

**CONNECTICUT RIVER BASIN  
DIADROMOUS FISH RESTORATION:  
Coordination and Technical Assistance  
F-100-R-40**



**Annual Progress Report  
October 1, 2022 - September 30, 2023**

U.S. Fish and Wildlife Service  
Connecticut River Fish and Wildlife Conservation Office  
Kenneth Sprankle, Project Leader  
103 East Plumtree Road  
Sunderland, MA 01375-9138

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## Executive Summary

Federal Aid Project # F-100-R-40

**States:** Connecticut, Massachusetts, New Hampshire, and Vermont

**Project Title:** Connecticut River Basin Diadromous Fish Restoration: Coordination and Technical Assistance

**Period Covered:** October 1, 2022 - September 30, 2023

**This annual report provides an opportunity to organize and document, to varying degrees, work activities conducted by the Connecticut River Fish and Wildlife Conservation Office (CTRFWCO), formerly the Connecticut River Coordinator's Office, which includes work outside of the Connecticut River basin and activities not funded by this grant.**

*Cover photo – American Shad being landed on the Farmington River, Windsor Connecticut in spring 2023.*

### Objectives

- Coordinate the Connecticut River Diadromous Fish Restoration Program as a unified effort of State and Federal fishery agencies.
- Provide technical assistance to the fishery agencies and other program cooperators.
- Represent the Service on several Commissions, Technical Committees, and work cooperatively with State agencies and other partners.
- Identify fishery program priorities, design, and implement projects to address issues and opportunities, and develop plans (e.g., resource management, research, monitoring).
- Administer or serve in additional capacities on grant programs to address fish habitat, passage, management, and research projects.

### Accomplishments

#### Program Coordination

- Organized and coordinated three Connecticut River Atlantic Salmon Commission (CRASC) meetings and two Technical Committee meetings (Appendix A, agendas). Provided various agenda item reports and updates at these meetings.
- Provided annual upstream and downstream fishway operations letters (for CRASC) to hydropower owner/operators and the Federal Energy Regulatory Commission (FERC).
- Coordinated with main stem power companies and state agency partners to ensure fish passage facilities were operated as planned in 2023.
- Arranged meetings and worked on the formation of the new Connecticut River Migratory Fish Restoration Cooperative over the period. Coordinated partner agencies and staffs' engagement that lead to the signed Cooperative Agreement, forming this new Cooperative, effective in September of 2023.
- Coordinated the development of a project list of assessment, research, outreach, planning needs for CRASC with the Technical Committee and partners and developed a priority ranking for funding. This was to facilitate the use of \$700,000 in the Federal Budget for fiscal year 2023, that was placed

in the CTRFWCO Station's budget.

- A breakout of funded projects and activities for these funds and their status are presented later this report, in the CRASC Section.
- The FY23 CRASC funding came with a task for the Department of Interior to report back to Congress on a Study Report. The Science Applications Division of USFWS was contacted for support in this assigned task. Over the course of the year, typically bi-weekly meetings have been held by a core group of state, federal and some NGO members to develop a “partnership” approach for a watershed conservation initiative.
- Worked within USFWS, with select partners, and more broadly, to ensure CRASC and its successor organization (Cooperative) had its roles understood and integrated into a proposed initiative (by a team of NGOs) in the drafting of the “Connecticut River Watershed Partnership Act” that was introduced as both a Senate and House Bill in 2023. This work is ongoing.
- Continued management of the CRASC FY22 federal budget allocation of \$500,000 occurred in this report period. In the previous year the CRASC had approved uses of these funds for program priorities. The funds were administered from the CTRFWCO Station Budget.
  - A breakout of projects and activities and their status are presented later this report, in the CRASC Section.
- Following CRASC approved uses of FY22 funds, in October through December of 2022, completed the Cooperative Grant Agreement (Year 1, \$135,600) to fund the Connecticut River Conservancy's projects in 2023 that included the two-state creel survey, fishway counting staff, web-based fishway count site, and community science monitoring.
- Worked with CRC staff and organized other CRASC Fisheries Biologist members, to plan and develop intercept creel surveys for both Connecticut and Massachusetts, for April – June 2023, in targeted areas.

### Staffing

- Completed the process of hiring a term GS11 Fisheries Biologist for the office using approved CRASC funds (FY22 and FY23), which covers a two-year term position. Dr. Corey Eddy was onboarded in mid-March 2023 at the CTRFWCO.
- Hired and managed two paid seasonal interns (Kyle Hubbard and Rogue Brock), using a grant agreement with American Conservation Experience who worked full-time from April 1, through August 30, 2023.
- Completed a grant agreement with the Student Conservation Association in July 2023, to hire interns for the 2024 season.

### Technical Assistance

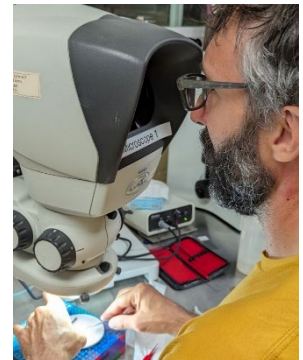
- Worked with several other agency biologists in the fall of 2022 to develop and negotiate a mitigation fund amount for Firstlight Power's Northfield Mountain Pumped Storage Project (NMPS). Terms were agreed upon and this amount was included in the signed Settlement Agreement (SA).
- Worked as team member on a Settlement Agreement on Fish Passage and Flows with Firstlight Power for their Turners Falls Project and NMPS Project: <https://www.fws.gov/press-release/2023-04/service-and-partners-file-settlement-agreement-firstlight-improved-fish>
- The SA was signed by FLP, USFWS, NOAA Fisheries, MA Division of Fisheries and Wildlife, The Nature Conservancy in April 2023. The SA is under review by FERC and can be found here: [https://elibrary.ferc.gov/eLibrary/filelist?accession\\_num=20230331-5600](https://elibrary.ferc.gov/eLibrary/filelist?accession_num=20230331-5600)
- This SA was based on the numerous relicensing studies, process and deliberations started in 2013.
- Served as the USFWS member to the ASMFC Shad and River Herring Technical Committee (TC), participating in meetings and worked on a variety of TC activities over the course of the report year.

- Served as the USFWS representative to the NOAA River Herring Habitat Conservation Plan's Steering Committee, a final report was released in May 2023: <https://www.greateratlantic.fisheries.noaa.gov/policyseries/index.php/GARPS/article/view/29>
- Completed the Annual Sport Fish Restoration Grant Report for FY22, in January 2023 and posted on CTRFWCO web site.
- Worked as a team member on the CRASC Technical Committee's American Eel Management Plan. This process included a public comment period with the final version approved by CRASC at their June 28, 2023, meeting. This Plan was submitted and accepted by the Federal Energy Regulatory Commission as a Comprehensive Management Plan: [https://elibrary.ferc.gov/eLibrary/filelist?accession\\_number=20230630-5021](https://elibrary.ferc.gov/eLibrary/filelist?accession_number=20230630-5021)
- Served as a member to the Holyoke Comprehensive Consultation Team (CCT), reviewed fish passage reports and developed agency recommendations on the 2023 Shortnose Sturgeon movement and upstream passage study plan.
- Conducted the annual spring adult river herring population assessment in the lower Connecticut River basin for the tenth year. Sampling occurred on 28 dates from 3 April through 12 June 2023. This ties the record high number of sample dates (2022) for the program. A total of 1,932 Blueback Herring were captured and processed on the boat with 149 Alewife also captured and processed.
- A total of 1,094 Blueback Herring and 141 Alewife were subsampled from the field and processed in the laboratory the following day to confirm species, extract otoliths, obtain scale and female ovary samples and gill tissue (freshwater mussel glochidia research).
- Data from spring 2023 Adult River Herring Population Assessment Program were entered into the Access database and spreadsheets to determine statistics and compare metrics that are objectives of this program (more data later in report). Alewife otoliths were examined by October 2023.
- Scale samples from the Blueback Herring (n = 1,094) and Alewife (n = 141) were cleaned and slide mounted using the new approaches developed by Jackie Stephens (USFWS Pathways/UMASS M.S. Student) who worked with the interns in summer 2023 to complete this work. All scale samples were examined by projector for spawning history by two readers independently, with consensus reads for disagreements, analyses covered later. This approach was also written into a manual developed by Jackie, that includes a test set of scales and other methods to improve accuracy and precision.
- Provided program information and requested data (e.g., fish counts) to cooperators, researchers, power companies, and the public.
- Obtained target 60 fish American Shad sample from Holyoke Fish Lift, dissected and prepared tissue samples for USFWS Fish Health examination (done annually), run by Darren Desmarais.
- In late August 2023, initiated the juvenile American Shad assessment project, sampling two evenings weekly in two main stem river reaches: 1) Vernon Dam, VT to Turners Falls Dam, MA and 2) Bellows Falls Dam, VT to Vernon Dam, VT. Darren updated data files and provided summary statistics.
- Corey Eddy worked as the Co-Chair of the CRASC Habitat Subcommittee to develop a current GIS for all Connecticut River basin anadromous species; historic and current range, barriers, fish passage status/type, and related other GIS layer data. This work is ongoing with the development of a Habitat Plan as one related goal for 2024.



## Cooperative Research

- Served as a M.S. thesis committee member to Jacqueline Stephens at the University of Massachusetts, under Dr. Allison Roy (Massachusetts Cooperative Fish and Wildlife Research Unit -MA Coop Unit) . Worked with Jackie and the Committee to define thesis research questions and provide guidance on approaches.
- Served as USFWS Project Officer and Cooperator for the U. S. Geologic Survey University of Massachusetts Coop Unit and Conte Fish Research Laboratory (CAFRC) study, “Environmental Factors Controlling Juvenile River Herring Productivity and Emigration (2019-2022)”, partially supported by the USFWS Science Support Program (SSP).
- Worked with then PhD candidate (now Dr.) Meghna Majardi on river herring passage count data from Holyoke as part of this SSP. A draft peer-review manuscript is in development.
- Served as Project Officer on the USFWS SSP Grant “Experiments to determine the ideal depths, widths, and aspects of fishway entrance designs for river herring and American Shad.” Research team worked on developing study design details and planning for implementation in 2024.
- Invited speaker for the August 2023 American Fisheries Society Annual Meeting (Grand Rapids, MI) symposium “Integrating Monitoring and Decision Tools for Data-limited Endangered and Invasive Species”. Developed and gave a presentation titled “**Connecticut River Blueback Herring stock status and trends, what have we learned?**”
- Continued required SCUBA certification trainings in spring 2023 and the Connecticut River Dive Team was approved as a DOI Research Dive Team in June with Corey Eddy as our Field Dive Officer. In July we participated in a SCUBA research project with the USFWS Lower Great Lakes FWCO, studying Lake Sturgeon in the Niagara River, NY.
- Worked with Drs. Ted Castro-Santos and Corey Eddy on the 2011 and 2012 American Shad Radio Tag study data analyses, with Corey as lead in peer-review manuscript development. Corey worked to familiarize himself with the data and R-code that he has been updating and also developing.
- Corey Eddy led a research project for the CRASC TC, to determine the age and size structure of juvenile eels using the Holyoke upstream eel passes (spring, summer and fall) to determine parasitic swim bladder nematode metrics (number, weight); and determine the size, sex, and age structure of adult eel using the downstream bypass sampler at Holyoke in September 2023. This work is ongoing and includes mounting, cross sectioning and staining of otoliths (n = 339 juvenile; n = 65 Silver). Study information will be used to explore development of an age structure-based population model.
- Organized a meetings among CRASC Sea Lamprey and Eel Subcommittee members with FWS Lamar Genetics Lab, to initiate plans for eDNA sampling with new equipment. CTRFWCO staff worked with partners (state and NGOs) to coordinate equipment and samples, enter field data, and ship 68 samples to the USFWS Genetics Lab in Lamar PA.



## Outreach

Invited seminar speaker to University of Maine Department of Fisheries, Wildlife and Conservation Biology, November 2023, “Migratory Fish Restoration and Management (status and trends) in the Connecticut River Basin.”

- Worked with CRC on a World Migratory Fish Day event at Holyoke Rows, MA, in May (<https://www.ctriver.org/event/celebrating-fish-restoration-on-the-connecticut-river-2/>)
- Worked with an individual who created two YouTube videos, the first showing our river herring field



sampling and the second the subsequent laboratory work:

([https://www.youtube.com/watch?v=3jis\\_wI8jfU](https://www.youtube.com/watch?v=3jis_wI8jfU)) and

(<https://www.youtube.com/watch?v=jtWHOU3MBZM>)

- Served as lead agency member for the September 2023 Sea Lamprey Rescue event, organized by the CRC, for the Turners Falls Power Canal outage (dewatering).
- Provided weekly fishway counts report of the basin to an email distribution list of approximately 225 people April – July, thereafter monthly (Appendix B). Posted report counts to the CTRFWCO web site.
- Worked to develop news releases on both the FirstLight Power Settlement Agreement in the spring and the creation of the new Connecticut River Cooperative in September.
  - <https://www.fws.gov/press-release/2023-10/partners-launch-new-connecticut-river-migratory-fish-restoration-cooperative>

## Acknowledgements

Many people have contributed to the work accomplished by this office in the report period that I want to recognize and thank. Darren Desmarais, CTR FWCO Fish Biologist, has numerous roles in field, lab and office project work most notably laboratory oversight, otolith reading, data entry and summary analyses. Corey Eddy CTR FWCO Fish Biologist, starting in March, had lead technical roles in research and analyses of shad radio telemetry data, coordinating and developing a CT River GIS and habitat team, leading a study on American Eel age and growth, and serving as the research dive team leader. Colleen Butler, CTR FWCO Administrative Assistant, managed many budget-related and other office management operation duties. Julie Butler, a Fishery Biologist for the Lake Champlain FWCO, provided critical assistance in completing the grant award, in Grant Solutions system/process, to the Connecticut River Conservancy.

Jaqueline Stephens as a USFWS Pathways Biologist and UMass Graduate Student, developed improved methods for scale preparation and analytical approaches working with other regional experts and trained the office seasonal interns in 2023. She completed a highly detailed manual of this work. Kyle Hubbard and Rogue Brock were the CTR FWCOs two seasonal paid interns, working from April to August. Both Kyle and Rogue were integral members to a diverse set of field and lab work only accomplished this year due to their efforts.

The Connecticut River Conservancy, Aliko Fornier, Kathy Urffer, and Kate Buckman have provided ongoing staff support for field activities over the course of the year.

Other thanks for assisting in the accomplishments over this report period go to:

State fishery agencies -

- Connecticut: Kevin Job, Tim Wildman, Jacque Roberts, Matt Goclowski, Justin Davis
- Massachusetts: Rebecca Quinones, Steven Mattocks, Brian Keleher and Ben Gahagan
- New Hampshire: Matt Carpenter
- Vermont: Lael Will and technicians

Federal agencies –

- USFWS: Melissa Grader, Tim Warren, Jessica Pica, David Perkins, and Phil Herzig
- NOAA Fisheries: Bill McDavitt and Bjorn Lake
- USGS Conte Lab: Ted Castro-Santos, Alex Haro, Brett Towler, and Micah Kieffer
- USGS Massachusetts Cooperative Fish and Wildlife Research Unit: Allison Roy

and

Sierra Humiston, Holyoke Gas and Electric  
Steve Leach, FirstLight Power

## The Diadromous Fish Restoration Program and The Connecticut River Atlantic Salmon Commission

The administration of the interjurisdictional cooperative effort to restore diadromous fish species to the Connecticut River basin was accomplished through the Connecticut River Atlantic Salmon Commission (the Commission). During the period from 1967-1983 (prior to the Commission), restoration of anadromous fish, primarily Atlantic Salmon and American Shad, on the Connecticut River was guided by the Policy Committee and the Technical Committee for Fisheries Management of the Connecticut River

Basin. The importance of this formally structured, coordinating, and regulatory body to the restoration program was federally recognized in 1983 when Congressional consent was given to the Connecticut River Basin Atlantic Salmon Compact, Public Law 98-138. The enabling legislation was re-authorized for another 20 years in 2003 and will expire on October 28, 2023. This law, originally passed by the legislative bodies in each of the four basin states, created the Commission and conveys Congressional support to an interstate compact for the restoration of anadromous fish to the Connecticut River Basin. The Commission is comprised of ten Commissioners (Table 1) including a high-level government employee and a public sector representative appointed by the governor of the appropriate state, and the Northeast Regional Directors of both the U.S. Fish and Wildlife Service (USFWS) and the National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service (NMFS) also referred to as NOAA Fisheries.

The Commissioners develop and act on policy matters and are advised on scientific and technical matters by a Technical Committee. The Technical Committee is comprised of senior staff biologists from each Commission member agency, the U.S. Forest Service (USFS), and the Massachusetts Division of Marine Fisheries (Table 2). The Technical Committee has eight subcommittees, with specific areas of responsibility (American Shad, River Herring, Atlantic Salmon, American Eel, Sturgeon, Sea Lamprey, Fish Passage, and Habitat). Other experts and cooperators from the member agencies including the U.S. Geological Survey, Conte Anadromous Fish Research Center (CAFRC), Trout Unlimited, The Nature Conservancy, Connecticut River Conservancy, private industry, and others participate with the subcommittees and Technical Committee as needed. The Connecticut River Coordinator (Coordinator), also the Connecticut River Fish and Wildlife Conservation Office Project Leader, is an employee of the USFWS, acts as the Executive Assistant to the Commission and the Secretary for the Technical Committee and is the USFWS Technical Committee representative.

The CRASC meets at least twice each year, and the Technical Committee (and its subcommittees) meets as frequently as needed. This report period, the Commission met on December 6, 2022, February 17, 2023, and June 28, 2023. (see Appendix A for meeting agendas). The CRASC, in its federally approved entity, will expire on October 28, 2023. Work by members led to the CRASC approval at their June meeting of the new Connecticut River Migratory Fish Restoration Cooperative using a Memorandum of Understanding as the legal instrument. In September 2023, this MOU was signed by the four basin State Directors of Fish and Wildlife agencies, the Northeast Regional Director of USFWS and the Northeast Regional Administrator of NOAA Fisheries.

The Coordinator roles include coordination of state and federal activities, providing; technical expertise, project development and implementation of fish population assessments, restoration, management, and research programs, program evaluation, assisting the USFWS Ecological Services Division on Federal Power Act with select Federal Energy Regulatory Commission (FERC) projects, and conducting advocacy and outreach of the cooperative diadromous fish restoration program in the Connecticut River watershed (Figure 1). The Coordinator also organizes meetings, identifies priorities, develops initiatives and plans, implements them, and maintains and develops partnerships to accomplish objectives. The Coordinator serves as the USFWS representative to the Atlantic States Marine Fisheries Commission's Shad and River Herring Technical Committee and on other subcommittees as needed.

Fish species under restoration and enhancement in the Connecticut River basin include American Shad, Blueback Herring, Sea Lamprey, American Eel, and Alewife, primarily addressed by efforts to provide safe, timely, and effective upstream and downstream passage to historic habitats as well as measures to improve habitat quality (e.g., address rapid, large-scale fluctuations in sub-daily discharge from hydropower operations). Shortnose Sturgeon, a federally endangered species, is under recovery and continues to be monitored, studied, and protected in a variety of ways, some of which will be covered in later report text. Atlantic Sturgeon are also present in the lower river and are federally protected.

In 2023, there were no documented adult Atlantic Salmon returns to the basin. The Connecticut Department of Energy and Environment Protection (CTDEEP) continued fry stocking with its Atlantic Salmon Legacy Program working with the Connecticut River Salmon Association and its numerous salmon-in-schools program, providing a valuable outreach and education program to students in Connecticut. The program also maintains the presence of Atlantic Salmon in the basin, within the State of Connecticut. In 2023, a total 195,012 salmon fry were stocked in the West Branch of the Farmington River in May. In addition, 139,760 fry and 255 age-1 smolts were stocked in the Salmon River in April and May.

The Technical Committee had meetings on November 15, 2022, and June 14, 2023 (see Appendix A for meeting agendas). Subcommittees that were most active this period were American Eel, Sea Lamprey and Fish Passage as noted, with activities, in report summary highlight bullets.

The Federal 2023 Omnibus Appropriations Bill included funding for the CRASC, for a second year:

***Connecticut River Atlantic Salmon Commission.**-The agreement provides \$700,000 for the Connecticut River Atlantic Salmon Compact, as authorized in Public Law 98-138, for research, monitoring, conservation, and habitat restoration work related to this high-priority watershed. The Committees direct that the Secretary undertake a special resource study of the national significance of, and the suitability and feasibility of carrying out a basin-scale, nonregulatory program of conservation, stewardship, and enhancement of habitat for fish and wildlife in the Connecticut River basin.*

The CRASC Commission tasked the Technical Committee to develop a list of possible projects that were occurring and could utilize additional funding support or were new, for the noted areas (i.e., research monitoring, etc.) and to further provide a ranking of priority. The Technical Committee also engaged partners that have provided ongoing support to the purposes and goals of CRASC's restoration work. Refer to last year's annual report for the list of ranking criteria and process.

The CRASC approved list of projects are described in Table 3 and represent funding support for a diverse array of fishery needs covering population monitoring and assessment, fish passage research, resource utilization assessment, public outreach and education.

**Table 1. List of projects, activities, equipment targeted for funding by CRASC utilizing FY23 Federal Budget appropriation of \$700,000.**

EXPENSES	Org / Agency	Continuation of funding	Budget
<b>Annual personnel expenses (salary, benefits)</b>			
Community and applied science staff salary	CRC (Grant Agreement)	Y	\$75,000
Seasonal angler survey technicians (4), MA area <u>and</u> CT area	CRC (Grant Agreement)	Y	\$31,000
Fish passage monitoring at VT dams (2) - may be able to expand	CRC (Grant Agreement)	Y	\$15,000
Seasonal field technicians (n= 2) for 2024, partial funding	USFWS	Y	\$15,000
GS 11 Biologist (second year of two year term) - Dr. Corey Eddy	USFWS	Y	\$115,000
Science Application Coordinator and related costs for Special Report task	USFWS	N	\$70,000
			=====
<b>Total Personnel expenses</b>			<b>\$321,000</b>
<b>Nonpersonnel expenses</b>			
Migratory fish public engagement/marketing of CRASC priorities	CRC (Grant Agreement)	Y	\$15,000
Upstream Sea lamprey passage design & testing (year 2)	USGS Conte Lab (IDA)	Y	\$75,000
D-cylinder fishway evaluation vs. Denil (NOAA also funding)	USGS Conte Lab (IDA)	N	\$75,000
Downstream juv alosine passage study with diff rack spacing and angles	USGS Conte Lab (IDA)	N	\$90,000
Update the FWS Turbine Blade Strike Model, expand and enhance	USGS Conte Lab (IDA)	N	\$14,000
			=====
<b>Total Nonpersonnel Expenses</b>			<b>\$269,000</b>
		<b>Total</b>	<b>\$590,000</b>
	<b>CRASC FY 23, Federal Budget allocation</b>		<b>\$700,000</b>
	<b>Remaining unallocated funds</b>		<b>\$110,000</b>

“CRC” Connecticut River Conservancy

The Connecticut River Atlantic Salmon Commission assembled a working group in January 2023 representing fish and wildlife agency leaders in each of the four Connecticut River basin states, the National Oceanic and Atmospheric Administration, several key non-governmental organizations (NGOs), and a U.S Fish and Wildlife Service (Service) assigned coordinator from the Northeast Region’s Science Applications Program. This working group adopted a model successfully applied to other similar watershed-wide projects (i.e., Delaware River Basin Conservation Act of 2016 and the Chesapeake Watershed Investments for Landscape Defense (WILD) Act of 2020).

The working group convened biweekly to discuss the need and suitability for a non-regulatory program in the Connecticut River watershed. The team works collaboratively to identify common goals and objectives and continually works to develop a more coordinated and comprehensive approach to possible conservation activities as was done in the Delaware and Chesapeake Bay watersheds.

In October of 2023, the Service, Connecticut River Watershed Partnership, formerly the Friends of Conte, and other agency and NGO partners organized a watershed-wide partners meeting. Over 100 partners attended, virtually and in-person, three concurrent meetings in the upper river basin (Lancaster, NH), middle basin (Easthampton, MA), and lower basin (Old Lyme, CT). Discussions focused on the need for restoration, protection, and stewardship of habitat for fish and wildlife populations as well as recreational opportunities for people living in and visiting the watershed. Feedback will inform the suitability and feasibility of a non-regulatory broad-based conservation program.

CRASC scheduled meetings (Commission and Technical) were open to the public as the new Connecticut River Migratory Fish Restoration Cooperative will be/is, contact Ken Sprankle at [ken\\_sprankle@fws.gov](mailto:ken_sprankle@fws.gov)

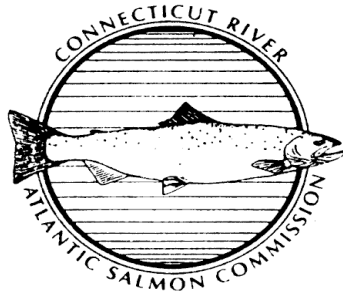
or at 413-548-9138, to receive notices for scheduled meetings. Interested citizens are given the opportunity to provide input and area news publishers are notified of scheduled meetings via email. Any one requiring hearing assistance or any other considerations should contact Ken Sprankle at least 3 weeks in advance of scheduled meetings, so appropriate arrangements can be made. The Connecticut River Migratory Fish Restoration Cooperative will become the new mechanism/organization for the agencies (after November 1, 2023), with a similar governance structure, better aligned goals, purposes and functions, and opportunities for public involvement.

**Table 2. Connecticut River Atlantic Salmon Commission Membership (as of September 2023).**

 <b>Connecticut River Atlantic Salmon Commission</b>	
<b>Federal</b>	<b>U.S. Fish and Wildlife Service</b> <i>Kyla Hastie (Acting)</i> Regional Director, Region 5 Rick Jacobson, alternate
	<b>National Marine Fisheries Service</b> <i>Michael Pentony</i> Northeast Administrator <i>Christopher Boelke, alternate</i>
<b>Connecticut</b>	<b>Connecticut Dept. of Energy and Environmental Protection</b> <i>Peter Arrestad (Acting)</i> Chief, Bureau of Natural Resources Tim Wildman, alternate
	<b>Public Sector Representative</b> <i>Tom Chrosniak</i>
<b>Massachusetts</b>	<b>Massachusetts Division of Fisheries and Wildlife</b> <i>Mark Tisa</i> Director Todd Richards, alternate
	<b>Public Sector Representative</b> <i>vacant</i>
<b>New Hampshire</b>	<b>New Hampshire Fish and Game Department</b> <i>Scott Mason</i> Executive Director <i>Dianne Timmins, alternate</i>
	<b>Public Sector Representative</b> <i>Donald McGinley</i>
<b>Vermont</b>	<b>Vermont Department of Fish and Wildlife</b> <i>Christopher Herrick</i> Commissioner Eric Palmer (Vice Chair), alternate
	<b>Public Sector Representative</b> <i>David Deen</i>

**Table 3. Connecticut River Atlantic Salmon Commission Technical Committee Membership.**

<b>Connecticut River Atlantic Salmon Commission Technical Committee</b>	
Federal	<b>U.S. Fish and Wildlife Service</b> <i>Kenneth Sprankle</i>
	<b>National Marine Fisheries Service</b> <i>William McDavitt</i>
	<b>U.S. Forest Service</b> <i>Vacant</i>
Connecticut	<b>Connecticut Dept. of Energy and Environmental Protection</b> <i>Tim Wildman</i>
Massachusetts	<b>Massachusetts Division of Fisheries and Wildlife</b> <i>Rebecca Quinones</i>
	<b>Massachusetts Division of Marine Fisheries</b> <i>Ben Gahagan</i>
New Hampshire	<b>New Hampshire Fish and Game Department</b> <i>Matthew Carpenter</i>
Vermont	<b>Vermont Department of Fish and Wildlife</b> <i>Lael Will</i> (Chair)





# Connecticut River Watershed Selected Tributaries & Dams

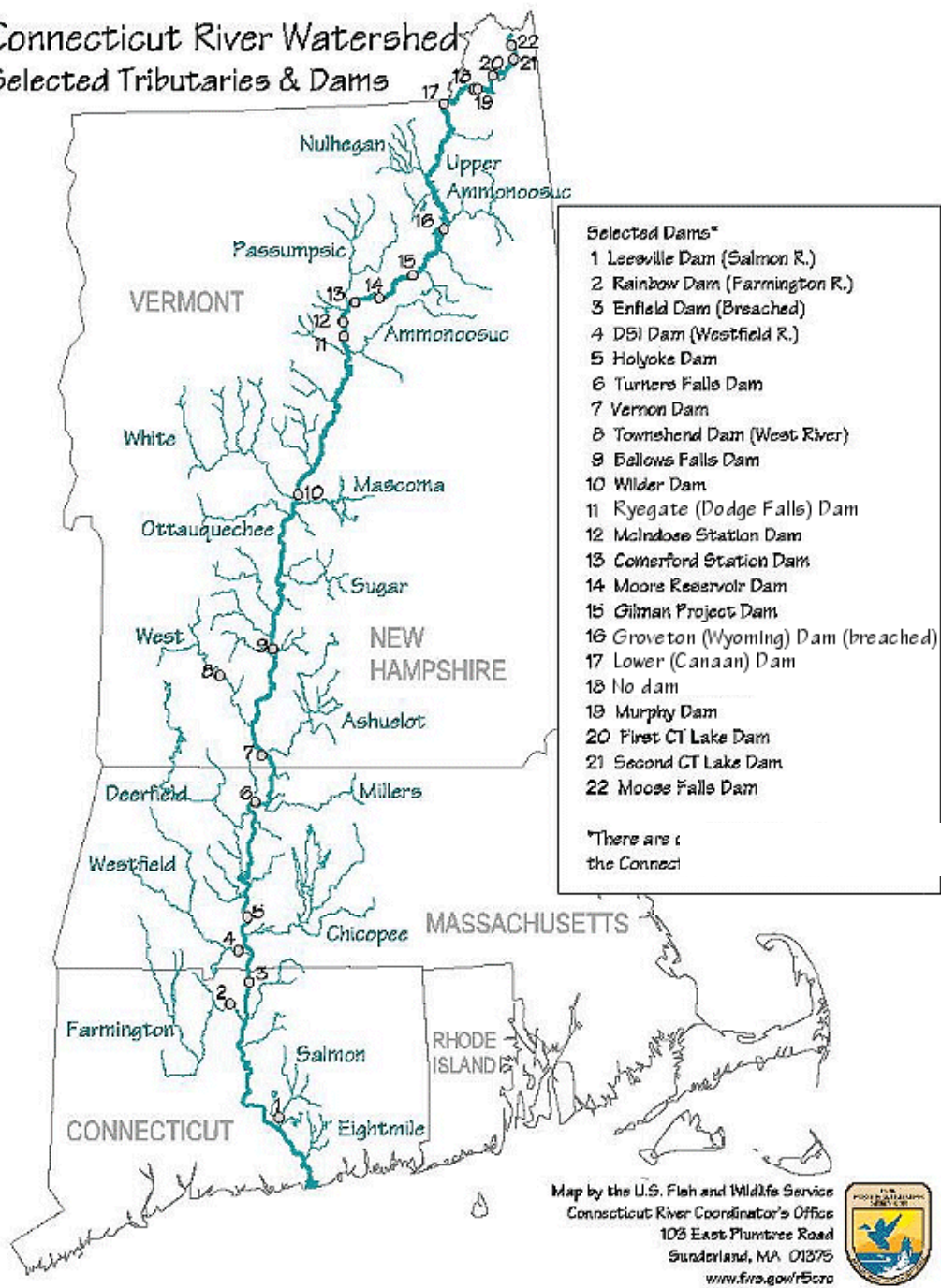


Figure 1. Connecticut River basin with major tributaries and main stem dams.

## Coordination and Technical Assistance Funding

The Connecticut River Fish and Wildlife Conservation Office (CTRFWCO), under the USFWS’ Wildlife and Sport Fish Restoration Program’s F-100-R-40 and a five-year Memorandum of Understanding, for this report period, was targeted to receive \$30,000 from the four state fishery agencies using their annual Sport Fish Restoration Program apportionment (F-100-R) or agency-generated funds. The grant funds were assessed an USFWS administrative overhead fee (18%) leaving \$24,590 available. The Office also primarily utilized Station Base Funds (Management Assistant Funds) that totaled \$310,305.00 for FY23. In addition, the FY22 CRASC Federal Budget allocation of \$500,000, that was placed in the CTRFWCO budget was used per the approved spending plan by CRASC, this included \$94,000 for GS11 hire (year 1) and \$9,000.00 for eDNA sample analyses for 70 samples (qPCR, two species), shipped in summer 2023. All CRASC FY22 funds were either obligated or spent according to the approved uses by end of FY23. From the FY23 CRASC budget allocation, the CTRFWCO used an approved \$15,000.00 for the SCA Grant Agreement for interns completed in July 2023. The remaining balance of CRASC FY23 funds was subsequently \$685,000.00 as of the end of this report period, with the balance to be applied in the approved items described in Table 3.

**Table 4. Federal fiscal year 2023 (report period) funds utilized by the CTRFWCO.**

Station Base FWS Budget	Four State Agreement	CRASC Fed Budget	Total
\$310,305.00	\$24,590.00	\$118,000.00	\$452,895.00

## Project Accomplishments

The Connecticut River Fish and Wildlife Conservation Office enhanced the Commission and States’ ability to plan, coordinate, manage, evaluate, and implement restoration programs through a variety of activities, some of which are described in detail in the following sections. Please note that data presented in this report have been reviewed to the extent possible, but is subject to change and should be considered provisional. Use of any presented data should be discussed with the Coordinator to avoid potential issues with use, analyses, and/or interpretation.

### **Fisheries management, restoration, assessment, technical assistance and additional select information**

In 2023 the adult population assessment program for river herring began on April 3, 2023, utilizing boat electrofishing as the primary sampling gear, for the tenth year of data. The first year of this annual program was in 2013, with 2020 work cancelled due to Covid. Study objectives of the project include: 1) obtain a minimum whole fish sample of 80 Blueback and Alewife for age structures, per target sample location, each day the study is conducted; 2) obtain baseline demographic data on all sampled river herring (species, length, weight, sex, spawning condition); 3) derive relative abundance catch measures using repeated standardized (time) sample runs; 4) conduct surveys across a broad geographic range of spawning aggregations and over the duration of the runs (April-June), representing spatial and temporal variations for both species; 5) determine fish ages from otoliths and spawning history from scale examinations; and 6) utilize standard stock assessment procedures and statistics to describe status and trends and examine other relevant data for influence on and relation to population metrics.

This long-term monitoring program was developed to address identified priority data needs, specific to the Connecticut River and also more broadly coast-wide, as described in the Atlantic States Marine Fisheries Commission’s River Herring Benchmark Stock Assessment Report released in May 2012 and the most recent August 2017 release of the River Herring Stock Assessment Update (<http://www.asmfc.org/species/shad-river-herring>). The ASMFC report concludes “...river herring continue to be depleted on a coast wide basis and near historic lows.” The ASMFC’s River Herring

Benchmark Stock Assessment remains in process with a target completion date in May 2024.

**Table 5. An annual summary of the CTRFWCO’s river herring population assessment program’s effort, catch, and laboratory processing total by species (2013-2023).**

	2013	2014	2015	2016	2017	2018	2019	2021	2022	2023
Number of sample dates	18	21	20	25	26	23	27	25	28	28
Total sample runs	81	124	114	145	145	147	147	118	173	151
Total electrofishing seconds	41,177	55,736	56,025	71,845	68,353	69,835	80,473	56,838	84,208	73,147
Total bluebacks captured	714	2,593	1,448	1,586	2,650	2,396	3,456	1,813	1,433	1,932
Total alewives captured	107	220	258	586	200	366	243	128	470	149
Blueback Herring otolith/scale – lab	501	655	622	730	1,192	991	1,473	929	903	1,094
Alewife otolith/scale - lab	103	188	165	461	190	284	217	114	356	141

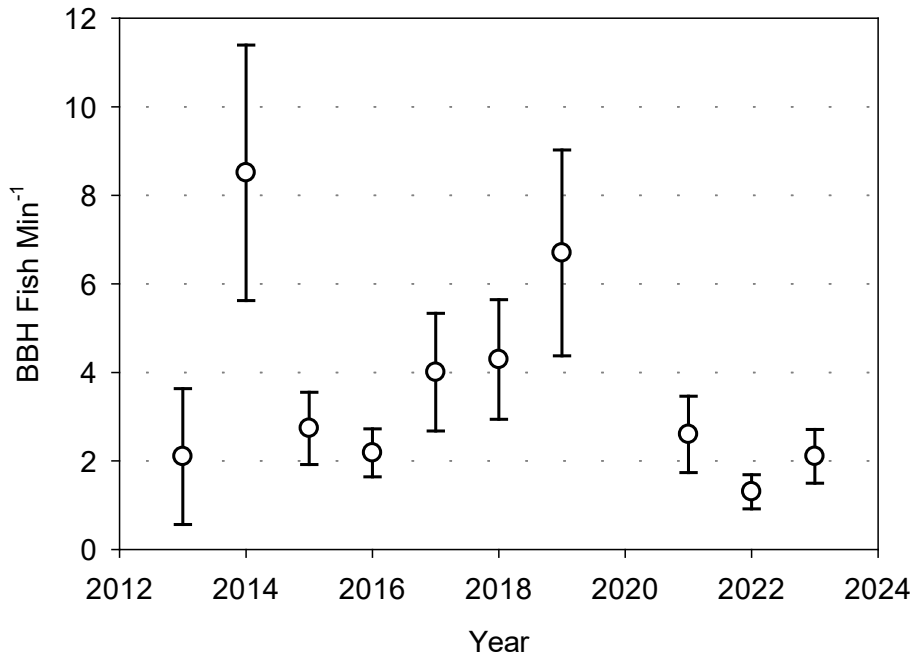
In 2023 we again sampled on 28 dates; variability with number of runs and electrofishing time are within expected ranges (Table 5). However, even given this high level of effort, our fish capture totals were low. Relative abundance is best represented by our catch-per-effort metric that accounts for variable sampling effort among years reported later.

In 2023, sampling was initiated on 3 April in Wethersfield Cove; no river herring were observed. On 6 April a total of 25 Alewife were sampled in the Mattabesset River; no Blueback Herring observed. On 10 April in Wethersfield Cove a total of 13 Blueback Herring were sampled, noted as the first detected arrival on spawning grounds. This is considered early in our data time series, same as observed in 2022 and 2021.



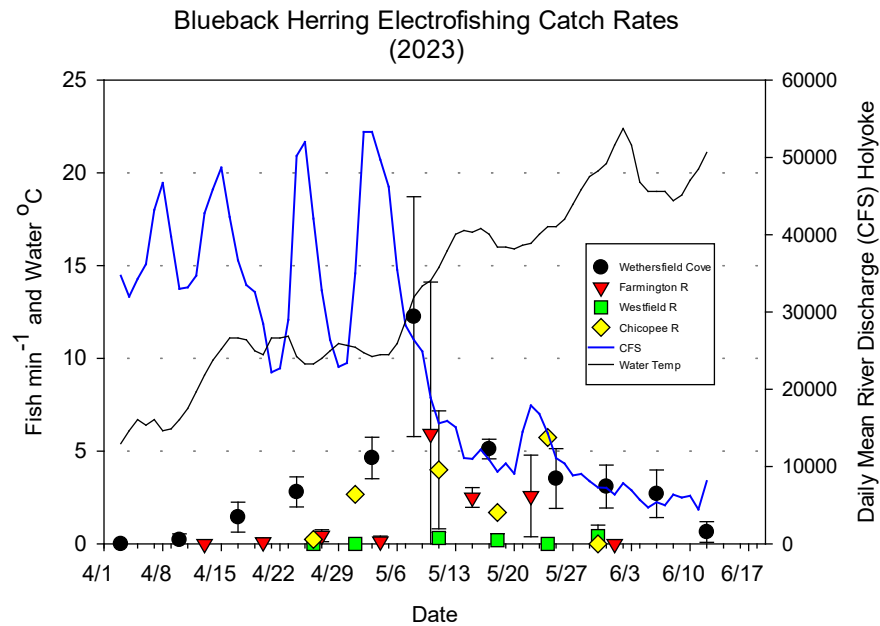
When sampling runs encounter high catch rates (~>60 fish collected, only occurs with Blueback Herring), with less than the standard 500 seconds shock time expended, the run duration is shortened. This situation occurred on 6 runs in 2023 compared to only two runs in 2022 (record low). Other annual shortened run times were 9 runs in 2021, 22 runs in 2019, 18 runs in 2018 and 16 runs in 2017 and is reflected in the aggregate catch rate summaries and comparisons (Figure 2). The annual catch rate was based on the aggregate of individual sample runs, using all sites, after Blueback Herring were determined present in a sample area (removes varying frequencies and timing of early zero runs when only Alewife are being sampled). The Blueback Herring 2023 season annual aggregate relative-abundance was the second lowest value in the time series, 2.1 fish-per-minute (95% CI 0.61).

USFWS River Herring Spawning Stock Assessment, Connecticut River  
 mean annual relative abundance (95% CI) of Blueback Herring  
 (four sample areas, 2013-2023)

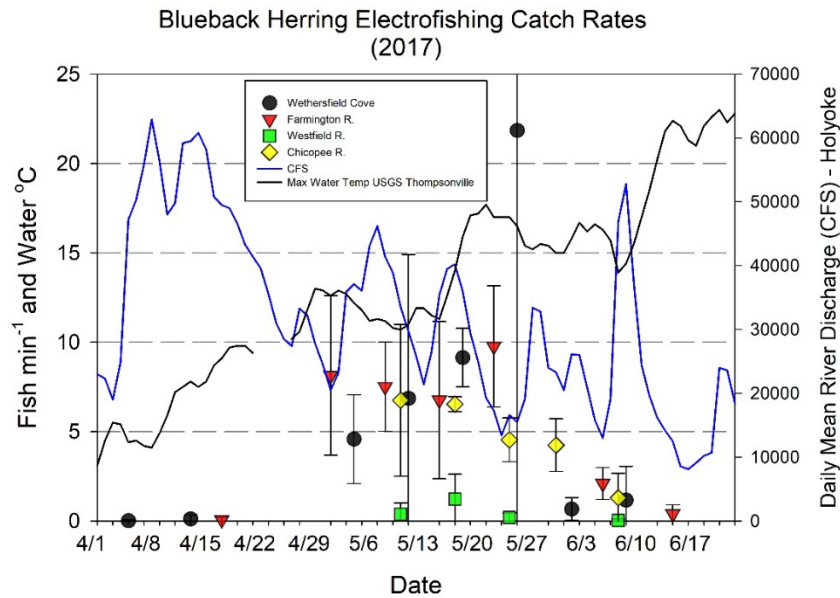


**Figure 2. Annual catch-per-unit effort (fish per minute) for Blueback Herring among four standard index areas. Sample efforts prior to first documented arrival are excluded from analyses (e.g., 141 runs vs. 173 total runs in 2021).**

Blueback Herring catch rates over the sample season were variable but overall, very low, the second lowest in overall in our time series. Relative abundance of Blueback Herring varied over space and time at the site level (Figure 3). In 2023, as shown in Figure 1, the low catch rates in the Farmington River were notable when compared to rates commonly observed in previous years data at the site level and in relation to Wethersfield Cove. Consistently low catch rates, including zero fish, were observed on the Westfield River over the season, which is common (Figure 3). The Chicopee River exhibited wide ranging catch variability, from extremely low rates to moderate (for this year) thought to be tied to variability in that tributary’s discharge regime in May and June of 2023 (at low discharge habitat becomes very limited and boat operation is restricted). Only one sample run is possible under “good” water discharge conditions given the upstream limits of shoals that are always impassable approximately 1 km upstream of the Connecticut River. Wethersfield Cove demonstrated abundance rates over time representative of a normal distribution over the season, with the Farmington River performing at a substantially reduced rate compared to previous years and in relation to Wethersfield Cove. Wethersfield Cove often demonstrates the highest catch rates among sites and seems less influenced by discharge rates that may affect tributaries habitat conditions more directly. A comparison plot of these same data for the year 2017 shows the extent of decreases at the site level, noting that 2017 was an “intermediate” year for overall relative abundance in the study time series (Figure 4).

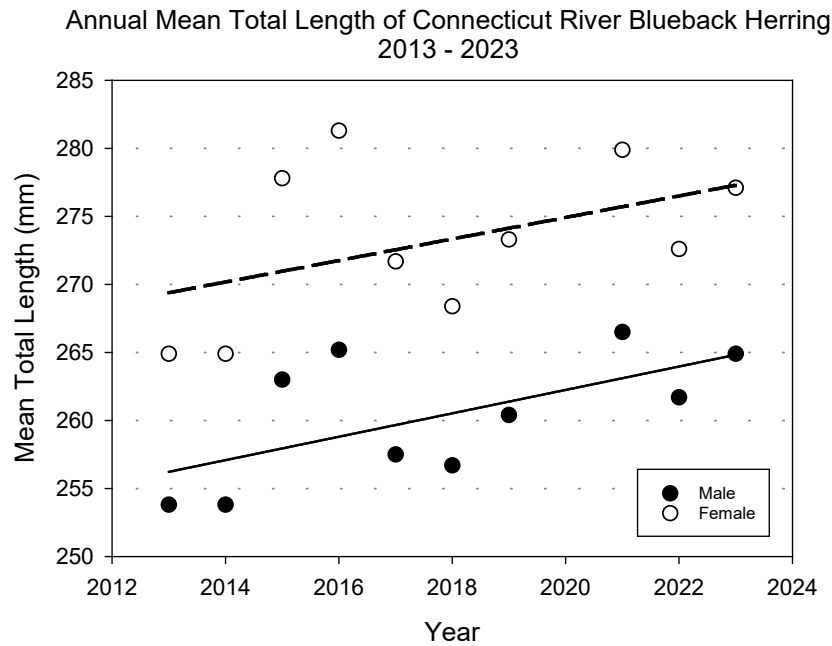


**Figure 3. Adult Blueback Herring relative abundance expressed as mean fish captured per minute  $\pm$  standard deviation, by sample area and date for 2023 season. Reported daily mean water temperature (black line; USGS Thompsonville) and daily mean river discharge (blue line; USGS Holyoke).**



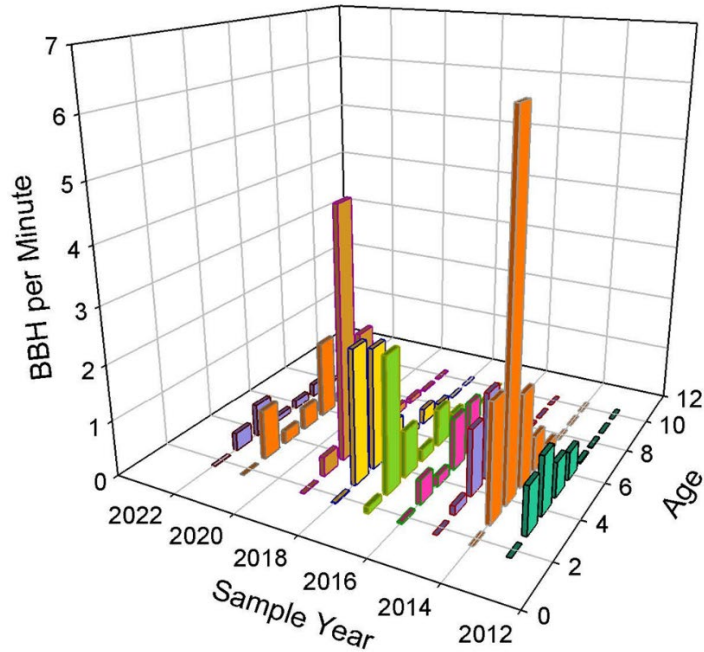
**Figure 4. Comparison figure of adult Blueback Herring relative abundance expressed as mean fish captured per minute  $\pm$  standard deviation, by sample area and date for the 2017 season. First Y axis kept to same scale for comparison with 2023; second Y axis scale slightly different.**

A summary of Blueback Herring mean total lengths (mm) are shown by sex and year in Figure 5 with regression lines for both data sets. The mean size of male and female Blueback Herring was intermediate for the assessment time series in 2023 and the overall trend suggests an increase in size over time. Age structure of the adult run, by sex, provides necessary information to help interpret shifts in general population measures, such as fish length data. Catch-at-age rates, from year to year, based on otolith age determinations applied to annual fish catch rates help better explain the frequency, timing and magnitude of this variability (Figure 6). Variability in annual juvenile production abundance for Blueback Herring, as measured by the CTDEEP Juvenile Alosine Seine Survey (juvenile index value), has shown a highly significant correlation to adult Blueback Herring catch-at-age, for age-4 fish in our program (Sprankle 2019).



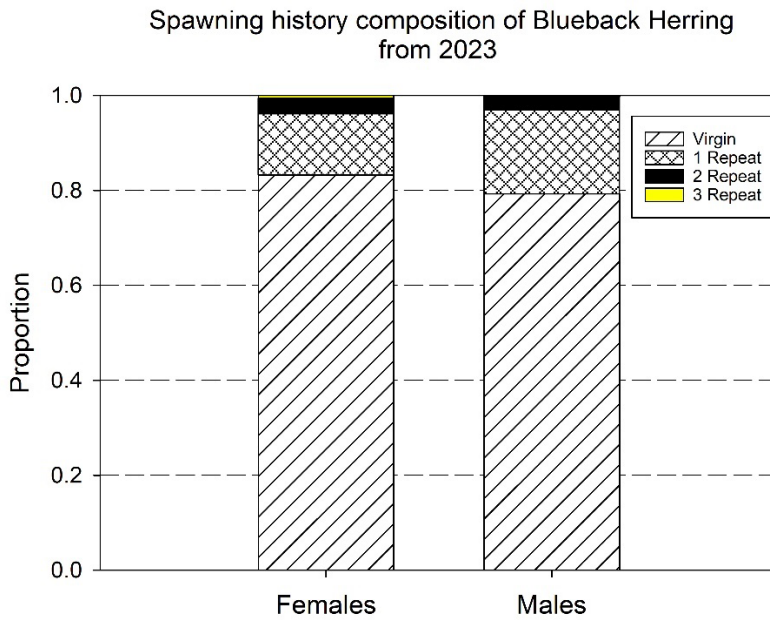
**Figure 5. Annual mean total length (mm) of Blueback Herring sampled by sex, all sites combined. Linear regression relationships are significant for males ( $P = 0.05$ ,  $r^2 = 0.39$ ) and not for females ( $P = 0.18$ ,  $r^2 = 0.21$ ).**

Relative abundance of Blueback Herring by age  
Wethersfield Cove and Farmington River



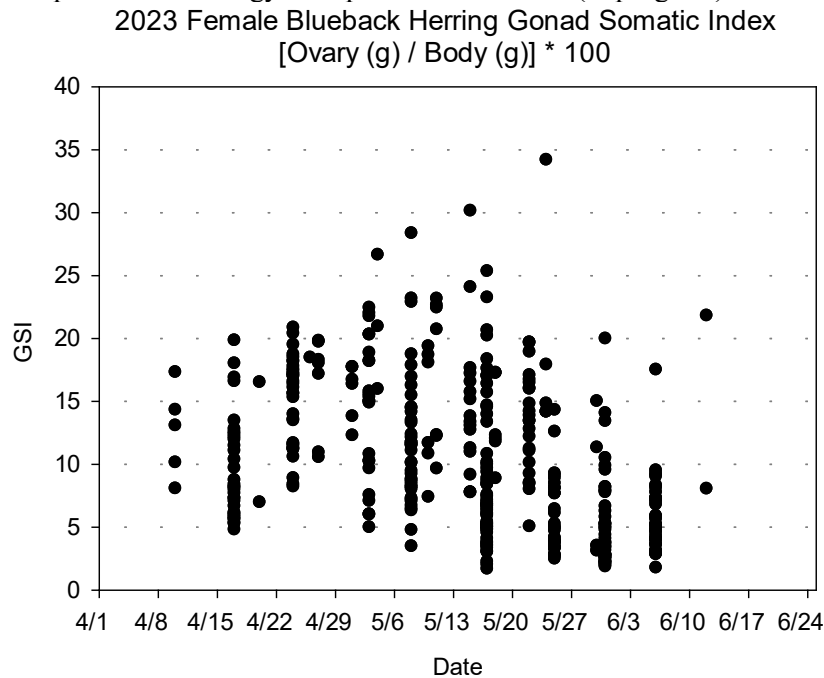
**Figure 6. Relative abundance (fish per min) by age, for Blueback Herring sampled annually from 2013 to 2022, from Wethersfield Cove and Farmington rivers (~80% of annual totals). Both “strong” and “weak” cohorts can be seen transitioning among years. In 2014 “strong” age-4 to age-5 in 2015. In 2016, “weak” age-4 to age-5 in 2017, as examples.**

In 2023, all retained Blueback Herring (n = 1,094) and Alewife (n = 141) were laboratory processed the day after sampling, using standardized procedures. Species identification confirmation were completed using peritoneal appearance (white Alewife, black to grey Blueback Herring), a scale sample was obtained, female ovaries removed and weighed, otoliths extracted, and a gill arch extracted (for mussel glochidia). In 2023, a Pancreatin (a digestive enzyme) bath was used to clean scales prior to slide mounting (n=8 per slide, fish). Jackie Stephens developed a methods manual that explains a rigorous process from scale collection from a fish, the various intermediate lab steps, to the examination of scales including the use of a trainer and test set of scales (Stephens 2023). A standard microfiche reader (microcolor 1100) was used independently by two readers to examine slide-mounted scales to determine spawning history (virgin, one repeat, two repeat, etc.) and assign a numeric confidence rating. Fish (slides) that were not in reader agreement were then examined by the two readers for a consensus determination. In 2023, for Blueback Herring, a relatively high proportion of virgin males (79.2%) and virgin females (83.2%) were determined (Figure 7). Given the new and improved methods, comparison to past years is not considered appropriate at this time.



**Figure 7. Spawning history, by sex, of all Blueback Herring laboratory processed from all sites in 2023 (n = 1,093).**

Female Blueback Herring ovaries from laboratory processed fish were extracted and weighed over the field season (N = 631) and were plotted over time, all sites combined (Figure 6). These dates were also examined in relation to the catch rates of females and broken out by sample area for the more in-depth work occurring on reproductive ecology with partner researchers (in progress).



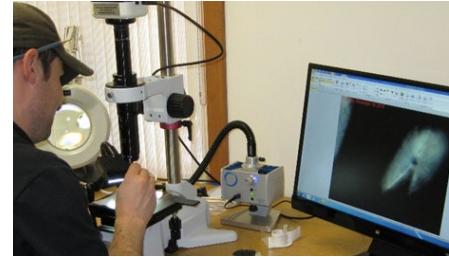
**Figure 8. A plot of spring 2023 Blueback Herring female gonadosomatic index (ovary wt./total weight\*100) as a percentage value over time, all site combined.**

Alewife population assessment data was limited by sample size, as has been the case over the program



(Table 5). This may be attributed to the fact the Connecticut River basin, at this time, has limited preferred habitat (pond and cove) for Alewife, compared to Blueback Herring. In addition, the spawning stock sizes of both species are at severely depressed levels in this basin and adjacent coastal runs of Connecticut. A total of 120 Alewife were sampled from the Mattabeset River over all three sample dates in that system (April 6, 12, and 19). A total of 25 Alewife were sampled on April 10 and 17 from Wethersfield Cove. The cove is the first and last area to be sampled and is done so weekly for the full season. An additional four Alewife were sampled in the Farmington River.

The age structure for sampled Alewife was completed in the report period, with age-5 fish shown as the dominant cohort (Table 7). Blueback Herring otolith aging is completed in winter months before the start of the following season. The age structure information helps explain the noted highest mean length for both male and female Alewife in 2023 (Table 8). These data support other observations in recent years of reduced adult returns, both in this basin and adjacent coastal runs. This shift in fish size comports with less than expected proportions of age-3 and age-4 fish for males.



**Table 6. The age structure for Alewife sampled from the Connecticut River in 2023, by sex with cohort representation expressed in percentage contribution.**

Age	Male		Female	
	N	%	N	%
3	5	5.8	3	5.5
4	30	34.9	15	27.3
5	51	59.3	30	54.5
6	0	0.0	4	7.3
7	0	0.0	3	5.5
	<b>86</b>		<b>55</b>	

Scale analyses of Alewife for spawning history aligns with the previously noted data. For females the spawning history consisted of 47.3% virgin 30.1% one repeat, 20.0% two repeat and 1.8% three repeat. For males, spawning history was determined as 60.0% virgin, 28.2% one repeat, and 11.2% two repeat.

**Table 7. Mean total length of all Alewife sampled in 2023 by sex, with standard deviations.**

Year	Male	Female
	Mean TL mm ( $\pm$ SD)	Mean TL mm ( $\pm$ SD)
2013	261.6 (15.8)	287.7 (16.2)
2014	266.2 (10.8)	276.1 (15.5)
2015	273.1 (11.7)	287.9 (12.4)
2016	270.7 (18.0)	286.4 (19.0)
2017	265.0 (18.3)	278.4 (21.4)
2018	269.5 (14.9)	280.0 (18.1)
2019	274.4 (11.0)	291.3 (15.0)
2021	264.5 (9.5)	276.2 (13.8)
2022	272.4 (9.1)	286.0 (11.1)
2023	277.7 (11.0)	292.1 (13.1)

## Program Results

The Connecticut River Fish and Wildlife Conservation Office collected and reported information relating to the activities and accomplishments occurring in the Connecticut River basin diadromous fisheries restoration program. Note some of the data presented here are preliminary, nor were all counts were final at the time of this report (Appendix B).

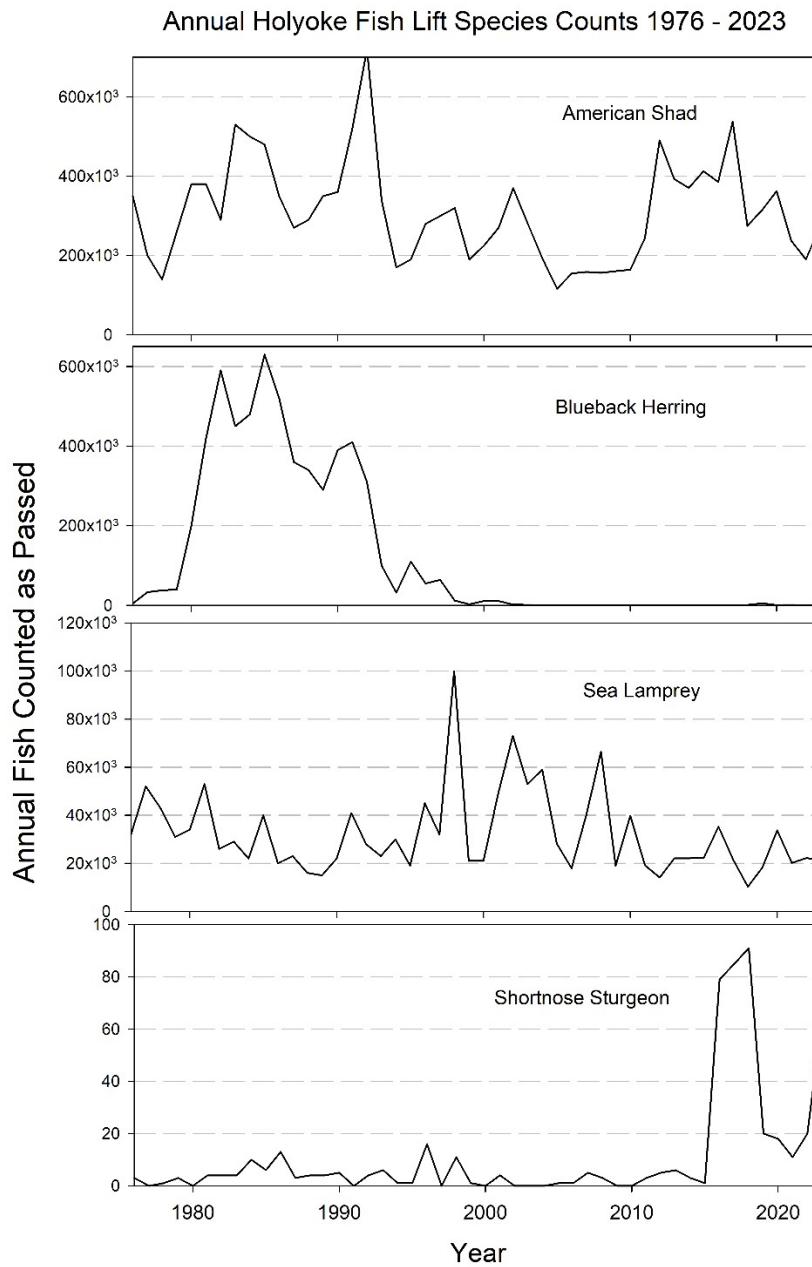


**Figure 9. Holyoke Gas and Electric Fish Passage Team members in the counting room.**

### **Migratory Fish Returns**

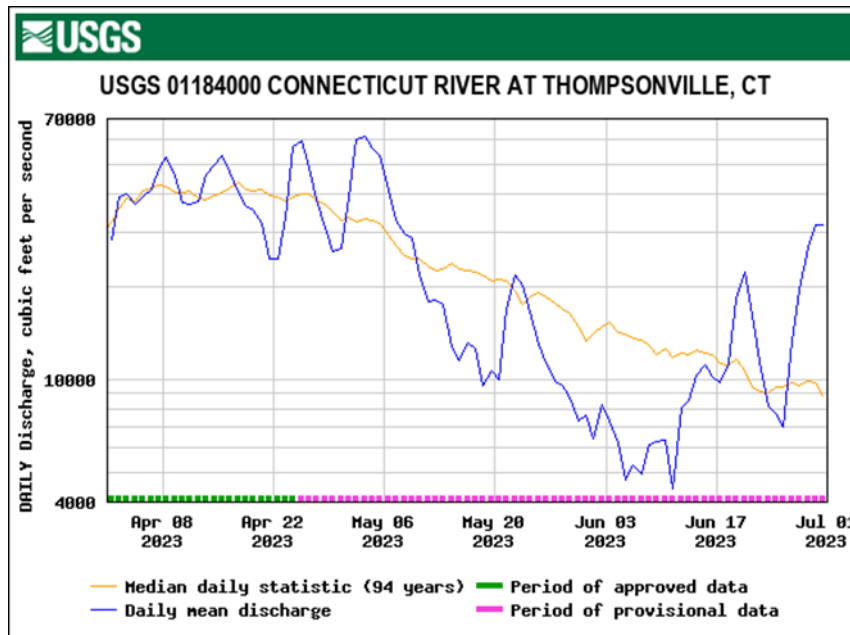
#### American Shad

A total of 297,041 adult American Shad were counted in 2023 at all first-barrier passage facilities in the basin. A total of 277,367 American Shad were passed upstream of the Holyoke Dam, Massachusetts (river km 138) in 2023 through its two fish lifts, which is a 46% increase from 2022 (Figure 11). The mean annual passage count at Holyoke for the period 1980-2022 is 318,983 ( $\pm$ SD 129,829). The Holyoke Fish Lift opened on 4/11/23 following delays due to ice and high-water discharge. The lifts were closed the following dates: 4/13-17, 4/24- 26, 5/2-7, and 6/24- 7/2. Closures were triggered by high flows, poor visibility, or planned and approved work (late June). April had fluctuating high flow events that were of a shorter duration than historic “April” runoff conditions.



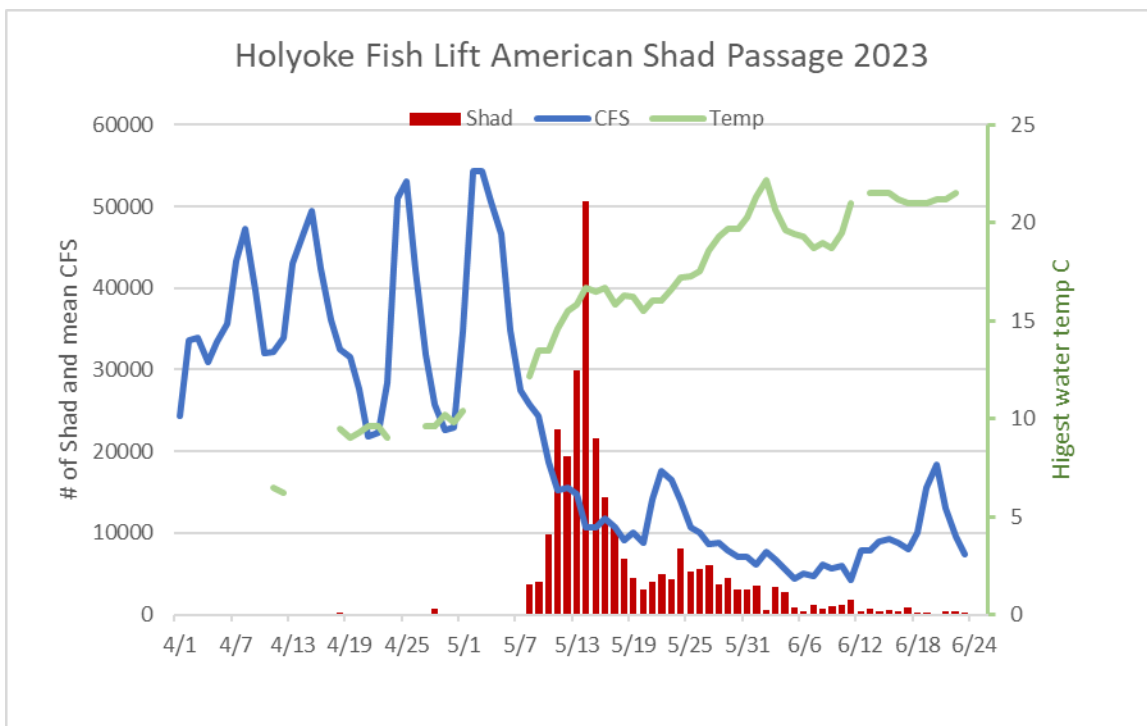
**Figure 10. Select count summary of Holyoke Fish Lifts passage counts for American Shad, Blueback Herring, Sea Lamprey and Shortnose Sturgeon (1976-2023). Fish passage counts are affected by structural and operational changes at both dams and fishways and by environmental conditions (temperature and flow/spill) within year and among years.**

Main stem river discharge was within expected variability of the long term daily means for April and then declined fairly rapidly to below average, and well-below average, from the second week of May to the middle of June (Figure 12).



**Figure 11. Mean daily river discharge measured at USGS Thompsonville Gage, with long-term mean values also shown.**

The highest single passage event for shad occurred on 5/14 with 50,710 fish counted (Figure 13). There were seven dates when over 10,000 American Shad passed around that peak date.



**Figure 12. Daily American Shad passage counts from Holyoke Fish Lifts with water temperature (green) and river discharge (blue; USGS) data included for the period April 1 to June 24, 2023.**

Holyoke Gas and Electric (HGE), in coordination with the state and federal agencies, facilitated trap-and-

haul facility use in 2023. The use of trap-and-haul at the HGE Holyoke Project supported research activities and the USGS Conte Laboratory, restoration activities by the USFWS North Attleboro National Fish Hatchery, Rhode Island Department of Environmental Management (RIDEM), CTDEEP, and fish health evaluation by the USFWS CTR FWCO (Table 9).

**Table 8. Summary of fish captured at the Holyoke Trap and Transfer Facility in 2023, by date, agency, species, number, and disposition/purpose. Destinations include Conte Lab (CAFRL) for experiments and then release and North Attleboro for fry production for restoration stockings in Massachusetts coastal systems.**

American Shad			
Date	Agency	Destination	Count
9-May	CTDEEP	CT	94
9-May	USFWS	N. Attleboro	91
10-May	CTDEEP	CT	95
10-May	CTDEEP	CT	95
10-May	USFWS	N. Attleboro	91
11-May	CTDEEP	CT	95
11-May	CTDEEP	CT	96
11-May	USFWS	N. Attleboro	90
12-May	CTDEEP	CT	97
15-May	USGS	CAFRL	80
16-May	USGS	CAFRL	80
17-May	USGS	CAFRL	80
18-May	USGS	CAFRL	80
18-May	RIDFW		80
19-May	RIDFW		80
22-May	USGS	CAFRL	80
22-May	RIDFW		80
23-May	USGS	CAFRL	82
24-May	USGS	CAFRL	78
25-May	USGS	CAFRL	82
30-May	USGS	CAFRL	80
31-May	USGS	CAFRL	82
1-Jun	USGS	CAFRL	80
2-Jun	USGS	CAFRL	81
5-Jun	USGS	CAFRL	30
7-Jun	USGS	CAFRL	35
		TOTAL	2114
Sea Lamprey			
23-May	USGS	CAFRL	28
28-May	USGS	CAFRL	38
25-May	USGS	CAFRL	25
2-Jun	CTDEEP	Restoration	213
		TOTAL	304

The three fish ladders at the Turners Falls Project were opened on 4/21/23 (Cabot Station, Spillway Ladder, and Gatehouse Ladder) following the requested CRASC Fish Passage Operations Plan for 2023. The first American Shad observed passing was on 5/1 at Spillway Ladder, with the first shad passing from Gatehouse Ladder on 5/8. Fishway counts were provided at regular intervals by FirstLight Power with a total of 33,782 American shad passing the Gatehouse Ladder at Turners Falls Dam in 2023, versus the 23,676 passed in 2022. The Turners Falls Dam and power canal is a three-fishway complex. Fish must first pass either the Cabot Station Ladder (into the power canal) or the Spillway Ladder, located at the base of the dam at the upstream end of the “bypassed reach.” Fish passing the Cabot Ladder exit into the lower power canal and requires that fish find one of two entrances to the Gatehouse Ladder at the upstream end of this 2.1-mile-long canal. Fish passed via the Spillway Ladder (at the dam) may go

directly to the entrance of the Gatehouse Ladder, but as in the case of all ladders, have opportunities to drop back, including into the canal. A total of 53,157 shad were counted passing into the power canal from the Cabot Station Ladder. A total of 7,265 shad were counted passing the Spillway Ladder. Spillway Ladder counted shad are believed to have limited fall back/loss (~ <10%) versus those in the power canal. Fish in the canal must locate and use the Gatehouse Ladder entrances, which are affected by several dynamic factors (e.g., turbulence, entrance gates attraction flow/locations). The single noted fishway closure was for Cabot Ladder on 4/26.

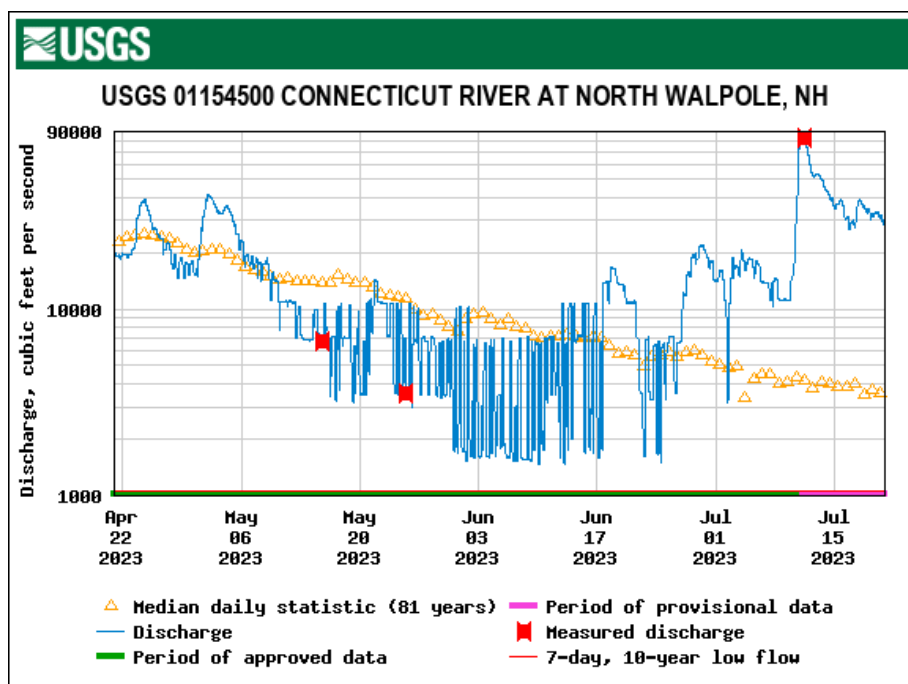
Overall, the 2023 passage number at Gatehouse Ladder (requiring passage as noted at two other ladders) as a percentage of American Shad passed at the Holyoke Dam Fish Lifts was 12.2% compared to 12.4% observed in 2022 (Table 9). The 2017 CRASC Shad Management Plan has a minimum passage objective of 397,000 American Shad for the Turners Falls Project, or ~58% of the minimum targeted passage objective at Holyoke, based on available upstream habitat. The CRASC Shad Plan describes there is 1.4 times the amount of shad habitat upstream of the Turners Falls Dam versus the amount of habitat between Holyoke and Turners Falls dams. In addition, density dependent growth impacts have been documented for juvenile shad sampled in the Holyoke to Turners Falls reach, versus the upstream habitat reaches (Mattocks et. al 2019). These facts and additional management goals and objectives of the CRASC Plan provide a clear rationale for the basis to achieve the defined passage performance criteria of the Plan and its Addendum on Fish Passage Performance (CRASC 2017; as amended 2022).

**Table 9. Annual American Shad fishway passage counts for Holyoke, Turners Falls and Vernon Projects on the main stem river, Rainbow Dam/Project (Farmington River), and the West Springfield Project (Westfield River) for the period 1980 – 2023.**

Year	Holyoke Dam Passed	Turners Falls Dam Passed	TF % of Holyoke Total	Vernon Dam Passed	Vernon % of TF Total	Farmington River, Rainbow Dam Passed	Westfield River, W. Springfield Dam Passed
1980	376,066	298	0.1			480	
1981	377,124	200	0.1	97	48.5	167	
1982	294,842	11	0.0	9	81.8	737	
1983	528,185	12,705	2.4	2,597	20.4	1,565	
1984	496,884	4,333	0.9	335	7.7	2,289	
1985	487,158	3,855	0.8	833	21.6	1,042	
1986	352,122	17,858	5.1	982	5.5	1,206	
1987	276,835	18,959	6.8	3,459	18.2	792	
1988	294,158	15,787	5.4	1,370	8.7	378	
1989	354,180	9,511	2.7	2,953	31.0	215	
1990	363,725	27,908	7.7	10,894	39.0	432	
1991	523,153	54,656	10.4	37,197	68.1	591	
1992	721,764	60,089	8.3	31,155	51.8	793	
1993	340,431	10,221	3.0	3,652	35.7	460	
1994	181,038	3,729	2.1	2,681	71.9	250	
1995	190,295	18,369	9.7	15,771	85.9	246	
1996	276,289	16,192	5.9	18,844	116.4	668	1,413
1997	299,448	9,216	3.1	7,384	80.1	421	1,012
1998	315,810	10,527	3.3	7,289	69.2	262	2,292
1999	193,780	6,751	3.5	5,097	75.5	70	2,668
2000	225,042	2,590	1.2	1,548	59.8	283	3,558
2001	273,206	1,540	0.6	1,744	113.2	153	4,720
2002	374,534	2,870	0.8	356	12.4	110	2,762
2003	286,814			268		76	1,957
2004	191,555	2,192	1.1	653	29.8	123	913
2005	116,511	1,581	1.4	167	10.6	8	1,237
2006	154,745	1,810	1.2	133	7.3	73	1,534
2007	158,807	2,248	1.4	65	2.9	156	4,497
2008	153,109	4,000	2.6	271	6.8	89	3,212
2009	160,649	3,813	2.4	16	0.4	35	1,395
2010	164,439	16,422	10.0	290	1.8	548	3,449
2011	244,177	16,798	6.9	46	0.3	267	5,029
2012*	490,431	26,727	5.4	10,386	38.9	174	10,300
2013	392,967	35,293	9.0	18,220	51.6	84	4,900
2014	370,506	39,914	10.8	27,706	69.4	536	4,787
2015	412,656	58,079	14.1	39,771	68.5	316	3,383
2016	385,930	54,069	14.0	35,513	65.7	141	5,940
2017	537,249	48,727	9.1	28,682	58.9	615	6,000
2018	275,232	43,146	15.7	31,724	73.5	341	5,752
2019	314,353	22,575	7.2	12,862	57.0	276	4,064
2020	362,423	41,252	11.4	13,897	33.7	510	5,549
2021	237,306	21,052	8.9	9,701	46.1	47	
2022	190,352	23,576	12.4	13,763	58.4	11	1,288
2023	277,367	33,782	12.2	29,372	86.9		
Mean	318,037	18,726		9,994		419	3,693
SD	128,464	17,944		12,303		445	2,154
Low	116,511	11		9		8	913
High	721,764	60,089		39,771		2,289	10,300

\* Vernon Ladder issue fixed for 2012

Vernon Dam (Vernon, Vermont) fish ladder was opened on 4/27/23 and closed on 7/20/23, following CRASC’s fishway schedule plan, by Great River Hydro. A total of 29,372 American Shad were counted passing Vernon fish ladder. Based on the Turners Falls Gatehouse Ladder American Shad passage (33,782) this translates to 87% of these fish moving above Vernon which is notable as the highest value since 2012 (Table 10).



**Figure 13. Daily average river discharge from first gage upstream of Vernon Dam, located 1 km downstream of Bellows Falls Dam for 4/21/23 through 7/20/23.**

Bellows Falls Fish Ladder was opened on 5/15/23 and passed 2,571 Sea Lamprey, species that to trigger that ladder's use, and 20 American Shad (at time of this report). This project's ladder was, by agreement, previously triggered on Atlantic Salmon upstream passage needs, so its period of operation was often limited/restricted in the past. The dam is located at the historic upstream extent of American Shad in the river.

The West Springfield Fish Ladder on the Westfield River was operated in 2023, count data were still under review at the time of this report. As of May 27, 2023, a total of 2,473 American Shad and 1,498 Sea Lamprey had passed.

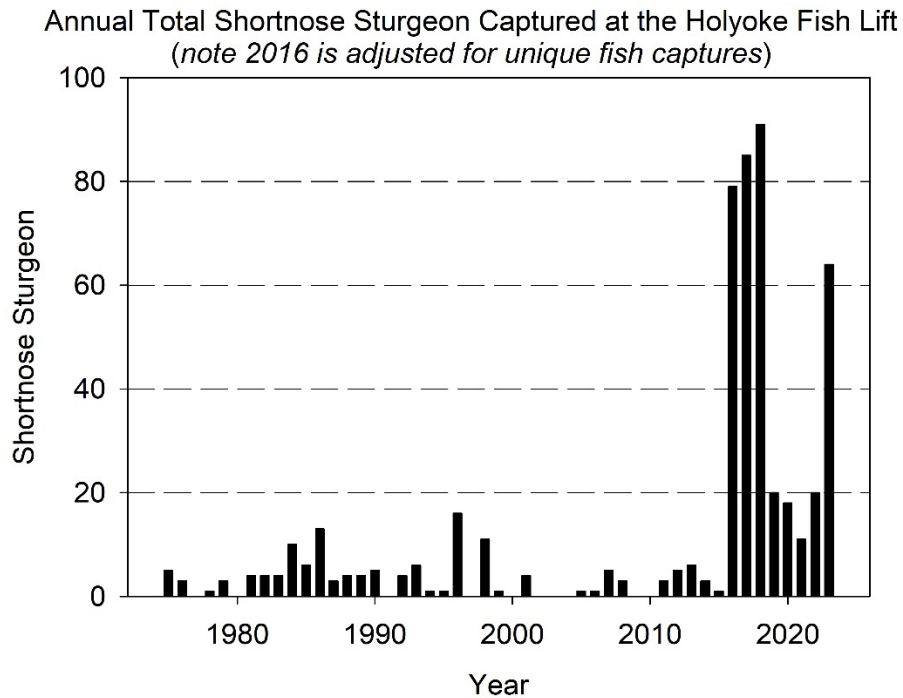
The Connecticut DEEP did not operate the Rainbow Dam fish ladder on the Farmington River in 2023 given concerns of its negative impacts (e.g., scale loss on shad) coupled with its very low passage of target fish species and the inadequate downstream fish passage protections for adults and juveniles. The dam/hydro project is owned by Stanley Black and Decker and due to its age, pre-dates the ability to use federal fish passage authority, unless certain triggers occur, (e.g., turbine upgrades). In addition, operational conditions of this facility have wide ranging peaking operations that can cause fluctuation in downstream aquatic habitat during the spawning periods of many fish species. The responsibility of providing safe, effective, and timely upstream and downstream fish passage to historic spawning and nursery habitats upstream of this dam (~95% habitat upstream) has not fallen on the dam owner/operator, but rather the citizens of the State of Connecticut to fund and operate.

Downstream passage and protection measures were operated at the previously listed facilities per CRASC Fish Passage Operations Schedule (Appendix C). Upstream Fish Passage Operations Schedules were also provided (Appendix C).



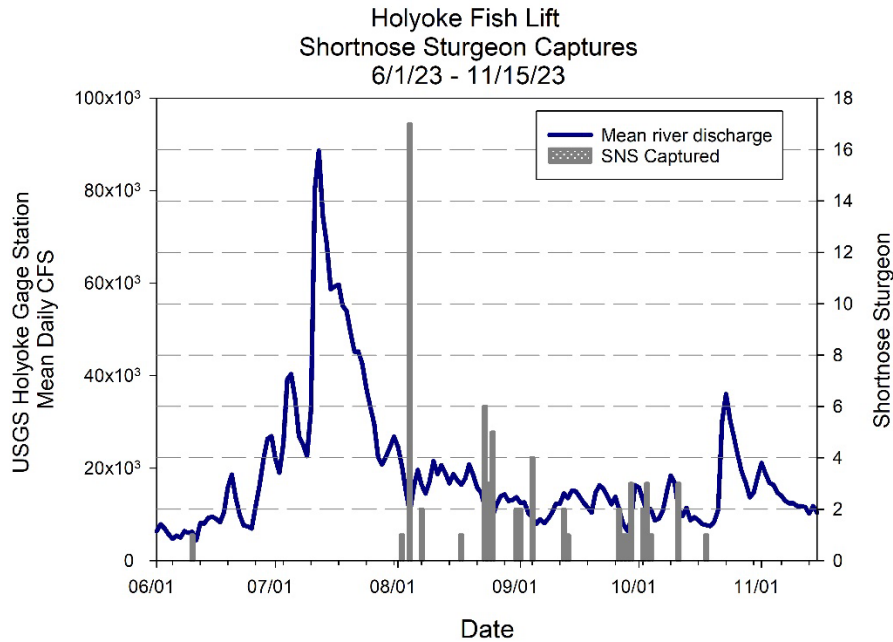
### Shortnose Sturgeon

A total of 64 Shortnose Sturgeon (SNS) were trapped and passed upstream at Holyoke Fish Lift in 2023. This is substantial increase from recent years annual passage totals since the modified spillway lift entrance was completed in 2016 (Figure 15).



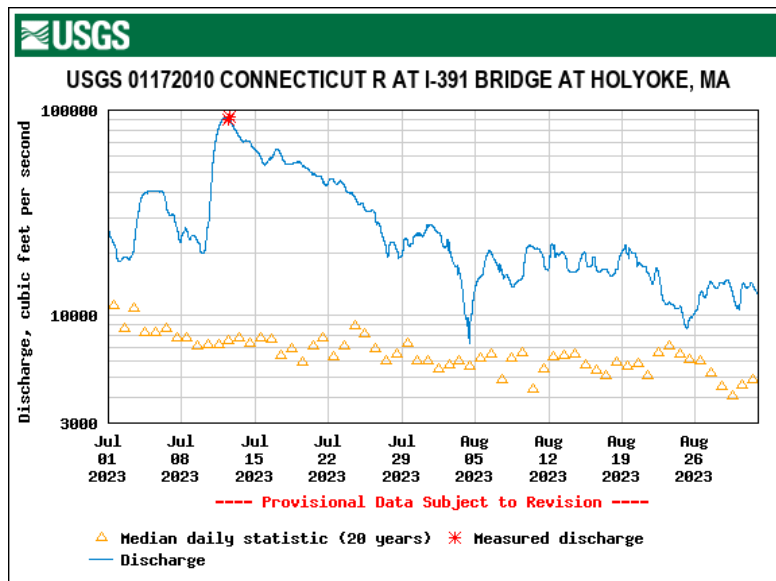
**Figure 14. Annual totals of Shortnose Sturgeon captured at the Holyoke Fish Lift, 1976-2023. Fish have only been approved by NOAA for regular upstream passage, since 2017, when downstream protective measures to address sturgeon were fully operational.**

The primary passage period for SNS has generally been in July and August with fish also passing early and later in the year. The 2023 season was unique in the extremely high flows that occurred in July and to a lesser degree in August, that was reflected in daily lift count data, largely due to lift closures when the river exceeds 40,000 CFS, and or turbidity was too high to effectively detect sturgeon in the lift/pass system (Figure 16).



**Figure 15. Plot of all SNS captured and passed upstream at HFL in 2023, with daily river discharge as measured at the Holyoke USGS gage.**

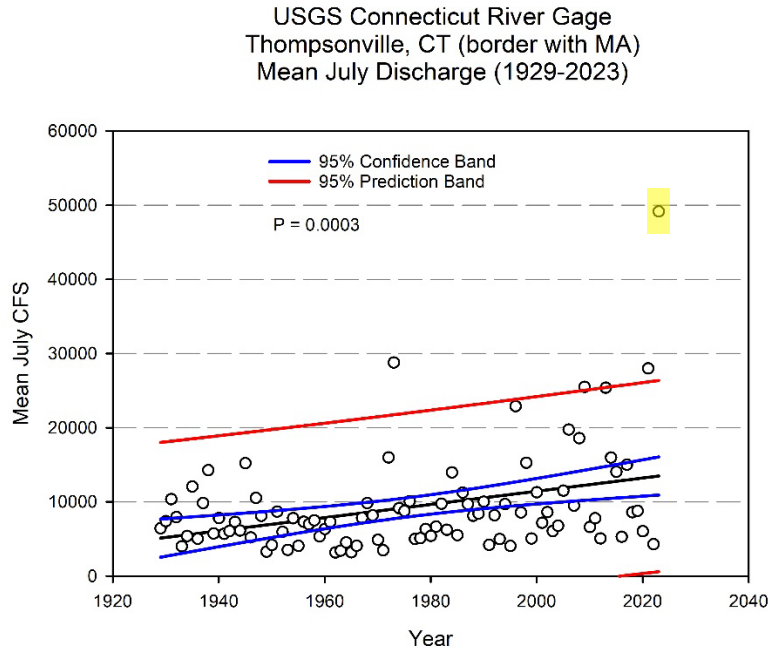
Daily mean CFS values for July and August at the Holyoke USGS gage, compared with the data of 2023 (blue), illustrate the magnitude and sustained duration of these above average conditions for these two months (Figure 17).



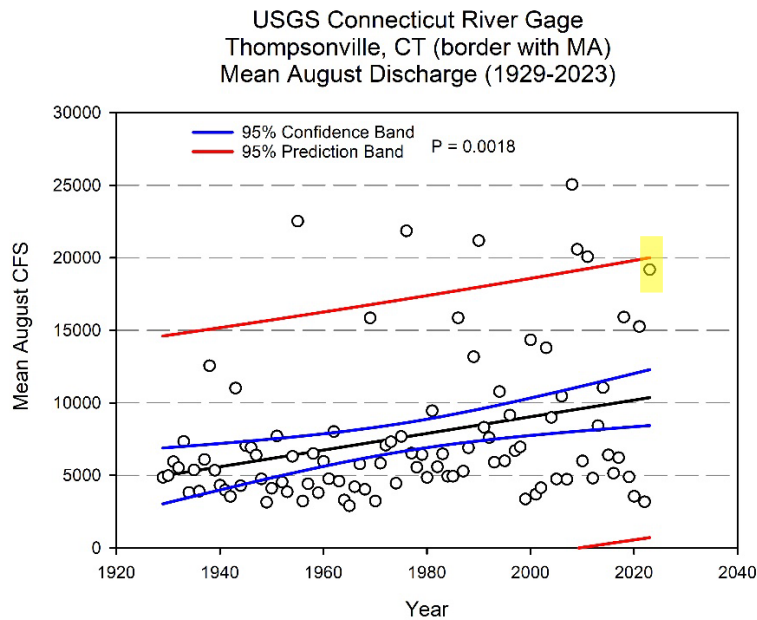
**Figure 16. The 2023 daily mean river discharge at the Holyoke USGS gage for the months of July and August with the 29 year mean values shown.**

The fish lift passage operations for SNS were impacted by these severe high river discharges in July and August that were record levels for the USGS data time series for their Thompsonville CT gage station (Figure 17 and 18). A statistically detectable increasing trend is evident from the USGS data time series

for this site, covering the period 1929 to 2023, with a large degree of variability (low  $r^2$ ).



**Figure 17. Mean annual discharge (cubic feet per second) for month of July from the Thompsonville CT, USGS gage for the period 1929-2023. The 2023 value is highlighted in yellow. A significant increasing trend in value was detected by linear regression ( $P=0.0003$ ) with an  $r^2 = 0.13$ .**



**Figure 18. Mean annual discharge (cubic feet per second) for month of August from the Thompsonville CT, USGS gage for the period 1929-2023. The 2023 value is highlighted in yellow. A significant increasing trend was detected by linear regression ( $P=0.002$ ) with an  $r^2 = 0.10$ .**

### Blueback Herring

The Holyoke Fish Lift counted 2,211 Blueback Herring passed in 2023 which is an improvement from the 283 Blueback Herring passed in 2021. In either case, the CRASC River Herring Management Plan's annual passage target at this facility is 300,000 to 500,000 fish to place some context on those counts

(Figure 11). There continues to be no detectable relationship between the USFWS' Blueback Herring CPUE and HFL counts. Concerns with large, consistent reductions in annual run counts of river herring throughout Connecticut, Rhode Island and areas of Massachusetts (systems off Narragansett and Buzzards Bay) in 2022 and again in 2023, resulted in ad hoc meetings of state and federal biologists that work in these geographic areas, in the fall of both years.

The USFWS and several other agencies including CTDEEP, have sought to increase attention on river herring bycatch in the Atlantic Herring fisheries managed by the New England Fishery Management Council (NEFMC) and use past and recent published research that supports concerns of disproportionate bycatch from river herring stock in Connecticut and Rhode Island. These data and findings are reported in Reid et al. 2022 using finer scale genetic discrimination approaches not applied before. Subsequently, another important paper was published in 2023 that examined potential time and area closure management options to address river herring bycatch in this area with new modeling approaches that were shown to have good agreement with data sets (Roberts et al. 2023). The NEFMC has initiated steps to examine ways to better address river herring bycatch with its plan for Amendment 10 development for Atlantic Herring. The USFWS and partner river herring agencies intend to remain engaged in those discussions.

#### Sea Lamprey

A total of 22,489 Sea Lamprey were counted from first barrier fishways returning to the Connecticut River basin in 2023. This is a slight decrease from the 2022 count for first barriers (23,042), driven primarily by the Holyoke Fish Lift that passed 21,168 (Figure 11). The annual mean number of Sea Lamprey passed at Holyoke is 32,434 fish (1976-2022). The 25<sup>th</sup> percentile for HFL is 21,158 and the 75<sup>th</sup> percentile is 40,301.

A total of 19,724 Sea Lamprey subsequently passed upstream of Turners Falls Dam (through Gatehouse Ladder), or 93% of the number passed at Holyoke (the proportion in 2022 was 41%). This is a remarkably high percentage given past data for this statistic. A total of 8,060 Sea Lamprey passed upstream of Vernon Dam (or 40% of the Gatehouse Ladder total, vs. 56% in 2022) with an incomplete count of 2,371 lampreys passed upstream of Bellows Falls Dam.

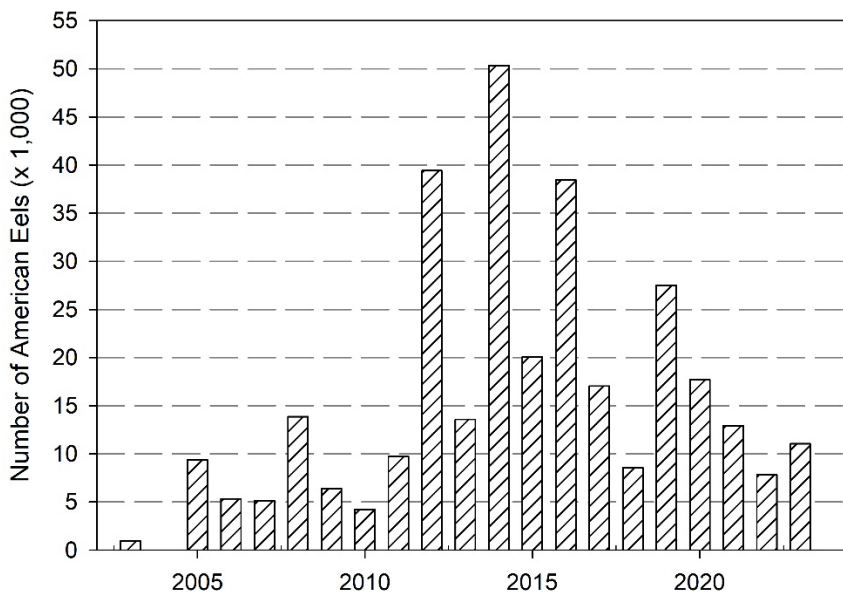
#### Striped Bass

A total of 116 Striped Bass were passed at HFL, which is ~ 75% decrease from the most recent years.

#### American Eel

The American Eel passage count at Holyoke Dam, which used three specially designed ramp/traps in different project locations (tailrace fish lift entrance, upper stilling basin, and S. Hadley shore of bypass reach), totaled 11,048 in 2023. This is an increase from the 7,841 eels counted in 2022 (Figure 19). The eel ramps were installed and operational on April 5, 2023. All three facilities were operated through November 15, 2023, with some exceptions. The Holyoke Gas and Electric Report on American Eel passage will be available in the winter of 2024 and will compare catch rates among the trap locations and provide details on other statistics. American eels captured in these ramp/traps are relatively small, primarily ranging between 10-20 cm in total length.

**Annual American Eel Ramp/Trap Counts  
for Upstream Passage at Holyoke Dam  
2003-2023**



**Figure 19. Annual American Eel ramp/trap counts reported by Holyoke Gas and Electric, at Holyoke Dam, for the period 2003-2023.**

The CRASC Technical Committee, as part of its American Eel Management Plan development, had identified as one research need, updating analyses of the age structure of juvenile eel passing at Holyoke as well as outmigrating adult silver eels. Work on this study began in June with 187 juvenile eels subsampled from HGE eel traps.

Gizzard Shad

A total of 60 Gizzard Shad were counted at the Holyoke Fish Lift in 2023, which is consistent with past years count data.

**Literature Cited**

CRASC. 2017. Connecticut River American Shad Management Plan. Amended 2022, Fish Passage Performance Addendum. USFWS, 103 East Plumtree Road, Sunderland, MA.

Mattocks, S., B. Keleher, and K. Sprankle. 2019. Juvenile American Shad assessment in the Connecticut River from Holyoke Dam to Bellows falls Dam, 2017-2018. USFWS, 103 East Plumtree Road, Sunderland, MA. <https://www.fws.gov/r5crc/>

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Stephens, Jacqueline. 2023. River herring and the holy scale. U. S. Fish and Wildlife Service, 103 East Plumtree, Sunderland, MA

## Appendix A

Connecticut River Atlantic Salmon Commission meeting agendas for report period.



**CRASC Commissioners:**

**CTDEEP:**

Andrew Fisk  
Peter Arnestad (Alt.)

**CT Public Sector:**

Tom Chrosniak

**MA DFW:**

Mark Tisa  
Todd Richards (Alt.)

**MA Public Sector:**

vacant

**NHFG:**

Scott Mason  
Scott Decker (Alt.)

**NH Public Sector:**

Donald McGinley

**NMFS:**

Michael Pentony  
Chris Boske (Alt.)

**USFWS:**

Kyla Hastie (Acting RD)  
Rick Jacobson (Alt.)

**VTFW:**

Christopher Herrick  
Eric Palmer (Vice Chair/Alt.)

**VT Public Sector:**

vacant

**Executive Assistant:**

Kenneth Sprankle

**Technical Committee:**

**CTDEEP:**

Tim Wildman

**MA DFW:**

Rebecca Quinones

**MA DMF:**

Ben Gahagan

**NHFG:**

Matthew Carpenter

**NMFS:**

William McDavitt

**USFS:**

Jeremy Mears

**USFWS & Secretary:**

Kenneth Sprankle

**VTFW:**

Lael Will (Chair)

**DATE:** December 6, 2022

**TO:** CRASC Commissioners, other interested parties, and public

**FROM:** Kenneth Sprankle, Connecticut River Coordinator

**SUBJECT:** Connecticut River Atlantic Salmon Commission Meeting Agenda

The Connecticut River Atlantic Salmon Commission meeting is scheduled for **December 6, 2022 from 10:00 a.m. to 12:20 p.m.** that will be held **both in-person** (Conte Laboratory, Turners Falls) and **also remotely** using the Microsoft "Teams" Application\*. If interested in participating, you must contact me via email ([ken\\_sprankle@fws.gov](mailto:ken_sprankle@fws.gov)) to be added to the "invite list" for that teams and to determine who will be in-person.

### Agenda

1. (10:00-10:15) – **Decision:** Determination of a quorum, approval of today's agenda, and review of minutes from June 28, 2022, meeting, CRASC Officer positions and vacancies – *Vice Chair Eric Palmer*
2. (10:15-10:35) – **Informational and Decision:** CRASC Status of \$500,000 Federal Funds in FY22 Budget – *Vice Chair Palmer*
  - A. Review of status of activities, expenditures, plans for FY22 funds - *Ken Sprankle*
  - B. CRASC appropriation plan for potential FY23 budget allocation, review of Technical Committee recommendations – *Sprankle*
  - C. Vote on potential FY23 fund project list
3. (10:35-10:55) – **Discussion:** Draft Charter for the "Connecticut River Migratory Fish Restoration Cooperative" – *Vice Chair Palmer*
4. (10:55-11:05) – **Informational:** Coordinators Report– *Sprankle*
  - A. Fishway count summaries and related information
5. (11:05-11:25) – **Informational:** Report of the CRASC Technical Committee from 11/15/22 Meeting – *TC Chair Lael Will*
6. (11:25-11:50) – **Informational and discussion:** Presentation of a proposed federal bill "Connecticut River Watershed Partnership Act" developed by the Friends of Conte Refuge – *Markelle Smith and Kristen Sykes*
7. (11:50-12:15) – **Informational and discussion:** Mike Slattery (USFWS) perspective as the Landscape Partnership Coordinator for the Delaware River and its Federal Conservation Funding Act.
8. (12:15-12:20) – **Other Business**



**CRASC Commissioners:**

**CTDEEP:**  
Andrew Fisk  
Peter Arrestad (Alt.)  
**CT Public Sector:**  
Tom Chrosniak  
**MADFW:**  
Mark Tisa  
Todd Richards (Alt.)  
**MA Public Sector:**  
vacant  
**NHFG:**  
Scott Mason  
Scott Decker (Alt.)  
**NH Public Sector:**  
Donald McGinley  
**NMFS:**  
Michael Pentony  
Chris Boelke (Alt.)  
**USFWS:**  
Kyla Hastie (Acting RD)  
Rick Jacobson (Alt.)  
**VTFW:**  
Christopher Herrick  
Eric Palmer (Vice Chair/Alt.)  
**VT Public Sector:**  
David Deen  
**Executive Assistant:**  
Kenneth Sprankle

**DATE:** February 17, 2023  
**TO:** CRASC Commissioners, other interested parties, and public  
**FROM:** Kenneth Sprankle, Connecticut River Coordinator  
**SUBJECT:** Connecticut River Atlantic Salmon Commission Meeting Agenda

The Connecticut River Atlantic Salmon Commission meeting is scheduled for **February 17, 2023, from 10:00 a.m. to 12:15 p.m.** that will be held both in-person (Conte Laboratory, Turners Falls) and remotely using the Microsoft “Teams” Application\*. If interested in participating, you must contact me via email ([ken\\_sprankle@fws.gov](mailto:ken_sprankle@fws.gov)) to be added to the “invite list” for that teams and to determine who will be in-person.

**Agenda**

1. (10:00-10:10) – **Decision:** Determination of a quorum, approval of today’s agenda, and review of minutes from December 6, 2022, meeting, new member, vacant position – *Chair Andy Fisk*
2. (10:10-10:45) – **Informational and Decision:** CRASC Status of \$700,000 Federal Funds and “DOI special report directive” in FY23 Budget – *Chair Fisk*  
A. Review of CRASC/TC proposed funding activities, plans for FY23 funds - *Ken Sprankle, group*  
B. Vote on FY23 funds project list and “DOI special report”  
C. Status of FY22 CRASC funds, plans for 2023 - *Sprankle*
3. (10:45-11:00) - **Informational:** USFWS approach/plan to address CRASC FY23 Appropriations Article charge to the DOI – *Liz Willey (USFWS)*
4. (11:00-11:10) – **Discussion and Decision:** Update on the Draft Charter for the “Connecticut River Migratory Fish Restoration Cooperative” – *Vice Chair Palmer*  
A. Set deadlines for next steps
5. (11:10-11:30) – **Informational:** Presentation on the Atlantic States Marine Fisheries Commissions, American Eel Stock Assessment Subcommittee Benchmark Stock Assessment and Peer Review – *Sheila Eyles (USFWS)*
6. (11:30-11:55) – **Informational and Decision:** Connecticut River American Eel Management Plan, presentation, discussion – *Tim Wildman and Lael Will*  
A. Vote on Plan for Public Review
7. (11:55-12:10) – **Public Comment**
8. (12:10-12:15) – **Other Business**

CRASC Adopted Management Plans: American Shad and Fish Passage Addendum (2017; 2022), Sea Lamprey (2018), River Herring (2004), and pending American Eel. Future Plan updates or new plan(s); River Herring and Habitat.

1



**CRASC Commissioners:**

**CTDEEP:**  
Andrew Fisk (Chair)  
Peter Aarrestad (Alt.)  
**CT Public Sector:**  
Tom Chrosniak  
**MADFW:**  
Mark Tisa  
Todd Richards (Alt.)  
**MA Public Sector:**  
vacant  
**NHFG:**  
Scott Mason  
Dianne Tummins (Alt.)  
**NH Public Sector:**  
Donald McGinley  
**NMFS:**  
Michael Pentony  
Chris Boelke (Alt.)  
**USFWS:**  
Kyla Hastie (Acting RD)  
Rick Jacobson (Alt.)  
**VTFW:**  
Christopher Herrick  
Eric Palmer (Vice Chair/Alt.)  
**VT Public Sector:**  
David Deen  
**Executive Assistant:**  
Kenneth Sprankle

**DATE:** June 28, 2023

**TO:** CRASC Commissioners, other interested parties, and public

**FROM:** Kenneth Sprankle, Connecticut River Coordinator

**SUBJECT:** Connecticut River Atlantic Salmon Commission Meeting Agenda

The Connecticut River Atlantic Salmon Commission meeting is scheduled for **June 28, 2023, from 1:00 p.m. to 3:10 p.m.** that will be held both in-person (Conte Laboratory, Turners Falls) and remotely using the Microsoft “Teams” Application\*. If interested in participating, you must contact me via email ([ken\\_sprankle@fws.gov](mailto:ken_sprankle@fws.gov)) to be added to the “invite list” for that teams and to determine who will be in-person.

**Agenda**

1. (1:00-1:10) – **Decision:** Determination of a quorum, approval of today’s agenda, and review of minutes from February 17, 2023, meeting, vacant position – *Chair Andy Fisk*
2. (1:10-1:30) – **Decision:** CRASC American Eel Management Plan. Review of comments received review process and updated version. – *Lael Will*
3. (1:30-1:45) - **Informational:** Connecticut River Coordinator’s Report, fishway counts and related data, spring river herring assessment program updates, regional summaries of counts. *Ken Sprankle*
4. (1:45-2:00) – **Informational:** Technical Committee Report, updates on activities. – *Lael Will*
5. (2:00-2:25) – **Informational:** Presentation on River Herring Management in Southern New England – *Kevin Job (CTDEEP)*  
A. Updates on river herring bycatch topics for New England Fishery Management Council (Atlantic Herring fisheries) – *Job and Sprankle*
6. (2:25-2:45) – **Informational and Decision:** CRASC federal funds status and updates.  
A. Grant activity updates from the Connecticut River Conservancy – *Alibi Fournier (CRC)*  
B. Status and update on FY23 allocated funds, remaining “reserve” funds for DOI Special Study Report, possible allocation of remaining funds. – *Sprankle*
7. (2:45-2:55) – **Informational:** Connecticut River Watershed Partnership (FY23 CRASC, congressional DOI responsibility), updates on progress to date, process and plans – *Lisabeth Willey (USFWS) and Andy Fisk*
8. (2:55-3:05) – **Public Comment**
9. (3:05-3:10) – **Other Business**

CRASC Adopted Management Plans: American Shad and Fish Passage Addendum (2017; 2022), Sea Lamprey (2018), River Herring (2004), and pending American Eel. Future Plan updates or new plan(s); River Herring and Habitat.



Appendix A.

Connecticut River Atlantic Salmon Commission – Technical Committee meeting agendas for report period.



**CRASC Commissioners:**

*CTDEEP:*

Andrew Fisk  
Peter Aarrestad (Alt.)

*CT Public Sector*

Thomas Chrosniak

*MADFW:*

Mark Tisa  
Todd Richards (Alt.)

*MA Public Sector:*

Vacant

*NHFG:*

Scott Mason  
Scott Decker (Alt.)

*NH Public Sector:*

Donald McGinley

*NMFS:*

Michael Pentony  
Christopher Boelke (Alt.)

*VTFW:*

Christopher Herrick  
**Vice Chair**, Eric Palmer (Alt.)

*VT Public Sector:*

Vacant

*USFWS:*

Kayla Hastie (Acting Regional Director)

Rick Jacobson (Alt.)

*Executive Assistant:*

Kenneth Sprankle

**Technical Committee:**

*CTDEEP:*

Tim Wildman

*MADFW:*

Rebecca Quinones

*VTFW:*

**Chair**, Lael Will

*MADMF:*

Ben Gahagan

*NHFG:*

Matthew Carpenter

*NMFS:*

Bill McDavitt

*USFWS:*

Jeremy Mears

*USFWS and Secretary:*

Kenneth Sprankle

**DATE:** November 15, 2022

**TO:** CRASC Commissioners, Technical Committee members and advisors, and other interested parties

**FROM:** Kenneth Sprankle, Connecticut River Coordinator

**SUBJECT:** Technical Committee Draft Meeting Agenda

A Connecticut River Atlantic Salmon Commission **Technical Committee** meeting is scheduled for **November 15, 2022, from 10:30 -12:35 p.m.** that will be held in person at the USGS Conte Laboratory and also using the Microsoft “Teams” Application\*. If interested in participating, you must contact me via email ([ken\\_sprankle@fws.gov](mailto:ken_sprankle@fws.gov)) to be added to the “invite list” for that application/system. I do not need responses for invite list from any CRASC members or people identified in below agenda. **Please confirm any planned participation as either “in person” or “remote via teams”.**

**Agenda**

1. **10:30-10:40** Call to order and approval of Meeting Minutes from June 15, 2022 (*Lael Will*)
2. **10:40-10:50** CRASC Commission update for \$500,000 allocations (from June Meeting), status, Comm. request for additional potential rankings (*Ken Sprankle*)
3. **10:50-11:00** Coordinator’s Report (*Ken*)
  - A. CT River basin fishway count summaries/related data
  - B. Regional fishway count reports
4. **11:00-11:25** Fish Passage Subcommittee (*Melissa Grader*)
  - A. Great River Hydro Fish Passage Agreement
  - B. FirstLight Hydro Agreement in Principal (Fish Passage, Protections)
  - C. Fiske Mill Dam (*Ashuelot River*) update
5. **11:25-11:35** Shad Studies Subcommittee (*Ken*)
  - A. CTDEEP Juvenile Shad and BBH Seine Index (*Jacques Bernway*)
6. **11:35-12:00** River Herring Subcommittee (*Ken*)
  - A. ASMFC Benchmark River Herring Stock Assessment update
  - B. Southern New England Fisheries Agency meeting on River Herring stocks
  - C. Spatial and temporal genetic stock composition of river herring bycatch in southern New England Atlantic Herring and mackerel fisheries (*Ben Gahagan*, co-author, presentation)
7. **12:00-12:10** Sturgeon Subcommittee (*Micah Kieffer*)
  - A. Conte Lab activities
  - B. CTDEEP research
8. **12:10-12:20** Sea Lamprey Subcommittee (*Jeremy Mears*)
  - A. Activities update, eDNA sample planning
9. **12:20-12:30** American Eel Subcommittee (*Tim Wildman*)
  - A. Draft CRASC TC American Eel Management Plan, to Commission for review
  - B. ASMFC Benchmark Stock Assessment update
10. **12:30-12:35** Other business

Appendix A. Connecticut River Atlantic Salmon Commission – Technical Committee meeting agendas for report period, continued.



**CRASC Commissioners:**  
**CTDEEP:**  
 Chair, Andrew Fisk  
 Peter ~~Arrestad~~ (Alt.)  
**CT Public Sector:**  
 Thomas ~~Chrosniak~~  
**MADFW:**  
 Mark Tisa  
 Todd Richards (Alt.)  
**MA Public Sector:**  
 Vacant  
**NHFG:**  
 Scott Mason  
 Dianne Timmins (Alt.)  
**NH Public Sector:**  
 Donald McGinley  
**NMFS:**  
 Michael ~~Pentony~~  
 Christopher ~~Roelke~~ (Alt.)  
**VTFW:**  
 Christopher Herrick  
 Vice Chair, Eric Palmer (Alt.)  
**VT Public Sector:**  
 David ~~Depp~~  
**USFWS:**  
 Kayla Hastie (Acting Regional Director)  
 Rick Jacobson (Alt.)  
**Executive Assistant:**  
 Kenneth Sprankle

**Technical Committee:**

**CTDEEP:**  
 Tim Wildman  
**MADFW:**  
 Rebecca Quinones  
**VTFW:**  
 Chair, Lael Will  
**MADMF:**  
 Ben Gahagan  
**NHFG:**  
 Matthew Carpenter  
**NMFS:**  
 Bill ~~McDavitt~~  
**USFS:**  
 Jeremy Mears  
**USFWS and Secretary:**  
 Kenneth Sprankle

**DATE:** June 14, 2023

**TO:** CRASC Commissioners, Technical Committee members and advisors, and other interested parties

**FROM:** Kenneth Sprankle, Connecticut River Coordinator

**SUBJECT:** Technical Committee Draft Meeting Agenda



A Connecticut River Atlantic Salmon Commission **Technical Committee** meeting is scheduled for **June 14, 2023, from 1:00 -3:30 p.m.** that will be held in person at the USGS Conte Laboratory and also using the Microsoft "Teams" Application\*. If interested in participating, you must contact me via email ([ken\\_sprankle@fws.gov](mailto:ken_sprankle@fws.gov)) to be added to the "invite list" for that application/system. I do not need responses for invite list from any CRASC members or people identified in below agenda. **Please confirm any planned participation as either "in person" or "remote via teams".**

**Agenda**

1. 1:00-1:10 Call to order and approval of Meeting Minutes from November 15, 2022 (Lael Will)
2. 1:10-1:20 CRASC Commission update for \$700,000 funding (from February Meeting), approved, status, DOI Special Report and "Watershed Conservation Initiative" (Ken Sprankle)
3. 1:20-1:35 Coordinator's Report (Ken)
  - A. CT River basin fishway count summaries/related data
  - B. Regional fishway count reports
4. 1:35-1:55 Fish Passage Subcommittee (Melissa Grader, Bill ~~McDavitt~~)
  - A. Great River Hydro item updates
  - B. ~~EjrstLight~~ Hydro Fish Passage and Flow Agreement with agencies, others.
  - C. Rainbow Dam and fish ladder, Farmington River (Bruce Williams)
5. 1:55-2:25 River Herring Subcommittee (Ken)
  - A. USFWS Spawning Stock Assessment, summary data for 2023
  - B. New England Fishery Management Council, Atlantic Herring Committee activity updates on river herring bycatch monitoring, management options, others.
6. 2:25-2:35 Sturgeon Subcommittee (Micah Kieffer)
  - A. Conte Lab activities
  - B. Holyoke Gas and Electric Study on adult SNS upstream movements up to and over Holyoke Dam.
  - C. SCUBA surveys for YOY SNS (Corey Eddy)
7. 2:35-2:45 Sea Lamprey Subcommittee (Jeremy Mears)
  - A. Sea lamprey nest count surveys
  - B. eDNA survey plans
8. 2:45-3:00 American Eel Subcommittee (Lael)
  - A. Draft CRASC TC American Eel Management Plan, in final review stages
  - B. eDNA survey plans
  - C. Aging study, plan objectives and approaches (Corey)
9. 3:00-3:15 Anadromous Fish GIS, barriers, fish passage, removals (Corey)
10. 3:15 Other business

## Appendix B

Fishway Count Report produced by CTRFWCO for distribution and posted on the office web site. Often a second page includes field pictures or other data.

		<b>Connecticut River Basin Fishway Passage Counts</b>											
<i>Final 2023</i>													
<p>This report is compiled by the U.S. Fish and Wildlife Service, CT River Fish and Wildlife Conservation Office using fishway count data provided by several agencies as well as power companies and is dependent in most cases on the review of video counts, that have an associated time lag for updates. Please visit <a href="http://www.fws.gov/r5crc">http://www.fws.gov/r5crc</a> for more information.</p>													
Fishway, River - State	Data as of:	American Shad	Alewife	Blueback Herring	Atlantic Salmon	American Eel	Sea Lamprey	Striped Bass	Gizzard Shad	Shortnose Sturgeon	Other/ comment		
Rogers Lake-CT	final		1,245										
Mary Steube, Mill-CT	final		7,636										
Mill Pond, Falls -CT	final		106	0									
Moulson Pond, Eightmile-CT	final		151	17			15						
Leesville, Salmon-CT	no counts												
StanChem, Mattabesset-CT	final	0	239	0			0						
Rainbow, Farmington-CT	closed*										not run in 2023		
W. Springfield, Westfield-MA	5/27	2,473					1,498				730 white suckers		
Holyoke, Connecticut-MA	final	277,367		2,211		11,048	21,168	116	60	64			
Easthampton, Manhan-MA	no counts										operated in season		
**Turners Falls-Gatehouse, Connecticut-MA	Final	33,782		3			19,724						
Vernon, Connecticut-VT	final	29,372					8,060				missing data for parts of 8 dates		
Bellows Falls, Connecticut-VT	final	20					2,571				partial count		
<i>Total to basin, only first barrier counts</i>		279,840	8,026	2,228	0	11,048	22,681	116	60	64			
<i>Last year totals</i>		191,651	6,681	370	4	7,845	23,042	314	63	20			
<p>* CTDEEP will not operate the Rainbow Fish Ladder due its documented poor performance and the lack of suitable downstream fish passage protection measures at the Stanley Works owned dam/project. Fish passage at this project has been the responsibility of the CTDEEP, due to FERC legal rulings and timing of that facilities construction.</p> <p>** <i>Spillway Fish Ladder - at the dam 7,265 shad, 2 river herring, 10,842 sea lamprey; Cabot Station Ladder, base of canal, 53,157 shad, and 12,742 sea lamprey. Note that at Turners Falls Project (Dam/Canal) fish must use one of these two fishways first before having the opportunity to pass the final A - total collected from 3 eel ramp/traps at Holyoke in 2022</i></p>													

## Appendix C

CRASC 2023 Fish Passage Operations Schedule for both Upstream and Downstream measures.

### Connecticut River Atlantic Salmon Commission 2023

#### Connecticut River Schedule of Upstream Fish Passage Operations

Location (Project)	Upstream Fish Passage	Species	Life Stage	Dates of Operation <sup>1</sup>	Hours of Operation
<b>Wilder</b>	Ladder	salmon	adult	May 15 - July 15	24 hrs/day
	Ladder	salmon	adult	September 15 - Nov 15	24 hrs/day
<b>Bellows Falls</b>	Ladder <sup>2</sup>	salmon	adult	May 15 - July 15	24 hrs/day
	Ladder	salmon	adult	September 15 - Nov 15	24 hrs/day
<b>Vernon</b>	Ladder <sup>2</sup>	salmon	adult	April 15 - July 15	24 hrs/day
	Ladder	salmon	adult	September 15 - Nov 15	24 hrs/day
	Ladder	shad & herring	adults	April 7 <sup>(1)</sup> - July 15	24 hrs/day
<b>Turners Falls</b>	Cabot Ladder, Gatehouse Ladder, and Spillway Ladder	salmon	adult	April 7 - July 15	24 hrs/day
	3 facility ladders	salmon	adult	September 15 - Nov 15	24 hrs/day
	3 facility ladders	shad & herring	adults	April 4 <sup>(1)</sup> - July 15	24 hrs/day
<b>Holyoke</b>	Zone-of-Passage Flows <sup>3</sup>	salmon, shad, herring and sturgeon	adult	April 1 – November 15	24 hrs/day
	Tailrace and Spillway lifts	salmon	adult	April 1 – July 15	up to 12 hrs/day <sup>4</sup>
	Both lifts	salmon	adult	September 15 – Nov 15	up to 12 hrs/day <sup>4</sup>
	Both lifts	shad & herring	adult	April 1 – July 15	up to 12 hrs/day <sup>4</sup>
	Both lifts	sturgeon	adult	April 1 – November 15	up to 12 hrs/day <sup>4</sup>
	Tailrace, and Spillway Eelways	eel	juvenile	April 15 - November 15 <sup>5</sup>	24 hrs/day

**1 - Actual dates of operation are based on passage of fish at the previous downstream fishway (excluding Holyoke). Turners Falls fishways shall be operational as soon as 50 shad have been counted passing Holyoke Fishlifts. Vernon Fish Ladder shall be operational within three days of the Turners Falls fishways being opened.**

2 - Agencies have requested the operation of Bellows Falls fish ladder either once 100 sea lamprey are passed at the Vernon Dam Ladder or an adult salmon is passed, whichever occurs first.

3 - Zone -of-passage flow of 1,300 cfs or more to the bypass reach below the dam

4 - Actual hours of operation on a day-to-day basis are to be determined by the MADFW in consultation with the project owner.

5 - Actual eelpass installation dates are dependent on river flow conditions and in consultation between project owner and MADFW and USFWS

6 – Dependent on noted adult salmon passed at HFL

Continued next page.

**Connecticut River Atlantic Salmon Commission  
2023  
Connecticut River Schedule of Downstream Fish Passage Operations**

Location (Project)	Downstream Fish Passage Exit	Species	Life Stage	Dates of Operation	Hours of Operation
<b>Gilman/Dalton</b>	Interim Bypass Sluice	salmon	smolt	<b>Not required</b>	
<b>Moore</b>	Bypass Sluice and Trap	salmon	smolt	<b>Not required</b>	
<b>McIndoes</b>	Log Sluice	salmon	smolt	<b>Not required</b>	
<b>Ryegate (Dodge Falls)</b>	Fish Bypass Facility	salmon	smolt	<b>Not required</b>	
<b>Wilder</b>	Log Sluice	salmon	smolt	<b>Not required</b>	
		salmon	adult	October 15 - December 31 <sup>1</sup>	24 hrs/day
<b>Bellows Falls</b>	Angled Fish Guide Wall and Log Sluice	salmon	smolt	<b>Not required</b>	
		salmon	adult	October 15 - December 31 <sup>1</sup>	24 hrs/day
<b>Vernon</b>	Fish Bypass at Unit 10	salmon	smolt	<b>Not required</b>	
		salmon	adult	October 15 - December 31 <sup>1</sup>	24 hrs/day
		shad	adult	April 7 <sup>2</sup> - July 31	24 hrs/day
		shad	juvenile	August 1 - November 15	24 hrs/day
	Louver and Fish Pipe at Unit 4	eels	adult	September 1 – November 15	24 hrs/day
		salmon	smolt	<b>Not required</b>	
		salmon	adult	October 10 - December 31 <sup>1</sup>	24 hrs/day
		shad	adult	April 7 <sup>2</sup> - July 31	24 hrs/day
		shad	juvenile	August 1 - November 15	24 hrs/day
<b>Northfield</b>	Barrier Net	salmon	smolt	<b>Not required</b>	
<b>Turners Falls</b>	Log Sluice and Trash Sluice	salmon	smolt	<b>Not required</b>	
		salmon	adult	October 15 - December 31 <sup>1</sup>	24 hrs/day
		shad	adult	April 7 <sup>2</sup> - July 31	24 hrs/day
		shad	juvenile	<b>August 1 - November 15</b>	24 hrs/day
		eels	adult	September 1 – November 15	24 hrs/day

1 - Downstream passage operation, for adults will only be required if 50 or more adults are documented as passing upstream of a dam/facility.

2 – Downstream passage measures should be operational for American Shad at the same time as upstream passage is initiated.

3 – Fish passage operations/schedule may be adjusted by NOAA Fisheries, USFWS, and/or MADFW.

Continued next page.

**Connecticut River Atlantic Salmon Commission  
2023**

**Connecticut River Schedule of Downstream Fish Passage Operations**

<b>Location (Project)</b>	<b>Downstream Fish Passage Exit</b>	<b>Species</b>	<b>Life Stage</b>	<b>Dates of Operation</b>	<b>Hours of Operation</b>
<b>Holyoke</b>	Canal Louver and new (2016) low level Bypass	salmon	smolt	<b>Not required</b>	
		salmon	adult	October 15 - December 31 <sup>1</sup>	24 hrs/day
		shad	adult	April 1 – July 31	24 hrs/day
		shad	juvenile	August 1 - November 15	24 hrs/day
		eels	adult	September 1 – December 1	24 hrs/day
		sturgeon	adult	April 1 – November 15 <sup>3</sup>	24 hrs/day
		sturgeon	juvenile	April 1- November 15 <sup>3</sup>	24 hrs/day
	Bascule Gate	eels	adult	September 1 – December 1	24 hrs/day
		salmon	smolt	<b>Not required</b>	
		salmon	adult	October 15 - December 31 <sup>1</sup>	24 hrs/day
		shad	adult	April 1 - July 31	24 hrs/day
		shad	juvenile	August 1 - November 15	24 hrs/day

1 - Downstream passage operation, for adults will only be required if 50 or more adults are documented as passing upstream of a dam/facility.

2 – Downstream passage measures should be operational for American Shad at the same time as upstream passage is initiated.

3 – Fish passage operations/schedule may be adjusted by NOAA Fisheries, USFWS, and/or MADFW.

## Epilogue

### History of the Anadromous Fish Program

Native diadromous fishes (diadromy includes anadromous and catadromous fishes, with American Eel being the only catadromous species in this basin) were once abundant in the Connecticut River basin excluded from habitat only by natural barriers and their physiological limitations. Atlantic Salmon ascended the main stem Connecticut River to Beechers Falls, VT, nearly 400 miles upriver from its outlet at Long Island Sound. American Eel have been documented even farther upstream in the basin by early New Hampshire Fish Game Department studies in Pittsburgh, New Hampshire. No fishery management or scientific information exists that provides an accurate technical description of the pre-colonial diadromous fish populations. However, historical accounts of the region are filled with references to abundant American Shad, river herring and Atlantic Salmon runs that were known to have been an important food source in the spring for the native people and early European settlers. As colonization by Europeans and the development of waterpower sites expanded throughout the basin, anadromous fish populations notably declined. A major cause of the declines or loss of runs was from the construction of dams that blocked fish migrations from reaching their spawning habitat (Figure 1). Tributaries were more easily dammed initially, and so elimination of these species progressed rapidly in these areas first, with settlement and use of early waterpower for mill power. The first dam across the main stem Connecticut River was constructed as early as 1798, for barge/boat movement, near the present site of Turners Falls, Massachusetts. This dam blocked returning American Shad, river herring, Atlantic Salmon and Sea Lamprey from access to spawning and nursery habitat in the northern and central portion of the river basin. As a result, those species simply disappeared from areas of the basin in both New Hampshire and Vermont, not to be seen again for nearly 200 years.

An interagency state/federal program to restore Atlantic Salmon to the Connecticut River based on the stocking of fry hatched from eggs taken from Penobscot River Atlantic Salmon was initiated in the 1860s, decades after the initial construction of the Holyoke Dam, MA. Although the effort resulted in the return of hundreds of adult salmon for several years in the 1870s and 1880s, the program eventually failed due to both uncontrolled harvest of fish in Connecticut waters and the failure to construct effective fish passage at dams in Massachusetts. Concurrent with the salmon restoration effort were the state's American Shad culture and stocking efforts to enhance reduced runs of this valued species. Both species were fished heavily in the river, most notably at the river's mouth on Old Lyme and Old Saybrook, Connecticut. Work to restore and enhance these two species was conducted through developing fish culture techniques that were gaining popularity as an approach to achieve fishery management goals. The lack of knowledge on how to manage the fisheries, how to deal with fish passage all contributed to the collapse of this initial restoration effort.

Although interest continued in restoring Atlantic Salmon to the basin, no action was taken for many decades due to the lack of funds and the lack of effective fish passage technology (an early design fish ladder had been installed at Holyoke Dam). The condition of the river environment continued to deteriorate in response to widespread pollution and dam construction through the early to mid-1900s. However, by the 1960s, some tributary dams were breached, and pollution abatement programs were initiated. Long-term cooperative restoration programs became feasible with the passage of the federal Anadromous Fish Conservation Act of 1965 (P.L. 89-304) which made funds available for interstate fish restoration programs. The combined effects of these events set the stage for coordinated anadromous species restoration. In 1967 the four basin states and USFWS, (National Marine Fisheries Service later created from a branch within the USFWS in 1970) signed a statement of intent to restore anadromous fishes including American Shad, Atlantic Salmon, and river herring to the Connecticut River. A Connecticut River Policy Committee comprised of the administrative heads of the resource agencies was the mechanism used to advance on restoration goals and objectives. Atlantic Salmon was a focus species due to its appeal for recreational angling opportunities by the resource agencies. Early salmon stockings were initially comprised of two-year old smolts of Canadian origin reared in federal trout hatcheries that had recently been converted to salmon production. The term smolt defines a salmon life-stage when the

transitional migration from freshwater to the marine environment occurs, typically in the months of April and May. The first adult salmon return from these hatchery smolt releases was documented in 1974.

Early in the Atlantic Salmon Program, the management emphasis was placed on stocking smolts with the USFWS building a salmon hatchery in Bethel, Vermont, and CTDEEP and MADFW converting trout hatcheries for salmon production. Production of stream-reared smolts, from juvenile stockings was combined with smolts produced in hatcheries to increase smolt emigration from the river. A major effort was begun in 1987 to stock fry into appropriate habitat in the basin, based upon in-river research results that demonstrated a ten-fold rate of return from stream reared smolts vs. hatchery origin smolts.

Beginning in 1994, the Program utilized only “Connecticut River” fish, with no introductions of genetic material from outside the basin. Genetic monitoring had demonstrated the development of some unique genetic characteristics (alleles) that distinguish the Connecticut River population from other populations at that scale. The use of conservation genetics enabled the Program to maintain a genetically healthy population to maximize genetic diversity and reduce risks from genetic issues.

Adult Salmon returns per 10,000 stocked fry declined dramatically from what had been documented from 1979 through 1994, when this rate averaged 0.71 (high of 1.6). For the period 1995 through 2008, the mean adult/10,000 fry stocked was 0.11 (refer to U.S. Atlantic Salmon Assessment Committee Report 27 – 2014 Activities (<http://www.nefsc.noaa.gov/USASAC/Reports/>)). This later period is when the program shifted to fry stocking as the primary restoration strategy, coinciding with this unexpected decline in fry return rates (due to marine survival rate decreases). This situation translated to a sustained reduction approximately 1/6 of what had been observed for this rate prior to 1994, even as issues of safe downstream passage of smolts at hydropower facilities and ocean fishery closures were completed. Studies over time have shown shifts in salmon marine prey species abundance and distributions, shifts in predator assemblages, and shifts in marine habitat area use are likely contributing factors that can be tied to climate change. The impacts from large scale shifts in marine conditions were also being observed in other Atlantic Coast salmon populations, both wild (Canada) and in various forms of other active restoration (Maine, New Hampshire, Rhode Island).

The severe damage to the White River National Fish Hatchery (WRNFH) in fall of 2011, from a flood event, severely impacted the Salmon Program as it maintained a high proportion of the domestic broodstock and subsequently annual egg and fry production for all the states. WRNFH had been producing approximately 65% of the fry for the Program in the preceding 10 years. The loss of this facility, in conjunction with ongoing reviews of the best science and information related to restoration efforts, and emerging USFWS Northeast Region fisheries issues and priorities, led the USFWS to announce its decision to conclude fish culture activities for the Connecticut River Atlantic Salmon Program. That announcement was made in public at the July 2012 Connecticut River Atlantic Salmon Commission meeting. Subsequently, in the fall of 2012, the Commonwealth of Massachusetts decided it would no longer culture salmon at its Roger Reed State Hatchery. The last spawning of domestic salmon broodstock occurred at that facility in 2012, with all fry and remaining Connecticut River salmon of various ages stocked out in 2013. The State of New Hampshire had concluded the restoration effort with a last stocking in 2012, while the final stocking in Vermont was in 2013.

The State of Connecticut continues to operate a “Salmon Legacy Program,” which is not a restoration program but serves other defined purposes. The goal of Connecticut’s program is to maintain Atlantic Salmon in select watersheds, maintain existing genetics of the Connecticut River salmon, provide fish for their state broodstock fishery program (outside of the Connecticut River basin), and support the widely popular Salmon in Schools Program, that helps connect and engage children, teachers and their families with nature and aquatic science.

Action to provide upstream fish passage on the Connecticut River main stem in the mid-1900s occurred



in 1955, when a rudimentary fish lift was constructed at Holyoke Dam to pass American Shad and river herring, that relied on humans pushing them in wheeled buckets for release upstream of the dam. At that time, and for approximately three decades after, the Enfield Dam remained a partial barrier, even though laddered; it eventually disintegrated completely in the late 1980s. The Holyoke Dam facility was expanded in 1976 when substantial upstream passage modifications occurred, with a new second lift installed in the spillway (or at the base of the dam, as opposed to the existing “tailrace” lift entrance where the turbines release). Although not studied, upstream passage efficiency appeared to improve greatly with corresponding increases in annual fish counts for species like American Shad and Blueback Herring (Figure 4). Other fishways built at dams on the main stem river and tributaries allowed returning Atlantic Salmon, American Shad, river herring, American Eel, and Sea Lamprey access into select portions of the basin (with varying degrees of fishway effectiveness) targeted for restoration. Major issues with several different fishways have been apparent relative to ineffectiveness at passing American Shad, river herring, American Eel (downstream) and Shortnose Sturgeon. These issues have been dealt with on a case-by-case basis, with varied degrees, of success. There has also been a greater emphasis placed addressing safe, effective, and timely downstream passage of fish and lifestages which has presented challenges that have been worked on through new approaches, research, and evaluations.

Upstream passage at Turners Falls Dam (Massachusetts) fishways (first operational in 1980) have been studied and modified for decades and is one of the projects in the FERC relicensing process at this time. Passage issues relative to American Shad are best explained by the fact that no ladders of the size required on the main stem had been designed for that species as the cooperative restoration effort took this management need on in the 1970s. The USFWS relied on the best information (no specific studies available) at the time that suggested West Coast fish ladders on the Columbia River were effective at passing introduced American Shad. This led to the adoption of these designs, downsized considerably from the Columbia River, for use on the main stem Connecticut River dams. The USFWS worked with the power companies in the design and construction, to develop operating parameters for flow, velocities, and turbulence measures. However, the downscaling created some unforeseen challenges in hydraulics for these species that the agencies, researchers (USGS CAFRC), and power company consultants have worked on understanding and attempted to resolve (some of these) over the years with our increasing knowledge.

Following on the Turners Falls ladders completions, the Vernon Dam (Vermont) fish ladder became operational in 1981 with Bellows Falls and Wilder dam fish ladders in the subsequent years. As the number of salmon fry stocked in the basin increased during the late 1980s, concern grew for the potential negative effects of hydroelectric turbines or other passage routes on outmigrating smolts, as well as juvenile and post spawn adult American Shad. Efforts to provide safe and effective downstream fish passage on both main stem and tributary projects were initiated in the 1980s. In 1990, a Memorandum of Agreement (MOA) were signed with two major utility companies that operated hydroelectric facilities at six main stem projects that established time frames for downstream fish passage construction. The Holyoke Dam and Hadley Falls Power Station is a good example of a very recent large-scale fish passage improvement project, designed specifically to address; downstream passage and protection of adult American Eel and Shortnose Sturgeon as well as upstream passage of Shortnose Sturgeon and other anadromous species that became operational in 2016, using new fish passage engineering approaches.

The state and federal agencies continue to work in close cooperation with many partners to address fish management, protection, enhancement, and restoration topics for both fish populations and habitats. This work is important for the ecological, recreational, and commercial benefits, derived from healthy native fish populations and the aquatic habitats they require and people benefit from. Currently, ongoing fisheries work includes continuing efforts to increase both diadromous species abundance levels and distributions (particularly upper basin and in tributaries) as well as stock structure characteristics (e.g., multiple age classes, repeat spawner component) to support population resilience and health (as characterized by status). The current FERC relicensing process for the five main stem facilities is important in this regard relative to the 30–50-year length of these federal licenses and the opportunity to

seek conditions and measures that protect the public's fishery resources now and for future generations. The CRASC its predecessor, the Connecticut River Policy Committee, and now the Connecticut River Migratory Fish Restoration Cooperative have provided and will continue to provide, a critical coordinated fishery leadership role resulting in many positive outcomes not commonly observed in many of the other large heavily dammed East Coast river basins.