment. Some of these efforts are described below.

United States

- Many states conduct monitoring of river herring in the rivers. This is primarily carried out through fishways at dams and barrier weirs (e.g., Riverherring.com), but sampling via seine nets in the rivers also occurs. For example, Maine, New Hampshire, Massachusetts and Rhode Island estimate run sizes using electronic counters or visual methods. Various counting methods are used at the Holyoke Dam fish lift and fishways on the Connecticut River. Young-of-year (YOY) surveys are conducted through fixed seine surveys capturing YOY alewife and blueback herring generally during the summer and fall in Maine, Rhode Island, Connecticut, New York, New Jersey, Maryland, District of Columbia, Virginia and North Carolina. Rhode Island conducts surveys for juvenile and adult river herring at large fixed seine stations. Virginia samples river herring using a multi-panel gill net survey and electroshocking surveys. Florida conducts electroshocking surveys to sample river herring. Maine, New Hampshire, Massachusetts, Rhode Island, Maryland, and North Carolina collect age data from commercial and fisheries independent sampling programs, and length-at-age data. Visit each state’s fisheries division for more information (e.g., Maine DMR, New York DEC).

- In 2012, ASMFC completed a benchmark assessment for river herring, which is divided into two volumes. Volume I includes the Terms of Reference, Advisory Report, Technical Committee Response to Peer Review Report, and the Coastwide Assessment. Volume II includes State/Jurisdiction–specific Stock Status Summaries. Additional information can be also found at “Stock Status.”

- NMFS’ Northeast Fisheries Science Center collects fishery-independent data during standardized research vessel surveys from Cape Hatteras to the Scotian shelf. These surveys and other data collection programs also provide oceanographic and plankton data for monitoring the health and status of marine resources and their habitat. Additional information can be found in the following cruise reports:
  - Spring Cruise Report
  - Fall Cruise Report

- NMFS conducted an analysis of trends in alewife and blueback herring relative abundance. Additional information can be found at “Stock Status.”

- It is also important to note that many smaller scale monitoring efforts occur along the coast. Based on the number of efforts, these are too numerous to note, but each is important to providing information on river herring (e.g., migratory fish counts on mainstem dams, www.riverherring.com, fisheries dependent data of annual harvest rates).

Canada

“Coming Soon”

The management and monitoring efforts for river herring to date have been critical to river herring conservation and
understanding. However, inherent challenges remain due to the many data gaps and research needs. Furthering conservation and monitoring efforts are important to restoring river herring, and identified needs can help provide a roadmap.
(Ongoing Management and Monitoring tab)

Overview of Federal Statutes

The **Magnuson-Stevens Fishery Conservation and Management Act (MSA)** is the primary law governing marine fisheries management in Federal waters. The MSA was first enacted in 1976 (amended in 1996 and 2006) and aided in the development of the domestic fishing industry by phasing out foreign fishing. The MSA created eight regional fishery management councils, focuses on rebuilding overfished fisheries, protecting essential fish habitat, reducing bycatch, mandates the use of annual catch limits and accountability measures to end overfishing, provides for widespread market-based fishery management through limited access privilege programs, and calls for increased international cooperation. It also requires that Federal fishery management plans (FMP) contain conservation and management measures that are consistent with the ten **National Standards**.

Under the MSA, there is also a requirement to describe and identify **Essential Fish habitat (EFH)** in each Federal FMP. EFH is defined as "...those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity," and are further clarified to be defined as: (1) waters - aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate; (2) substrate - sediment, hard bottom, structures underlying the waters, and associated biological communities; (3) necessary - the habitat required to support a sustainable fishery and the managed species’ contribution to a healthy ecosystem; and (4) spawning, breeding, feeding, or growth to maturity - stages representing a species’ full life cycle. EFH has not been designated for alewife or blueback herring, though EFH has been designated for numerous other species in the Northwest Atlantic, and measures to improve habitats and reduce impacts resulting from those EFH designations (e.g., EFH for Atlantic salmon and Atlantic herring) may directly or indirectly benefit river herring.

Authorized under the terms of the **Atlantic States Marine Fisheries Compact**, the **Atlantic States Marine Fisheries Commission (ASMFC)** aims to promote better utilization of the fisheries (marine, shell, and anadromous) of the Atlantic seaboard “by the development of a joint program for the promotion and protection of such fisheries, and by the prevention of the physical waste of the fisheries from any cause.” The ASMFC may issue interstate fishery management plans (FMP) that must be administered by state agencies. If the ASMFC believes that a state is not in compliance with a coastal FMP, it must notify the Secretaries of Commerce and Interior. If the Secretaries find the state not in compliance with the management plan, the Secretaries must declare a moratorium on the fishery in question.

The **Fish and Wildlife Coordination Act and Federal Power Act** provide the basic authority for NMFS’ involvement in evaluating impacts to aquatic resources from proposed development and energy projects. It requires that river herring and other aquatic resources and wildlife receive equal consideration to other project features. It also requires Federal agencies that construct, license or permit water resource development projects to first consult with NMFS (and the U.S. Fish and Wildlife Service and State fish and wildlife agencies) regarding the impacts on trust resources and consider measures to mitigate potential impacts. The **Anadromous Fish Conservation Act** authorizes the Secretaries of Interior and Commerce to enter into cost sharing with states and other non-Federal interests for the conservation, development, and enhancement of the nation’s anadromous fish. Investigations, engineering, biological surveys, and research, as well as the construction, maintenance, and operations of hatcheries, are also authorized through this act.

NMFS manages river herring stocks under the **Atlantic Coastal Fisheries Cooperative Management Act (ACFCMA)**, where, in the absence of an approved and implemented FMP under the Magnuson-Stevens Act, and after consultation with the appropriate Fishery Management Council(s), the Secretary of Commerce may implement regulations to govern fishing in the Exclusive Economic Zone (EEZ), from 3 to 200 nautical mi (nm) offshore. The regulations must be: (1) compatible with the effective implementation of an Interstate Fishery Management Plan for American Shad and River Herring (ISFMP) developed by the ASMFC; and (2) consistent with the national standards set forth in section 301 of the MSA. Amendment 2 to the ISFMP was adopted by ASMFC in 2009, establishes a foundation for river herring management, and was developed to address concerns with stock status and the ability to assess status with a lack of fishery independent data.
The Federal Water Pollution Control Act (FWPCA), also called the “Clean Water Act,” mandates Federal protection of water quality. The law also provides for assessment of injury, destruction, or loss of natural resources caused by discharge of pollutants. The FWPCA prohibits the discharge of dredged or fill material into navigable waters without a permit and also authorizes programs to remove or limit the entry of various types of pollutants into the nation’s waters. The FWPCA has played a role in reducing discharges of pollutants, restricting the timing and location of dredge and fill operations, and affected other changes that have improved river herring habitat in many rivers and estuaries over the last several decades. Similarly, the Marine Protection, Research and Sanctuaries Act of 1972 (MPRSA) and the Shore Protection Act of 1988 (SPA) protect fish habitat through establishment and maintenance of marine sanctuaries, and regulate ocean transportation and dumping of dredge materials, sewage sludge, and other materials. The Rivers and Harbors Act of 1899 requires a permit to place structures in navigable waters of the United States or modify a navigable stream by excavation or filling activities.

The National Environmental Policy Act of 1969 (NEPA) requires an environmental review process of all Federal actions. This includes preparation of an environmental impact statement for major Federal actions that may affect the quality of the human environment. Less rigorous environmental assessments are reviewed for most other actions, while some actions are excluded from formal review. These reviews provide an opportunity for the agency and the public to comment on projects that may impact fish and wildlife habitat. Congress passed policy on values of estuaries and coastal areas through the Coastal Zone Management Act (CZMA) and Estuarine Areas Acts. Comprehensive planning programs, to be carried out at the state level, were established to enhance, protect, and utilize coastal resources. Federal activities must comply with the individual state programs. Habitat may be protected by planning and regulating development that could cause damage to sensitive coastal habitats.

Additionally, protection and good stewardship of lands and waters managed by Federal agencies, such as the Departments of Defense and Energy (as well as state-protected park, wildlife and other natural areas), contributes to the health of nearby aquatic systems that support important river herring spawning and nursery habitats.

Within the Canadian government, the Department of Fisheries and Oceans Canada (DFO) develops and implements policies and programs that support Canada’s interests in lakes, rivers, and ocean waters. The “Fisheries Act” (R.S.C., 1985, c. F-14) was enacted to regulate projects that may cause serious harm to fish. Any project being conducted in or near waterbodies that support a fishery (commercial, recreational or Aboriginal) that have the potential to cause serious harm to fish cannot be carried out unless authorized by the Minister of Fisheries and Oceans Canada. The purpose of the Act is to protect fish and their habitat by avoiding or minimizing any harm that may come to these resources. The Act also provides new authorities to protect these fisheries (commercial, recreational, or Aboriginal) by addressing threats such as aquatic invasive species.
Overview of Federal Management Efforts

Commercial fisheries which incidentally catch river herring in Federal waters are managed by the New England and Mid-Atlantic Fishery Management Councils (NEFMC and MAFMC, respectively) and the NMFS through the MSA. Several management measures intended to reduce commercial fisheries interactions with river herring and shad in Federal waters are currently in place. These management measures have been developed by the NEFMC, the MAFMC, the Greater Atlantic Regional Fisheries Office of the NMFS, and the Northeast Fisheries Science Center and promulgated through Federal fishery management plans for Atlantic Herring and Atlantic Mackerel, Squid, and Butterfish. Because the seasonal and inter-annual distribution of river herring and shad are highly variable, the Councils, NMFS and ASMFC believe that the most effective measures to address river herring and shad catch are those that increase accounting of incidental catch, limit the Atlantic herring and mackerel fisheries when appropriate, and promote cooperative efforts with the industry to minimize incidental catch.

The types of management measures currently in place or being considered fall into five general categories: 1) limitations on total river herring and shad catch; 2) improvements to at-sea sampling by fisheries observers; and 3) river herring avoidance program; 4) increased monitoring of Atlantic herring and mackerel fisheries; and 5) including river herring in a Federal fishery management plan. These measures are described below.

1) Limits on Total River Herring and Shad Catch

Vessels fishing for Atlantic mackerel and Atlantic herring can encounter river herring and shad. The Mid-Atlantic and New England Fishery Management Councils recommended river herring and shad catch caps for these fisheries and NMFS implemented catch caps for these fisheries beginning in 2014. Managers don’t currently have enough data to determine biologically-based river herring and shad catch caps or to assess the potential effects of such catch caps on river herring and shad populations coastwide. However, the Councils and NMFS believe river herring and shad catch caps provide a strong incentive for the mackerel and herring fleets to continue avoiding river herring and shad. These catch caps are intended to allow for the full harvest of the mackerel and herring annual catch limits while reducing river herring and shad incidental catch.

In November 2014, NMFS proposed a two-phase river herring and shad cap for the mackerel fishery for the 2015. The two-phase cap is intended to ensure that the incentive to avoid river herring and shad remains strong regardless of mackerel catch levels. The cap starts at the 89 mt, but increases to 155 mt if mackerel catches surpass 10,000 mt and river herring and shad catch up to that point has stayed below 89 mt. Catch of river herring and shad on fishing trips that land greater than 20,000 lb of mackerel count towards the cap. If NMFS determines that 95 percent of the river herring and shad cap has been harvested, a 20,000-lb mackerel possession limit will become effective for the remainder of the fishing year.

In December 2014, NMFS implemented river herring and shad catch caps for the Atlantic herring fishery for 2014 and 2015. Catch of river herring and shad on fishing trips that land more than 6,600 lb of herring count towards the caps. Caps are area and gear specific. If NMFS determines that 95 percent of a river herring and shad cap has been harvested, a 2,000-lb herring possession limit for that area and gear will become effective for the remainder of the fishing year.

The caps are as follows:

- A midwater trawl cap for the Gulf of Maine (86 mt);
- A midwater trawl cap for Cape Cod (13 mt);
- A midwater trawl cap for Southern New England (124 mt); and
- A bottom trawl cap for Southern New England (89 mt).

Please visit [www.nero.noaa.gov/aps/monitoring/riverherringshad.html](http://www.nero.noaa.gov/aps/monitoring/riverherringshad.html) to learn more about river herring and shad catch caps.
2) Improvements to At-Sea Sampling by Fisheries Observers in Atlantic Herring and Mackerel Fisheries

The NEFMC and MAFMC recommended management measures to improve quality of at-sea fisheries observer data by discouraging discarding (known as slippage) before catch has been sampled by an observer. It is important to have all catch made available to an at-sea observer because river herring and shad encounters are rare, and even a few un-sampled hauls can affect observer data on river herring and shad encounters. In 2014, NMFS prohibited slippage on fishing trips by limited access herring and mackerel/squid vessels carrying observers, except when safety, mechanical failure, or excess catch of spiny dogfish prevented catch from being brought aboard the vessel. Additionally, midwater trawl vessels carrying an observer that slip catch when fishing in the Groundfish Closed Areas are required to immediately leave the closed areas and remain outside of the closed areas for the remainder of that trip. If a vessel does slip catch when an observer is aboard, the vessel is required to complete a released catch affidavit describing the slippage event. To further discourage discarding prior to sampling on observed fishing trips, the New England and Mid-Atlantic Councils also recommended slippage consequence measures. Specifically, if herring and mackerel/squid vessel slip catch due to safety, mechanical failure, or excess catch of spiny dogfish, vessels would be required to move 15-miles before resuming fishing. If vessels slip catch for any other reason, the vessel would be required to immediately terminate its trip and return to port. These slippage consequence recommendations have been submitted to NMFS and are currently under review.

3) Increased Monitoring of Atlantic Herring and Mackerel Fisheries

The New England and Mid-Atlantic Councils recommended increasing at-sea observer coverage in the herring and mackerel fisheries to gain a better understanding of river herring behavior and fishery encounters and help ensure the effectiveness of management measures. Budget uncertainties prevented NMFS from being able to implement the increased at-sea observer coverage recommended by the Councils. To help address the recommendations for increased monitoring, NMFS has taken the lead on an omnibus amendment that would establish industry-funded monitoring programs for fisheries that require additional observer coverage to meet specific fishery management plan goals. This amendment would allow for industry-funded monitoring in all New England and Mid-Atlantic fisheries and is considering increased coverage levels for the Atlantic herring and mackerel fisheries. The New England and Mid-Atlantic Councils recommended that monitoring options in addition to at-sea observers, such as electronic monitoring, portside sampling, and at-sea monitors, be further developed in the industry-funded monitoring amendment during 2015.

4) River Herring Avoidance Program

The NEFMC and MAFMC support a river herring avoidance program that uses real-time catch data to help fishing vessels avoid areas where interactions with river herring are high. The program is a collaborative effort through the University of Massachusetts Dartmouth School for Marine Science and Technology, the Massachusetts Division of Marine Fisheries and the Sustainable Fisheries Coalition, and members of the herring and mackerel fisheries. Preliminary results from the program suggest near-real time communication systems can potentially be an effective way for fishermen to accurately avoid areas of high river herring incidental catch. Unlike the temporary closing of river herring “hotspots” approach, the near-real time communication method is dynamic, finer scale, and has the potential to reduce river herring incidental catch while not having significant negative economic impacts to the fishing industry. The Councils will each evaluate the program in two years to see if corresponding regulatory requirements should be developed. However, the current, wide-spread industry support for the avoidance program is because, in part, this program is currently voluntary and does not have associated regulatory requirements. The river herring avoidance program has financial support through the Atlantic Herring Fishery Management Plan for 2014-2015.

5) Consideration of River Herring in a Federal Fishery Management Plan

In October 2013, the Mid-Atlantic Council considered whether river herring and shad needed additional Federal management. After extensive discussion, public testimony, and consideration of public comment, the Council determined that additional management of river herring and shad under a Federal fishery management plan was neither required nor appropriate at this time given ongoing conservation efforts.
Instead, the Mid-Atlantic Council recommended addressing additional conservation of river herring and shad through an interagency working group focused on catch. The Council will review the progress of the working group on a regular basis and in 2016 formally evaluate the effectiveness of the working group approach to determine if it is appropriate or if a different strategy is required to manage river herring and shad. In January 2015, the New England Council also considered whether river herring and shad needed additional Federal management. After a careful review of current river herring and shad management and conservations efforts, the Council determined that including river herring and shad in Federal fishery management plan was not warranted at this time, but that it would re-consider additional Federal management for river herring and shad in 2018.
(Plan Components tab)

Plan Components

The Conservation Plan components include the focused issues of the River Herring TEWG’s subgroups and overarching committee, as well as other important considerations. It is important to note the TEWG considered information already identified by NMFS, ASMFC, NEFMC and MAFMC when developing a list of research needs and conservation actions (Note: These lists were not generated by consensus and reflect individual expert opinion provided by TEWG members and the public).

Stock Status
Habitat
Climate Change
Fisheries
Species Interactions
Genetics/Hybrids/Landlocked
Traditional Ecological Knowledge
Outreach
Ecosystem

Picture credit: Jerry Prezioso, NOAA
**Stock Status**

In 2012, the ASMFC completed its benchmark stock assessment for river herring. It found stocks on the US Atlantic coast are depleted to near historic lows. The “depleted” determination was used instead of “overfished” and “overfishing” because many factors, not just directed and incidental fishing, are contributing to the declining abundance of river herring. In addition to reducing harvest, recovery of river herring will need to address issues such as fish passage, predation, water quality, and climate change.

The assessment looked at the available data for 52 stocks of alewife and blueback herring, and determined, where possible, stock status relative to historic levels. It found that 23 stocks were depleted, one stock was increasing, and were unable to determine the status for 28 stocks due to lack of data. Trends over the last ten years of data showed two stocks increasing, six were stable, and four were decreasing, with the trend being unknown for the remaining rivers from Maine through South Carolina. Trends were assessed by identifying patterns in the available data, where data was insufficient conduct a model-based assessment. Because the river herring assessment is data-poor, it could not determine true estimates of abundance or fishing mortality.

For a historical perspective of river herring commercial landings, please click here.

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**Recent Trends** of Alewife and Blueback Herring


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<th>Increasing</th>
<th>Stable</th>
<th>Decreasing</th>
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<td>Damariscotta A</td>
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Trends in the remaining rivers from Maine through South Carolina were unknown.

A – Alewife
B – Blueback herring
AB – Alewife and blueback herring
* - Trends from the last ten years of data

During NMFS’ review of the status of the species, in order to assess the risk of extinction for alewife and blueback herring, to inform the listing determination, rangewide trends in the relative abundance of alewife and blueback herring were assessed for each species, as well as for each species-specific stock complex (see NEFSC’s Trend Analysis). For alewife, the stock complexes include Canada, Northern New England, Southern New England and the mid-Atlantic. For blueback herring, the stock complexes are Canada, Northern New England, Southern New
England, Mid-Atlantic and Southern. The baseline for the overall risk assessment assumed that there has already been a significant decline in abundance in both species due to a reduction in carrying capacity and overfishing as indicated in various publications, as well as other threats. The modeling generated a population growth rate for each species and stock complex. The data used to inform the modeling for the coast-wide trend were from specific NEFSC trawl surveys. Stock-specific time series of alewife and blueback herring relative abundance were obtained from the ASMFC stock assessment and Canada’s Department of Fisheries and Oceans. Relative abundance of a stock was considered to be significantly increasing or decreasing if the 95% confidence intervals of the population growth rate did not include zero. In contrast, if the 95% confidence intervals included zero, the population was considered to be stable because the increasing or decreasing trend in abundance was not significant. For alewife, modeling results showed an increasing trend for coastwide and Canada stock, and stable for the Northern New England, Southern New England, and Mid-Atlantic. For blueback herring, modeling results showed a stable trend coastwide, and in the Northern New England, Southern New England and Southern Atlantic stocks, and a decreasing trend in the Mid-Atlantic. No data was available for the Canada stock of blueback herring.

### Results of NEFSC Trends Analysis for Alewife and Blueback Herring

<table>
<thead>
<tr>
<th>Alewife</th>
<th>Blueback Herring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coastwide - Increasing</td>
<td>Coastwide - Stable</td>
</tr>
<tr>
<td>Canada - Increasing</td>
<td>Canada – No Data</td>
</tr>
<tr>
<td>Northern New England - Stable</td>
<td>Northern New England - Stable</td>
</tr>
<tr>
<td>Southern New England - Stable</td>
<td>Southern New England - Stable</td>
</tr>
<tr>
<td>Mid-Atlantic - Stable</td>
<td>Mid-Atlantic - Decreasing</td>
</tr>
<tr>
<td></td>
<td>South Atlantic - Stable</td>
</tr>
</tbody>
</table>

- **Stable** - across all model runs, the 95% confidence intervals for the estimated population growth rate did contain zero for blueback herring. Accordingly, the abundance of blueback herring range-wide did not significantly increase or decrease.
- **Increasing** - across all model runs, the 95% confidence intervals for the estimated population growth rate did not contain zero for alewife. Accordingly, the abundance of alewife range-wide significantly increased over time.
- **Decreasing** - across all model runs, the growth rate 95% confidence intervals for the Mid-Atlantic stock did not include zero, indicating that the abundance of this stock was significantly decreasing.
- **No Data** – No data was available for this species in this stock.

The TEWG **Stock Status Subgroup** has considered issues specific to appropriate methodologies to quantitatively assess river herring populations rangewide (e.g., consider data poor approaches, identify data needs). Additional information on these discussions, including identified research needs to inform the topic and ongoing efforts can be found at:

- **Stock Status Subgroup**
- **Data Gaps and Research Needs**
- **Research/Conservation Efforts**
**Habitat: Riverine and Marine**

River herring need a variety of habitats for spawning, rearing, and transitioning to and from saltwater. As adults, river herring reside in marine waters most of the year and move to freshwater rivers to spawn. The substrate preferred for spawning varies greatly and can include gravel, detritus, and submerged aquatic vegetation. Blueback herring prefer swifter moving waters compared to alewives. Nursery areas include freshwater and semi-brackish waters. Little is known about their habitat preference in the marine environment.

River herring have seasonal spawning migrations that are cue by water temperature. Depending upon temperature, blueback herring typically spawn from late March through mid-May. However, they spawn in the southern parts of their range as early as December or January, and as late as August in the northern portion of their range. Alewives have been documented spawning as early as February in the southern portion of their range, and as late as August in the northern portion of the range. The river herring migration in Canada extends from late April through early July, with the peak occurring in late May and early June. Blueback herring generally make their spawning runs about 2 weeks later than alewives do. River herring conform to a metapopulation paradigm (e.g., a group of spatially separated populations of the same species which interact at some level) with adults frequently returning to their natal rivers for spawning but with some limited straying occurring between rivers.

**General Habitat Threats**

**Dams/Barriers**

River herring require safe, timely and effective passage to spawning and rearing habitat in freshwater systems as well as migration to the sea for growth to maturity. Dams and other barriers to upstream and downstream passage (e.g., culverts) can block or impede access to habitats necessary for spawning and rearing; can cause direct and indirect mortality from injuries incurred while passing over dams, through downstream passage facilities, or through hydropower turbines; and can degrade habitat features necessary to support essential river herring life history functions. Man-made barriers that block or impede access to rivers throughout the entire historical range of river herring have resulted in significant losses of historical spawning habitat for river herring and declines in abundance of both blueback and alewife populations. While estimates of habitat loss over the entire range of river herring are not available, estimates from studies in Maine show that less than 5 percent of lake spawning habitat and 20 percent of river habitat remains accessible for river herring.

Dams are also known to impact river herring through various mechanisms, such as habitat alteration, fish passage delays, and entrainment and impingement. River herring can undergo indirect mortality from injuries such as scale loss, lacerations, bruising, eye or fin damage, or internal hemorrhaging when passing through turbines, over spillways, and through bypasses. NMFS has developed a primer outlining the critical information needs for planning and installing fish passage.

**Climate Change**

John Catena, of NOAA, supervises the crew as a fish ladder is being installed into the cut in the dam. Massachusetts, Byfield, Essex County. November 2023.

Picture credit: Essex County Greenbelt Association, Ci
Impacts from global climate change induced by human activities are likely to become more apparent in future years (Intergovernmental Panel on Climate Change. Climate variability rather than climate change is expected to have more of an impact on river herring from 2024-2030. Impacts of climate change on river herring have been investigated in marine habitats and are ongoing in freshwater habitats. Many observed changes in river herring biology related to environmental conditions have been noted, but few detailed analyses are available to distinguish climate change from climate variability.

**Water Quality (Chemical)**

Nutrient enrichment from non-point sources of pollution has become a major cumulative problem for many coastal waters; especially in the mid-Atlantic and southeast regions of the U.S.. Nutrient loading results from the individual activities of coastal development, marinas and recreational boating, sewage treatment and disposal, industrial wastewater and solid waste disposal, ocean disposal, agriculture, and aquaculture. Excess nutrients from land based activities accumulate in the soil, pollute the atmosphere, pollute ground water, or move into streams and coastal waters. Nutrient inputs are known to have a direct effect on water quality. For example, nutrient enrichment can stimulate growth of phytoplankton that consumes oxygen when they decay, which can lead to low dissolved oxygen that may result in fish kills; this condition is known as eutrophication.

In addition to the direct cumulative effects incurred by development activities, inshore and coastal habitats are also threatened by persistent increases in certain chemical discharges. The effects associated with known contaminants (e.g., PCBs, hydrocarbons, non-industrial waste) on river herring life history is largely unknown. Recent studies have highlighted the possible effects of contaminants, such as deicing road salt and copper, on anadromous species’ egg development.

**Water Quantity (Physical and Thermal)**

The physical characteristics of streams (e.g., stream width, depth, and current velocity; substrate; and temperature) can be altered by water withdrawals. River herring can experience thermal stress, direct mortality, or indirect mortality when water is not released during times of low river flows and water temperatures are higher than normal. Water flow disruption can also result in less freshwater input to estuaries, which are important nursery areas for river herring and other anadromous species.

**Dredging**

Dredging can negatively affect alosine populations by producing suspended sediments and migrating alosines are known to avoid waters of high sediment load. Fish may also avoid areas that are being dredged because of suspended sediment in the water column. Filter-feeding fishes, such as alosines, can be negatively impacted by suspended sediments on gill tissues. Suspended sediments can clog gills that provide oxygen, resulting in lethal and sub-lethal effects to fish.

Nursery areas along the shorelines of the rivers in North Carolina have been affected by dredging and filling, as well as by erection of bulkheads; however, the degree of impact has not been measured. In some areas, juvenile alosines were unable to enter channelized sections of a stream due to high water velocities caused by dredging.

**TEWG Habitat Subgroup**

The TEWG Habitat Subgroup has considered issues specific to the impacts from various factors affecting river herring habitat including, but not limited to, connectivity (e.g., fish passage), water quality/quantity, and appropriate habitat characteristics. Additional information on these discussions, including identified research needs to inform the topic and ongoing efforts can be found at:

- Habitat Subgroup
- Research Needs (coming soon)
- Research/Conservation Efforts
(Plan Components tab)

Climate Change

Many observed changes in river herring biology related to environmental conditions have been noted, but few detailed analyses are available to distinguish climate change from climate variability. Impacts from global climate change induced by human activities are likely to become more apparent in future years (Intergovernmental Panel on Climate Change. Climate variability includes natural variability in the Earth's climate which acts in association and simultaneously with climate change, which represents long-term change in the climate system (>50 years). Impacts of climate change on river herring have been investigated in marine habitats and are ongoing in freshwater habitats. For example, a change to the amount of preferred marine habitat and a potential northward shift in marine distribution is expected as a result of climate change.

The TEWG Climate Change Subgroup has considered issues related to the above specific to the impacts of climate change and climate variability on river herring rangewide (including in freshwater). Additional information on these discussions, including identified research needs to inform the topic and ongoing efforts can be found at:

- Climate Change Subgroup
- Research Needs (coming soon)
- Research/Conservation Efforts
(Plan Components tab)

Fisheries

River herring formerly supported significant commercial and recreational fisheries throughout their range. Fisheries were traditionally executed in rivers, estuaries, and coastal waters using weirs, traps, dip nets and gillnets. Currently, river herring are harvested by directed commercial and recreational fisheries in some state waters. Commercial and recreational fishing in state waters is authorized through a sustainable fisheries management plan as required under Amendment 2, adopted by ASMFC in 2009, prohibited commercial and recreational river herring fisheries in state waters as of January 1, 2012, unless a state or jurisdiction develops and receives approval for a sustainable fisheries management plan (SFMP). To date, SFMPs have been approved for Maine, New Hampshire, New York, North Carolina and South Carolina. There are also incidental catches and discarding of river herring in state waters but little is known regarding the extent of this activity.

While there are no directed commercial or recreational fisheries for river herring in Federal waters, river herring are incidentally harvested in commercial fisheries for other species using midwater trawl gear, small mesh bottom trawl gear, and large mesh gillnet gear. Commercial fisheries in Federal waters are managed by the NEFMC, MAFMC, and NMFS through the Magnuson-Stevens Fishery Conservation and Management Act. River herring are also harvested in Canada and managed by Department Fisheries and Ocean through the Fisheries Act. Additional specifics can be found at “Ongoing Monitoring and Management.”

The TEWG Fisheries Subgroup has considered issues related to the above specific to the impacts from state and federal fisheries rangewide. Additional information on these discussions, including identified data gaps and conservation ideas to inform the topic and ongoing efforts can be found at:

- Fisheries Subgroup
- Data Gaps and Conservation Ideas
- Research/Conservation Efforts
(Plan Components tab)

Species Interaction

River herring play an extremely important role in freshwater and marine foodwebs. In estuaries and freshwater, during the river herring migration, river herring represent an easily obtainable, high caloric value prey item for many species of fish, birds and mammals. The immigration of adult river herring and emigration of juveniles within East Coast rivers represents a feast to many predatory species. In freshwater and estuary environments river herring abundance is unmatched in terms of biomass by any other prey species within the range that river herring live. During the spring spawning migration, river herring likely contribute significantly to overall breeding success of many predators whose breeding season closely overlaps their arrival. In the marine environment, river herring play an equally important role for many marine fishes such as striped bass, spiny dogfish, Atlantic cod and Pollock; as well as many marine mammals and birds, including whales, seals, ospreys, cormorants, and gulls. In fact, in a 2008 report, Adrian Jordaan and his colleagues identify many instances where declines in abundance of many species of fish in nearshore habitats that prey on river herring, such as cod and haddock, have been attributed to declines in river herring abundance.

Prior to ecological disturbances predation likely had a negligible effect on river herring populations. But as a consequence of environmental impacts over the last 150 years (e.g. dam construction, pollution, overfishing) that have considerably reduce river herrings’ abundance, the schools of river herring are likely considerably smaller, more spatially and temporally sporadic then historically, and subsequently more vulnerable to predation pressures.

The effects of predation on river herring are more pronounced in recent decades particularly as striped bass populations have rebounded and as new predatory species have been intentionally or accidentally introduced. Striped bass are also anadromous and can easily take advantage of schools of river herring, particularly around dams that block or slow river herrings’ ability to migrate. River herring populations most affected by increases in striped bass populations are predominately south of Maine where the immigration of both species into estuaries and rivers is more synchronous with one another.

Throughout the East Coast, intentional and accidental introductions of invasive species have added to the list of predators that prey on river herring. Many species introductions were done to provide more opportunities for recreational fisheries. The more desirable introductions often include larger predatory species that offer greater entertainment value to recreational anglers. Consequential to these introductions, native fish species are threatened with increases in predation, and competition for food and space. Throughout the Mid-Atlantic and Southeast, the intentional and accidental introduction of blue catfish and flathead catfish (both native to the Mississippi River basin) has significantly increased predation on many native fauna including river herring. Blue and fathead catfish pose an additional threat to river herring over many other introduced species because of their ability to effectively utilize riverine, tidal freshwater, and brackish habitats. Similar to the threat of striped bass predation, catfish also gain advantage at pools below dams where river herring congregate.

The TEWG Species Subgroup has considered issues related to the above specific to the interactions between river herring and other components of the ecosystems they occupy rangewide (includes trophic interactions and ecosystem services in freshwater, estuarine and marine environments). Additional information on these discussions, including other information to inform the topic and ongoing efforts can be found at:

- Species Interaction Subgroup
- Research Overview to Inform Future Studies
- Research/Conservation Efforts
(Plan Components tab)

Genetics/Hybrids/Landlocked

The range-wide stock and population genetic structure of alewife and blueback herring is currently unknown, but recent research using newly developed Single Nucleotide Polymorphisms (SNPs) for specimens collected across their entire geographic range should provide this vital information. Prior research to inform the spatial scale of stock structure has used genetic markers (i.e., microsatellites), life history information, and morphometric data. To date, genetic data suggests evidence of regional stock complexes for both alewife and blueback herring, even though many rivers comprise genetically distinguishable groups. Migration and mixing patterns of alewives and blueback herring in the ocean are currently unknown, though regional stock mixing is suspected, and efforts are currently underway to better understand river herring marine ecology. Otolith microchemistry may help inform stock structure where molecular markers provide only course resolution, and important efforts have occurred. When considering a rangewide perspective, standardized approaches to stock structure are important for providing comparable datasets.

The TEWG Genetics/Hybrids/Landlocked Subgroup has considered issues related to the above specific to rangewide stock structure. Also, this subgroup has considered possible effects from hybridization, understanding the effects of stocking on genetic diversity, and any impacts landlocked populations may have on anadromous forms via introgression following dam removal and fish passage improvement projects. Additional information on these discussions, including identified research needs to inform the topic and ongoing efforts can be found at:

- Genetics/Hybrids/Landlocked Subgroup
- Research Needs
- Research/Conservation Efforts
(Plan Components tab)

Traditional Ecological Knowledge

Traditional ecological knowledge on river herring is an important consideration and can help inform river herring conservation. A definition of traditional knowledge from the Society of Ecological Restoration is included below:

Traditional knowledge refers to the knowledge, innovations and practices of indigenous and local communities around the world. Developed from experience gained over the centuries and adapted to the local culture and environment, traditional knowledge is transmitted orally from generation to generation. It tends to be collectively owned and takes the form of stories, songs, folklore, proverbs, cultural values, beliefs, rituals, community laws, local language, and agricultural practices, including the development of plant species and animal breeds. Traditional knowledge is mainly of a practical nature, particularly in such fields as agriculture, fisheries, health, horticulture, and forestry.

Knowledge from indigenous and local communities are important to the conservation plan as it provides an intimate knowledge of river herring, the habitats where they live, and changes that may have affected them over time. Subsequently this is an important source of knowledge of river herring’s local distributions, abundances, behaviors and threats. This information can be useful to help identify research needs, as a means of data validation, and identifying potential unknowns that may warrant further investigation.

The below provide a few ongoing initiatives related to traditional ecological knowledge:

Tribal Information

River herring are important to State and Federally Recognized Tribes. Consistent with Executive Order 13175 Consultation and Coordination with Indian Tribal Governments, Secretarial Order 3206 American Indian Tribal Rights, Federal-Tribal Trust Responsibilities, and the Endangered Species Act (June 5, 1997), and the Tribal Consultation and Coordination Policy for the Department of Commerce, there has been coordination and collaboration with our tribal partners on the development of the River Herring Conservation Plan. The following list highlights some of our ongoing work with our tribal partners:

- In response to NMFS’ interest in understanding the cultural importance of river herring in the U.S. and Canada to East Coast Native American Tribes and First Nations to support the River Herring Conservation Plan, the Passamaquoddy Tribe, Pleasant Point, drafted a comprehensive paper entitled: The Cultural Importance of River Herring to the Passamaquoddy People. To directly link to the cultural paper, please visit: http://www.wabanaki.com/wabanaki_new/documents/Passamaquoddy%20and%20River%20Herring-Cultural%20Importance%20v5.pdf). For the Passamaquoddy Tribe, Pleasant Point, main website on alewife, please visit: http://www.wabanaki.com/wabanaki_new/st_croix_alewife.html.
- The Next Steps Work Group is a unique collaboration between Federal Partners and the Passamaquoddy Tribe on river herring restoration in the St. Croix watershed.

Collaboration with our tribal partners, the fishing industry, as well as other partners and stakeholders, will enhance the ability to fully restore alewife and blueback herring. These two species are critical to fully functioning marine, estuarine, and freshwater ecosystems.
“The Fish that Feeds All”

Fisher men and women, by virtue of spending much of their time on the water with hooks, lines, traps, and nets, have intimate knowledge of coastal, marine and freshwater ecosystems. They know, in detail, the local distribution, abundance, and behavior of the species they harvest; this knowledge is gained from years of first-hand observations and experimentation with different fishing techniques.

In 2014, Maine Sea Grant and NMFS received funding from NOAA’s preserve America Initiative to document and share harvesters’ knowledge of alewives, blueback herring and American eel in Downeast Maine. These species have been harvested by residents for centuries and are an important part of the region’s fishing heritage. All three species are diadromous: they spend part of their lives at sea and part in freshwater. In doing so, they create important ecological links between coastal and inland ecosystems.

Visit seagrant.umaine.edu/oral-histories-alewife-eel for links to videos and narrative descriptions of this effort.

Coastwide Survey of river herring fishermen

As part of NMFS’ efforts to better understand the status of river herring populations, the threats they face, and how to best restore their populations, the agency carried out a social science survey to document fishermen and women’s observations of river herring. Commercial, recreational, and sustenance fisheries for river herring have taken place throughout virtually the entire range of both species for centuries. Fishermen and women have detailed knowledge of the fish in their local areas. They observe many aspects of river herring runs that NMFS considers to be indicators of the health of the runs, including the duration of the run, the size of the fish, and the abundance of the fish. Fishermen and women often fish in the same areas over many years and are able to notice changes in the fish stocks in their local areas over time. Past studies have documented examples of fishermen and women observing changes in fish stocks before those changes were evident in data collected by biologists.

- Report (Coming Soon)
(Plan Components)

Outreach

Increased awareness of river herring is important to further conservation. NMFS and ASMFC have been involved in various outreach initiatives with partners to raise general awareness of river herring, including the TEWG and conservation plan initiative. Examples of outreach initiatives and efforts include:

- **Atlantic States Marine Fisheries Commission** - The Atlantic States Marine Fisheries Commission (ASMFC) is a commission of U.S. Atlantic states formed to coordinate the conservation and management of 25 nearshore fish species, including river herring. For more information about their various meetings, please visit [http://www.asmfc.org/](http://www.asmfc.org/).
  - NMFS/ASMFC TEWG Update at February ASMFC meeting
  - NMFS/ASMFC TEWG Update at February ASMFC meeting

- **Fishery Management Councils** - The New England Fishery Management Council (NEFMC) and the Mid-Atlantic Fishery Management Council (MAFMC) are two of eight regional councils established by federal legislation in 1976, and are charged with conserving and managing fishery resources off the New England and Mid-Atlantic coasts. For information about their various Council meetings, please visit [http://www.nefmc.org/](http://www.nefmc.org/) and [http://www.mafmc.org/](http://www.mafmc.org/).
  - NMFS/ASMFC TEWG presentation at January NEFMC meeting.
  - NMFS/ASMFC TEWG presentation at April MAFMC meeting.

- **World Fish Migration Day** - World Fish Migration Day is a one day global initiative, with local events worldwide, to create awareness about the importance of open rivers and migratory fish including river herring. NMFS is a supporter of this effort that was initiated by World Wildlife Fund, The Nature Conservancy, IUCN SSC/WI Freshwater Fish Specialists Group, Wanningen Water Conult and LINKit Conult. May 24 is the official day of celebration, but there are various events scheduled nationally throughout May. For more information, please visit [http://www.worldfishmigrationday.com/](http://www.worldfishmigrationday.com/)
  - Flat Fish Activity with alewife

- **NMFS GARFO River Herring website** - There are several divisions in the NMFS Great Atlantic Regional Fisheries Office (GARFO) that are working together to further outreach on river herring conservation. A website was developed to increase outreach these efforts and additional information can be found at: [http://www.greateratlantic.fisheries.noaa.gov/protected/riverherring/](http://www.greateratlantic.fisheries.noaa.gov/protected/riverherring/)

- **NMFS and ASMFC River Herring Technical Expert Working Group website** - A website was developed with information on the Technical Expert Working Group and its subgroups, including meeting summaries and a calendar of future meetings. Meetings are open to the public and are generally webcast. Additional information can be found at: [http://www.greateratlantic.fisheries.noaa.gov/protected/riverherring/tewg/index.html](http://www.greateratlantic.fisheries.noaa.gov/protected/riverherring/tewg/index.html)

- **Anadromous Species of Concern Bookmark (coming soon)**

- **River herring news stories** - For the latest stories on river herring, please visit the GARFO News Room website, [http://www.greateratlantic.fisheries.noaa.gov/mediacenter/index.html](http://www.greateratlantic.fisheries.noaa.gov/mediacenter/index.html)

### 2015
- Research Projects Selected to Help Us Learn More about River Herring

### 2014
- Fish as Habitat?
- River Herring Survey to Begin in August
- What’s So Special About May 24?
- Sharing World Experiences on River Restoration
- Strategic Effort to Conserve River Herring

### 2013
- River Herring Update
- Developing Conservation Plan for River Herring
- Work Begins to Remove Whittenton Pond Dam
- Astounding Increase in Herring Numbers on Acushnet

### 2012

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28
River Herring News
Herring Recovery at Plymouth Rock

There are many river herring outreach efforts along the coast. Based on the number of efforts, these are too numerous to note, but each is important to raising awareness about river herring (e.g., Town Brook River Herring Festival).
(Plan Components tab)

Ecosystem

River herring are an important part of the marine, estuarine, and freshwater ecosystems, providing food for a variety of animals and including important commercial and recreational fish like cod and haddock, and providing nutrients derived in the marine environment to the freshwater habitats that they migrate to. In order to successfully restore river herring, it is important to increase the resilience of both species, therefore, the full array of interactions within the ecosystems that they occupy must be considered. Because of river herrings role in freshwater, estuary and marine foodwebs their restoration will likely afford significant ancillary benefits to a wide range of species, including other diadromous species.

The TEWG Ecosystem Integration Committee has discussed issues to ensure that an ecosystem perspective is taken to the River Herring TEWG. Due to the overlapping nature of many of the considerations for river herring, communication and collaboration is important in order to avoid duplication of efforts and utilize limited resources. The Committee provides a forum to integrate information across the subgroups to inform the overall NMFS and ASMFC’s conservation strategy for these species. Additional information on these discussions, including overlapping needs and ongoing efforts can be found at:

- Ecosystem Integration Committee
- Overlapping Needs
- Research/Conservation Efforts
Research/Conservation Needs and Ongoing Efforts

Research and conservation needs have been identified by NMFS and ASMFC, as well as our partners (e.g., ASMFC Shad and River Herring Technical Committee, councils) over the years. Most recently, the River Herring TEWG and its subgroups have worked to consider ongoing efforts to determine what research is needed to restore river herring. These needs relate to habitat, fisheries, climate change, species interaction, stock status, and stock structure. Also, there are many items that cut across these specific topics where ecosystem integration is necessary. Identified research and conservation needs are important to highlight, and may help to find funds to meet these needs.

Research/Conservation Efforts

There have been many previous and ongoing efforts to fill-in gaps and further river herring conservation (e.g., identified in TEWG subgroup products). Funding sources are important to try to fill these needs and there have been many important funding projects/initiatives to date which have contributed to what is currently known for river herring. Please go to "Funding Sources" for additional information.

The small-scale and large scale efforts from Canada through Florida involving those from the general public to government working to conserve river herring (e.g., fish-friendly hydropower, barriers to fish passage, watershed cleanups, in-stream flows and flow augmentation) are too numerous to list, but each important. These are not broken down by individual plan component as many of these have overlapping benefits.

Restoration Efforts

Federal Fishery Management

Several management measures intended to reduce commercial fisheries interactions with river herring and shad in Federal waters are currently in place or are being developed. These management measures have been developed by the New England Fishery Management Council, the Mid-Atlantic Fishery Management Council, the NMFS Greater Atlantic Regional Fisheries Office, and the Northeast Fisheries Science Center, and promulgated through Federal fishery management plans for Atlantic Herring and Atlantic Mackerel, Squid, and Butterfish.

River Herring Avoidance Programs

These programs use real-time catch data to help fishing vessels avoid areas where interactions with river herring are high.

- River herring avoidance in the Atlantic herring and mackerel fisheries: [http://www.umassd.edu/smast/bycatch/](http://www.umassd.edu/smast/bycatch/)
- River herring avoidance in the Longfin squid fishery: [http://squidtrawlnetwork.squarespace.com/project-summary/](http://squidtrawlnetwork.squarespace.com/project-summary/)

ASMFC River Herring Sustainable Fishery Management Plans
Maine
New Hampshire
New York
North Carolina
South Carolina

**National Fish and Wildlife Foundation’s River Herring Initiative**

For example, Atlantic Coastal Fish Habitat Partnership and The Nature Conservancy's collaboration to convene a series of webinars and supplemental meetings, and one in-person workshop, to gather river-system specific river herring information to prioritize, plan, and strategize river herring restoration needs. Also, the Smithsonian Environmental Research Center efforts to conduct run count and spawning habitat use surveys in tributaries of Chesapeake Bay.

**St. Croix Watershed Restoration**

Maine passed legislation in 2013, rescinding previous legislation to block river herring passage in the St. Croix watershed. After over two decades of blocked fish passage, river herring were once again allowed to access historic habitat in the St. Croix upstream of Grand Falls. Following the barrier removal in 2013, the Next Steps group was formed. The group, comprised of NMFS, USFWS, EPA, BIA and Passamaquoddy, holds monthly coordination calls to discuss river herring restoration and fish passage improvements in the St. Croix. NMFS is also involved in the FERC relicensing at the Vanceboro project and has reserved authority for fish passage.

**Funded Research Projects**

Fishing and the Environment (FATE) funded projects to investigate the impacts of climate change on river herring in marine and freshwater environments.

ASMFC and NMFS funded research projects to address high priority needs include:

- **Project Title:** Linking life stages: marine bycatch mortality, freshwater productivity, and spawning stock recruitment. To be conducted by the Massachusetts Division of Marine Fisheries and the University of California-Santa Cruz in partnership with the Connecticut Department of Energy and Environmental Protection, The Nature Conservancy, the University of Massachusetts-Amherst, and the U.S. Geological Survey’s Massachusetts Cooperative Fish and Wildlife Research Unit.
- **Project title:** Determination of extant herring runs in the Barnegat Bay and Raritan River watersheds. To be conducted by Barnegat Bay Partnership and Rutgers University (The State University of New Jersey).

NOAA has recently funded projects related to river herring in coordination with our partners. A few examples are listed below, and completion reports will be available at “NOAA GARFO Grants Database.”

- **Title:** Bio-Monitoring and Assessment Project for American Shad and River Herring in the Susquehanna River Basin, Phase XVI-XX. Source: Atlantic Coastal Act, NA10NMF4740290. PA Fish & Boat Commission. Since the 1960's, the Susquehanna River Anadromous Fish Restoration Cooperative and its predecessors have renewed efforts to restore American shad and other migratory fish to the Susquehanna River Basin. Although American shad has been the primary focus of alosine restoration in this long-term project, funded by NOAA under the Atlantic Coastal Act, the work plan covers the following:
  1. Susquehanna River seine hauls for juvenile alosines.
  2. Lift-netting of Lower Susquehanna River for juvenile alosines.
  3. Conowingo Dam West Fish Lift operation for the collection of adult alosines.
  4. American shad otolith analysis.
  5. Contract administration and project oversight.
- **Title:** Documentation and Quantification of Alosids Utilizing Fish Passage Facilities and Collection of Biological Data on Adult American Shad - Phases 15 through 19. Source: Interjurisdictional Fisheries Act,
NA10NMF4070354. Pennsylvania Fish & Boat Commission. Its focus is on American shad, but the scientists also work closely with USFWS grant programs that may monitor other alosids as well, so it may be worthwhile to determine what monitoring data, other than the shad run in the Lehigh and Delaware Rivers is (or has been) collected.

- Title: Portside commercial catch sampling and comparative bycatch sampling for Atlantic herring, Atlantic mackerel and Atlantic menhaden fisheries. Maine Department of Marine Resources. Source: Atlantic Coastal Cooperative Statistics Program (ACCSP), NA13NMF4740203. The top priority is the biological sampling of the Atlantic herring commercial fishery, including Atlantic menhaden and mackerel and other incidentally retained species of interest, because the information derived has critical value in gauging the health of the east coast herring meta populations.

Research Set-Aside Program

Using funds from the 2014/2015 Atlantic Herring Research Set Aside (RSA), a project “Characterizing and reducing river herring incidental catch in the Atlantic herring mid-water trawl fishery,” is underway by the University of Massachusetts, Dartmouth/School for Marine Science and Technology (SMAST). This project will increase the accuracy and precision of river herring incidental catch estimates by sampling mid-water trawl vessels at a high rate. This project also hopes to reduce river herring incidental catch.

This program is managed by the NMFS Northeast Cooperative Research Program. Landings that pay for RSA research are allocated by the New England and Mid-Atlantic Fishery Management Councils (NEFMC and MAFMC, respectively). Money generated by the sale of the awarded RSA quota funds the proposed research, and compensation is provided for vessels harvesting the quota in the form of direct fish sales in the commercial fishing industry or in the form of additional fishing opportunities in the for-hire and charter recreational fishing industry.

Further Research/Conservation Efforts

NMFS and ASMFC are committed to further research on and conservation of river herring through a number of ongoing efforts, many of which involve collaboration with our partners. Some of these efforts are described on the Conservation Plan further research page.

There are numerous research efforts underway for river herring, and the above just captures a few of these. However, river herring remains a data poor species. Although important research and conservation efforts are underway, continued efforts are needed (see “Conclusions and Looking Forward”).
(Research/Conservation Efforts)

Restoration Efforts

NOAA Habitat Restoration Projects

Between 1992 and early 2015, NOAA, though its Restoration Center, Habitat Conservation Division, and Protected Resources Division, has provided funding of and technical assistance on 284 fish passage projects along the Atlantic Coast, the majority of these projects occurring in the Northeast region. More than 41 percent of these projects are dam removals while other fish passage types include nature-like and structural fishways, culvert removals and replacements, and stream channel restoration. River herring are the primary target species for most of these projects. Collectively, these projects have provided access to more than 2,160 river miles of spawning and rearing habitats, and afforded access to 24,220 acres of ponds and lakes serving as important spawning and rearing habitats for alewife. NOAA funding for these project has exceeded $72 million, and has been matched or leveraged another $45 million.

For completed passage barrier removal projects, NOAA requires Tier I implementation monitoring to document implementation outcome and basic effectiveness of target species passage following project completion. Tier II monitoring addresses more sophisticated ecological effectiveness questions and conducted over longer post-project periods at selected NOAA-funded barrier removal sites. Tier II monitoring addressing project effectiveness for river herring is presently being conducted on the Penobscot River (ME), Patapsco River (MD), and Mill River (MA) passage restoration sites.

NOAA, in collaboration with the U.S. Geological Survey (USGS) and the U.S. Fish and Wildlife Service (USFWS) seek to improve passage by river herring and other diadromous fishes at barrier removal sites by developing passage design criteria for each Atlantic Coast diadromous fish species. Federal interagency criteria are being developed specifically for the design of nature-like fishways and to assess passage conditions at dam removal sites, and are expected to be released to the public in spring 2015. A federal interagency passage design manual is also in preparation to supplement the passage design criteria and is expected to be released to the public by early 2016.

Penobscot River Restoration Project: Great Works and Veazie Dam Removals and Howland Dam Bypass

The Penobscot River Restoration Project (PRRP) is the successful outcome of many years of negotiations amongst the previous dam owner, Pennsylvania Power and Light, the current dam owner, Brookfield, U.S. Department of the Interior, Penobscot Indian Nation, the State of Maine, and multiple non-governmental organizations (NGOs; Atlantic Salmon Federation, American Rivers, Trout Unlimited, Natural Resource Council of Maine, among others). As part of the PRRP, Great Works Dam, the second mainstem dam on the Penobscot River, was removed in 2012 and Veazie Dam, the first mainstem dam on the Penobscot River, was removed in 2013. The PRRP, if fully implemented, also calls for the decommissioning of the Howland hydroelectric project and construction of a nature-like bypass fishway around the existing dam, which will remain in place. The bypass is currently under construction in 2015. As a result of the dam removals and fishway addition, 13 miles of river habitat will be
reopened to diadromous fish access, and will provide improved access (habitat above one or more fishways) to 454 miles of the upstream river network and 39 lakes historically used by alewife as spawning and rearing habitats. With completion of the PRRP, blueback herring will have improved access to 93 percent of its historical-use habitat, and alewives will have improved access to 31 percent of its historical-use habitat in the Penobscot River watershed.

The Maine Department of Marine Resources has also published an Operational Plan for the Restoration of Diadromous Fishes to the Penobscot River (MDMR, 2009) which details future targets and restoration goals in the Penobscot River watershed. The plan goal for alewife restoration is to restore alewife and blueback herring populations to self-sustaining levels in historical habitat within 40-48 years. The plan outlines restoration for alewife in thirteen Phase 1 priority lakes beginning in 2010, followed by restoration of an additional eighteen to twenty-two Phase 2 and 3 lakes based on a timetable linked to the success of the Phase 1 lake returns. The Plan also includes scheduled monitoring of adult river herring returns at hydroelectric dams on the Penobscot River.

Other Barrier Removals Restoring River Herring Populations

Gulf of Maine Fishways

In addition to river herring projects for which NOAA is leading through the Penobscot River Focus Area, NOAA’s Restoration Center has also partnered with state and local community organizations to complete priority passage projects on other rivers and streams in the Gulf of Maine. Recently complete projects include: Pokey Dam Fishway, East Machias River: In 2014 a Denil fishway was constructed at the outlet of Crawford Lake in Downeast Maine, providing alewife access to 4,591 acres of high-quality spawning and rearing habitats in Crawford, Lower Mud, Upper Mud, and Pocomoonshine Lakes located in the East Machias River watershed. This structural fishway replaced an old wooden fishway that had fallen into disrepair and no longer provided effective alewife passage. Nequasset Lake Fishway, Nequasset Stream: In 2014 a structural pool-and-weir fishway was constructed at the outlet of Nequasset Lake on Nequasset Stream, a tributary to the lower Kennebec River. The project replaced a concrete-and-wood fishway that had fallen into disrepair, and restored alewife access to 392 acres of lake spawning habitat. Pre- and post-restoration monitoring is being conducted by a dedicated team of volunteers overseen by the Kennebec Estuary Land Trust.

Town Brook Dam Removals

Town Brook is a small but highly important 1.5-mile long stream that runs from the Billington Sea, a 269-acre lake, to Plymouth Harbor in Plymouth, Massachusetts. Historically, the river sustained important migratory fish runs of alewife, blueback herring, and rainbow smelt. Beginning in the 1790s, six dams were constructed or reconstructed on Town Brook. In the recent past to address the dwindling fish runs, the Massachusetts Division of Marine Fisheries netted and trucked river herring around the dams and released them into their upstream spawning grounds. With assistance from the NOAA Restoration Center and many other project partners, the Town of Plymouth has restored fish passage on Town Brook. Fishways were first replaced at two of the dams at Newfield Street (2001) and the Jenney Grist Mill (2006). The Billington Street dam and its non-functioning fish ladder were removed in 2003, and the stream and riparian habitat upstream of the former barrier were restored to natural conditions. River herring telemetry studies funded by NOAA documented high passage efficiency at this restored site. The Billington Street dam project was the first dam removal in Massachusetts addressing river herring passage restoration and provided a precedent for future dam removals for diadromous fish passage in the state. The Water Street bridge reconstruction and barrier removal at the head-of-tide were
completed in 2014 to allow river herring to effectively pass upstream throughout the normal tide cycles. The Off-Billington Street dam was removed in late 2014 and the restored stream reach now provides unimpeded fish passage at and upstream of this location. The Plymco Dam was removed in early 2015 and the upstream reach has also been restored for river herring passage. Lastly, a feasibility study has been completed for the removal of the Holmes dam, and removal of the dam is expected to be completed in 2017. To date, more than $4 million have been spent on multiple fish passage and stream restoration projects on Town Brook through 2015.

Acushnet River Nature-like and Structural Fishways
The Acushnet River has been the focus of a large-scale effort to restore river herring and American eel populations by improving access into the New Bedford Reservoir – the primary spawning and nursery habitat for alewife. A cooperative effort between the Massachusetts Division of Marine Fisheries (MA DMF), the National Marine Fisheries Service (NMFS), and the U.S. Fish and Wildlife Service (USFWS) focused on fish passage improvements at three barriers on the river. Prior to project implementation, three barriers on the 4-mile long Acushnet River impeded herring passage to more than 220 acres of upstream spawning and rearing habitats. The most upstream barrier (New Bedford Reservoir dam, 11-feet high), was fitted with a Denil fishway in 2002. Fish passage at the lower two barriers was completed in 2007 with the installation of step-pool nature-like fishways at each the Sawmill dam and Hamlin Street dam sites. The average run size on the Acusnet River prior to these fish passage improvements was less than 400 river herring, annually. Following construction, there has been an increasing trend in annual herring run size, with the 2013 run size 1,870% greater than pre-construction conditions. The Acushnet River herring run is expected to reach a run size in the tens to hundreds of thousands of returning adults, annually. A technical report on this project is available at: http://www.mass.gov/eea/docs/dfg/dfm/publications/tr-56.pdf, and the Buzzards Bay Coalition, a lead non-governmental organization for the project, has additional information on the Sawmill site restoration on its web site: http://www.savebuzzardsbay.org/AcushnetSawmill. NMFS was the lead agency for the design, permitting, and construction of the two nature-like fishways, and managed these two projects on behalf of the New Bedford Harbor Trustee Council (NBHTC). MA DMF was the lead agency for the design, permitting, and construction of the technical fishway at the New Bedford Reservoir Dam. All of the fish passage improvement work, including monitoring, was funded through the NBHTC. The MA DMF has been monitoring the runs on the Acushnet River annually since 2005. To census the river herring population and other species assemblages, MA DMF installed a sampling trap at the top of the New Bedford Reservoir Denil fishway. An electronic counter was also installed at the trap exit to record numbers of fish passing during periods when manual counts and species identification are not conducted. Lastly, an ecological restoration project at the site of the Sawmill Dam will be completed in spring 2015. This important restoration project removed multiple acres of pavement and other defunct impervious surfaces, and restored the site with natural habitats including red maple swamp and emergent marsh habitats providing water quality and wildlife benefits.

Bride Brook Culvert Replacement
In 2006, the NOAA Restoration Center began working on assessment and design of a culvert to replace two undersized elliptical culverts at the tidal mouth of Bride Brook to Long Island Sound at Rocky Neck State Park in East Lyme, Connecticut. Culverts at this site were originally installed in 1934 as part of a Federal Works Progress Administration project, and replaced by the dual culverts in 1981. One of the culverts was non-functional, and the second culvert had hydraulic flows which adversely affected passage by alewife. Historically, Bride Brook was known to have a significant run of herring, typically runs of up to 175,000 adults, annually prior to the installation of the former dual culverts. As the culverts fell into
disrepair, the annual river herring run size dwindled, substantially. This small but highly important stream, with a length of 2 miles and traversing through a 78-acre tidal marsh, discharges from Bride Lake, a 72-acre waterbody with high water quality and no development along its entire shoreline, providing excellent spawning and rearing habitat for alewife. In 2009, NOAA, through the American Recovery and Reinvestment Act, awarded funds to Save the Sound (STS) to remove the derelict culverts, install a new larger, concrete box culvert and low-level stone groins at the beachfront, and restore the dune system (13,000 beachgrass plugs were planted by volunteers) through which the culvert was installed. Besides STS and NOAA, project partners included the Connecticut Department of Energy and Environmental Protection (CT DEEP), Natural Resources Conservation Service, USFWS, and Fish America Foundation. CT DEEP with assistance from STS and NOAA oversaw the culvert and groin installation, successfully completed in early 2010. The CT DEEP has been monitoring the site with an automated fish counter installed at the outlet of Bride Lake. Funds for the fish counter were provided through the NOAA-STS RAE Partnership. The river herring run size has increased substantially, reaching more than 287,000 fish in 2012, 363,000 in 2013, and 265,000 returning adults in 2014. This run size well exceeds the numbers historic run numbers in the 1970s before the former culvert fell into disrepair; and it is anticipated that the run may further increase in size in future years. Now during springtime alewife spawning in Bride Lake, the shoreline boils with spawning alewife activity which attracts ospreys, bald eagles, and other wildlife in search of food.

**Raritan River Passage Restoration**

NOAA has been involved with passage restoration on the Raritan River in New Jersey for more than a decade. The NOAA Restoration Center began a diadromous fish database and photographic inventory of the major dams beginning in 2004. NOAA and NJDEP worked closely together to establish the Raritan River Fish Passage Initiative in 2008 bringing together stakeholders from other state, local and federal agencies, non-profit organizations, utilities and private dam owners. Three dams on the main stem of the Raritan River were removed under a State Natural Resources Damage Settlement between NJDEP and the El Paso Corporation (now Kinder Morgan) for injuries to NJ waterways resulting from contamination to ground water and surface waters at three industrial locations. These include the Calco dam, removed in 2011, the Robert Street dam, removed in 2012, and the Nevius Street dam, removed in 2013. The Calco dam, the most downstream barrier, was notched to allow passage during higher flows, sometime prior to 2003. Shad and river herring observations began in 1996 at a fish way viewing window installed by NJDEP at the Island Farm Weir at River Mile 22. The annual run size prior to dam removal was typically less than 1,000 of combined American shad and river herring. In the year following the removal of the Calco dam the survey count was 495 individuals. In 2014 shad passage was documented one mile upstream of the former Robert Street dam, giving indication that shad and river herring are now migrating to the base of the next full impediment known as the Head Gates Dam. This dam has been targeted for future removal by USFWS, NOAA and NJDEP. Rutgers University is under contract with the NJDEP to continue the Island Farm Weir viewing window surveys through 2016. Researchers have replaced VHS viewing with digital infrared cameras that collect data during both day and night conditions. Additionally Rutgers has added a radio tagging and tracking program which allows researchers to monitor passage efficiency through the fishway. The Raritan River Fish Passage Initiative partners continue to work towards a goal of removing or enhancing fish passage at four additional Raritan River barriers during 2015-2020.

**Patapsco River Dam Removals**
In 2010, NOAA, the Maryland Department of Natural Resources and American Rivers completed the demolition of the Simkins and Union Dams on the Patapsco River near Ellicott City, Maryland. These projects are critical components of what will be the largest river restoration in the state of Maryland, and will establish a model for future dam removal efforts in the Chesapeake Bay watershed. The primary objective of these removals is to restore healthy spawning and rearing habitats by opening 65 miles of habitat for target fish species including river herring, American shad and American eel. A third dam and the first blockage on the Patapsco River, Bloede Dam, is scheduled for removal in 2015. Once removed, diadromous fishes will have free access to upriver reaches for the first time in more than 100 years. Large-scale monitoring efforts are underway by the Maryland Biological Stream Survey to record returns of diadromous species including measuring the abundance of river herring in the watershed. Additional monitoring of the Patapsco River includes 30 cross-sections for repeat topographic surveys and bed sediment grain-size sampling; five areas where high-density points are repeat-surveyed to develop and update digital elevation models (DEMs) of erosional and depositional hotspots; repeat photo stations to document physical changes in river morphology; and installation of three U.S. Geological Survey gages where continuous river and suspended sediment discharge data are being collected for further analysis on the restoration of the river.

Planning for Passage Restoration: Chesapeake Bay Fish Passage Prioritization

The Chesapeake Bay watershed covers over 64,000 square miles, has over 140,000 miles of mapped rivers and streams, and includes more than 5,000 dams, most of which are barriers to diadromous fish species. The NOAA Restoration Center, working in concert with members of the Chesapeake Bay Fish Passage Work Group (CBFPWG) and the U.S. Fish and Wildlife Service (USFWS), has developed a geographic information system to support resource agencies in identifying and selecting dams for removal in the Bay watershed. This web-based tool identifies high-priority dams aimed at reconnecting fragmented river and stream habitats by removing or bypassing key barriers to fish passage, with the goal to restore or enhance populations of target species such as alewife and blueback herring. Since 1989, the CBFPWG has reopened more than 2,730 miles of stream habitat for diadromous fishes.

NOAA and USFWS have used this tool to rank and target dam removal projects in the Chesapeake Bay watershed that produce the greatest ecological gains for target species in the Chesapeake Bay, and have partnered together on dam removal projects such as Bloede Dam on the Patapsco River (MD), Centreville Dam on Gravel Run (MD), and Harvell Dam on the Appomattox River (VA). The tool is available to the public and can be accessed at: http://chesapeake-fpp.s3website-us-west-1.amazonaws.com/map/.
Restoring Habitat in the Northwest Atlantic Large Marine Ecosystem

Habitat restoration is a NOAA priority. However, in the past it has been difficult to show the benefits of these restoration efforts. Often this is due to the small size of the restoration project relative to an overall watershed. Also monitoring project success can be difficult because projects and results are often long term. To help illustrate habitat restoration results, NOAA Fisheries researchers are working in collaboration with East Carolina University and the University of Maryland to evaluate the potential economic and ecological impacts of fully restoring the Atlantic Coast riverine habitat.

This project will describe conceptually the long-term benefits of restoring riverine habitat along the Atlantic Coast and what those improvements could mean in terms of increased commercial and recreational fishing. In addition, it’s intended to demonstrate how overall improvements in ecosystem health benefit society through jobs and other economic impacts.

Habitat Changes in Atlantic Coast Riverine Habitat

For centuries, riverine habitat along the Atlantic Coast has been deteriorating. These changes have been especially difficult for diadromous fish because they use riverine habitat to spawn or develop as juveniles, and this habitat has been fragmented by the construction of dams. The loss of habitat ultimately affects diadromous fish by physically reducing the ecosystem’s carrying capacity of these species and forcing fish to spawn in sub-optimal habitats, which can lead to reduced productivity. Together these changes impact the overall health of the ecosystem, as well as the commercial and recreational fisheries that depend on these species.

As part of this collaborative project, researchers are examining the population and ecosystem-level responses of American shad, alewife, and blueback herring if historical spawning grounds of these species were re-opened to use. This research includes three phases:

1. Mapping historical spawning grounds and estimating population responses.
2. Quantifying the importance of these species as forage fish for the Northwest Atlantic Large Marine Ecosystem.
3. Estimating the socio-economic impacts derived from not only commercial and recreational fishing, but also related ecosystem benefits.

The researchers have completed the first phase of the project in 2014 and are currently continuing their research with an expected final completion in late 2015. For additional information, please contact Wesley Patrick at wesley.patrick@noaa.gov.
(Research/Conservation Efforts tab)

Funding Sources

Atlantic Coastal Act

With the passage in December 1993 of P.L. 103-206, the Atlantic Coastal Fisheries Cooperative Management Act (ACA), the National Marine Fisheries Service, in cooperation with the United States Fish and Wildlife Service, was charged with the responsibility of supporting the interstate fisheries management efforts of the Atlantic States Marine Fisheries Commission (ASMFC). ACA projects are carried out to gather information and conduct activities that support management of United States multi-jurisdictional fisheries. These projects respond to fishery management planning, data collection (statistics), research, habitat, and law enforcement needs under the Atlantic Coastal Act. Many of the projects funded are base elements that support fishery management programs for interacting Federal, and interstate fisheries. Therefore, funding under the Act provides a stable funding base for much of the interstate and cooperative State/Federal fisheries management programs that are carried out in U.S. Atlantic coast waters.

Programmatic funds apportioned to ASMFC member states based on a formula that includes a 1/3 equal distribution, a 1/3 distribution weighted by the value of each state’s commercial and recreational fisheries, and a 1/3 distribution weighted by the number of ASMFC fisheries management plans (FMPs) in which each state participated. Eligible states are also allowed to allocate their individual funds to each other for joint programs to support ASMFC management plans, or to ASMFC, as long as any reallocation is based on the above priorities.  http://www.nmfs.noaa.gov/sfa/state_federal/State-Federal-WEB/acfcmafs.htm

The Atlantic Coastal Cooperative Statistics Program (ACCSP)

ACCSP was established via the signing of a Memorandum of Understanding (MOU) by its partner members in 1995. The ACCSP signatory partners are the fifteen Atlantic coast states, the National Marine Fisheries Service, the U. S. Fish and Wildlife Service, the Atlantic States Marine Fisheries Commission, the New England Fishery Management Council the Mid-Atlantic Fishery Management Council and the South Atlantic Fishery Management Council. The MOU established the purpose and original goals and governance structure for ACCSP. Having determined that there is an urgent shared and compelling need for improved statistical data on fisheries of the Atlantic coast of the United States, the partners in this MOU confirm their intent to establish an Atlantic Coastal Cooperative Statistical Program (ACCSP). This program is intended to coordinate present and expanded marine fisheries data collection and data management activities through coastwide cooperative planning, innovative uses of statistical theory and design, and consolidation of appropriate data into an integrated database system. Thus, the ACCSP is intended to provide overall coordination of both recreational and commercial data collection programs. The use of both recreational and commercial statistics in the overall fishery management process, including stock assessments and the drafting of fishery management plans, dictates the need for a fully accepted unified approach to provide coastwide coordination of all aspects of marine fishery data collection and management.  http://www.accsp.org/

Atlantic States Marine Fisheries Commission (ASMFC)

The Atlantic States Marine Fisheries Commission (ASMFC) is a commission of U.S. Atlantic states formed to coordinate the conservation and management of 25 nearshore fish species, including river herring. For more information visit, http://www.asmfc.org/about-us/program-overview

Bycatch Reduction Engineering Program (BREP)

The mission of the BREP is to develop technological solutions and investigate changes in fishing practices designed to minimize bycatch of fish (including sponges and deep sea and shallow, tropical corals) and protected species (including marine mammals, seabirds, and sea turtles) as well as minimize bycatch injury and mortality (including post-release injury and mortality).http://www.nmfs.noaa.gov/by_catch/bycatch_BREP.htm
Fisheries and the Environment (FATE)

FATE (Fisheries And The Environment) supports fisheries oceanography research that is driven to provide scientific advice on the sustainable use of U.S. fisheries resources under changing environmental conditions.  
http://www.st.nmfs.noaa.gov/fate/

Habitat Assessment Improvement Plan (HAIP)

The Marine Fisheries Habitat Assessment Improvement Plan (HAIP) was published in May 2010 and is the first nationally coordinated plan to focus on the marine fisheries aspects of habitat science. It outlines current gaps in NOAA Fisheries' habitat science, steps to improve habitat assessments, and the need for a nationally-coordinated habitat science program. The HAIP addresses the current lack of knowledge regarding the association of marine species and their habitats, which impedes effective fisheries and habitat management, protection, restoration, and stock assessment. The document is intended to serve as a blueprint for NOAA Fisheries for coordinating its diverse habitat research, improving habitat assessments, and guiding efforts to increase support for habitat science.  

Interjurisdictional Fisheries Act of 1986

This Act establishes a formula-based financial assistance program with two overall purposes: 1) to promote and encourage state activities in support of the management of interjurisdictional fishery resources and 2) to promote the management of interjurisdictional fisheries resources throughout their range. Funds are made available to the States under Section 308(a) based on a complex apportionment formula that utilizes the volume and value of fish landed in each state by domestic commercial fishermen. Cost sharing projects are generally funded at a 75 percent level of federal participation (though the federal share can go as high as 90 percent).  

Marine Fisheries Stock Assessment Improvement Plan (SAIP)

The Marine Fisheries Stock Assessment Improvement Plan (SAIP) is the report of the NOAA Fisheries National Task Force for Improving Fish Stock Assessments. This report is the latest of a series of plans for enhancing and modernizing NOAA Fisheries programs for data collection, information technology, data management, stock assessments, scientific research, and fisheries management. The report includes specific recommendations for improving the quality of NOAA Fisheries' stock assessment programs and emphasizes the need for the agency to foster partnerships and cooperative research programs with other federal agencies, state agencies, private foundations, universities, commercial and recreational fishing organizations and individuals, environmental groups, and others with a vested interest in collecting similar types of data.  
http://www.st.nmfs.noaa.gov/StockAssessment/

National Fish and Wildlife Foundation (NFWF) River Herring Initiative

NFWF is an independent working foundation that raises money for the U.S. Fish and Wildlife Service (USFWS) and NOAA. NFWF is working to restore the health of the marine and coastal environment through conservation initiatives such as the River Herring Initiative.  
http://www.nfwf.org/riverherring/Pages/home.aspx#.VOO0NPnF9VU

NOAA Climate Program

The Climate Program Office (CPO) manages competitive research programs in which NOAA funds high-priority climate science, assessments, decision support research, outreach, education, and capacity-building activities designed to advance our understanding of Earth’s climate system, and to foster the application of this knowledge in risk management and adaptation efforts.  
http://cpo.noaa.gov/

NOAA GARFO Grants
The Greater Atlantic Regional Fisheries Office (GARFO) is responsible for the conservation, development and management of marine resources in the U.S. Territorial Sea and the Exclusive Economic Zone (EEZ) throughout the Northeast from Maine to Virginia. The grants program within the Operations and Budget Division administers a broad range of financial assistance and program partnership activities directed at supporting the core mission of the NOAA Fisheries Service. [http://www.greateratlantic.fisheries.noaa.gov/ob/grants/index.html](http://www.greateratlantic.fisheries.noaa.gov/ob/grants/index.html)

**NOAA Habitat Blueprint**

The Habitat Blueprint is NOAA’s strategy to integrate habitat conservation throughout the agency, focus efforts in priority areas, and leverage internal and external collaborations to achieve measurable benefits within key habitats such as rivers, coral reefs, and wetlands. Within each of the NOAA regions, there has been effort to form habitat focus areas. There were a series of nominations made for the Greater Atlantic Region (GAR) that were reviewed and scored based on NOAA's goals for this initiative. The Penobscot River in Maine and the Choptank River in Maryland were selected to be the focus areas for the GAR.


**Northeast Regional Coordinating Council (NRCC)**

Joint Committees enhance coordination among fishery management partners concerning process-related issues, data needs, and stock assessments; or serve as mechanisms to facilitate management negotiations. [http://www.nefmc.org/committees/northeast-regional-coordinating-council-nrcc](http://www.nefmc.org/committees/northeast-regional-coordinating-council-nrcc)

**Research Set-Aside (RSA)**

Research Set-Aisle programs are unique to federal fisheries in the northeast. Although the Northeast Cooperative Research Program manages them, no federal funds are provided to support the research. Instead, funding is provided annually by the sale of Set-Aisle allocations for quota managed or days-at-sea (DAS) managed fisheries. RSA in the Atlantic Herring Fishery Management Plan is currently used to fund research to reduce catch of river herring. [http://www.nefsc.noaa.gov/coopresearch rsa_program.html](http://www.nefsc.noaa.gov/coopresearch rsa_program.html)

**Saltonstall-Kennedy Program (SK)**

The Saltonstall-Kennedy (S-K) Grant Program is a national competitive program administered by the National Marine Fisheries Service (NMFS) of the National Oceanic and Atmospheric Administration, Department of Commerce. The program provides grants or cooperative agreements for research and development projects to benefit the U.S. fishing industry. [http://www.greateratlantic.fisheries.noaa.gov/ob/grants/sk](http://www.greateratlantic.fisheries.noaa.gov/ob/grants/sk)

**Sea Grant (SG)**

Sea Grant’s mission is to enhance the practical use and conservation of coastal, marine and Great Lakes resources in order to create a sustainable economy and environment. [http://seagrant.noaa.gov/](http://seagrant.noaa.gov/)

**United States Fish and Wildlife Service (USFWS)**

The USFWS has potential funding from a variety of different programs and grants. This include the Wildlife and Sport Fish Restoration Program (Sport Fish Restoration and State Wildlife Grants), Fisheries Program (National Fish Passage and National Fish Habitat), as well as other programs (North Atlantic Landscape Conservation Cooperative, Partners for Fish and Wildlife, Coastal Program, and Tribal Wildlife Grant Program). Additionally, the State Wildlife Grant Program, Regional Conservation Needs Grants (e.g., Topic 7 originally designed for river herring work, but none has ever been funded) and National Fish Passage Program may be the most promising opportunities for USFWS funding for new river herring work.
United States Geological Survey (USGS)

The USGS is a science organization that provides impartial information on the health of our ecosystems and environment, the natural hazards that threaten us, the natural resources we rely on, the impacts of climate and land-use change, and the core science systems that help us provide timely, relevant, and useable information. http://www.usgs.gov/
Further Research/Conservation Efforts

NMFS and ASMFC are committed to further research on and conservation of river herring through a number of ongoing efforts, many of which involve collaboration with partners. These include the below:

Restoration

NOAA is involved in restoration efforts that are both proactive and regulatory based in the northeast and southeast. Proactive restoration is generally community efforts with funding through our Habitat Restoration. Major projects include the Penobscot River Habitat Focus Area where two mainstem dams were removed and a third will incorporate a nature-like bypass. Visit the “Restoration Efforts” page for more information on these community efforts.

Restoration efforts are also supported by regulatory actions through the Fish and Wildlife Coordination Act and Federal Power Act. These actions include improvements to migratory habitat by requiring upstream and downstream fishway construction. These regulatory actions are important in areas where proactive efforts are unlikely to occur. In addition, there are instances where the regulatory efforts promote proactive restoration. For example, the Madison Electric Dam removal on the Sandy River, actions on the Penobscot River, and elsewhere started in the regulatory process and evolved into something more productive using a proactive approach.

Mitigating impacts from development and energy projects: NMFS is involved in mitigating impacts from development and energy projects in both the northeast and southeast. An example showing how river herring benefit from these authorities includes the below:

In August 2012, Green Island Power Authority (GIPA) received a Federal Energy Regulatory Commission (FERC) license for the Green Island Hydropower Project at the Troy Dam on the Hudson River. The license adopted requirements of a Settlement Agreement signed by NMFS, U.S. Fish and Wildlife Service, New York State Department of Environmental Conservation and GIPA in December 2009 which requires both upstream and downstream fish passage facilities be constructed at the site and extensive monitoring and maintenance plans be prepared to ensure fishways are operating as designed to safely and effectively pass fish. We are currently participating in post-license activities to ensure the terms of the license are met and safe, timely and effective passage is provided for the target species, including blueback herring, alewife, American shad, and American eel.

Habitat Models

NMFS Greater Atlantic Region funded a NEFSC project to use environmental data collected as part of the NEFSC bottom trawl survey to model marine habitat preferences for alewife, blueback herring, and Atlantic herring. Habitat preferences were associated with bottom temperature, bottom salinity, depth, solar position, and region of the Northwest Atlantic Ocean. The models will be coupled with oceanographic forecast models, and model accuracy will be evaluated through directed sampling with the cooperative research fleet. The ultimate project goal is to develop a river herring/Atlantic herring overlap forecast tool for use by the Atlantic herring fishery to minimize incidental river herring catches.

Habitat Blueprint

The Habitat Blueprint was designed to increase the effectiveness and efficiency of NOAA’s habitat work by facilitating strategic planning and action across NOAA line offices and with partner organizations. The Delmarva/Choptank River and Penobscot River are two of ten Habitat Focus Areas that have been selected as part of NOAA’s Habitat Blueprint Framework.
St. Croix Monitoring

NMFS (through ASMFC) and the U.S. Fish and Wildlife Service (USFWS) provided funding to the Atlantic Salmon Federation in 2014 to continue river herring counts at the Milltown Dam fishway in the St. Croix watershed. The work augmented a 33-year time series for alewife enumeration at the Milltown head of tide dam. This work also allowed for an evaluation of the rate of recolonization and identification of the proportion of blueback herring and alewives in the river herring run.

Fish Passage Activities

The ASMFC Fish Passage Working Group (FPWG) is a collaboration of state, federal, and non-government organization fish passage experts. Past and ongoing efforts of the FPWG contributing to the conservation of river herring include: prioritization of barriers in need of fish passage, recommendations of fish passage targets in each Atlantic Coast state, guidance to state agencies on participation in the Federal Energy Regulatory Commission’s hydropower licensing process, and guidance on effective fish passage approaches. Additional information on FPWG efforts can be found on the ASMFC website (http://www.asmfc.org/habitat/fish-passage).

Hydropower-Related Research

NMFS is working on the development of a life history-based model for the setting of quantitative-supported fish passage survival performance standards at Federal Energy Regulatory Commission (FERC) licensed hydroelectric facilities in the Northeast US. The first stage of the study will focus on American shad, and the second stage will focus on river herring (alewife and blueback herring) pending available funds. Performance standards refer to levels of upstream and downstream passage survival at each selected FERC project, accounting for direct, indirect and cumulative levels of mortality, that allow for the achievement of river and species-specific restoration or other conservation goals. NMFS anticipates that performance standards will be developed on a FERC project-by-project basis, although the modeling will be at the watershed scale.

Ecosystem Research

NMFS is working with our partners on various ecosystem research to learn more about river herring’s role in the ecosystem. Some of these projects include:

- **Hydroacoustic surveys in the Penobscot Estuary**
  - Identifying spatial and temporal variability of river herring (and other species) biomass within the watershed. – Justin Stevens, Mike O’Malley, and Rory Saunders
  - Species Interactions – Merging River Herring Data (Hydroacoustics) and telemetry data (Atlantic salmon smolt) within the Penobscot estuary. – James Hawkes, Justin Stevens, Mike O’Malley, Graham Goulette, and Rory Saunders (NMFS).

- **Estuary Trawl Surveys in the Penobscot River**
  - Identify seasonal abundance and habitat use trends - Justin Stevens and Christine Lipsky (NMFS)
  - Describing size and age structure of River Herring in the Penobscot Estuary – Justin Stevens and William Duffy (NMFS)
  - Using stable isotopes to identify habitat use patterns – Karen Wilson (USM) and Justin Stevens (NMFS)
Juvenile Beach Seine Surveys

- Seasonal migration patterns and relative abundance – Richard Dill (ME – DMR) and Justin Stevens (NMFS)

Penobscot Tributary River Run Monitoring

- Blackman stream fish counter operation – Richard Dill (ME – DMR)

Diadromous Fish as Prey in Gulf of Maine Groundfish

- Temporal shift in diadromous fish in diets of predators - Christine Lipsky (NMFS) and Keri Stepanek (ME-DMR)
- Comparison diadromous fish in diets of predators between nearshore Kennebec and Penobscot River systems – Christine Lipsky (NMFS) and Keri Stepanek (ME DMR)

Climate Research

A joint NOAA NOS, NMFS, and OAR project will, amongst other things, assess statistical and dynamical downscaling techniques for estuarine environments that serve as critical early-life environments for many commercial, recreational, and protected fishes (contact: Vincent Saba). Additionally, through a funded Special Early-Stage Experimental or Development (SEED) project (contact: Charles Stock), OAR and NMFS are assessing the use of seasonal to decadal climate predictions for marine resource management. Studies such as these are important to help improve future climate assessments and year-to-year management of marine resources, including those for river herring. For additional information, refer to the NEFSC Climate Change website.

River Herring Avoidance

NMFS awarded a 2014 Bycatch Reduction Engineering Program Grant, to Cornell Cooperative Extension of Suffolk County for “Enhanced Bycatch Avoidance Communication Network for River Herring & Butterfish.” The bycatch avoidance network provides the longfin squid fleet with a system to collect, report, and receive information at sea and allows for real-time avoidance of butterfish and shad/river herring bycatch.

Summary

There are numerous research efforts underway for river herring, and the above just captures a few of these. However, river herring remains a data poor species. Although important research and conservation efforts are underway, continued efforts are needed (see “Conclusions and Looking Forward”).
Habitat Blueprint

The Habitat Blueprint was designed to increase the effectiveness and efficiency of NOAA’s habitat work by facilitating strategic planning and action across NOAA line offices and with partner organizations.

The Penobscot River Habitat Focus Area

The Penobscot River is one of ten Habitat Focus Areas that has been selected as part of NOAA’s Habitat Blueprint Framework.

NOAA has two broad goals for the Penobscot River Habitat Focus Area:

- Restore multiple diadromous fish populations and protect fish habitat
- Improve the prey base for offshore fish species, including groundfish in the Gulf of Maine

NOAA has worked with and continues to collaborate with many partner organizations on several restoration projects throughout the Penobscot watershed. These efforts have resulted in major improvements in habitat quality and fish abundances for many species, especially alewife. There is potential to build off previous work and leverage of existing partnerships to restore and protect ecologically important fish habitats, threatened and endangered species, and species of concern such as alewife and blueback herring. This encouraging potential made the Penobscot River an ideal Habitat Focus Area under NOAA’s Habitat Blueprint Framework.

NOAA will address the Penobscot River goals through several targeted objectives:

- Identify priority areas for fish passage and habitat protection to increase access of diadromous fish to habitat
- Remove dams, replace culverts, and construct fishways
- Continue pre- and post-monitoring of dam removal and other restoration projects to assess impacts on fish populations and water quality
- Provide accurate and timely ecological forecasts and forecasts for river-based recreational activities
- Communicate the benefits of habitat restoration and protection to fish populations, water quality, recreation, and the resiliency of coastal communities

The Penobscot HFA will build upon NOAA’s recent track record of fish passage restoration in the watershed. In addition to significant NOAA support for the Great Works and Veazie dam removals, NOAA (through the Restoration Center) has supported the following representative fish passage projects in recent years with design and construction funding.

Blackman Stream Fishway: A masonry pool-and-weir fishway was constructed in 2009 and restored passage to 1,223-acre Chemo Pond in the Blackman Stream sub-watershed, a tributary to the Penobscot River.

Pushaw Lake Fishway: A Denil fishway was constructed at the outlet of Pushaw Lake, which provided access to an estimated 5,461 acres of alewife spawning habitat.

Davis Pond Fishway: An Alaskan steeppass fishway was constructed in 2013 at the outlet of Davis Pond, providing access to 851 acres of alewife spawning habitat in Davis Pond and Holbrook Pond, in the Blackman Stream sub-watershed.

Coleman Pond Fishway: A masonry pool-and-weir fishway was constructed at the outlet of Coleman Pond in the Ducktrap River watershed, a tributary to Penobscot Bay. The fishway replaced a former dam and fishway that had fallen into disrepair, restoring access to 223 acres of alewife spawning habitat.
Etna Pond Fishway: In 2013, an Alaskan steeppass fishway was constructed at an mill barrier downstream of Etna Pond on Souadabscook Stream, a tributary of the lower Penobscot River. The project restored passage to an estimated 361 acres of alewife spawning habitat.

Monitoring Strategies: An interdisciplinary team has begun looking at long-term potential for river herring monitoring in the Penobscot watershed, such as electronic counters or volunteer counts on key tributaries, with anticipated teams recommendations in 2015.

The Delmarva/Choptank River Habitat Focus Area

The Delmarva/Choptank River is one of ten Habitat Focus Areas that has been selected as part of NOAA’s Habitat Blueprint Framework.

The Delmarva/Choptank River Habitat Focus Area, which includes the Choptank and Little Choptank Rivers, is located on Maryland’s Eastern Shore. The Choptank River, with headwaters in Delaware, is the longest river on the Delmarva Peninsula. This area is a treasured part of the Chesapeake Bay ecosystem with habitat for spawning river herring. NOAA Restoration Center, as part of the Choptank Habitat Focus Area efforts, will explore removal of fish blockages in the Choptank River.
Conclusions and Looking Forward

There has been much progress by NMFS, ASMFC and our partners to further river herring conservation and address data gaps through a coordinated coastwide effort. This Conservation Plan is intended to increase public awareness about river herring, stimulate cooperative research efforts, and inform efforts to conserve the species through the following goals:

- Increase coordination of river herring research and conservation
- Identify key research needs for assessment and conservation
- Identify conservation actions to address threats
- Cultivate research groups to address key topics
- Identify funding sources for river herring research and conservation
- Further conservation efforts to address threats
- Improve information to be used in the next assessment
- Improve information used in conservation efforts
- Increase outreach about river herring

Although the plan is in the early stages of development a number of important outcomes have occurred relative to achieving the goals:

- Increased coordination with partners through establishment of the TEWG, including six subgroups and one integration committee.
- Funded two projects through a River Herring Request for Proposals to further information on river herring populations.
- Developed this initial River Herring Conservation Plan which is intended to be dynamic, easily updated and comprehensive. The plan considers the information compiled by the TEWG, and will be further refined based on TEWG and public input.
- NMFS Greater Atlantic Region funded a Northeast Fisheries Science Center (NEFSC) project to develop a river herring/Atlantic herring overlap forecast tool for use by the Atlantic herring fishery to minimize incidental river herring catches.
- NMFS (through ASMFC) and the U.S. Fish and Wildlife Service (USFWS) provided funding to the Atlantic Salmon Federation to continue river herring counts at the Milltown Dam fishway in the St. Croix watershed.
- NOAA conducted a coastwide social science survey to document fishermen’s observations of river herring in commercial, recreational, and subsistence fisheries.
- NOAA selected the Penobscot River in Maine and the Choptank River in Maryland as Habitat Focus Areas under NOAA’s Habitat Blueprint, targeting financial resources and technical assistance to support habitat conservation and restoration efforts in these high-priority watersheds including removing passage barriers and restoring unimpeded river herring passage and spawning and rearing habitats.
- Incorporated information provided by the Passamaquoddy Tribe, Pleasant Point, on the cultural importance of river herring to the Tribe into this conservation plan.
- NMFS began work towards the development of a life history-based model that can inform the setting of quantitative-supported performance standards for American shad and river herring for hydropower projects.
- NMFS and ASMFC are continuing to work with our partners on climate change assessments related to river herring.
- NMFS is working with our partners to study to the long-term benefits of restoring riverine habitat along the Atlantic Coast.
The projects NMFS and ASMFC funded through the River Herring Request for Proposals are important to highlight. Additional information will be shared on the status of these projects as the information is available.

It is important to establish goals to show success in restoring river herring through improving the status of river herring throughout much of its Atlantic coastal range. With more information, these goals can be refined in collaboration with our partners so that we can obtain indicators for restoration (e.g., fish, watershed health) in the future. Progress on the goals to date show a commitment to increase coordination with partners, as well as obtain and improve data collection information on river herring.

River herring are a critical component on the ecosystem, and serve as an important forage species for key commercial fisheries such as groundfish. Additionally, based on the coastwide range and many threats river herring face, conservation of river herring must be looked at holistically. It is essential to avoid duplication of effort, as well as to make the most use of limited resources. For example, it is important to capitalize on conservation and research efforts for other species (e.g., shad, Atlantic salmon, Atlantic sturgeon, shortnose sturgeon) which will also benefit river herring.

Implementation

NMFS and ASMFC are committed to furthering progress on river herring in collaboration with our partners. We have reviewed the products from the TEWG, public comment, as well as our own science and management needs are committing to the following in 2015:

- The need for improving the utility of data collected from state surveys (e.g., for use in the next stock assessment) has been discussed at many Technical Expert Working Group (TEWG) meetings. NMFS and ASMFC believe this would be important to discuss with our partners through a River Herring Data Collection Standardization Meeting. ASMFC’s Shad and River Herring Management Board will be discussing the outcomes of the TEWG’s work in May, including this suggestion. Pending Board direction to conduct a meeting, the ASMFC would organize such a meeting in cooperation with NMFS pending available funds.
- NMFS will continue work towards the development of a life history-based model that can inform the setting of quantitative-based performance standards for American shad and river herring for hydropower projects.
- Relay progress on funded projects through the ASMFC and NMFS River Herring Request for Proposal.
- NMFS will continue to develop more detailed, science-based and applied research Tier 2 passage monitoring for barrier removals, and anticipates use of available funds to address critical Tier 2 monitoring at targeted, high priority fish passage sites in the Northeast and other U.S. regions.
- NMFS, in collaboration with the U.S. Geological Survey (USGS) and the U.S. Fish and Wildlife Service (USFWS) will continue to develop a set of passage criteria for each of the East Coast diadromous fish species including alewife and blueback herring.
- NMFS NEFSC will continue its efforts to use environmental data to develop a river herring/Atlantic herring overlap forecast tool for use by the Atlantic herring fishery to minimize incidental river herring catches.
- NMFS will continue to work with tribal partners to:
  1. identify areas where collaboration to restore river herring can occur;
  2. identify potential opportunities for funding that may enhance the tribes ability to engage in river herring conservation and management activities; and
  3. engage in formal government to government consultation, as well as informal coordination and communication, in fulfillment of federal trust responsibility.
- NOAA will continue on-going regulatory actions at hydropower dams in support of improving or maintaining safe, timely and effective migratory pathways.
- NMFS will continue on-going habitat and restoration efforts. This will include furthering work on NOAA Habitat Blueprint and Atlantic Habitat Focus Areas.
- NOAA will continue various efforts to improve climate assessments, including working with our partners on those specifically related to river herring.
- NOAA will research climate downscaling techniques to improve climate assessments.
- NMFS will continue to work with our partners to study the long-term benefits of restoring riverine habitat along the Atlantic Coast.
- NMFS and ASMFC will continue to present to our partners on the River Herring TEWG and Conservation Plan to identify next steps and areas for continued collaboration.
Looking Forward

Although there have been many successes to fill-in data gaps and conserver river herring, challenges remain. NMFS and ASMFC have factored in specific management and science needs to develop research priorities, which can be found on the Conservation Plan research priorities page.

These research needs are intended as a resource for NMFS and ASMFC, as well as partners, including fishery management councils, state agencies, fishery management organizations, non-profit organizations, scientists, academic institutions, and the fishing industry. Research can be integrated in management and should inform and improve current and future conservation efforts. These needs and priorities may also assist our partners in the development of proposal ideas when funding opportunities arise. Efforts will continue to increase outreach, both internally and externally, to help leverage funds and increase awareness of priority needs.

This plan will be continually monitored and evaluated to determine success in achieving the goals. Additionally, the research needs and goals will evolve over time as we continue to learn about river herring. River herring restoration is not a single agency effort and it will require commitments from all partners, including the TEWG.

Further discussion with the TEWG is needed to track and monitor progress of conservation actions and research. Additional input from the TEWG and public on this initial conservation plan will also help refine it.
NMFS and ASMFC Research Priorities

The National Marine Fisheries Service (NMFS) and the Atlantic States Marine Fisheries Commission (ASMFC) have factored in specific management and science needs to develop the below list of priorities. These are broken down into Tier 1 (highest priority) and Tier 2 (i.e., intended to better inform less understood potential threats).

**Tier I**

- The following information is needed to establish performance standards for fish passage effectiveness and restoration needs:
  - Improve understanding of historic and current distribution of alewife and blueback herring spawning habitat, and the spawning behavior of blueback herring;
  - Assess river herring production capacity and drivers of production in various habitats; and
  - Calculate and/or improve life stage-specific estimates of natural and human mortality rates for river herring.

- Riverine mortality at hydrodams (i.e., predator mortality due to upriver migration delays and downstream turbine and other dam-related mortality).

- Further information on the impacts of fisheries on river herring and/or reducing impacts through activities such as:
  - Comparing and contrasting catch data collected at sea to data collected dockside;
  - Evaluating the suitability of electronic monitoring and reporting for collecting data on river herring;
  - Supporting existing state portside sampling programs;
  - Supplementing river herring bycatch avoidance programs; and
  - Gear modification.

- Information on the marine phase of alewife and blueback herring specific to:
  - Migrations at sea (e.g., determination of river origin of individual catch in coastal/ocean independent surveys, tagging);
  - Determination of river origin of incidental catch in non-targeted ocean fisheries; and
  - Marine survival.

- Information on the impacts of climate change, including ocean acidification, on river herring.

**Tier 2**

- Further information on contaminant effects in freshwater systems (e.g., implication of known contaminants on fecundity, growth and survival).

- Information on trophic interactions such as those between river herring and other fish species (e.g., Atlantic herring, Atlantic mackerel) and predator/prey impacts.

These research needs are intended as a resource for NMFS and ASMFC, as well as our partners, including state agencies, fishery management organizations, non-profit organizations, scientists, academic institutions, and the fishing industry. These needs and priorities may assist our partners in the development of proposal ideas when funding opportunities arise. We will continue to work to increase outreach on the topic both internally and externally to help leverage funds and increase awareness of priority needs.