CONNECTICUT RIVER BASIN DIADROMOUS FISH RESTORATION: Coordination and Technical Assistance

Annual Progress Report October 1, 2023 - September 30, 2024

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

Table of Contents

List of Figures

List of Tables

Executive Summary

States: Connecticut, Massachusetts, New Hampshire, and Vermont

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

Period Covered: October 1, 2023 - September 30, 2024

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. Presented data includes end of calendar year statistics, such as fishway counts for 2024.

Cover photo – Alewife acoustic tagging at Bride Lake with Tim Wildman (CTDEEP Biologist) and Ken Sprankle (CTRFWCO), part of the larger River Herring Migration and Movement study implemented in 2024 in partnership with CTDEEP Fisheries Division and the USGS Conte Research Laboratory.

Objectives

- Coordinate the Connecticut River Diadromous Fish Restoration Program as a unified effort of State and Federal fishery agencies and other partners.
- Provide technical assistance to the fishery agencies and other program cooperators (power companies, universities, non-governmental organization).
- Represent the Service on Commissions, Technical Committees, various other structures, and work cooperatively with State agencies and other cooperators and partners.
- Identify fishery program priorities; design, and implement projects to address needs, 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

<u>Program Coordination</u>

- Organized and coordinated final Connecticut River Atlantic Salmon Commission (CRASC) meeting held on October 5, 2023 (Appendix A agendas). The CRASC immediately transitioned into the Connecticut Migratory Fish Restoration Cooperative (Cooperative) following a very similar organizational structure with current and future goals and purposes better aligned with this transition. Details on the basis, purposes, structure and operation of the Cooperative can be found at: https://www.fws.gov/media/ct-river-migratory-fish-restoration-cooperative-agreement
- Organized and coordinated the Cooperative's public meetings on 2/15/24 and 6/18/24 and its Technical Committee public meetings on 1/17/24 and 6/7/24 (Appendix A, agendas) in role of "Restoration Coordinator". Developed agendas, organized meeting materials and reports, and provided reports and updates. Organized additional working meetings for these two groups and subgroups to address items including the planning and process for the FY24 $700,000.00 federal

budget item to be used in support of the Cooperative's goal and purposes.

- Provided, in March, the annual upstream and downstream fishway operations letters to main stem 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 2024.
- Coordinated the development of a request for proposals for the Cooperative (July), released to the Cooperative's email distribution list on August 20, with submissions due on September 20, 2024. This was done to provide an updated approach for the FY24 federal funding ($700,000) from Congress, placed in this Office's budget. The announcement resulted in a diverse project list of assessment, research, and outreach projects that totaled $1.5 million. The Technical Committee met weeks later (outside of this reporting period) to determine the priority recommendations for funding to be forwarded to the Cooperative.
    - A breakdown of funded projects and activities for these funds and their status are presented later in this report, in the CRASC / Cooperative's Section.
    - Work to obligate these funds to the University of Massachusetts, the U.S. Geological Survey Conte Laboratory, the Connecticut River Conservancy and expend funds on other approved uses is ongoing.
- The FY23 federal funding ($700,000) from Congress came with a task for the Department of Interior to report back to Congress on a Study Report. During this report period, the Program Coordinator served on both an internal USFWS Team, working to develop an approach to collaborate with the newly formed Connecticut River Watershed Partnership, and in meetings with organizers of the CRWP, as that group continued its organizational development. That work remains ongoing.
- Continued management of the CRASC FY23 federal budget allocation of $700,000 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 breakdown of projects and activities and their status are presented later in this report, in the CRASC / Cooperative's Section.
- Following CRASC approved uses of FY23 funds, in December 2023 through February 2024, completed the Connecticut River Conservancy's Cooperative Grant Agreement (Year 2, $135,600) that included the two-state creel survey, fishway counting staff, web-based fishway count site, and community science monitoring activities.
- Developed Inter-Departmental Agreements with USGS Conte Research Laboratory to provide approved FY23 funds for five projects, December 2023 to February 2024.
    - A breakdown of projects and activities and their status are presented later in this report, in the CRASC / Cooperative's Section.
- Worked with CRC staff and state fisheries biologist members, to review CRC creel data and its analyses obtained in 2023 and develop plans for 2024 survey, which was implemented. Brian Keleher (MA Division of Fisheries and Wildlife) completed some summary analyses of these data and shared them at the February 2024 Cooperative meeting.
- Served as USFWS Fisheries Program technical lead on meetings and planning regarding the Town of Westerly (Rhode Island), Potter Hill Dam in December and January. Working with the conservation team led by Suzanne Paton (USFWS Coastal Program, Biologist), developed and provided written and in-person testimony to the Town Council at a January 2024 meeting, in support of the dam's removal with supporting rationale for migratory fish restoration (first barrier on that river).
- Worked in collaboration with Kevin Job (CTDEEP Fisheries Biologist) to develop a letter for the Cooperative to submit to the New England Fishery Management Council (NEFMC) on its Amendment 10 Scoping Process, which in part was to consider addressing river herring bycatch and monitoring measures in the Atlantic Herring Fishery. In April, a final version of the letter from Cooperative's Chair, Andrew Fisk, was submitted to the NEFMC (Appendix B). Attended and spoke at the Connecticut Public Meeting held by the NEFMC on this topic in April.

- Corey Eddy (CTRFWCO) served as co-Chair of the Coop's Habitat Subcommittee with Bill McDavitt (NOAA). Corey created a GIS map with agency anadromous fish data, barriers with barrier details including fishways, and other attributes, coordinating with state agency members over the period. Work is ongoing but targeted for completion in winter 2025 with a new Anadromous Fish Barrier Plan.

Staffing

- Hired and managed two paid seasonal interns (Gab DeVito and Dylan Eagan), using a grant agreement with Student Conservation Association, who worked full-time from April 1, through August 30, 2024.
- Completed a grant agreement with the Student Conservation Association in July 2024, to hire interns for the 2025 season.
- Supervised one unpaid student intern Jordan Shea, Westfield State University, spring of 2024.

Technical Assistance

- 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. Major item of work was the review and commenting of the Draft River Herring Benchmark Stock Assessment as a TC member. The Benchmark Assessment and its Peer Review was approved by the ASMFC at its August Board meeting.
- Completed the Office's Annual Report for FY23, in January 2024 and posted on CTRFWCO web site https://www.fws.gov/media/connecticut-river-basin-diadromous-fish-restoration-coordination-and-technical-assistance-f
- Served as a member to the Holyoke Comprehensive Consultation Team (CCT), reviewed fish passage reports for 2023 and developed agency recommendations on the 2024 Shortnose Sturgeon movement and upstream passage study plan.
- Darren Desmarais completed the aging of 2024 Alewife and Blueback Herring otoliths. Those data will be provided later in the report. He also entered all associated river herring program data into our databases and developed summary statistics.
- 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 4 April through 12 June 2024. This is the same (highest) number of sample dates, as in 2022 and 2023, for this program. A total of 852 Blueback Herring were captured (only 44% of the total in 2023) and processed on the boat with 62 Alewife also captured and processed. Analyses will be provided later in the report.
- A total of 682 Blueback Herring and 61 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.

- Data from spring 2024 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).
- Scale samples from the Blueback Herring (n = 682) and Alewife (n = 61) were cleaned and slide mounted using the new approaches developed by Jackie Stephens (Stephens 2023) who worked with the interns in summer 2024 to complete this task. All scale samples were examined by microfiche projector for spawning history by two readers independently, with consensus reads for disagreements, analyses covered later. Jackie's analyses of scale reader precision as part of her M.S. thesis showed a significant improvement in reader precision and reduced bias once this protocol was

implemented (starting in 2023). Results are shown later.

- 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.
- Conducted the Juvenile American Shad Assessment Project (August - October of 2023 and 2024), 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. More details provided later in this report.

Cooperative Research

- A large-scale cooperative research project was developed and implemented in partnership with CTDEEP Fisheries Division and USGS Conte Research Laboratory to determine migration and movement of Alewife and Blueback Herring in the Connecticut River and from Brides Lake in both freshwater and marine environments. This project was worked on over the report period with greatest field intensity in deploying (February-March) and retrieving (July-August) 30 receivers and in the capture and surgical tagging of 98 Alewife and 102 Blueback Herring in the months of April and May. Tags are actively pinging for 388 days, allowing for marine array detections of post-spawning fish via shared data systems and in-river detection of any returning repeat spawners in 2025. A large volume of tag detection data has been obtained at this stage of the study (i.e. our freshwater array) which is ongoing. More details on this are provided later in this report.
- Data associated with the River Herring Migration and Movement Study were uploaded to the Atlantic Coast Telemetry network (ACT, aka, MATOS), for data sharing: https://matos.asascience.com/project/detail/270
- 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 Leader). Thesis defense completed in December 2024.
- Worked with Meghna Majardi (NOAA, lead author) as one of her co-authors on a manuscript in development describing factors that are related to phenological shifts in the Blueback Herring adult run counts at Holyoke Fish Lift and various factors of influence.
- Provided SCUBA research support (Corey Eddy coordinated as our office Dive Team Leader) to the Ohio River National Refuge and its partners for federally endangered mussel assessments in the Ohio River: July 15 – 19, 2024.
- 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 trials in 2024, to be continued in 2025.
- Corey Eddy leads a research project for the American Eel Subcommittee, 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.

Outreach

- Gave a presentation on Connecticut River Migratory Fish Status, Trends and current management and research activities to the Connecticut River Valley Chapter of Trout Unlimited, Brattleboro, VT on March 25, 2024.
- Worked with CRC on a World Migratory Fish Day event at the Manhan Fish Ladder, Easthampton MA, on May 25, 2024 (https://www.youtube.com/watch?v=WeN8D8GnaZM)
- Provided weekly fishway counts report of the basin to an email distribution list of approximately 250 people April – July, thereafter monthly (Appendix C). Posted report counts to the CTRFWCO web site.

Acknowledgements

Melissa Grader (Ecological Services) retired in October 2024 after a 30-year career with the USFWS. She will be missed for many reasons including her dedication, expertise, leadership, and work ethic that was impactful for fish and wildlife restoration. This was most notably accomplished in her role as the USFWS lead Biologist in numerous FERC hydropower activities with complex relicensings, processes, settlement agreements, and other ongoing challenges related to fish passage/protections and related management activities. The Connecticut River basin, and many other river systems in Vermont, Massachusetts, Connecticut and Rhode Island all benefitted from her career's work. We wish her happiness in retirement!

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, equipment and gear preparation, otolith reading, data entry, and summary analyses. Corey Eddy, CTR FWCO Fish Biologist, had lead technical roles in analyses of shad radio telemetry data gathered in 2011 and 2012 working with USGS Research Biologist Ted Castro-Santos, leading the Habitat Subcommittee and its GIS map creation, leading a study on American Eel age and growth, running fieldwork activities, and serving as the research SCUBA Dive Team Leader. Elizabeth Evans, Administrative Assistant, managed many budget-related and other office management operation duties including managing varied funding sources from states and inter department grant agreements. 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, worked with our seasonal interns on training for scale preparation and reading, using her manual, and assisted with fieldwork. Gab DeVito and Dylan Eagan, our two seasonal paid interns, worked from April to August. Both Gab and Dylan were integral members of field and lab work over their tenure.

The Connecticut River Conservancy's, Aliki Fornier, Kathy Urffer, and Kate Buckman 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, Juliet Wittwer Jamie Merola, Olivia Dayner, Marly Laberge, Emily Simroth, Hanna Lloyd
- Massachusetts: Steven Mattocks, Brian Keleher
- New Hampshire: Matt Carpenter
- Vermont: Lael Will

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

Others-

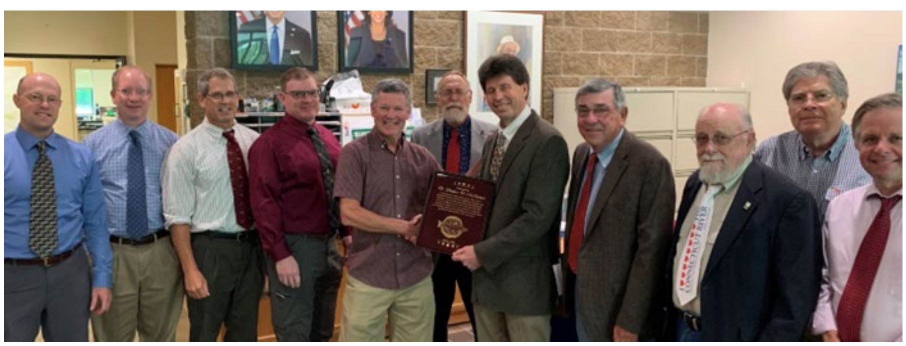
- Sierra Humiston, Holyoke Gas and Electric
- Steve Leach, FirstLight Power
- Jordan Shea, Westfield State University intern

The Diadromous Fish Restoration Program, Connecticut River Atlantic Salmon Commission and Connecticut River Migratory Fish Restoration Cooperative

The administration of the interjurisdictional cooperative effort to restore diadromous fish species to the Connecticut River basin transitioned in 2024, from the Connecticut River Atlantic Salmon Commission (the Commission) to the Connecticut River Migratory Fish Restoration Cooperative (Cooperative).

During the period from 1967-1983, restoration of anadromous fish was guided by the Policy Committee and the Technical Committee for Fisheries Management of the Connecticut River Basin. In 1983, 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 expired on October 28, 2023. The Commission was comprised of ten Commissioners including State Fish and Wildlife Agency Directors 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).

The Connecticut River Migratory Fish Restoration Cooperative (Cooperative) agreement, was signed in September 2023 (https://www.fws.gov/media/ct-river-migratory-fish-restoration-cooperative-agreement). The Cooperative maintains a similar structure and function as the CRASC, with the same identified leaders (Directors) of state and federal fish and wildlife agencies and a public member appointed by the state's fish and wildlife agency Director. The Cooperative also has a Technical Committee and a Restoration Coordinator who serves the Cooperative in its operations.



Last CRASC Meeting, Commissioners with Dr. Steve McCormick (left) receiving an award from Chair Eric Palmer.

The final CRASC meeting was held on October 6, 2023 at the USGS Conte Research Laboratory. Subsequently, meetings of the new Cooperative and its Technical Committee occurred during 2024 (Appendix A).

The Cooperative (https://www.fws.gov/sites/default/files/documents/2024-11/ct-r-coop-membership-list-nov-2024.pdf) met for the first time on February 15, 2024 and elected the Chair, Andrew Fisk (MA Public Member), and Vice Chair, Todd Richards (MA Division of Fisheries and Wildlife). The remaining unobligated $110,000.00 from the CRASC FY23 Federal Budget was allocated at that meeting. The Technical Committee presented three items for these funds; 1) $74,000.00 to extend Corey Eddy's position through October 2025, 2) $22,000.00 for eDNA laboratory supplies for Vermont Fish and Wildlife and to process lab samples at USFWS Lamar Genetics Laboratory, and 3) $14,000.00 to support

USGS Conte Laboratory Biologist Aaron Heisey's analytical work on the river herring acoustic tag study. These items were all approved by the Cooperative.

The Federal 2024 Omnibus Appropriations Bill included funding for the CRASC, for a third 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 Cooperative met again on June 18, 2024, to discuss the $700,000.00 directed into the Connecticut River Fish and Wildlife Conservation Office's station budget from the Federal Omnibus Bill. The Cooperative recognized a time sensitive need to help support CTRFWCO seasonal fishery staff in 2025 ($24,000 agreement deadline in July) and approved that use. It also agreed to support the USFWS Coordination role, with partial funding support to Science Applications and Liz Wiley's role ($75,000.00) working with the Connecticut River Watershed Partnership; the DOI required the Cooperative report back to Congress on these funds.

On August 14, 2024, an email was sent to the migratory fish restoration community by Ken Sprankle (n=237) that announced the opportunity to submit proposals that align with the purposes of the Cooperative. It was noted that $601,000.00 was available and a three-page Request for Proposals document (developed in July) was attached to better define funding availability, a distribution plan, categories and types of work to be considered, and related details on submission package materials. The deadline for submission was September 20, 2024.

A total of 18 project or equipment proposals were received, covering a wide range of activities or needs that were aligned with the Cooperative's purposes. The total cost of these proposals was $1,210,545.00. All were discussed and eleven projects or equipment purchases were recommended for approval by the Cooperative, fully utilizing the remaining balance of $601,000.00 (Table 1). At the November 6, 2024 Cooperative's meeting, the activities noted in Table 1 were approved.

Table 1. List of projects, activities, equipment targeted for funding by CRASC utilizing FY24 Federal Budget appropriation of $700,000.

Activity	Location(s)	Amount
Connecticut River Conservancy - ongoing grant activities support, outreach, public engagement, fishway counts, angler survey, planning	CRC Grant agreement	**$226,000**
Seasonal intern hire (2025) funding support for CTR FWCO	USFWS CTR FWCO	**$24,000**
USFWS Science Application - support Liz Wiley and work on Watershed Partnership	USFWS Hadley	**$75,000**
Continue GS 11 Fish Biologist funding support at the CTR FWCO for ALL COOP activities (full year)	USFWS CTR FWCO	**$120,000**
Purchase a large pound net - for capturing Blueback Herring - Wethersfield Cove	CTRFWCO, COOP	**$4,000**
Electrofisher generator replacements for MA Fisheries Efishing boat and tote barge	MA Div Fish and Wildlife	**$3,600**
Purchase Acoustic Receivers to replace losses from ongoing studies and expand capabilities	CTRFWCO, COOP	**$10,000**
GIS Visualization of American Eel Range Re-expansion in the Connecticut River Watershed	Conte Research Lab (CRL), Turners Falls, MA	**$16,242**
Evaluating stress in migrating Connecticut River American shad	Conte Research Lab (CRL), Turners Falls, MA	**$32,869**
Expansion of TBSA model, the USFWS turbine blade strike mortality software, tool development	Conte Research Lab (CRL), Turners Falls, MA	**$18,000**
Shortnose sturgeon surveys upstream of Turners Falls Dam	Conte Research Lab (CRL), Turners Falls, MA	**$40,000**
Mapping Shortnose Sturgeon Habitat in the Middle CT River	MA Coop Research Unit	**$20,125**
Assessing River Herring Habitat and Productivity in the Connecticut River	UMASS MA Coop Research Unit	**$110,164**
	Total	**$700,000**

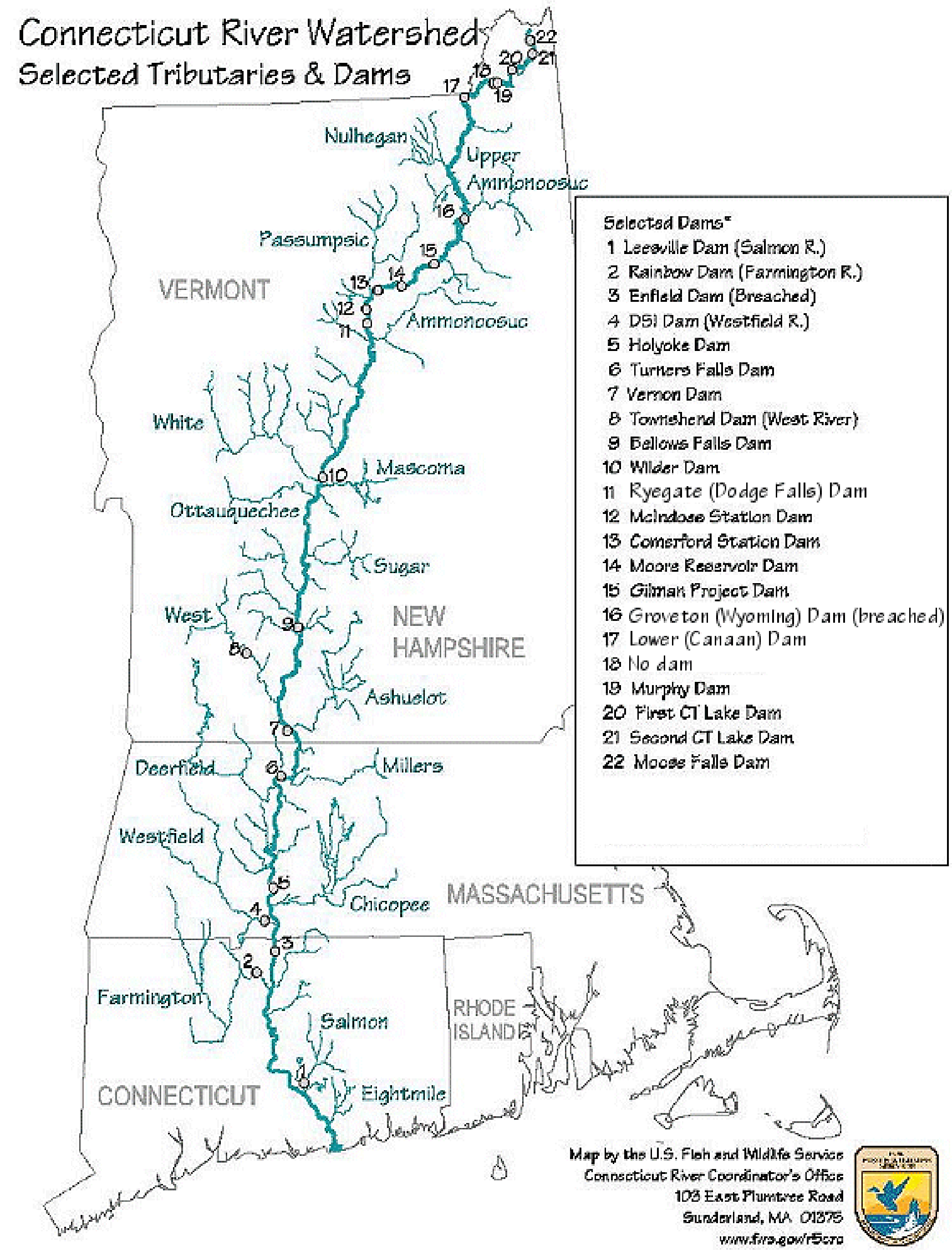


Figure 1. Connecticut River basin with major tributaries and main stem dams.

Coordination and Technical Assistance Funding

The Connecticut River Fish and Wildlife Conservation Office (CTRFWCO), receives $30,000 from the four state fishery agencies. These funds were assessed a USFWS administrative overhead fee (18%) leaving $24,590 available. The Office also primarily utilized Station Base Funds (Management Assistant Funds) that totaled $330,305.00 for FY24. In addition, the FY23 CRASC Federal Budget allocation of $700,000, that was placed in the CTRFWCO budget, was used per the approved spending plan by CRASC, including expenditures in this report period (refer to the 2023 Annual Report for those details). CRASC designed federal funds in FY24, $700,000.00, also placed in the CTRFWCO budget, had only $24,000.00 drawn down to support the agreement for one seasonal employee in 2025. The remaining FY24 funds were being obligated or spent on approved uses at the time of this report (prior section).

Table 2. Federal fiscal year 2024 (report period) funds utilized by the CTRFWCO.

Station Base FWS Budget	Four State Agreement	CRASC Fed Budget	Total
$330,305.00	$24,590.00	$134,000.00	$488,895.00

Project Accomplishments

The Connecticut River Fish and Wildlife Conservation Office enhanced the Cooperative's and States' ability to plan, coordinate, manage, evaluate, and implement restoration/assessment/research programs through a variety of activities, some of which are described in more detail in the following sections. Please note that data presented in this report have been reviewed to the extent possible, but are 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

<u>River Herring Spawning Stock Assessment and Monitoring</u>

In 2024 the adult population assessment program for river herring began on April 2, 2024, utilizing boat electrofishing as the primary sampling gear, for the 11th 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 Herring and Alewife for otoliths and scale samples, per target sample location, each day the study is conducted; 2) obtain 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 identified by the Atlantic States Marine Fisheries Commission's River Herring assessment documents and by the Cooperative. The 2024 ASMFC River Herring Benchmark Stock Assessment included our program's data as it achieved the required 10-year data time series. Analytical approaches were limited to trends of abundance (none detected for our data – but did not include 2024 data) and estimated mortality rates were based on fish age-5 and older. This mortality rate estimate is not considered very informative to the Connecticut River as over 60% of our adult run is typically comprised of age-3 and age-4 year classes. Overall, the assessment's use of our data was limited and did not delve into the relationship of the CTDEEP juvenile index and our catch-at-age abundance data that has been demonstrated in these reports (a significant relationship to age-4 cohorts over time). It also did not cover many other objectives and elements that will be reported in the following text as they were not accepted "standardized data" across the East Coast data sources.

Table 3. An annual summary of the CTRFWCO's river herring population assessment program's effort, catch, and laboratory processing total by species (2013-2024).

	2013	2014	2015	2016	2017	2018	2019	2021	2022	2023	2024
Number of sample dates	18	21	20	25	26	23	27	25	28	28	28
Total sample runs	81	124	114	145	145	147	147	118	173	151	155
Total electrofishing seconds	41,177	55,736	56,025	71,845	68,353	69,835	80,473	56,838	84,208	73,147	76,537
Total bluebacks captured	714	2,593	1,448	1,586	2,650	2,396	3,456	1,813	1,433	1,932	852
Total alewives captured	107	220	258	586	200	366	243	128	470	149	62
Blueback Herring otolith/scale – lab	501	655	622	730	1,192	991	1,473	929	903	1,094	682
Alewife otolith/scale - lab	103	188	165	461	190	284	217	114	356	141	61

In 2024 we again sampled on 28 dates; the variability with number of runs and electrofishing time are within expected ranges (Table 3). However, even given a high time-series level of effort, our fish capture totals were the lowest in our survey time series. Relative abundance is best represented by our catch-per-effort metric that accounts for variable sampling effort among years, reported later.

Sampling was initiated on 4/2/24 in the Mattabesset River, with a single Alewife sampled. Subsequent weekly sampling through the month of April was notably void of any river herring, in spite of good conditions. It was not until 4/24 on the Mattabesset that a sample of multiple Alewife were first captured. This is several weeks later than typically observed at this site for this species. That date was also the first date of multiple Blueback Herring, also a later appearance than expected. In 2024, Blueback Herring were commonly observed in the final week of April, also several weeks later than typical.

When a sampling run encounters high catch rates (i.e. more than approximately 60 fish collected, which only occurs with Blueback Herring), in less than the standard 500 seconds shock time expended, the run duration is shortened. This situation occurred on 2 runs in 2024 tying the same in 2022 (record low). The Blueback Herring 2024 season annual aggregate relative abundance was 0.91 fish per minute (standard error 0.129), based on 113 sampling runs, the lowest relative abundance value in the time series Figure 2.

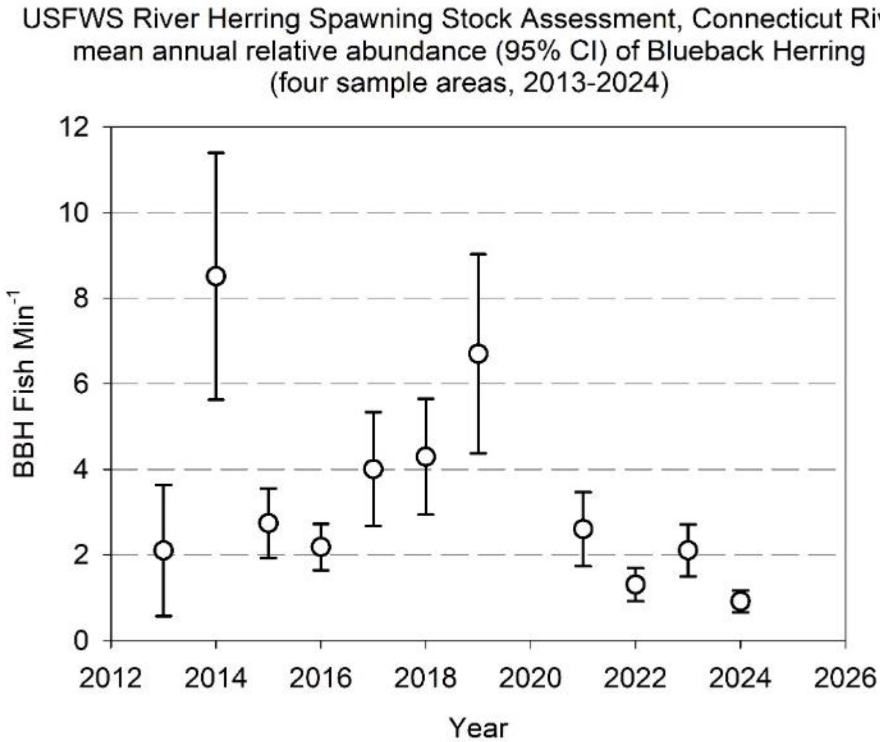


Figure 2. Annual catch-per-unit effort (fish per minute) for Blueback Herring among four standard index areas. Sample efforts prior to first documented arrival are excluded from analyses (e.g., 141 runs vs. 173 total runs in 2021).

Blueback Herring catch rates over the sample season were variable but consistently low, the lowest in our time series. Relative abundance of Blueback Herring varied over space and time at the site level (Figure 3). In 2024, as shown in Figure 3, 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 were observed on the Westfield River over the season, which is common (Figure 3). The Chicopee River demonstrated low catch rates through the month of May. Wethersfield Cove, typically our highest abundance site, shows a "normal distribution" over the season as fish arrive, build to a peak level and decline. The Farmington River continues to perform 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 is less influenced by variable discharge rates that may affect a tributary's habitat conditions more profoundly (limiting depths and water velocities). 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 (refer to Figure 2) in the study time series (Figure 4).

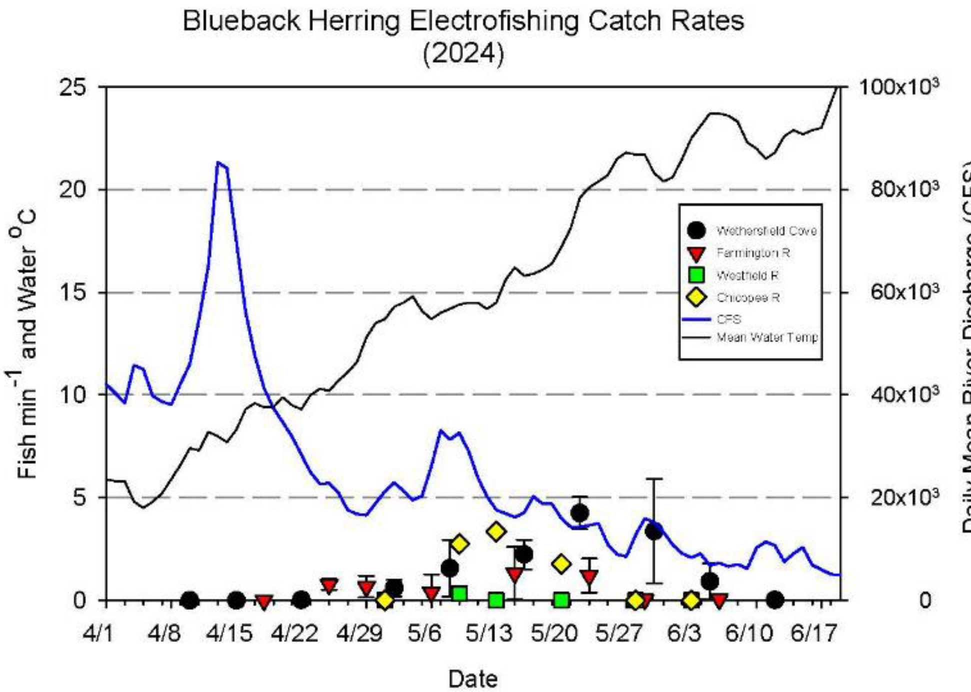


Figure 3. **Adult Blueback Herring relative abundance expressed as mean fish captured per minute ± standard deviation, by sample area and date for 2024 season. Reported daily mean water temperature (black line; USGS Thompsonville) and daily mean river discharge (blue line; USGS Thompsonville, CT).**

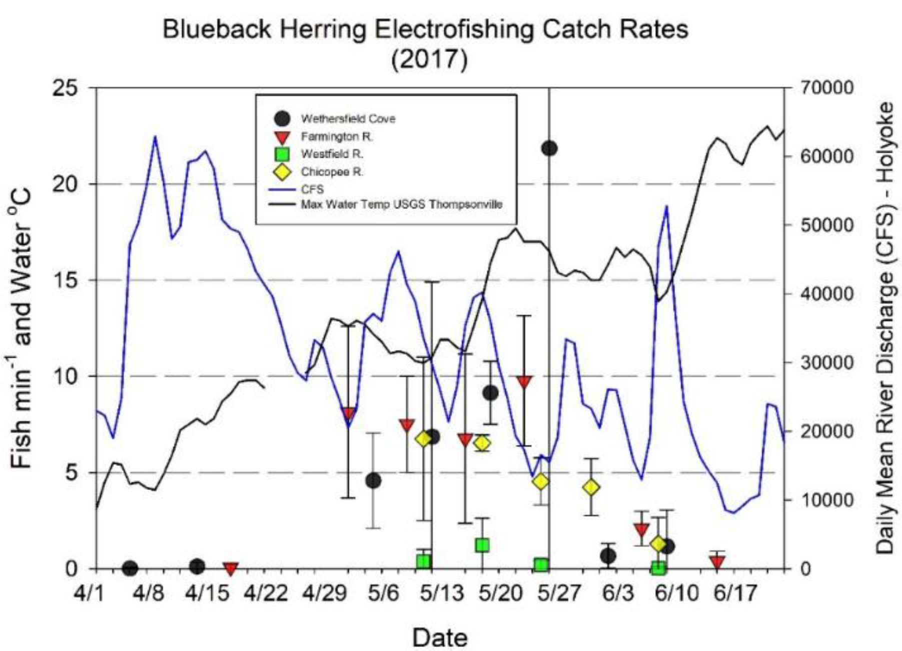


Figure 4. **Comparison figure of adult Blueback Herring relative abundance expressed as mean fish captured per minute ± standard deviation, by sample area and date for the 2017 season. First Y axis kept to same scale for comparison with 2024; second Y axis scale slightly different.**

A summary of Blueback Herring annual mean total lengths (mm) is shown by sex and year in Figure 5 with regression lines for both data sets (no significance). The mean size of male and female Blueback Herring was intermediate for the assessment time series in 2024 and the overall trend suggests an increase in size over time.

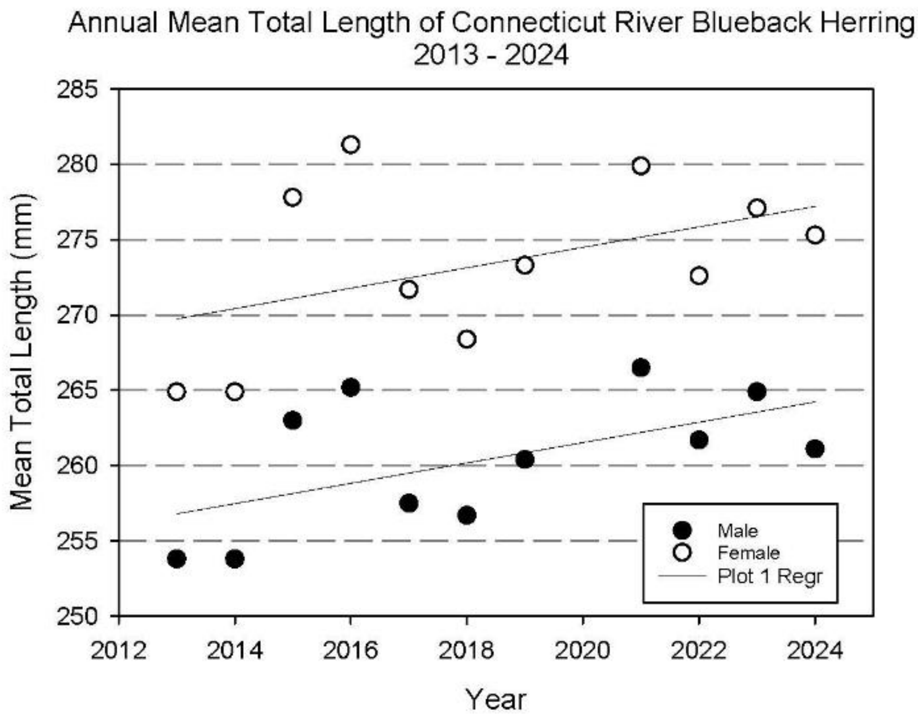


Figure 5. Annual mean total length (mm) of Blueback Herring sampled by sex, all sites combined. Linear regression relationships are not significant: males (P = 0.07) and females (P = 0.16).

The age structure of Blueback Herring sampled in 2024 was determined by otolith aging. Darren Desmarais completed the aging in time for this report, partially due to the smaller sample size of lab processed fish. For the period 2013 to 2023, a total of 9,026 Blueback Herring have been aged (combined sexes) with males making up 69% and females 31% of this structure (Table 4). Age-4 fish, on average have been the dominate age class for both sexes. However, age structure in any single year can be affected by the presence of both strong and weak year classes as noted earlier. In 2024, age-5 fish (combined sexes) was the dominate age class, though for males, this was negligible difference from age-3 (Table 5). Another deviation from past years is the sex ratio of fish in 2024, with female bluebacks making up 43% of the total fish sampled (40% of those subsampled for aging).

Table 4. The age structure of Blueback Herring sampled by the CTRFWCO Assessment Program, from otolith aging, for the years 2013 – 2023 inclusive.

	Blueback Herring 2013 - 2023					
	Both Sexes		Males		Females	
Age	N	%	N	%	N	%
2	42	0.5	42	0.7	-	
3	2402	26.6	1785	28.6	617	22.1
4	3075	34.1	2131	34.2	944	33.8
5	1741	19.3	1163	18.7	578	20.7
6	1166	12.9	741	11.9	425	15.2
7	467	5.2	295	4.7	172	6.2
8	114	1.3	64	1.0	50	1.8
9	16	0.2	11	0.2	5	0.2
10	3	0.0	2	0.0	1	0.0
Sum	9026		6234		2792	

Table 5. The age structure of Blueback Herring sampled by the CTRFWCO Assessment Program, from otolith aging, for 2024.

	Blueback Herring 2024					
	Both Sexes		Males		Females	
Age	N	%	N	%	N	%
2	13	1.9	13	3.3	-	
3	159	23.7	111	27.8	48	17.6
4	157	23.4	93	23.3	64	23.5
5	216	32.2	110	27.6	106	39.0
6	100	14.9	59	14.8	41	15.1
7	12	1.8	7	1.8	5	1.8
8	6	0.9	2	0.5	4	1.5
9	6	0.9	3	0.8	3	1.1
10	2	0.3	1	0.3	1	0.4
Sum	671		399		272	

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 2020).

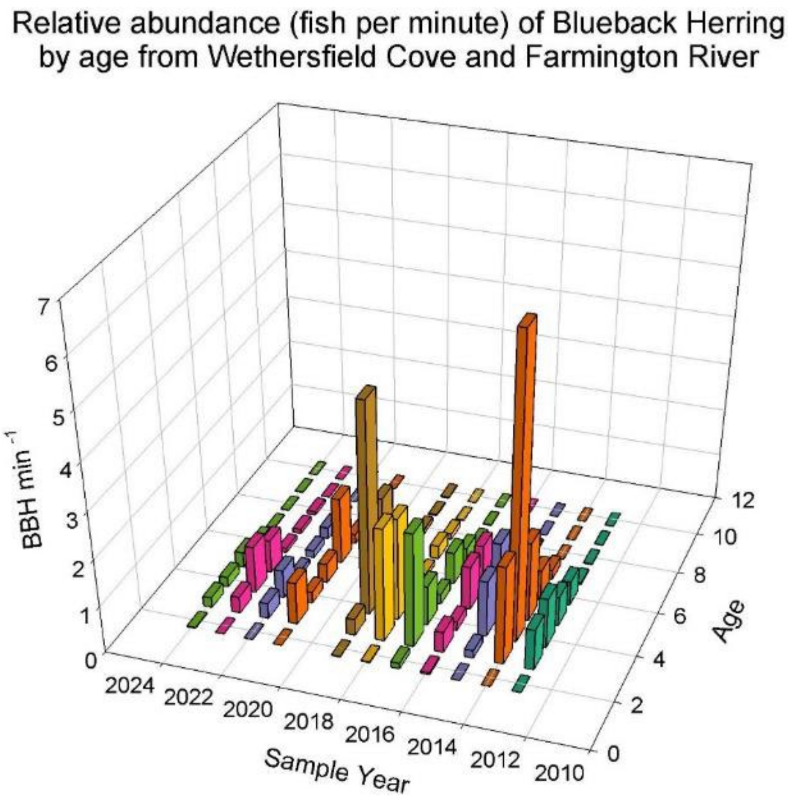


Figure 6. Relative abundance (fish per min) by age (sexes combined), for Blueback Herring sampled annually from 2013 to 2024, from Wethersfield Cove and Farmington rivers (~80% of annual total sample). Both "strong" and "weak" cohorts can be seen transitioning among years. In 2018 a "strong" cohort age-3 to age-6 in 2021 is shown. In 2015, a "weak" cohort age-3 to age-5 in 2017, is shown.

In 2024, all retained Blueback Herring (n = 682) and Alewife (n = 61) were laboratory processed the day after sampling. Species identification confirmation was completed using peritoneal appearance (i.e. white Alewife, black to grey Blueback Herring), a scale sample was obtained, female ovaries removed and weighed, and otoliths extracted. In 2024, a Pancreatin (a digestive enzyme) bath was used to clean scales prior to slide mounting (n=8 per slide, fish). Jackie Stephens provided methods training and oversight of our study's scale reading using her manual with the seasonals (Stephens 2023). The Stephen's protocol manual uses a training scale set, followed by a test set, with other manual text and scale images to improve accuracy and precision. As part of her master's thesis, her analyses of our scale reader data showed a significant increase in precision and improved accuracy in 2023 scale reader results (first year new protocols implemented). A standard microfiche reader (microcolor 1100) was used independently by two our two seasonals to examine slide-mounted scales to determine spawning history (virgin, one repeat, two repeat, etc.) and assigned a numeric confidence rating. Fish (slides) that were not in reader agreement were then examined by the two readers for a consensus determination. The proportion of virgin vs. repeat spawner decreased notably from 2023 to 2024 and is explained by the shift in age composition between these years. Referring to Figure 6, the greatest single proportional contribution by one age class was age-4 (1.0 fish per min) in 2023, which shifted in 2024 (age-4 rate 0.2 vs. age-5 rate 0.3 fish per min).

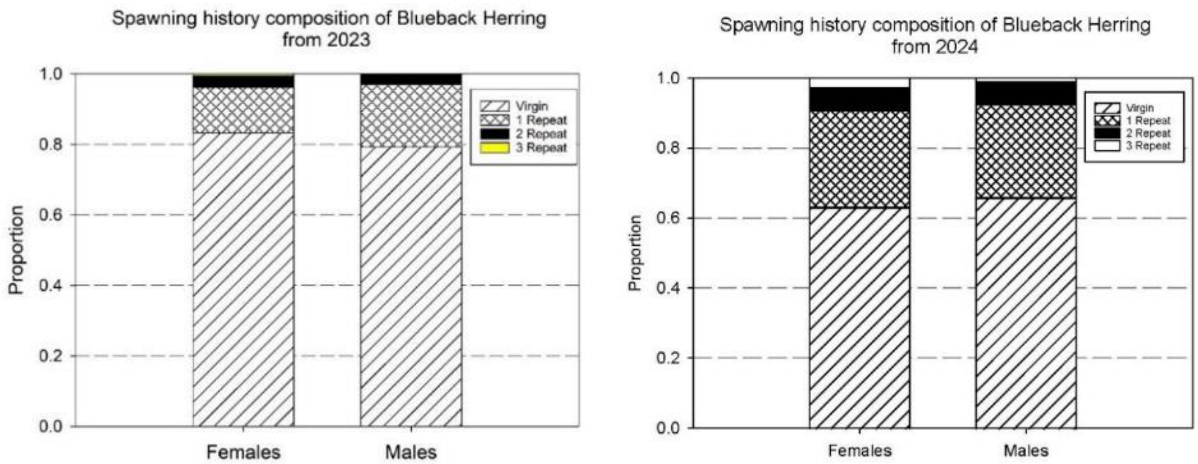


Figure 7. Right Panel, Spawning history, by sex, of all Blueback Herring laboratory processed from all sites in 2024 (n = 682) and Left Panel, same data for 2023 (n = 1,093).

Female Blueback Herring ovaries from laboratory processed fish were extracted and weighed over the field season (N = 278) to derive a reproductive status index. As we have learned there are differences in female arrival and reproductive status over time, based on sample location, the provided figure is from Wethersfield Cove data (Figure 8).

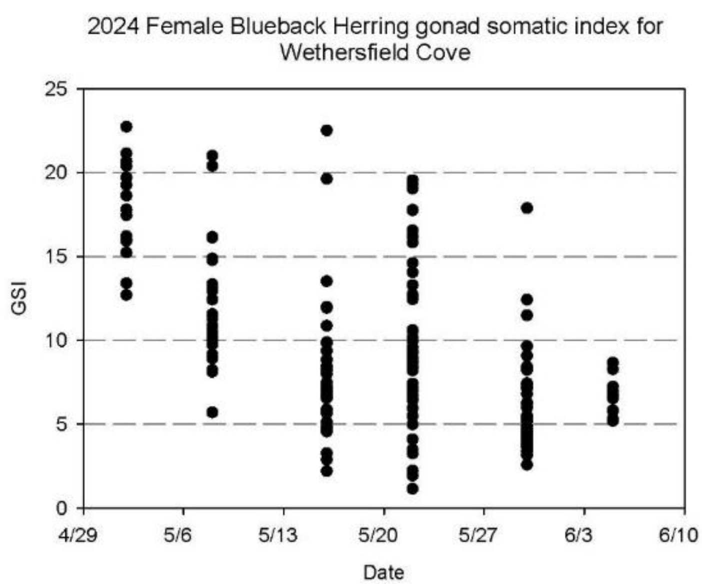
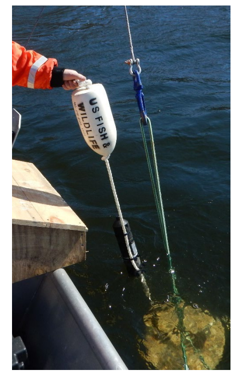


Figure 8. A plot of spring 2024 Blueback Herring female gonadosomatic index (ovary wt./total weight*100) as a percentage value over time, for Wethersfield Cove.

Alewife population assessment data was limited by a record low sample size resulting in those data not included for this report (Table 3).

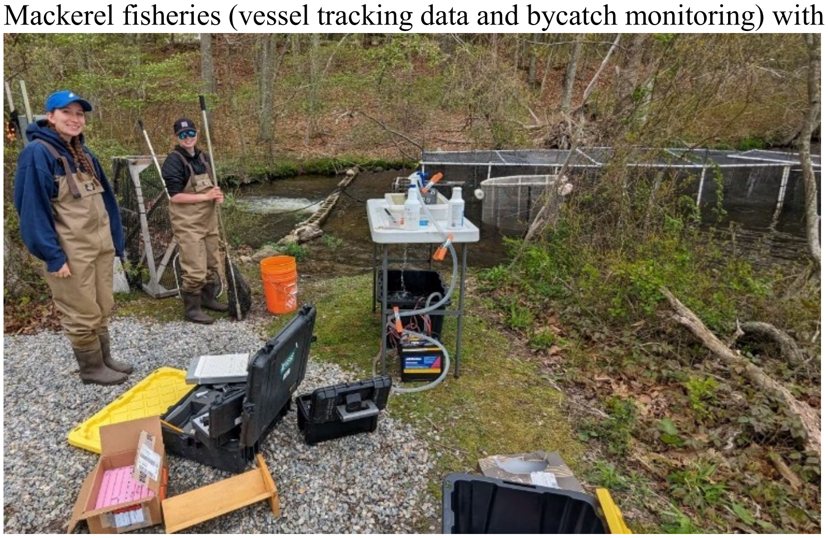
Cooperative River Herring Migration and Movement Study

Working in partnership with CTDEEP's Diadromous Fisheries Program and the USGS Conte Research Laboratory, we had planned to tag an equal number of Alewife (n=100) and Blueback Herring (n=100) near the river mouth using short set, tended drift gill nets. Fish were surgically implanted with VEMCO V7 tags programmed for the maximum 180 second ping burst. This will provide a minimum of 380 days of tag life. Netting and tagging began the first week of April 2024 and occurred weekly (typically 3 days per week) through early May, a total of 18 dates. Our plan was to tag only a portion of collected fish (<20%), in multiple tagging bouts daily, that were to be released with untagged fish at the tagging site. This spring, low Alewife catch rates forced a shift in protocol whereby Alewife were tagged as they migrated into Brides Lake, CT, a small coastal system 12 mile to the east of the Connecticut River.



Over 50 receivers were deployed in the main stem Connecticut River from the mouth to the base of the Holyoke Dam (MA), in several large coves and a number of tributaries in February and March of 2024. With the shift to tag fish in Brides Lake, we deployed additional receivers off the mouth of Brides Brook, in Long Island Sound. The CTDEEP also has several large receiver arrays in Long Island Sound that bracket the Connecticut River's mouth (including Brides), across to Long Island, New York. Our project has been integrated into the Middle Atlantic Telemetry Observation Network MATOS program.

The objectives of our study include, for both Alewife and Blueback Herring:
1) Determine rates, timing and extent of upstream movements,, residency in the river, and downstream movements; 2) Determine factors (e.g. environmental, biological) that influence migration and movements; 3) Determine use of main stem habitat versus cove and tributary habitats and the extent to which there is any movement among habitat types; 4) Describe the timing, duration, and conclusion of the spawning migration; 5) Describe post spawn movements for fish that reach Long Island Sound and among the many existing large marine acoustic arrays off New England and Canada working with MATOS; 6) Determine adult repeat spawners and their subsequent movements in 2025 and any fidelity to 2024 habitat use; 7) compare and contrast movements and timing in all habitats (in river and marine) between the two species; and 8) compare commercial fishing activity for Atlantic Herring and Atlantic Mackerel fisheries (vessel tracking data and bycatch monitoring) with marine movement detections.



Using short set, tended drift gill nets in the lower river fish we netted fish with a fairly high level of effort, supporting the observed low catch rates on the spawning grounds. Blueback catches became notable the second week of April and diminished over time with one odd high catch date on May 14. At the CTDEEP Marine Office, a total of 43 Alewife were tagged and released with 98 Blueback Herring. The tagged fish were released with (in sum) a total of 212 untagged Blueback Herring. An additional 59

Alewife were netted from the Brides Lake fish weir/trap, tagged, and released into the lake (Figure 9).

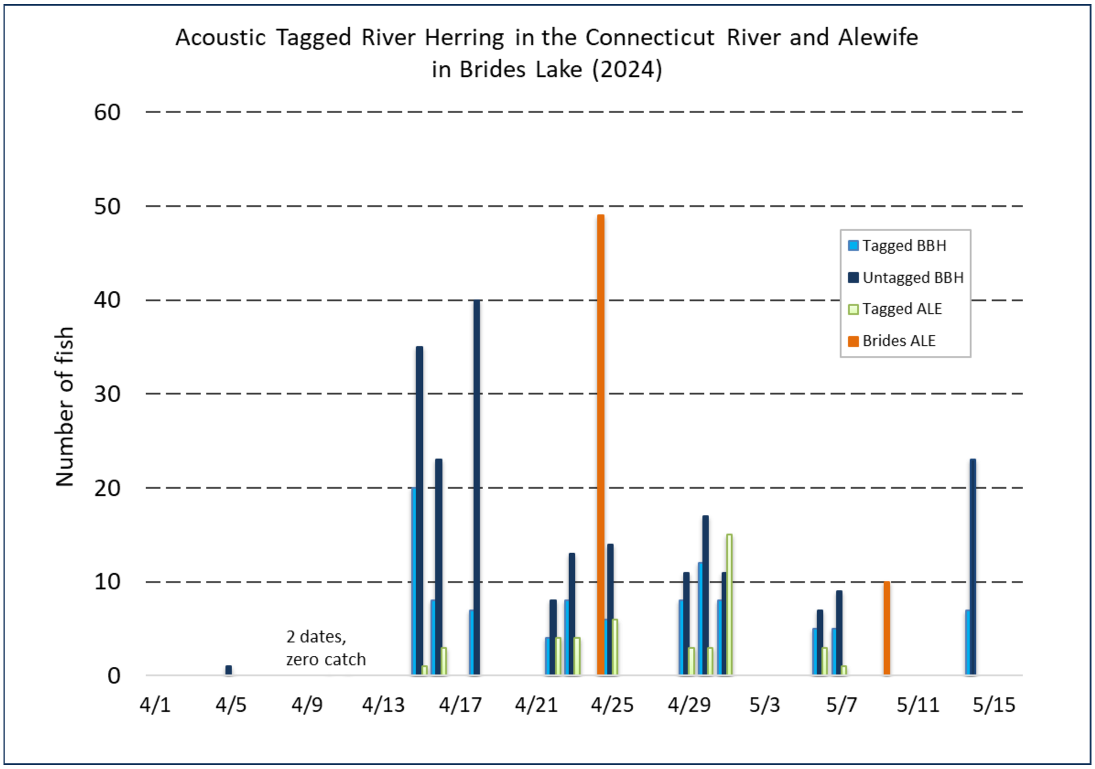


Figure 9. Dates of gill net collection and tagging at the river mouth April 5 to May 14, 2024. Breakout of fish surgically tagged and number of untagged fish co-released in Old Lyme. Brides Lake fish were tagged and released on site with the presence of large numbers of untagged fish in the immediate area.

In July and August 2024, all in-river receivers, but two, were successfully retrieved with all data downloaded. As some receiver moorings became embedded in the substrate, our SCUBA team was able to free several units that would have been otherwise lost. The data were uploaded to MATOS. Provisionally, the receiver data showed a large volume of tagged fish movement data. The data showed that 75% of the tagged Blueback Herring were "viable" for in-river study objectives (or 25% fallback). This is the same rate observed for capture and tagging performance in 2021 and can be considered a successful level relative to similar tagging study designs. A provisional tagged fish movement plot, in river only, is shown in Figure 10 (developed by Aaron Heisey, Conte Lab). Fish were tagged and released at river kilometer (rkm) 5 with Essex CT defined as the upper bound of estuarine habitat (rkm 20).

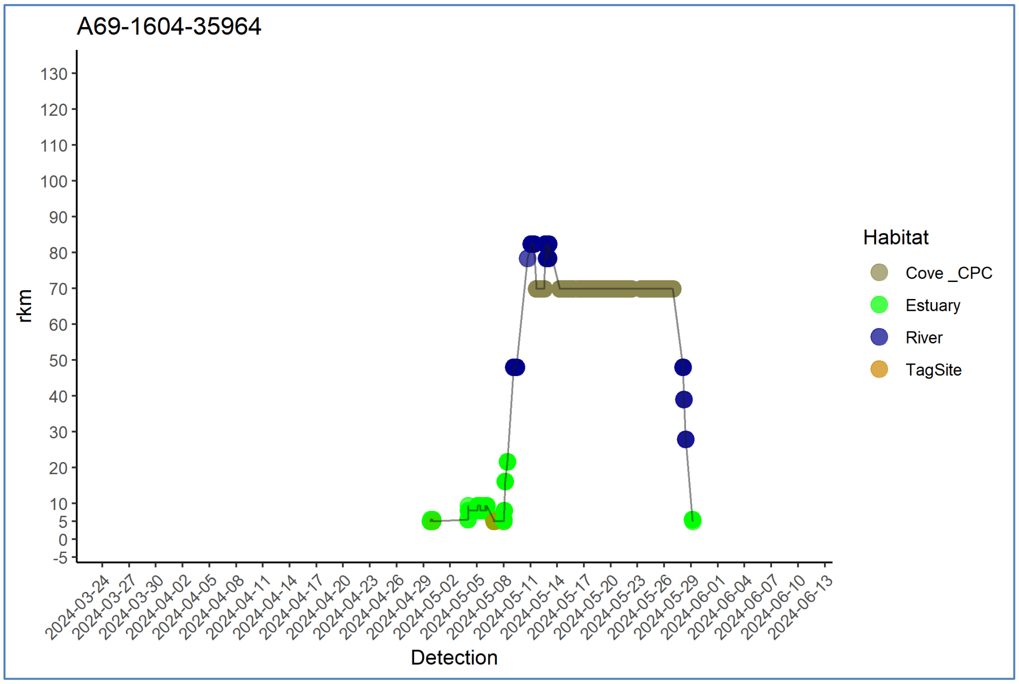
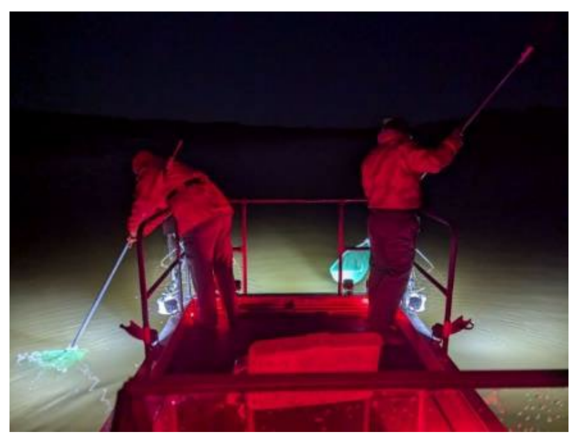


Figure 10. A Blueback Herring captured, tagged, and released in Old Lyme, CT (rkm 5) on April 29, 2024.

The tagged fish in this example exhibited a commonly observed limited upstream movement for a one-week period, followed by a rapid, directed upstream movement. The fish spent 20 days in Crow Point Cove, before leaving in a rapid, directed downstream movement. Marine detections from the CTDEEP Long Island Sound receivers were not available at the time of this report.

Juvenile American Shad Assessment



This assessment program was initiated in 2017 with the MA Division of Fisheries and Wildlife (MADFW) to provide data on juvenile American Shad and Blueback Herring production through weekly evening sampling events, starting in late August through the end of October by boat electrofishing in three main stem river segments; Holyoke Dam to Turners Falls Dam, Turners Falls Dam to Vernon Dam, and Vernon Dam to Bellows Falls Dam. Study objectives, over space and time, include, 1) derive relative abundance rates (fish per minute) 2) collect fish length and weight data and 3) examine these and other data over space and time. These data are used to describe recruitment strength, test hypotheses, and examine factors that may influence metrics of management interest. The MADFW had covered the Holyoke to Turners section in past years but was unable to continue this work since 2022. Our office has been able to continue the monitoring program, over time, for the Turners to Vernon reach and the Vernon to Bellows Falls reach. We sample two evenings a week, alternating between the two reaches each week. The reaches in both main stem segments are broken into an upper and lower section (15-20 km), with a random cell selection (~1km) of 5 sites per night. In 2024, Corey Eddy coordinated this effort and our office samples between the last week of August and the last week of October; a total of 19 sample dates and 95 sample runs. This is similar to 2023 when a total of 99 sample runs were conducted for the same time frame.

In 2024, a total of 971 juvenile shad were sampled over the study period, up notably from the 478 in 2023. As with the adult river herring assessment program, fish per minute rates provide a useful statistic to compare abundances over space a time. The annual mean abundance rate, by river segment has varied over time as shown in Figure 11. The 2024 adult shad spawner escapement, the number of passing adults counted atTurners Falls gatehouse ladder, was a record high in our study period and had an expected role in a high level of juvenile production. An examination of the full data time series, including the MADFW data for the Holyoke Pool, has been developed by Steven Mattocks (MADFW) and will be submitted to a peer review journal in 2025.

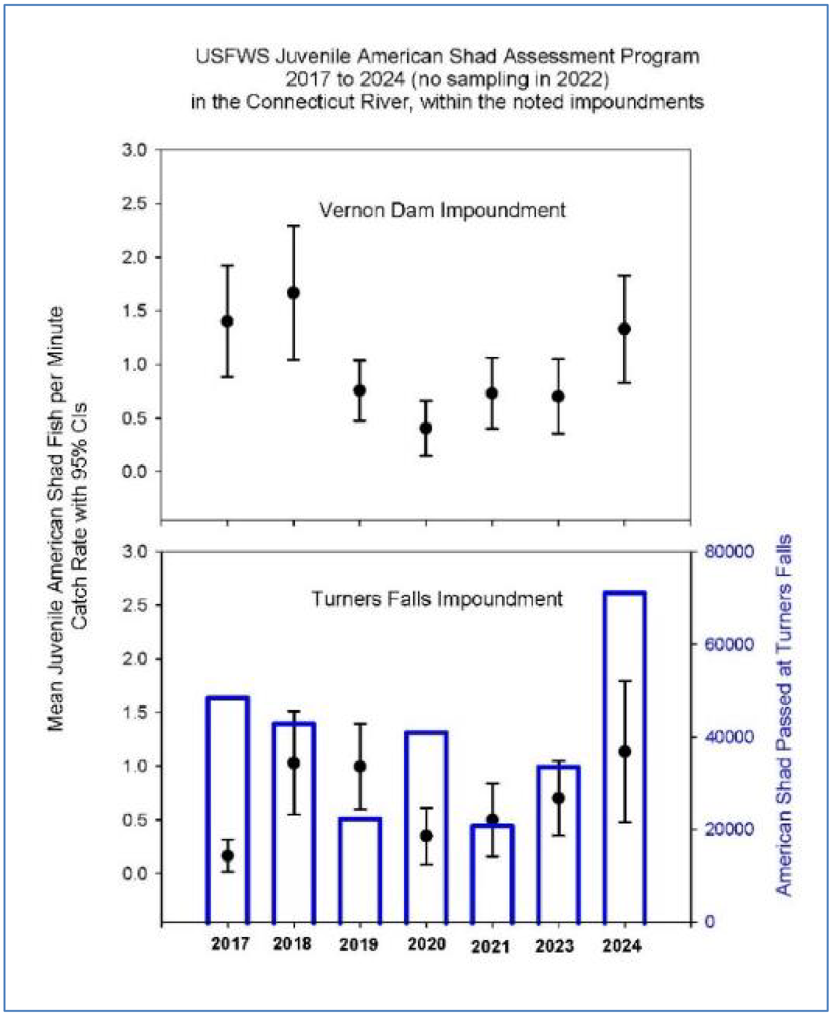


Figure 11. Juvenile American Shad annual catch rates from fall assessments.
The top panel, mean annual juvenile shad catch rate (with 95% confidence intervals) by year for the Vernon Dam Impoundment. Bottom panel, same statistics for the Turners Falls Impoundment with the annual adult American Shad passage count at the Turners Falls Gatehouse fish ladder on second y axis.

Program Results

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

Holyoke Gas and Electric fish passage counting room window, photo Sierra Humiston.

Migratory Fish Returns

American Shad

A total of 437,553 adult American Shad were counted in 2024 at all first-barrier passage facilities in the basin. A total of 433,009 American Shad were passed upstream of the Holyoke Dam, Massachusetts (river km 138) in 2024 through its two fish lifts, which is a 56% increase from 2023 (Figure 12). The mean annual passage count at Holyoke for the period 1980-2024 is 320,592 (±SD 128,147). The Holyoke Fish Lift opened on 4/22/24. The lifts were closed 6/17 – 6/20/24 in order to install PIT tag readers for the sturgeon passage study and to make the annual facility lift modifications for sturgeon.

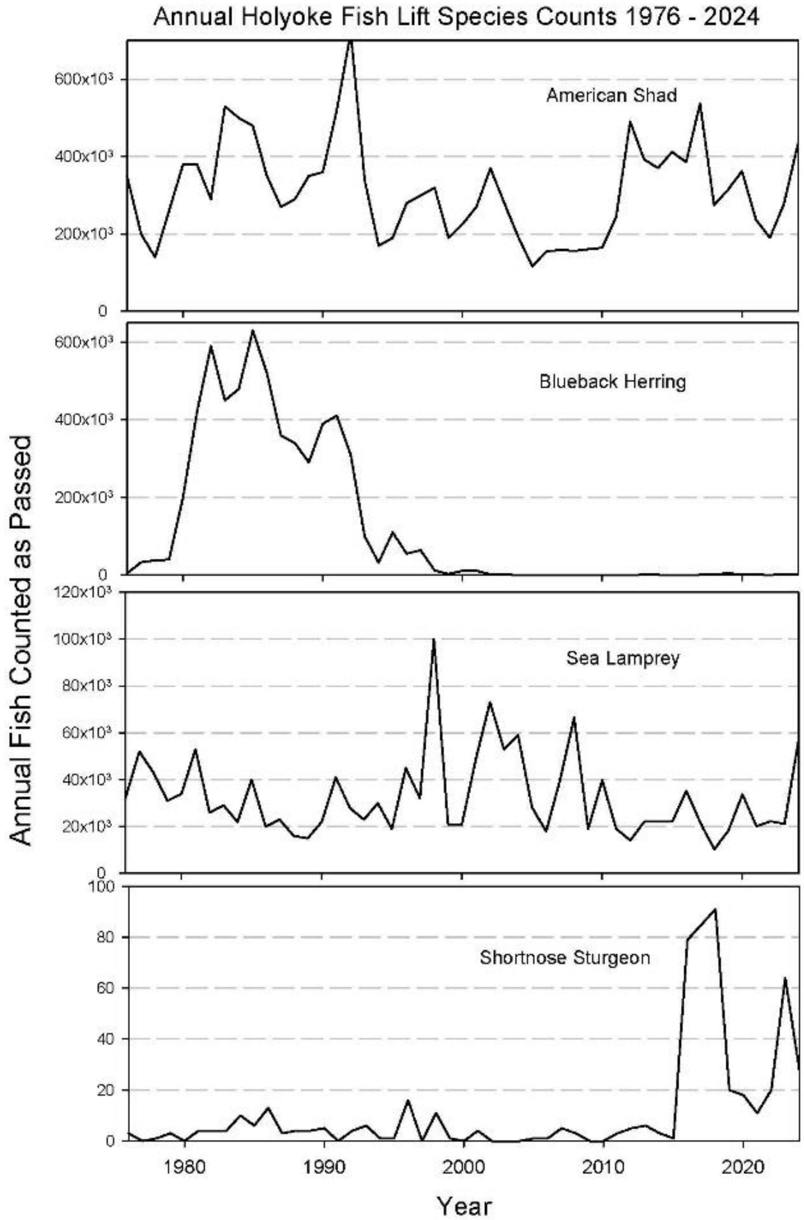


Figure 12. Select summary of Holyoke Fish Lifts annual passage counts for American Shad, Blueback Herring, Sea Lamprey and Shortnose Sturgeon (1976-2024).
Fish passage counts are affected by structural and operational changes at both dams and fishways and by environmental conditions (temperature and flow/spill) within year and among years.

Main stem river discharge was generally lower than average over the spring with some very low flow dates in early June that returned to near average before sharply declining for a brief period before spiking up into a modest above average rate for the end of June (Figure 13). These flow conditions created very favorable fishway attraction and entrance conditions for fish passage from late April through late June. Water temperatures were within an expected to elevated range of variability that comes with low flows and warmer weather (Figure 14). Note in figure 14 that the mean statistic is based on only two years of data.

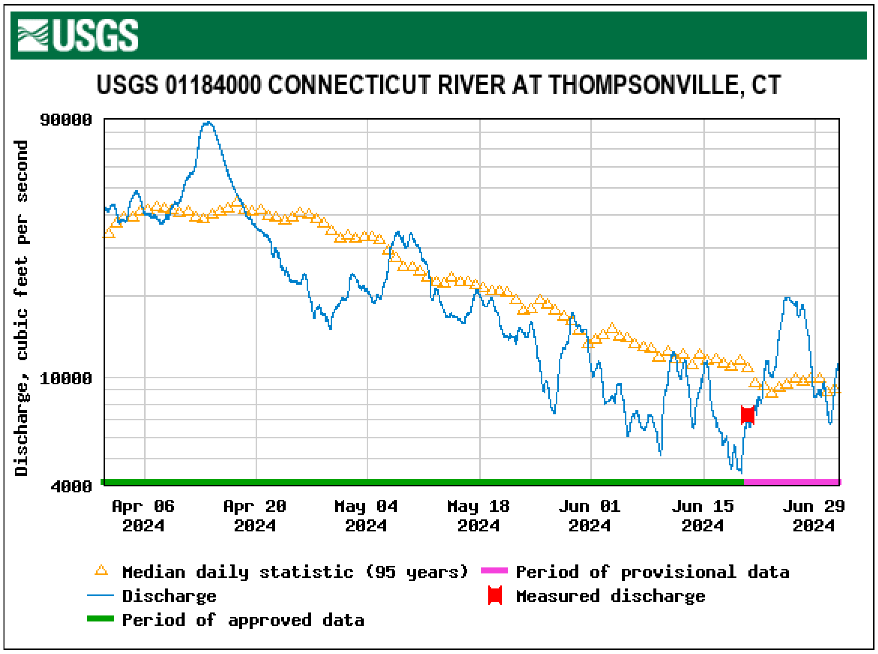


Figure 13. Mean daily river discharge measured at USGS Thompsonville Gage, with long-term mean values also shown.

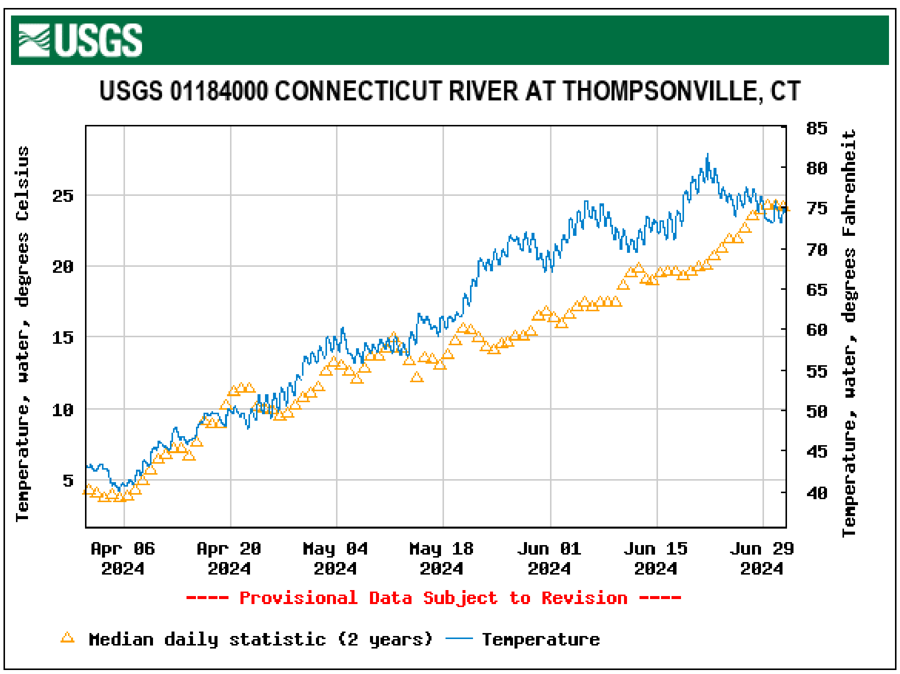


Figure 14. Mean daily river discharge measured at USGS Thompsonville Gage, with long-term mean values also shown.

The highest single passage event for shad occurred on 5/15 with 48,309 shad passed (Figure 15). There were 4 dates when over 40,000 American Shad passed around a mid-May peak period.

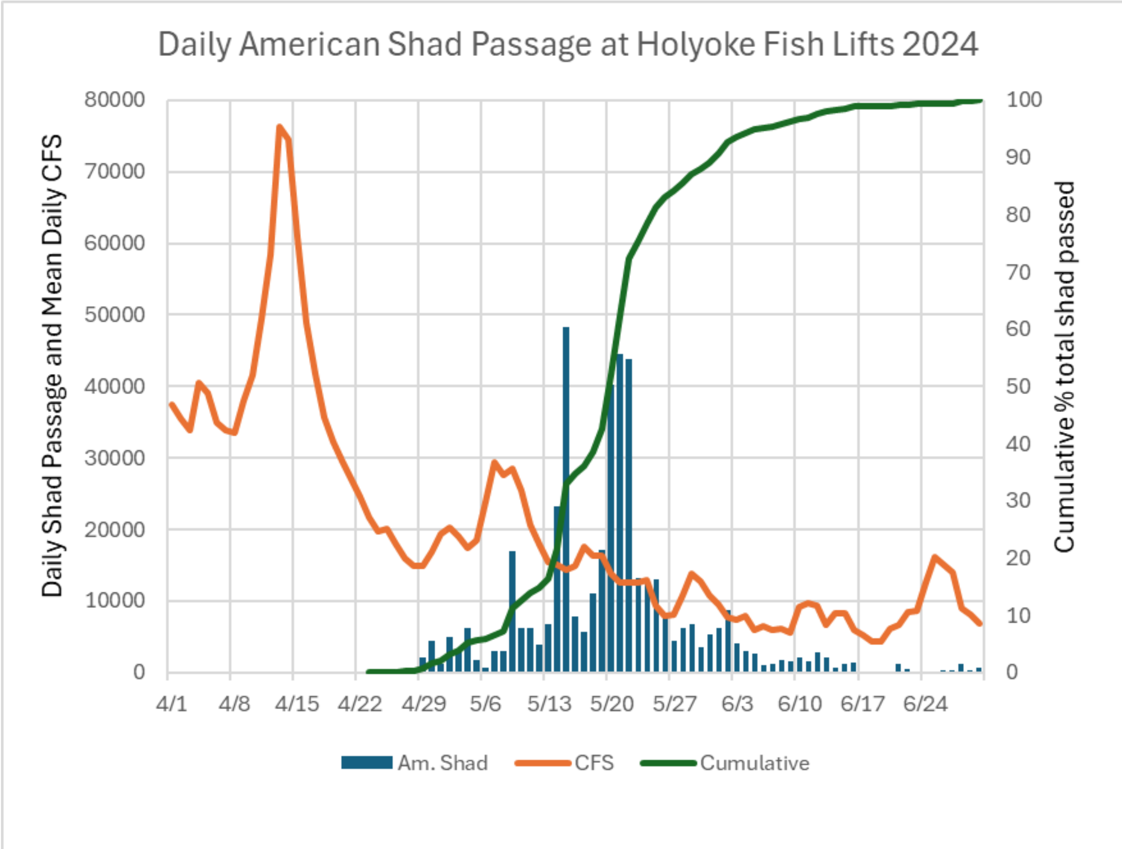


Figure 15. Daily American Shad passage counts from Holyoke Fish Lifts with mean river discharge orange; USGS) and cumulative running total percentage passed (green), for the period April 1 to June 30, 2024.

Holyoke Gas and Electric (HGE), in coordination with the state and federal agencies, facilitated fish trap-and-haul activities in 2024. The use of trap-and-haul at the HGE Holyoke Project supported research activities at the USGS Conte Laboratory, and 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 CTRFWCO (Table 6).

Table 6. Summary of fish captured at the Holyoke Trap and Transfer Facility in 2024, by date, species, agency and number. Destinations include Conte Lab (CAFRL) for experiments and then release and FWS North Attleboro for fry production for restoration stockings in Massachusetts coastal systems.

Date	Species	Conte Lab	CTDEEP	USFWS	RIDEM
8-May	American Shad	94			
13-May	American Shad	85			
14-May	American Shad	81	200	100	
15-May	Sea Lamprey	77	200	100	
15-May	American Shad	15			
16-May	American Shad	85	200		
16-May	Sea Lamprey	15			
17-May	Sea Lamprey	35			
20-May	American Shad	91			
20-May	Sea Lamprey	28			
21-May	American Shad	82			
21-May	Sea Lamprey	13			
22-May	American Shad	62		70	
22-May	Sea Lamprey	13			
22-May	Sea Lamprey	126			
23-May	American Shad				80
23-May	Sea Lamprey	22	300		
28-May	American Shad	62			
28-May	Sea Lamprey	30			
29-May	American Shad	42			
29-May	American Shad	30			
30-May	American Shad	41			
30-May	Sea Lamprey	24			
31-May	Sea Lamprey	13			
3-Jun	Sea Lamprey	25			
3-Jun	American Shad	36			
4-Jun	American Shad	45			66
5-Jun	American Shad				85
Sum	**American Shad**	**872**	**600**	**270**	**231**
Sum	**Sea Lamprey**	**400**	**300**		

The three fish ladders at the Turners Falls Project opened on 4/24/24 (Cabot Station Ladder) and 4/25/24 (Spillway Ladder and Gatehouse Ladder), following the Cooperative's requested Fish Passage Operations Plan for 2024. The first American Shad observed passing was on 4/30 at Cabot Ladder, with the first shad passing from Gatehouse Ladder on 5/1. Fishway counts were provided at regular intervals by FirstLight Power with a total of 71,309 American shad passing the Gatehouse Ladder at Turners Falls Dam in 2024, versus the 33,782 passed in 2023. At the time of this report the counts for the Cabot and Spillways ladders were not complete. 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. 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 Gatehouse Ladder was closed for operations on 7/15/24. Cabot and

Spillway ladders were closed on 7/12/24.

Overall, the 2024 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 16.5% which is a time series high (Table 7). 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 to achieve the defined passage performance criteria of the Plan and its Addendum on Fish Passage Performance (CRASC 2017; as amended 2022).

Vernon Dam (Vernon, Vermont) fish ladder was opened on 5/2/24 and closed on 7/16/24, following the Cooperative's fishway schedule, by Great River Hydro. A total of 50,938 American Shad were counted passing Vernon fish ladder through 7/2/24, which includes some period of camera/image outages 6/10-12/24. Based on the Turners Falls Gatehouse Ladder American Shad passage (71,309) this translates to 71% of the shad passed at the Gatehouse Ladder counted passing the Vernon Ladder (Table 7). Main stem river discharge, as measured at a USGS Gage one kilometer downstream of Bellows Falls Dam during the fish passage season, is shown in Figure 16.

Bellows Falls Fish Ladder was opened on 5/14/24 and passed an unknown number of Sea Lamprey and American Shad as count data were not available at the 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 2024, with a total of 4,544 American Shad counted passing. Other species counts were not available.

The Connecticut DEEP did not operate the Rainbow Dam fish ladder on the Farmington River again in 2024, following its first closure in 2023. This decision is based on concerns for its negative impacts on migrating fishes (e.g., scale loss on shad) coupled with its extremely low passage of target fish species and 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, this facility has wide ranging, unregulated generation operations that can cause dramatic fluctuation in downstream aquatic habitat during the spawning periods of many fish species, most notably in lower spring flow periods. 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, maintain, and operate.

Table 7. 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 – 2024.

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		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		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	incomplete count
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**	not operated	incomplete count
2024	433,009	71,309	**16.5**	50,938	**71.4**	not operated	4,544
Mean	320,592	19,921		10,925		419	3,635
SD	128,147	19,425		13,636		445	2,128
Low	116,511	11		9		8	913
High	721,764	71,309		50,938		2,289	10,300

* Vernon Ladder issue fixed for 2012

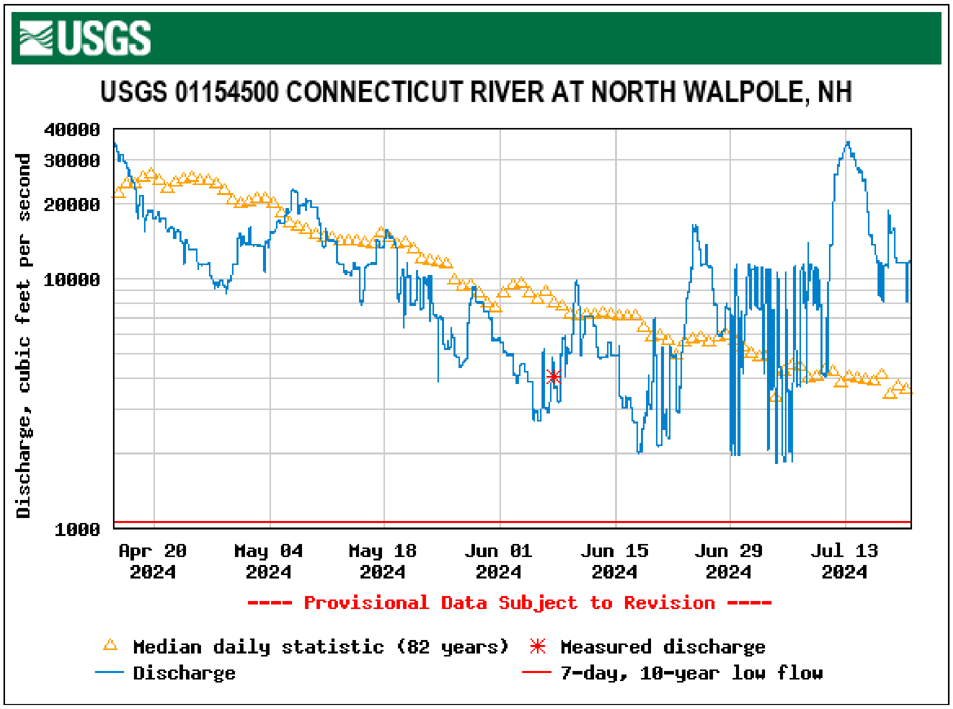


Figure 16. Daily average river discharge from first gage upstream of Vernon Dam, located 1 km downstream of Bellows Falls Dam for 4/15/24 through 7/20/24.

<u>Shortnose Sturgeon</u>

A total of 28 Shortnose Sturgeon (SNS) were trapped and passed upstream at Holyoke Fish Lift in 2024. This is substantial decrease from the 64 fish trapped and passed in 2023 (Figure 17). The lift, for sturgeon passage (defined as 7/1 to 11/15 period), was not operated on a total of 22 dates for facility repair work and high/turbid flow conditions.

A study to determine the number of sturgeon that approach the Holyoke Dam passage facilities, enter, and pass was initiated in 2023 relying on existing PIT tagged and active acoustic tagged fish. The Study Report by HGE was released in 2024 and resulted in written comments by the agencies (NOAA, USFWS CTRFWCO) and other Cooperative Consultation Team members (e.g., Don Pugh for Trout Unlimited) to HGE. The comments were addressed in a revised report by HGE. Key summary findings include 14 PIT tagged SNS passed out of a total of 65 PIT tagged fish detected inside the spillway lower fish lift entrance. This translates to a 21.5% internal passage efficiency. Based on that efficiency rate, from the obtained and presented data, an estimated total of 302 SNS would have entered the spillway fishway entrance in 2023 (when 64 fish were trapped and passed). There is much more to this study, not covered here, which continued in 2024. Study design changes in 2024 at the request of the agencies and partners included additional PIT tag reader antennas.

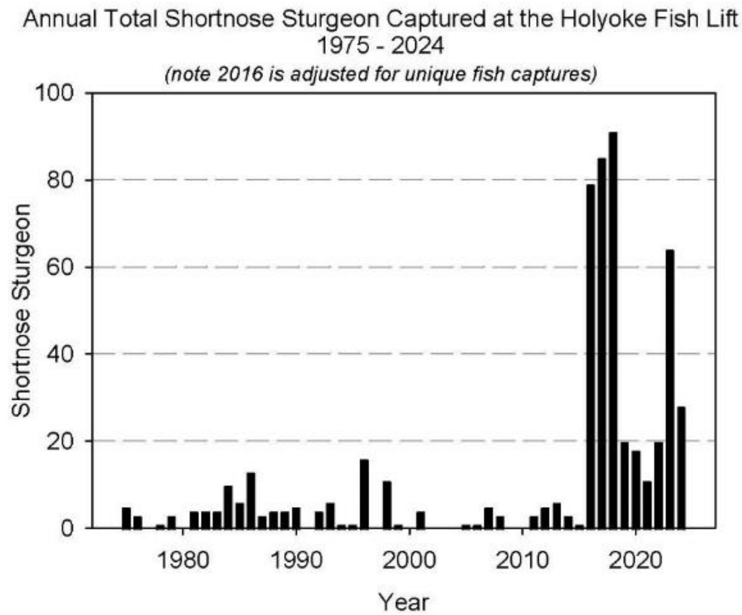


Figure 17. Annual totals of Shortnose Sturgeon captured at the Holyoke Fish Lift, 1976-2024. Fish have only been approved by NOAA for regular upstream passage, since 2017, when downstream protective measures to address sturgeon were fully operational.

The primary passage period for SNS has generally been in July and August with fish also passing early and later in the year. The study findings in the 2023 SNS Passage Report include more details on the timing of fish entry and fallback from the spillway fishway entrance. The noted low passage efficiency is attributed to the fact that most fish enter the fishway in the evening and fish lift operations are only scheduled to occur Monday through Friday between the hours of 9:00am and 3:00pm. Only 14% of the entries occurred between these operational hours. The 2024 SNS Passage Study was not completed at the time of this report.

River discharge (CFS) is significantly increasing over time based on USGS Thompsonville station data for the period 1929 to 2024 in the months of July and August (Figures 18 and 19). The mean July discharge for the period 1929 – 2023 was 9,314 CFS (S.D. 6,788). In 2024 this value was 14,346 CFS. The mean August discharge for the period 1929 – 2023 was 7,665 CFS (S.D. 4,994). In 2024 this value was 14,415 CFS.

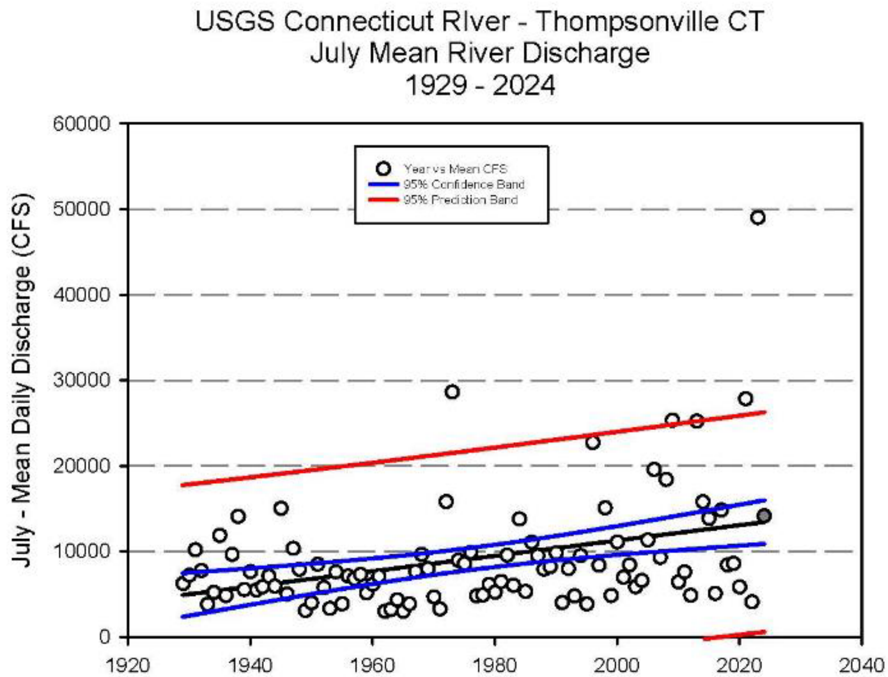


Figure 18. Mean annual discharge (cubic feet per second) for the month of July from the Thompsonville CT, USGS gage for the period 1929-2024.
The 2024 value is grey. Pearsons Correlation P = 0.0002.

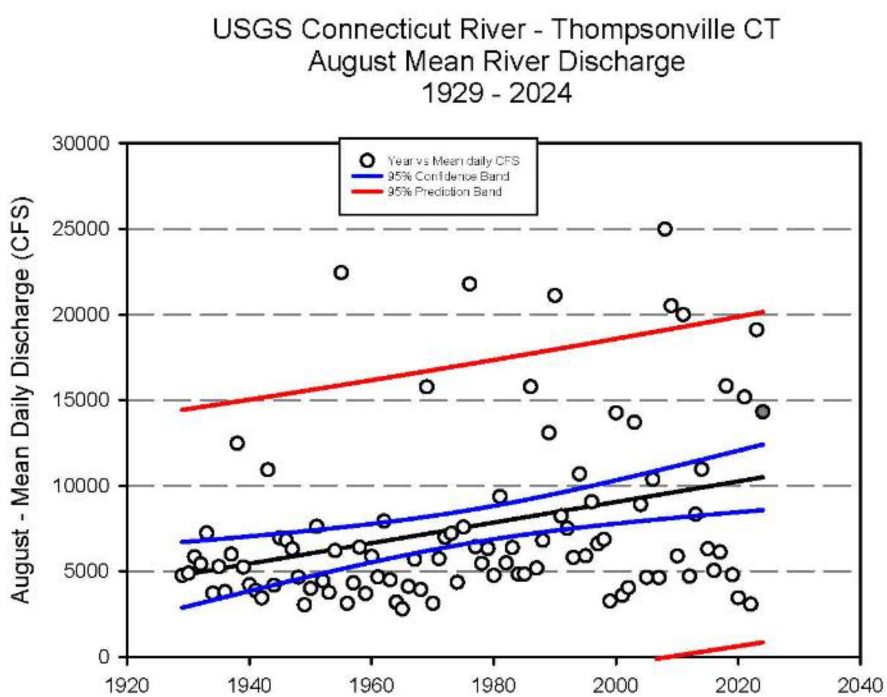


Figure 19. Mean annual discharge (cubic feet per second) for month of August from the Thompsonville CT, USGS gage for the period 1929-2024.
The 2024 value is in grey. Pearsons Correlation P = 0.0009.

Blueback Herring

The Holyoke Fish Lift counted 723 Blueback Herring passed in 2024 which is a decrease from the 2,211 Blueback Herring passed in 2023. This species remains functionally extirpated from its historic habitat upstream of Holyoke Dam (with viable fish passage systems) and in major systems like the Farmington River (upstream of Rainbow Dam). The CRASC River Herring Management Plan's annual passage target at Holyoke is 300,000 to 500,000 fish, to place some context on those counts. There continues to be no detectable relationship between the USFWS' Blueback Herring mean annual relative abundance catch rate and HFL counts. River herring run counts in other parts of Connecticut remained at low levels again in 2024 with a very few exceptions. In Rhode Island the monitored river herring runs also remained at very low levels again in 2024.

As noted earlier in the report, the New England Fishery Management Council has been working through a lengthy process on development of Amendment 10 to the Atlantic Herring Fishery. The Connecticut River Cooperative submitted a letter (April 2024) with data, rationales, and recommendations on measures to reduce river herring bycatch in the Atlantic Herring fishery off of Southern New England (SNE) (i.e., time and area closures), as well as improving the low level of bycatch monitoring in areas of noted bycatch concern off SNE (Appendix B). At the time of this report, work was continuing on this topic, with the 2025 Atlantic Herring quota severely cut (90% decrease) due to continued very low recruitment level for that species.

Sea Lamprey

A total of 60,525 Sea Lamprey were counted from first barrier fishways returning to the Connecticut River basin in 2024. This is a major increase from the 2023 count for first barriers (22,489), driven primarily by the Holyoke Fish Lift that passed 57,186 (Figure 12). The annual mean number of Sea Lamprey passed at Holyoke is 31,940 fish (1976-2023). There is no homing to their system of origin for adults seeking to spawn. We do know that the species responds to pheromones from both juveniles and adults, which the CTDEEP has shown can create runs of this species following previous year stockings into vacant habitat.

A total of 21,219 Sea Lamprey subsequently passed upstream of Turners Falls Dam (through Gatehouse Ladder), or 37% of the number passed at Holyoke. A total of 10,552 Sea Lamprey passed upstream of Vernon Dam (or 50% of the Gatehouse Ladder total).

Striped Bass

A total of 458 Striped Bass were passed at HFL, up from the 116 fish passed in 2023.

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 18,687 in 2024. This was a notable increase from the 11,048 eels counted in 2023. (Figure 20). The eel ramps were installed and operational on April 17, 2024. 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 2025 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.

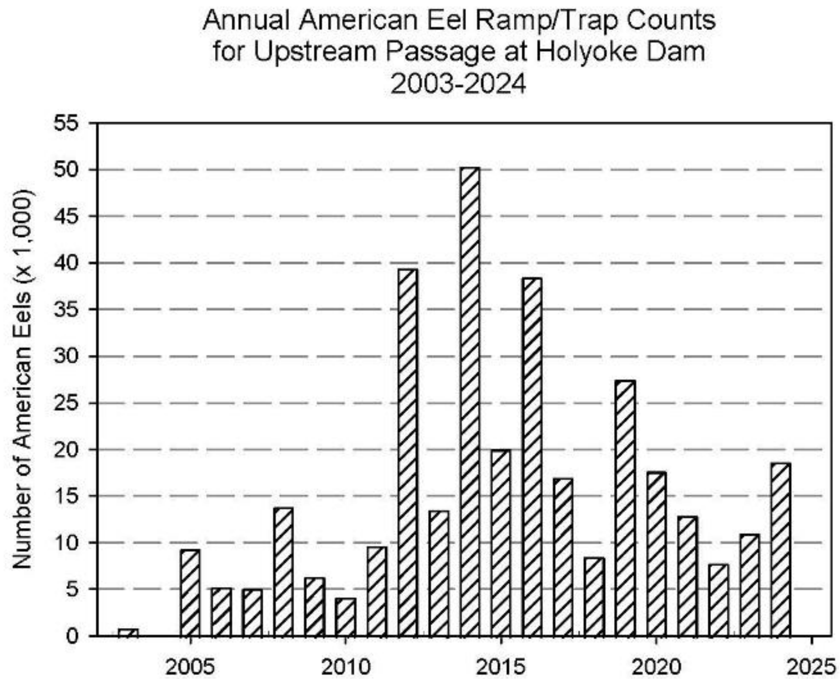


Figure 20. Annual American Eel ramp/trap counts reported by Holyoke Gas and Electric, at Holyoke Dam, for the period 2003-2024.

Corey Eddy has continued work on aging juvenile and Silver American Eels obtained in 2023 at Holyoke using seasonal and student help.

Gizzard Shad

A total of 73 Gizzard Shad were counted at the Holyoke Fish Lift in 2024, which is consistent with past years count data.

Literature Cited

ASMFC. 2024. Atlantic States Marine Fisheries Commission River Herring Benchmark Stock Assessment and Peer Review. Arlington, VA. Available online: https://www.asmfc.org/uploads/file/66f59e40RiverHerringAssessment_PeerReviewReport_2024.pdf

CRASC. 2017 (amended 2022). Connecticut River American Shad Management Plan and Fish Passage Performance Addendum. USFWS, 103 East Plumtree Road, Sunderland, MA. https://www.fws.gov/media/connecticut-river-american-shad-plan-2020

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/

Sprankle, K. 2020. Connecticut River anadromous fish restoration: Coordination and technical assistance F-100-R-37. https://www.fws.gov/media/usfws-connecticut-river-basin-annual-report-2020

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

Appendix A

Meeting agendas for CRASC and the Connecticut River Migratory Fish Restoration Cooperative.

CONNECTICUT
MASSACHUSETTS
NATIONAL MARINE FISHERIES SERVICE
103 East Plumtree Road
Telephone: 413/548-9138

VERMONT
NEW HAMPSHIRE
U.S. FISH AND WILDLIFE SERVICE
Sunderland, Massachusetts 01375
Fax: 413/548-9622

CRASC Commissioners:

CTDEEP:
Peter Aarrestad
CT Public Sector:
Tom Chrosniak
MADFW:
Mark Tisa
Todd Richards (Alt.)
MA Public Sector:
vacant
NHFG:
Scott Mason
John Magee (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

Technical Committee:

CTDEEP:
Tim Wildman
MADFW:
Rebecca Quinones
MADMF:
Ben Gahagan
NHFG:
Matthew Carpenter
NMFS:
William McDavitt
USFS:
Jeremy Mears
USFWS & Secretary:
Kenneth Sprankle
VTFW:
Lael Will (Chair)

DATE: October 5, 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 **October 5, 2023, from 10:00 a.m. to 12:00 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) to be added to the "invite list" for that teams and to determine who will be in-person.

Agenda

1. (10:00-10:10) – Determination of a quorum, approval of today's agenda and review of minutes from June 28, 2023, evolution of migratory fish management in the basin, recognition of Stephen McCormick (USGS) – *Vice Chair Eric Palmer*
2. (10:10-10:25) – Connecticut River Migratory Fish Restoration Cooperative, overview – *Ken Sprankle*
3. (10:25-10:40) – Connecticut River Watershed Partnership Act, a proposed bill in Congress, overview/status – *Markelle Smith (MA Audubon)*
4. (10:40-10:55) – Connecticut River Watershed Working Group, updates on progress to date, process and plans – *Lisabeth Willey (USFWS)*
5. (10:55-11:10) – Technical Committee, updates on activities eDNA survey project, and proposed plan update and habitat-connectivity priority plan – *Lael Will (TC Chair)*
6. (11:10-11:20) – Connecticut River Coordinator's Report, fishway counts, sturgeon, and related data passage data and juvenile shad monitoring - *Sprankle*
7. (11:20-11:40) – Fish Passage Program Updates – *Melissa Grader (USFWS) and Bill McDavitt (NOAA)*
   A. Hydropower company updates (regulatory, maintenance activities)
   B. Fiske Mill Dam, Ashuelot River and related updates
8. (11:40-11:50) – Presentation on American Eel study plan – *Corey Eddy (USFWS)*
9. (11:50-12:00) – Public Comment
10. (12:00) – Other Business

CRASC Adopted Management Plans: American Eel (2023), American Shad and Fish Passage Addendum (2017; 2022), Sea Lamprey (2018), River Herring (2004). Future Plan updates or new plan(s); River Herring and Habitat.

Connecticut River Migratory Fish Restoration Cooperative

State of Vermont, State of New Hampshire, Commonwealth of Massachusetts, State of Connecticut
U. S. Fish and Wildlife Service and National Oceanic and Atmospheric Administration Fisheries

Cooperative Members:

CTDEEP:
Peter Aarrestad
CT Public Sector
Thomas Chrosniak
MADFW:
Mark Tisa
Todd Richards (Alt.)
MA Public:
Andrew Fisk
NHFG:
Scott Mason
John Magee (Alt.)
NH Public:
Scott Decker
NMFS:
Michael Pentony
Christopher Boelke (Alt.)
VTFW:
Christopher Herrick
Eric Palmer (Alt.)
VT Public:
David Deen
USFWS:
Wendi Weber
Rick Jacobson (Alt.)
Restoration Coordinator:
Kenneth Sprankle

Technical Committee:

CTDEEP:
Tim Wildman
MADFW:
Rebecca Quinones
VTFW:
Chair, Lael Will
MADMF:
Joe Holbeche
NHFG:
Matthew Carpenter
NMFS:
Bill McDavitt
USFS:
Vacant
USGS:
Brett Towler
USFWS:
Kenneth Sprankle

DATE: February 15, 2024

TO: Cooperative members, Technical Committee members and advisors, and other interested parties

FROM: Kenneth Sprankle, Restoration Coordinator

SUBJECT: Cooperative Meeting Agenda

A Connecticut River Atlantic Salmon Commission **Technical Committee** meeting is scheduled for **February 15, 2024, from 10:00 -12:30 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) to be added to the "invite list" for that application/system. I do not need responses for invite list from any Cooperative members or people identified in below agenda. Please confirm any planned participation as either "in person" or "remote via teams".

Agenda

1. 10:00-10:10 Call to order, introductions, agenda review (*Eric Palmer*)
2. 10:10-10:20 **Decisional:** Determine Cooperatives Officer positions (*Eric*)
3. 10:20-10:35 Status of CRASC FY23 Funds and projects (*Ken Sprankle*)
   a. Review Tech Committee updated project needs list
   b. **Decisional**: Determine use(s) of unallocated $110,000 FY23 funds
4. 10:35-11:20 Technical Committee Report summaries (*Lael Will and Ken*)
   a. Fishway counts summaries and statistics for 2023
   b. River Herring
      i. **Decisional:** Authorize a letter to NEFMC Atlantic Herring Committee on its draft Amendment 10, in its Scoping Process
   c. American Shad
   d. Habitat
   e. Sturgeon
   f. Fish Passage
   g. American Eel
   h. Sea Lamprey
5. 11:20-11:55 Connecticut River Angler Survey preliminary results for 2023 and plans for 2024 (*Brian Keleher - MADFW and Aliki Fournier - CRC*)
6. 11:55-12:05 Conte Laboratory research updates (*Brett Towler*)
   a. Update on 2023 research projects at Conte
   b. Summary and status of 2024 studies
   c. Annual mechanism to identify Cooperative's research priorities for USGS Eastern Ecological Center and Conte Laboratory
7. 12:05-12:20 Report on status of Special Resources Study per CRASC FY23 (*Liz Willey and Mike Slattery - USFWS*)
8. 12:20-12:30 Outreach activities for the Coop in 2024 (*Ken, Aliki, others*)
9. 12:30-12:35 Other business
10. 12:35-12:40 Public comment period

Approved management plans on following page-

Connecticut River Migratory Fish Restoration Cooperative

State of Vermont, State of New Hampshire, Commonwealth of Massachusetts, State of Connecticut
U. S. Fish and Wildlife Service and National Oceanic and Atmospheric Administration Fisheries and Public Members

Cooperative Members:

CTDEEP:
Peter Aarrestad
CT Public Sector
Thomas Chrosniak
MADFW:
Mark Tisa
Todd Richards (Vice Chair)
MA Public:
Andrew Fisk (Chair)
NHFG:
Scott Mason
John Magee (Alt.)
NH Public:
Scott Decker
NMFS:
Michael Pentony
Christopher Boelke (Alt.)
VTFW:
Christopher Herrick
Eric Palmer (Alt.)
VT Public:
David Deen
USFWS:
Wendi Weber
Rick Jacobson (Alt.)
Restoration Coordinator:
Kenneth Sprankle

Technical Committee:

CTDEEP:
Tim Wildman
MADFW:
Steven Mattocks
VTFW:
Chair, Lael Will
MADMF:
Joe Holbeche
NHFG:
Matthew Carpenter
NMFS:
Bill McDavitt
USGS:
Brett Towler
USFWS:
Kenneth Sprankle

DATE: June 18, 2024

TO: Cooperative members, Technical Committee members and advisors, and other interested parties

FROM: Kenneth Sprankle, Restoration Coordinator

SUBJECT: Cooperative Meeting Agenda

A Connecticut River Migratory Fish Restoration Cooperative meeting is scheduled for **June 18, 2024, from 10:00 -12:30 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) to be added to the "invite list" for that application/system. I do not need responses for invite list from any Cooperative members or people identified in below agenda. Please confirm any planned participation as either "in person" or "remote via teams".

Agenda

1. 10:00-10:10 Call to order, introductions, agenda review, February 15, 2024 meeting notes review (*Todd Richards*)
2. 10:10-10:25 **Informational** Status of CRASC FY23 Funds and projects (*Ken Sprankle*)
3. 10:25-10:40 **Decisional:** Review, discuss and approve draft funding priorities plan for the use of the FY24 Federal funds. (*All*)
4. 10:40 – 10:55 **Informational** Review process for submission of funding projects and estimated timeframes for making decisions (*Todd Richards*)
5. 10:55 -11:20 Technical Committee Report summaries (*Ken for Lael Will*)
    a. Fishway counts summaries and statistics for 2024
    b. River Herring
    c. American Shad
    d. Habitat
    e. Sturgeon
    f. Fish Passage
    g. American Eel
    h. Sea Lamprey
6. 11:20-11:30 Presentation on 2024-2025 River Herring Migration and Movement Study (*Ken*)
7. 11:30-11:40 Report on status of Special Resources Study per CRASC FY23 (*Liz Willey*)
8. 11:40-11:50 Outreach activities for the Coop in 2024 (*Aliki Fornier- CRC grant, others*)
9. 11:50-11:55 Other business, Fall meeting date options 11/12, 11/13, 11/14, 11/19, 11/20…
10. 11:55-12:10 Public comment period

Approved management plans on following page-

Connecticut River Migratory Fish Restoration Cooperative

State of Vermont, State of New Hampshire, Commonwealth of Massachusetts, State of Connecticut
U. S. Fish and Wildlife Service and National Marine Fisheries Service

Cooperative Members:

CTDEEP:
Peter Aarrestad
CT Public Sector
Thomas Chrosniak
MADFW:
Mark Tisa
Todd Richards (Alt.)
MA Public:
Andrew Fisk
NHFG:
Scott Mason
John Magee (Alt.)
NH Public:
Scott Decker
NMFS:
Michael Pentony
Christopher Boelke (Alt.)
VTFW:
Christopher Herrick
Eric Palmer (Alt.)
VT Public:
David Deen
USFWS:
Wendi Weber
Rick Jacobson (Alt.)
Restoration Coordinator:
Kenneth Sprankle

Technical Committee:

CTDEEP:
Tim Wildman
MADFW:
Rebecca Quinones
VTFW:
Chair, Lael Will
MADMF:
Joe Holbeche
NHFG:
Matthew Carpenter
NMFS:
Bill McDavitt
USFS:
Vacant
USGS:
Brett Towler
USFWS:
Kenneth Sprankle

DATE: January 17, 2024

TO: Cooperative members, Technical Committee members and advisors, and other interested parties

FROM: Kenneth Sprankle, Restoration Coordinator

SUBJECT: Technical Committee Draft Meeting Agenda

A Connecticut River Atlantic Salmon Commission **Technical Committee** meeting is scheduled for **January 17, 2024, from 10:00 -12:30 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) to be added to the "invite list" for that application/system. I do not need responses for invite list from any Cooperative members or people identified in below agenda. Please confirm any planned participation as either "in person" or "remote via teams".

Agenda

1. 10:00-10:10 Call to order, introductions, agenda review (*Lael Will*)
2. 10:10-10:20 Review Subcommittee team memberships (*Lael*)
3. 10:20-10:30 Review of 2023 final fishway count (*Ken*)
4. 10:30-10:45 Technical Committee 2024 Project List (*Ken*)
   A. Updates on FY23 CRASC fund status for projects
5. 10:45-11:05 Habitat Subcommittee (*Corey Eddy, Bill McDavitt*)
   A. GIS development for anadromous fishes, barriers, related data layers
   B. Cooperative's Anadromous Fish Priority Habitat Plan
6. 11:05-11:25 River Herring Subcommittee (*Kevin Job, Ken*)
   A. USFWS Spawning Stock Assessment, summary data for 2023
   B. 2024 Alewife and Blueback Herring Migration and Movement Study (CTDEEP, USGS, USFWS).
   C. River Herring bycatch management updates for New England Fishery Mngt Council
7. 11:25-11:35 Sturgeon Subcommittee (*Micah Kieffer*)
   A. Holyoke Gas and Electric Study on adult SNS upstream movements.
   B. Summary of other in-river sturgeon research plans (CTDEEP, USGS).
8. 11:35-11:55 Fish Passage (Melissa Grader)
   A. Mainstem project updates
   B. Tributary project updates
9. 11:55-12:15 Conte Laboratory research updates (*Brett Towler*)
   A. Update on 2023 research projects at Conte
   B. Summary and status of 2024 studies
   C. Annual mechanism to identify Cooperative's research priorities for EEC and Conte
10. 12:15-12:25 Other Subcommittee updates (*Corey, Rebecca Quinones*)
    A. American Eel – age and growth study
    B. Sea Lamprey – 2024 planning
    C. American Shad – research paper
11. 12:25 Other business

Connecticut River Migratory Fish Restoration Cooperative

State of Vermont, State of New Hampshire, Commonwealth of Massachusetts, State of Connecticut
U. S. Fish and Wildlife Service and National Marine Fisheries Service and Public Members

DATE: June 7, 2024

TO: Cooperative members, Technical Committee members and advisors, and other interested parties

FROM: Kenneth Sprankle, Restoration Coordinator

SUBJECT: Technical Committee Draft Meeting Agenda

A Connecticut River Atlantic Salmon Commission **Technical Committee** meeting is scheduled for **June 7, 2024, from 10:00 -12:30 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) to be added to the "invite list" for that application/system. I do not need responses for invite list from any Cooperative members or people identified in below agenda. Please confirm any planned participation as either "in person" or "remote via teams".

Agenda

1. 10:00-10:10 Call to order, introductions, agenda review, review of January TC project list for additional funds (*Lael Will, Chair)*
2. 10:10-10:30 Review fishway count data (*Ken Sprankle*)
   A. USFWS Fish Passage Engineer Fishway inspections (*Jessica Pica*)
3. 10:30-10:40 CRASC funded 2024 Projects and Activities updates (*Ken*)
4. 10:40-10:50 Fish Passage Subcommittee (*Melissa Grader, Bill McDavitt*)
   A. Mainstem project updates
   B. Tributary project updates
5. 10:50-11:15 River Herring Subcommittee (*Kevin Job, Ken*)
   A. USFWS Spawning Stock Assessment, preliminary data / results
   B. 2024 Alewife and Blueback Herring Migration and Movement Study (CTDEEP, USGS, USFWS) progress to date – presentation.
   C. Update on New England Fishery Management Council's – Atlantic Herring Committee Amendment 10 Scoping Process relative to river herring bycatch
   D. Update on Atlantic States Marine Fisheries Commissions River Herring Benchmark Stock Assessment Report.
6. 11:15-11:35 Sturgeon Subcommittee (*Micah Kieffer*)
   A. 2024 Sturgeon Movement-Passage Study Plans for Holyoke Fish Lifts
   B. Summary of other in-river sturgeon research activities (CTDEEP, USGS).
7. 11:35-11:45 Habitat Subcommittee (*Corey Eddy, Bill McDavitt*)
8. 11:45-12:00 Conte Laboratory research priorities (*Brett Towler*)
9. 12:00-12:10 Other Subcommittee updates (*Corey Eddy, Lael*)
   A. American Eel – age and growth study
   B. Sea Lamprey – 2024 Planned activities (eDNA, nest surveys)
10. 12:10 Other business

Cooperative Members:

CTDEEP:
Peter Aarrestad
CT Public Sector
Thomas Chrosniak
MADFW:
Mark Tisa
Todd Richards (Alt.)
MA Public:
Andrew Fisk
NHFG:
Scott Mason
John Magee (Alt.)
NH Public:
Scott Decker
NMFS:
Michael Pentony
Christopher Boelke (Alt.)
VTFW:
Christopher Herrick
Eric Palmer (Alt.)
VT Public:
David Deen
USFWS:
Wendi Weber
Rick Jacobson (Alt.)
Restoration Coordinator:
Kenneth Sprankle

Technical Committee:

CTDEEP:
Tim Wildman
MADFW:
Steven Mattock interim
VTFW:
Chair, Lael Will
MADMF:
Joe Holbeche
NHFG:
Matthew Carpenter
NMFS:
Bill McDavitt
USGS:
Brett Towler
USFWS:
Kenneth Sprankle

Appendix B.

Letter submitted by the Cooperative to the New England Fishery Management Council on Amendment 10 Scoping for Atlantic Herring Fishery.

Connecticut River Migratory Fish Restoration Cooperative

Vermont Department of Fish and Wildlife, New Hampshire Fish and Game Department,
Massachusetts Division of Fisheries and Wildlife, Connecticut Department of Energy and Environmental Protection
U. S. Fish and Wildlife Service and National Oceanic and Atmospheric Administration Fisheries

April 17, 2024

Cate O'Keefe, Ph.D.
Executive Director
New England Fishery Management Council
50 Water Street, Mill#2
Newburyport, MA 01950

RE: Atlantic Herring Amendment 10 Scoping Comments

Dear Director O'Keefe,

This letter was developed by the Connecticut River Migratory Fish Restoration Cooperative (Cooperative) which serves as a non-regulatory forum for state and federal fish and wildlife agencies and public members to coordinate interstate migratory fishery management, restoration, and research programs in the Connecticut River watershed. The Cooperative was formed to replace the Connecticut River Atlantic Salmon Commission whose federal authorization expired in 2023.

The testimony and recommendations herein are submitted on behalf of the Cooperative member agencies U.S. Fish and Wildlife Service, CT Department of Energy & Environmental Protection, New Hampshire Fish & Game, Vermont Fish & Wildlife as well as public members representing all four watershed states. NOAA Fisheries abstained from the vote by the Cooperative on the motion to develop this letter and any recommendations on Amendment 10 given its role on the New England Fishery Management Council, and in the approval process for any action on behalf of the Secretary of Commerce. NOAA Fisheries was not involved in this letter development, review or any other aspect and it is not a signatory. The Massachusetts Division of Marine Fisheries, which is represented on the Cooperative's Technical Committee will be submitting a separate letter on behalf of the Commonwealth and is not a signatory here.

Signatories present four recommendations that taken together will significantly advance restoration of the severely depleted runs of river herring in southern New England. They are:

- Time & area closures,
- Annual scaling of river herring & shad bycatch quota allowance based on allowed Atlantic herring quota,
- Develop a southern New England (SNE) nearshore river herring bycatch sub-area for Atlantic herring Area 2, and
- Port-side monitoring

River herring restoration in the Connecticut River watershed, the largest river basin in New England, is a priority focus of the Cooperative, as was the case with the CRASC and its predecessor fishery organizations created in 1967. These fish are listed as Species of Greatest Conservation Need in the State Wildlife Action Plans in all four Connecticut River basin states and Rhode Island. The Cooperative's current implementation strategies identified in the 2004 Management Plan for River Herring in the Connecticut River basin seek to achieve and sustain annual passage of 300,000 to 500,000 adults at the Holyoke Fish Passage facility. This is the first mainstem location at which to count returning adults.

However, as shown in Figure 1, the annual passage counts have never recovered from the declines that started in the mid-1990s. Runs that were routinely between 300,000 and 600,000 adults have plummeted to less than a few thousand for the last two decades. These dramatic declines necessitated the full statewide closure of river herring fisheries, first by Connecticut in 2002 followed by Massachusetts in 2006. Similar closures are in place in Rhode Island. Due to lack of recovery, these fisheries have never reopened.

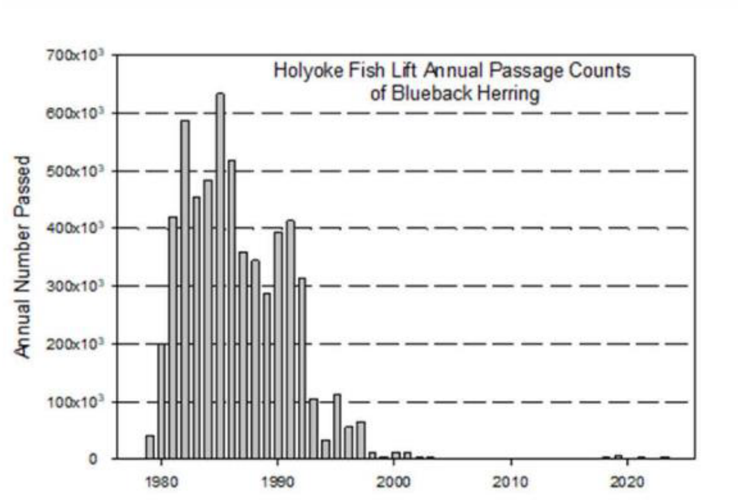


Figure 1. Annual count of Blueback Herring passed at the Holyoke Fish Lift (USFWS, Connecticut River Coordinator's Office).

The state and federal fisheries agencies, non-governmental organizations, and local governments have spent tens of millions of dollars since 2000 to open historic river herring habitat with fishways and dam removals across southern New England. Additionally, the hydroelectric power industry has spent tens of millions more to improve up and downstream passage at hydropower facilities. To supplement the restoration of these newly connected habitats, state and federal agencies have stocked hundreds of thousands of river herring across southern New England through trap and truck fish restoration programs since the late 1990's. River herring run data from this region show a lack of progress and oddly timed dips in adult spawning returns when considering young-of-year outmigrant abundances and environmental conditions.

We find the continuing trend of returns particularly disheartening given all of the resources and actions taken by agencies, organizations, and the public over the last twenty years, while viable, proven and reasonable management actions remain undone.

Recommendation 1-

The Cooperative recommends implementation of time and area closures in Herring Area 2, particularly in waters closest to the coastline of Southern New England (SNE) and Long Island, New York and also in the Cape Cod River Herring and Shad Bycatch Cap Area as a sub area of Herring Area 3.

The rationale and benefits afforded to SNE river herring restoration due to time and area closures are well described in two recent peer reviewed scientific publications. These publications build upon numerous other published work on these topics. The data and analyses clearly demonstrate that bycatch is a significant source of the problem.

Reid et al. (2022) states, "*Total Alewife mortality from 2012 to 2015 was estimated at 4.6 million fish within the focal region.[*an area defined in the study as the nearshore SNE waters between Montauk Point NY and Marthas Vineyard; including all of Block Island Sound*]....Within the reporting groups that represent rivers in SNE, the highest bycatch numbers came from Block Island Sound, Nantucket, and Long Island Sound....We used high resolution genetic reference datasets to determine the origins of river herring caught as bycatch in the Atlantic Herring and mackerel fisheries and found that bycatch was an important source of mortality for alewife and blueback herring originating from rivers within the Middle Atlantic and SNE.*"

There are verified and defensible tools to successfully implement reasonable closures that are appropriately dynamic and responsive to the needs of all stakeholders.

This is described inter alia in the Roberts et al. (2023) paper. Their river herring bycatch model was developed to "*integrate a species co-occurrence model with oceanographic forecasts to generate a subseasonal forecast*" that has been repeatedly stated as the tool to successfully and accurately determine the duration and location of closure areas. Roberts et al. states, "*If integrated into a potential decision support tool for fishers, this model could be updated weekly based on environmental conditions and adapted to the target/bycatch species of interest. This could allow commercial fishers to identify areas to avoid in order to decrease the likelihood in a highly variable environment or allow managers to close certain areas for short period of time, providing a 1-week lag time for preparation.*" The authors state, "*[O]our analyses demonstrates that subseasonal forecasts can be used to predict fisheries bycatch, and could be integrated into fisheries management to mediate target/bycatch species interactions and thus improve decision-making in a dynamic spatial management context.*"

There are a number of additional peer reviewed publications that have studied or reported the magnitude, frequency, geographic area, and sources of river herring bycatch in the Atlantic Herring fishery which all provide support for updating the outdated basis for the existing river herring bycatch caps (Didden 2021; Turner et al. 2017; Bethoney et al. 2017; Bethoney et al. 2014). For example, a paper by Hasselman et al. (2016), titled "Genetic stock composition of marine bycatch reveals disproportionate impacts on depleted river herring genetic stocks" provided earlier information to act upon before the more advanced Reid et al. (2022) paper.

<u>We know that time and area closures work. They are in place now in the Gulf of Maine and those runs are increasing.</u>

Similar scale restoration measures and efforts have occurred in river herring systems of the Gulf of Maine, where management responses are consistently shown in increased runs sizes (https://www.maine.gov/dmr/fisheries/sea-run-fisheries/programs-and-projects/trap-count-statistics). These numerous examples of increasing runs sizes are leading to re-opening plans for river herring fisheries that benefit the public and their local communities; ecologically, socially, recreationally, and commercially (https://www.asmfc.org/files/RiverHerringSFMPs/Maine_RiverHerringSFMP2020_w_Addendum.pdf).

In southern New England Area 2 Atlantic herring fishing pressure typically peaks from December through March and is often prosecuted very close to shore. These are both times of year and locations where returning river herring and shad are likely to be present (Reid et al. 2022). In contrast, the 1A

Atlantic herring management Area, covering Cape Cod Bay and the Gulf of Maine, does not permit any landings of Atlantic herring until after June 1. The Atlantic States Marine Fisheries Commission reports in this region that an average of 73% of the Atlantic herring quota occurred in the months of June to September and 27% in months of October to December for the inclusive period of 2020-2023. This 5-month Area 1A closure extends from the three-mile line to approximately 45 miles offshore. In addition, the 1A Area does not allow any midwater trawling from June 1 to September 30, and further limits that gear to three months total use in a calendar year.

There is also a very striking difference between the annual river herring and shad catch caps among these areas, with the Gulf of Maine bycatch cap, solely for midwater trawl, set at 76.7 metric tons or 21% of the total cap. The bycatch cap volume for SNE which includes both bottom trawl and midwater trawl totals 251.9 mt, which 70% of the total river herring/shad bycatch cap for the Atlantic Herring fishery management plan. While these two Atlantic Herring management areas are of differing total geographic size, the known and documented areas of fishery pressure and activity occur in comparably sized areas off SNE and in the New York Bight.

We see further urgency in the need for these actions because the 75% of the river herring/shad catch cap landings since this program's implementation in 2014 have been landed in Area 2 (Table 1). This is where the greater impact on river herring runs has been occurring.

Table 1. River herring/shad catch cap landings in metric tons, by catch cap area 2014-2023 (NOAA Fisheries).

Year	Southern New England	Cape Cod	Gulf of Maine
2014	27.1	0	0
2015	164.7	.7	11.1
2016	95.6	12.1	.1
2017	63.7	27.1	1.9
2018	168.9	65.1	.5
2019	135.2	19.4	24.7
2020	7.7*	3.7	30.2
2021	.7*	0*	.1*
2022	.5*	0*	5.2
2023	42.7	31.1	3.1
Total:	**706.8 mt**	**159.2 mt**	**76.9 mt**
Percentage:	**75%**	**17%**	**8%**

*Percent observer coverage of Atlantic herring trips qualifying for river herring/shad catch caps reported as 0% by NEFMC (Figure 2 below). Reasons given for low observer coverage were COVID-19 waivers, low observer retention, lack of funding, and delayed implementation of Industry Funded Monitoring program.

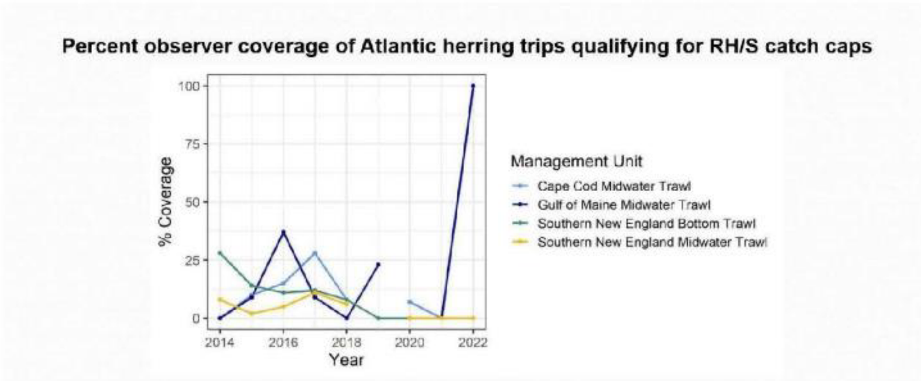


Figure 2. Percent observer coverage of Atlantic herring trips qualifying for river herring/shad catch caps (NEFMC 2023).

<u>Recommendation 2-</u>

The Cooperative recommends management measures to annually scale the river herring/shad bycatch quota allowance based on the allowed Atlantic Herring quota.

The size of the river herring/shad bycatch quota in Area 2 is unnecessarily large, both in absolute terms and relative to the size of the Atlantic herring quota. This excessive bycatch cap allows for a far greater take of river herring/shad than is biologically supportable. An additional reasonable and appropriate action is to annually scale the amount of river herring/shad bycatch to the Atlantic herring quota.

This type of action is not unique and is clearly prescribed in Standard 9 of the management guidance provided to Councils in the Magnuson-Stevens Act. There are numerous elements that lend strong support to regulating bycatch. Several are highlighted below for emphasis:

(a) *Standard 9.* Conservation and management measures shall, to the extent practicable:

(1) Minimize bycatch; and

(2) To the extent bycatch cannot be avoided, minimize the mortality of such bycatch.

(c) *Definition—Bycatch.* The term "bycatch" means fish that are harvested in a fishery, but that are not sold or kept for personal use.

(3) *Select measures that, to the extent practicable, will minimize bycatch and bycatch mortality.* The Councils should adhere to the precautionary approach found in the Food and Agriculture Organization of the United Nations (FAO) Code of Conduct for Responsible Fisheries (Article 6.5), which is available from the Director, Publications Division, FAO, Viale delle Terme diCaracalla, 00100 Rome, Italy, when faced with uncertainty concerning any of the factors listed in this paragraph (d)(3).

(4) *Monitor selected management measures.* Effects of implemented measures should be evaluated routinely. Monitoring systems should be established prior to fishing under the selected management measures. Where applicable, plans should be developed and coordinated with industry and other concerned organizations to identify opportunities for cooperative data collection, coordination of data management for cost efficiency, and avoidance of duplicative effort.

The Middle Atlantic Fishery Management Council's annual scaling of shad/river herring bycatch based on the varying annual allowed mackerel quotas is a good example of how this management action lines up with the Standard 9 guidance.

The static bycatch cap in SNE Herring Area 2 has created the nonsensical circumstance of increased take of river herring/shad even while the overall Atlantic Herring quote has been reduced. Even with the greatly reduced Atlantic Herring quotas in 2024, the near shore Cape Cod Midwater Trawl Management Area quickly reached the river herring bycatch cap of 33 mt (triggering a sub-area closure on Jan 23, 2024) before approaching the Atlantic Herring quota set for the larger Area 3 (see Figure 3 below), given the focus of fishing pressure close to shore.

Catch Cap	Quota (mt)	Cumulative Catch (mt)	Percent Quota Caught
Cape Cod Mid-water Trawl	32.4	36.3	112%
Gulf of Maine Mid-water Trawl	76.7	0.0	0%
Southern New England Bottom Trawl	122.3	0.0	0%
Southern New England Mid-water Trawl	129.6	0.0	0%

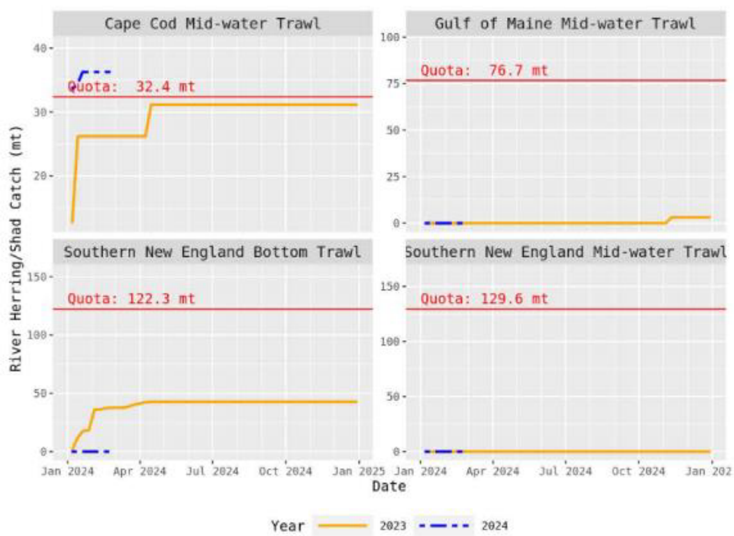


Figure 3. NOAA River Herring Quota Monitoring, Cape Cod Mid Water Trawl data shown in top left panel.

Recommendation 3-

The Cooperative recommends development of a near shore river herring bycatch sub-area, for SNE Area 2 of the Atlantic Herring Fishery.

As with other examples we have noted, this is not a unique management action. A nearshore sub-area would be consistent with the Cape Cod bycatch sub-area in Area 3 of the Atlantic Herring Fishery. This would set a lower threshold of "acceptable" bycatch rather than being lumped into the full Area 2 dimensions. The boundaries of this sub-area would contain documented areas of high river herring bycatch, with an understanding of their origins, based in past published data and would not be a substitute for time and area closures in Recommendation 1 but would complement that measure.

The rationale for this need and benefit to SNE river herring restoration, as well as the science-based tool to use, is well described in two recent peer reviewed scientific publications (Roberts et al. 2023; Reid et al. 2022). Without acknowledging the fact that the nearshore SNE area of Area 2 has been documented to both be a primary source of bycatch triggers (or approaching that level) and composed of a higher proportion of SNE river herring stocks, the current river herring and shad bycatch quota has the potential to remove 251.9 mt, or 70% of the total cap for the fishery management plan. This level of bycatch can occur, at this time, all within a potentially small sub-area of Area 2, known to be an area of concern for any sources of "non-natural mortality," resulting in closed river herring fisheries. There is no control for the spatial implications of river herring bycatch described in Reid et al. (2022).

Recommendation 4-

The Cooperative recommends port-side sampling for monitoring to supplement on-board observers as a more cost-effective bycatch monitoring tool.

This cost-effective management action will improve the precision of estimates and allow for on-going evaluation of new and dynamic management actions. Dynamic management based on valid data benefits all stakeholders and creates a fair and appropriate framework for river herring restoration.

Currently it is clear that the sole use of on-board fishery observers is not allowing for sufficient data to obtain the desired coefficient of variability (CV) of under 30% in NOAA's Standardized Bycatch Reporting Methodology (SBRM). Supplemental port-side monitoring program will efficiently and cost-effectively create more accurate data and also help benefit commercial fishers in evaluations and bycatch estimate confidence. Published estimates of bycatch and rates by year, area and gear have shown some wide-ranging values relative to the targeted CV goal, as presented in the memo dated April 3, 2023, by Herring Plan Development Team to the Herring Committee (see yellow highlighting, Table 2 below).

Table 2. River Herring and Shad catch cap performance summary as provided in the April 7, 2023, Herring Plan Development Team memo to the Herring Committee.

Table 1. River Herring/Shad Catch Cap Performance, 2015-2023[1]

Catch Cap	Year	Permit Count	Trip Count	RHS Catch Rate[2]	Est. RHS (mt)	Herring (mt)	Mackerel (mt)	KALL (mt)	Inseason RHS Catch Rate[3]	Observed Trips	CV[4]	Coverage Percent
	2015	13	55	0.0014	12.5	3,564	4,591	8,739	0.0016	4	0.23	7.3%
	2016	13	55	0.0015	13.5	5,682	4,336	10,172	0.0015	13	0.68	23.6%
	2017	17	71	0.0033	39.5	6,477	5,780	12,472	0.0033	17	0.38	23.9%
	2018	12	57	0.0089	109.0	4,067	7,927	12,143	0.0101	4	0.34	7.0%
RHS Mackerel	2019	11	32	0.0135	91.7	2,780	3,973	6,756	C	C	C	C
	2020	15	94	0.0022	23.1	2,615	7,504	10,277	0.0022	6	0.59	6.4%
	2021	12	44	0.0006	3.4	1,335	4,904	6,387	0.0000	3	1.24	6.8%
	2022	9	14	0.0020	6.8	1,963	1,203	3,242	0.0020	8	0.37	57.1%
	2023	9	12	0.0120	26.3	1,372	815	2,186	C	C	C	C
	2015	11	70	0.0001	0.7	12,364	58	12,424	0.0001	7	0.81	10.0%
	2016	12	63	0.0018	17.8	7,786	121	7,909	0.0018	10	0.82	15.9%
	2017	12	54	0.0037	27.1	6,713	1,262	7,978	0.0037	15	0.44	27.8%
	2018	9	60	0.0075	66.6	8,642	265	8,912	0.0075	5	1.01	8.3%
RHS Herring: CC MW	2019	7	40	0.0066	21.1	3,218	2	3,220	C	C		C
	2020	6	45	0.0010	3.8	2,805	1,025	3,851	0.0000	3		6.7%
	2021	2	C	C	C	C	C	C	C	C		C
	2022											
	2023	6	9	0.0117	24.5	1,227	565	1,792	C	C		C
	2015	11	45	0.0017	11.3	6,378	220	6,598	0.0020	4	0.95	8.9%
	2016	10	44	0.0001	0.6	4,098	1,876	5,981	0.0001	17	0.48	38.6%
	2017	9	67	0.0002	1.9	9,166	2,236	11,402	0.0002	6	0.65	9.0%
	2018	6	25	0.0002	0.5	2,830	4	2,834				0.0%
RHS Herring: GOM MW	2019	5	13	0.0256	24.7	929	21	950	0.0290	3	0.62	23.1%
	2020	7	11	0.0203	33.5	1,615	193	1,808	C	C	C	C
	2021	4	5	0.0001	0.1	1,140	-	1,158				0.0%
	2022	7	7	0.0022	5.2	1,285	816	2,105	0.0022	7	0.00	100.0%
	2023											
	2015	11	140	0.0256	103.7	3,742	155	4,047	0.0256	20	0.25	14.3%
	2016	15	161	0.0134	55.1	3,525	378	4,142	0.0134	18	0.34	11.2%
	2017	10	83	0.0142	35.0	1,789	164	2,471	0.0142	10	0.71	12.0%
	2018	8	36	0.0225	48.4	846	1,247	2,128	0.0251	3	0.25	8.3%
RHS Herring: SNE BT	2019	3	10	0.0251	14.1	300	260	561				0.0%
	2020	5	19	0.0034	2.1	162	424	632				0.0%
	2021	4	24	0.0043	0.7	143	0	144	C	C	C	C
	2022	2	C	C	C	C	C	C	C	C	C	C
	2023	4	13	0.0165	3.5	149	59	207	0.0190	3	0.50	23.1%
	2015	15	126	0.0052	64.4	10,969	1,450	12,437	0.0065	3	0.12	2.4%
	2016	14	119	0.0045	43.1	9,345	125	9,657	0.0045	6	0.38	5.0%
	2017	10	38	0.0097	28.7	1,900	874	2,858	0.0108	4	0.48	10.5%
	2018	10	53	0.0146	135.1	6,077	3,084	9,284	0.0158	3	0.87	5.7%
RHS Herring: SNE MW	2019	11	37	0.0155	120.4	4,398	3,402	7,803	C	C	C	C
	2020	5	5	0.0153	5.2	100	236	343				
	2021											
	2022	1	C	C	C	C	C	C	C	C	C	C
	2023	1	C	C	C	C	C	C	C	C	C	C

Source: GARFO DMIS and OBDBS databases as of 2023-01-31

[1]2023 data are preliminary.

[2]RHS catch rate used to extrapolate RHS catch. Transition rates are used when < 5 observed trips occur within the catch cap year and are highlighted in grey.

[3]RHS catch rate of observed trips occurring within catch cap year. Rate will be different than RHS CATCH RATE column when transition rates were used.

[4]Coefficient of Variation (CV) of inseason observed trips.

"C" denotes confidential vessel activity information

As noted above in the discussion on Table 1, the data on bycatch in the three management areas seemed to indicate dramatic reductions in the three years 2020-2023. These declines were however confounded by the absence of any on-board observers, making the numbers irrelevant and subject to erroneous conclusions. Port-side monitoring were it in place would have generated valid data that would have improved our ability to successfully manage by-catch impacts to river herring.

Published studies have made statements regarding the level of observer coverage and monitoring on river herring bycatch in the Atlantic Herring Fishery. Bethoney et al. (2020) in the NOAA Bycatch reduction engineering program final report (NOAA Grant # NA17NMF-4720262) stated, "*Lower than anticipated at-sea observer levels resulted in limited cases with reliable bycatch data. This low sample size inhibited the creation and evaluation of the fishery-dependent habitat model, which had unreliable results.*" In Hare et al. (2022) the authors state, "*…efforts to continue to improve catch data are needed in commercial and recreational fisheries. Specifically, efforts to improve monitoring of catch and incidental catch are needed, including self-reporting, human observers, and electronic monitoring.*"

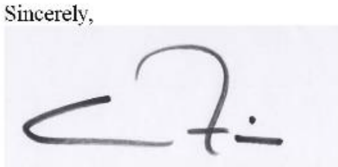
In further support of our recommendation for portside sampling Bethoney et al. (2020) states, *"Comparisons between trip-level river herring catch estimates from at-sea and portside data collected through unsorted subsamples revealed no significant differences between the methods (NEFMC)."*

Summary

The river herring populations of the southern New England coastline and Long Island, New York have been subjected to varying levels of bycatch mortality that is a serious and ongoing management concern for river herring restoration efforts. The cost to the public in closed river herring fisheries, loss of ecological function, impact to other commercial fisheries coupled with the many costly restoration measures mentioned earlier, must be considered as valid reasons to better regulate bycatch for the Atlantic Herring Fishery in southern New England. Current measures to set "bycatch caps" for river herring are now over a decade old, outdated, not biologically based, and not informed by the available science that provides clear direction for meaningful actions supported by the Magnuson Stevens Act.

We believe these recommendations constitute an appropriate, reasonable and demonstrably effective set of management actions that will significantly improve river herring populations. We appreciate the Council's efforts to engage the many stakeholders in the restoration of healthy and abundant runs of these important species.

Sincerely,



Andrew Fisk, Ph.D.
Northeast Regional Director, American Rivers
Chair & Public member, Massachusetts

Electronic copies:
Connecticut River Migratory Fish Restoration Cooperative members
CRMFRC, Technical Committee members

References

ASMFC (Atlantic States. Marine Fisheries Commission), 2017. River Herring Stock Assessment Update, Volume I: Coastwide Summary. 172 p. Arlington, VA.

Bethoney, N.D., Schondelmeier, B.P., Turner, S. M., O'Keefe, C., Hoffman, W.S. 2020. NOAA Bycatch reduction engineering program final report. NOAA Grant Number: NA17NMF4720262.

Bethoney, N.D., Schondelmeier, B.P., Kneebone, J., Hoffman, W.S., 2017. Bridges to best management: effects of a voluntary bycatch avoidance program in a mid-water trawl fishery. Mar. Pol. 83, 172–178.

Bethoney, N.D., Stokesbury, K.D., Schondelmeier, B.P., Hoffman, W.S., Armstrong, M.P. 2014 Characterization f river herring bycatch in the Northwest Atlantic midwater trawl fisheries. North American Journal of Fisheries Management 34:828-838.

Didden, J. 2021. River Herring and Shad Update. Mid-Atlantic Fishery Management Council. Dover. DE.

Hare, J.A., J.A., Borggaard, D.L., Alexander, M.A., Bailey, M.M., Bowden, A.A., Damon- Randall, K., Didden, J.T., Hasselman, D.J., Kerns, T., McCrary, R., McDermott, S., Nye, J.A., Pierce, J., Schultz, E.T., Scott, J.D., Starks, C., Sullivan, K., Beth Tooley, M., 2021. A review of river herring science in support of species conservation and ecosystem restoration. Mar. Coast. Fish. 13, 627–664.

Hasselman, D.J., Anderson, E.C., Argo, E.E., Bethoney, N.D., Gephard, S.R., Post, D.M., Schondelmeier, Schultz, T.F., Willis, T.V., Palkovacs, E.P., 2016. Genetic stock composition of marine bycatch reveals disproportional impacts on depleted river herring genetic stocks. Can. J. Fish. Aquat. Sci. 73, 951–963.

K.E. Roberts, J.E.F. Stepanuk, H. Kim, L.H. Thorne, C. Chong-Montenegro, J.A. Nye. 2023. Developing a subseasonal ecological forecast to reduce fisheries bycatch in the Northeast U.S.. Progress in Oceanography.

K Reid, J. Hoey, B. I. Gahagan, B. P. Schondelmeir, D. J. Hasselman, A. A. Bowden, M.P. Armstrong, J. C. Garza, and E. Palkovacs. 2022. Spatial and temporal genetic stock composition of river herring bycatch in southern New England Atlantic herring and mackerel fisheries. Canadian Journal of Fisheries and Aquatic Sciences.

Nelson, G. A., B. I. Gahagan, M. P. Armstrong, A. Jordaan, and A. Bowden. 2020. A life cycle simulation model for exploring causes of population change in Alewife. Ecological Modelling.

Turner, S. M., J. A. Hare, D. E. Richardson, and J. P. Manderson. 2017. Trends and Potential Drivers of Distribution Overlap of River Herring and Commercially Exploited Pelagic Marine Fishes on the Northeast U.S. Continental Shelf. Marine and Coastal Fisheries: Dynamics, Management, and Ecosystem Science. 9:13–22

Appendix C

Fishway Count Report produced by CTRFWCO for distribution and posted on the office web site.

Connecticut River Migratory Fish Restoration Cooperative

Connecticut River Basin Fishway Passage Counts

12/30/2024

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 http://www.fws.gov/r5crc for more information.

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		13,545								Mary Stuebe passed
Mary Steube, Mill-*CT*	final		27,415								
Mill Pond, Falls -*CT*	final		500								
Moulson Pond, Eightmile-*CT*	final		6	1			83				
Leesville, Salmon-*CT*	final						453				SL based nest counts
StanChem, Mattabesset-*CT*	final		642	4							
Rainbow, Farmington-*CT*	not operated										not operated
W. Springfield, Westfield-*MA*	final	4,544					2,803				
Holyoke, Connecticut-*MA*	final	433,009		723		18,687	57,186	458	73	28	
Easthampton, Manhan-*MA*											no counts
**Turners Falls-Gatehouse, Connecticut-*MA*	10/18	71,309					21,219				
Vernon, Connecticut-*VT*	7/2	50,938					10,552				
Bellows Falls, Connecticut-*VT*	na										was operated thru mid July
*Total to basin, only **first** barrier counts*		437,553	28,063	728	0	18,687	60,525	458	73	28	
Last year totals		279,840	8,026	2,228	0	11,039[A]	22,681	116	60	64	

* 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.

*** Partial Spillway Fish Ladder - 33,370 shad and 15,369 sea lamprey; Partial Cabot Station Ladder, base of canal, 33,275 shad and 9,345 sea lamprey - **NOTE not Final.** Note that at Turners Falls Project (Dam/Canal) fish must use one of these two fishways first before having the opportunity to pass the*

A - total collected from 3 eel ramp/traps at Holyoke in 2023

Appendix D

Brief 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 in 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 and 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 resource outcomes not commonly observed in many of the other large heavily dammed East Coast river basins.