CONNECTICUT RIVER BASIN DIADROMOUS FISH RESTORATION

Annual Progress Report
October 1, 2024 - September 30, 2025

U.S. Fish and Wildlife Service
Connecticut River Fish and Wildlife Conservation Office
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and
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Connecticut River Migratory Fish Restoration Cooperative
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Executive Summary

States: Connecticut, Massachusetts, New Hampshire, and Vermont

Project Title: Connecticut River Basin Diadromous Fish Restoration

Period Covered: October 1, 2024 - September 30, 2025

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. The data presented includes end of calendar year statistics, such as fishway counts for 2025.

Cover photo –Juvenile American Shad Assessment Project, USFWS, Gill, Massachusetts.

Objectives

- Coordinate the Connecticut River Migratory Fish Restoration Cooperative and its Technical Committee as a unified effort of State and Federal fishery agencies, public members, and a diverse array of partners.
- Provide technical assistance to the fishery agencies and other program cooperators (e.g., 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 Connecticut River Migratory Fish Restoration Cooperative (Cooperative) public meeting on 11/6/24 (Appendix A, agenda). The planned June 2025 meeting was canceled and their next meeting held in December.
- Organized and coordinated the Cooperative's Technical Meetings (public) on 10/22/24 and 6/10/25 (Appendix A, agendas).
- Developed Cooperative and Technical meeting agendas, meeting materials and reports, and provided reports and updates working with various members.
- Following the Cooperative's approved uses of FY24 Connecticut River funds from 11/6/24 meeting, worked (through June 2025) to develop and execute grant agreements for a number of different activities with the Connecticut River Conservancy, University of Massachusetts, and the USGS Conte Research Laboratory. Equipment purchases, as approved, were also completed (e.g., generator for MADFW and eDNA materials). Details on this can be found in the Cooperative's Report section.
- Organized and coordinated the Cooperative's Technical Committee Management and Research

Forum held on 2/25/25 in the USFWS Northeast Regional Office, Hadley, MA (Appendix B, agenda).

- Issued annual upstream and downstream fishway operations letters (March 2025) to main stem hydropower owner/operators and the Federal Energy Regulatory Commission (FERC).
- Coordinated with main stem power companies, state agency partners, and USFWS Fish Passage Engineer, Jessica Pica, to ensure fish passage facilities were operated as planned in 2025.
- Served as the USFWS and Connecticut River Migratory Fish Cooperative Steering Committee member to the Connecticut River Watershed Partnership, participating in meetings over the report period.
- The FY25 federal budget had $700,000 directed to USFWS to support the Connecticut River Cooperative. Worked to develop plans for use of these funds with Cooperative members that included a request for proposals (8/26/25), that were received by 9/26/25. Details on this follow in the Cooperative's Report section.
- Corey Eddy (CTRFWCO) served as co-Chair of the Cooperative's Habitat Subcommittee with Bill McDavitt (NOAA), organizing and running meetings through the year. Corey created a GIS map with agency anadromous fish data, barriers with details including fishways, and other attributes, coordinating with state agency members over the period (an example can be seen in Figure 1 and the map may be found through the following link https://fws.maps.arcgis.com/apps/instant/exhibit/index.html?appid=a429753165834e7685173a67a426ca20

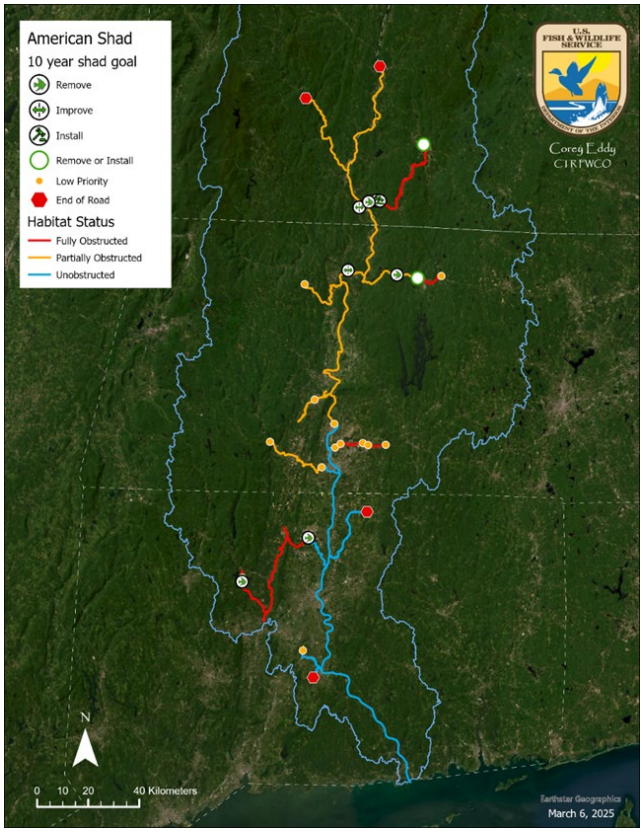


Figure 1. The current management range (unobstructed, partially and fully obstructed) for American Shad in the Connecticut River basin, from the GIS map. Barriers are shown as those needing improved passage, recommended for removal or passage installation, and as a low priority concern. More tabular information on barriers and locations is provided as attributes table in the GIS map and also in the plan document.

- A draft "Connecticut River Watershed Habitat Access Restoration Plan for Anadromous Fishes" was completed by the end of this report period and shared with the full Cooperative for their December 2025 Meeting.

Staffing

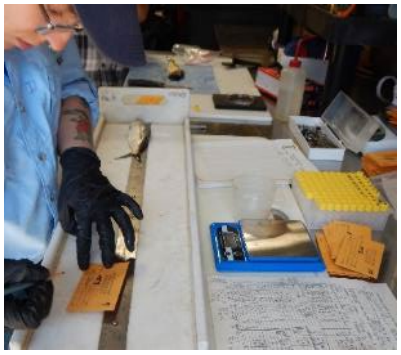
- Hired and managed two paid seasonal interns (Gab DeVito and Jordan Shea), using a grant agreement with Student Conservation Association, who worked full-time from April 1 through August 30, 2025.
- Completed a grant agreement with the Student Conservation Association in July 2025, to hire interns for the 2026 season, through approved use of FY24 Cooperative funds.
- Supervised one unpaid intern John McLaurin starting in July 2025, continuing into 2026.
- Darren Desmarias (Fishery Biologist) took the deferred retirement program offered by the Department of Interior in April 2025. He ceased working at the office in late April. However, that program guaranteed that he be paid through December 31, 2025, which is reflected in office budget accounting.
- Utilized Corey Eddy to assist in managing projects/activities, staff, volunteers, and partners.

Technical Assistance

- Served as the USFWS member to the ASMFC Shad and River Herring Technical Committee (TC), participating in meetings and working on a variety of TC activities over the course of the report year.
- Completed the Office's Annual Report for FY24, in January 2025 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 of the Holyoke Comprehensive Consultation Team (CCT), reviewed fish passage reports for 2024 season. Reviewed the 2025 Final Shortnose Sturgeon Upstream Passage Study Report and provided comments in coordination with other agency members.
- Conducted the annual spring adult river herring population assessment in the lower Connecticut River basin for the tenth year. Sampling occurred on 30 dates from 4/9/25 through 6/17/25. This is the highest number of sample dates since the start of this program in 2013. A total of 2,185 adult Blueback Herring were captured (a 2.5-fold increase from 2024) and processed on the boat with 234 Alewife also captured and processed (a 3.2-fold increase from 2024). Analyses will be provided later in the report and will account for sampling effort.



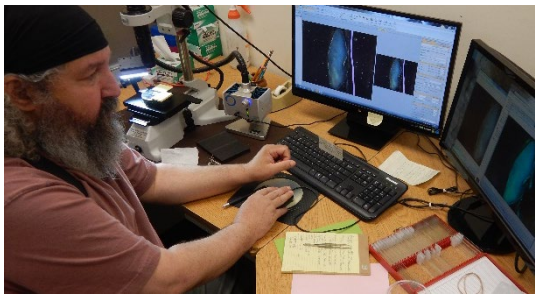
- A total of 1,419 Blueback Herring and 198 Alewife were subsampled from the field and processed in the laboratory the following day to confirm species identification, extract otoliths, obtain scales, and collect female ovary samples.
- Data from spring 2025 Adult River Herring Population Assessment Program were entered into spreadsheets and will be uploaded to the program database. Using entered data, catch-per-effort statistics, and other data on samples are presented later in this report.
- Scale samples from the laboratory-processed Blueback Herring and Alewife were cleaned and mounted on slides using the new approaches developed by Jackie Stephens (Stephens 2023). All scale samples were examined by microfiche projector for spawning history by two readers independently, with consensus reads for disagreements; analyses are covered later.
- Provided program information and requested data (e.g., fish counts) to cooperators, researchers,

power companies, and the public.

- Obtained target 60 American Shad sample from Holyoke Fish Lift, dissected, and prepared tissue samples for USFWS Fish Health examination, which is done annually.
- Our interns completed 17 environmental DNA sampling surveys, targeting location in New Hampshire and Vermont (e.g., Ammonoosuc, Passumpsic, Mascoma, Sugar, Ashuelot rivers) for the presence of American Eel and in some cases Sea Lamprey. Samples were sent to USFWS Northeast Fishery Genetics Laboratory for testing.
- Conducted the Juvenile American Shad Assessment Project in fall of 2024 and in 2025 with the federal government shutdown (10/1/25 through 11/13/25) limiting the 2025 assessment. Sampling was conducted 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 are provided later in this report.

Cooperative Research

- The cooperative river herring migration and movement research project, with CTDEEP Fisheries Division and USGS Conte Research Laboratory continued in 2025. River herring, acoustically tagged in spring 2024 (refer to 2024 annual report), were anticipated to return in spring 2025. The same suite of acoustic receivers was deployed in March 2025 (i.e., main stem Connecticut River, coves and tributaries, Brides Lake, and off the shoreline of Brides Brook in Long Island Sound). This project was worked on through the report period with greatest field intensity related to the preparation, deployment, and retrieval of receivers (July-August). Receivers were downloaded at CTRFWCO and data placed into databases system of partner researcher Aaron Heisey (Conte Laboratory). Data were uploaded to the Mid-Atlantic Acoustic Telemetry Observation System for data sharing: https://matos.asascience.com/project/detail/270
- Aaron Heisey (USGS Conte Lab study partner) presented some preliminary results of tagged fish movements at the Northeast Fish and Wildlife Conference in April 2025 (New Hampshire) . Aaron arranged meetings in the report period (e.g., CTDEEP, Conte Lab, CTRFWCO) to explain analytical approaches and framework for our first paper.
- 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) who defended in December 2024 and graduated in February 2025. Jackie continued to work with our office in the spring of 2025.
- Jackie completed the USGS Technical Report of her work on river herring scale reading for spawning marks and the analyses of our CTRFWCO river herring data: https://www.fws.gov/sites/default/files/documents/2025-05/css_main_168_stephens_etal_2025.pdf
  Stephens, J.B., A. Jordaan, D. Perkins, K. Sprankle, and A.H. Roy. 2025. Quality Assessment of Past Spawning Mark Estimations from a Long-Term Survey in the Connecticut River Watershed. U.S. Department of Interior, Fish and Wildlife Service, Cooperator Science Series FWS/CSS-168-2025, Washington, D.C. https://doi.org/10.3996/css36742600
- Corey Eddy continued to lead a research project for the American Eel Subcommittee, to determine the age and population size structure of juvenile eels using the Holyoke upstream eel passes; to determine parasitic swim bladder nematode metrics (e.g., number, weight); and determine the size, sex, and age structure of adult eel using the downstream bypass sampler at Holyoke in September 2023. He is supervising John McLaurin (volunteer starting in July



2025 to current, pictured here) on this project.

- Corey Eddy developed and ran new "R" package codes to further advance analyses of American Shad telemetry data collected in 2011 and 2012. Corey arranged meetings with cooperator Dr. Ted Castro-Santos on this project.
- Corey Eddy worked as a co-lead investigator with Dr. Alex Haro (USGS Conte Laboratory emeritus) on the documented distribution of American Eel in the Connecticut River basin and the development of a GIS map that includes data on barriers within these reaches (funded by FY24 Coop).

Outreach

- Presented Connecticut River Migratory Fish Status, Trends and current management and research activities to the Greenfield Community College Ecology class, on 10/28/25.
- Co-presenter at the Connecticut River Museum's "River Forum" on migratory fishes at Wesleyan University on 4/5/25.
- 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.
- CRC requested opportunity to develop a video on our river herring assessment project (field sampling portion) that was created and posted (August 2025) on their web site and on youtube: https://www.ctriver.org/post/river-herring-2025

Acknowledgements

Darren Desmarais, the single permanent Fishery Biologist for this office, took the deferred retirement program offered by the government in April 2025. Darren had worked over the past 25 years in several roles for USFWS Fisheries, including biologist at the Cronin Salmon Station (2000-2012) before being transferred to this office in 2012, with the conclusion of the Salmon Program. Darren's work and attention to detail made many office projects and tasks possible and well done, most notably the River Herring Assessment Project as well as other field and laboratory activities. We wish him 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. Corey Eddy CTR FWCO Fish Biologist, served in leadership roles with seasonals, volunteers, partners, Cooperative teams, and power company staff and had a dramatic impact on the quantity and quality of work accomplished. He led half of all field electrofishing (spring through fall) and related field activities with seasonals, volunteers, and partners and their scheduling. He led technical analyses of shad radio telemetry data gathered in 2011 and 2012 and coordinated working with USGS Research Biologist Dr. Ted Castro-Santos, developing new analytical approaches. He also led the Habitat Subcommittee and several research activities with Alex Haro and others as well as serving as the research SCUBA Field Diving Officer (diving led to the recovery of two acoustic receivers, otherwise lost). Elizabeth Evans, Administrative Assistant, managed many budget-related and other office management operation duties including 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 (M.S. UMass 2025), worked with our seasonals on trainings for scale preparation and reading, using her manual, and assisted with fieldwork. Gab DeVito and Jordan Shea, our two seasonal paid interns (Student Conservation Association), worked from April to August. Both Gab and Jordan were integral members of field and lab work, most notably completing the spawning history analyses.

The Connecticut River Conservancy's Kate Buckman and other CRC staff members provided ongoing staff support for activities over the course of the year, most notably in the fall after the seasonals terms ended. John McLaurin started volunteering for the office in July. Supervised by Corey Eddy, he has become proficient at mounting, staining, and reading American Eel otoliths. His work has advanced Corey's Cooperative Technical Committee's research project greatly. John's work for us continues into 2026 as he shifts to reading over 1,500 otoliths collected in our 2025 river herring assessment.

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
- Massachusetts: Steven Mattocks, Brian Keleher and Thornton Ritz
- New Hampshire: Matt Carpenter
- Vermont: Lael Will

Federal agencies –

- USFWS: Tim Warren, Jessica Pica, Jackie Stephens, Lisabeth Willey, Julie Butler, and Phil Herzig, Elizabeth Evans and Colleen Butler
- NOAA Fisheries: Bill McDavitt and Bjorn Lake
- USGS Conte Lab: Ted Castro-Santos, Aaron Heisey, Alex Haro, Brett Towler, and Micah Kieffer
- USGS Massachusetts Cooperative Fish and Wildlife Research Unit: Allison Roy
- University of Massachusetts, Amherst: Adrian Jordaan

Others-

- Sierra Humiston, Holyoke Gas and Electric
- Steve Leach, FirstLight Power
- Jennifer Griffin, Great River Hydro
- Don Pugh, Trout Unlimited

Connecticut River Migratory Fish Restoration Cooperative
Summary of Report Period Activities

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).

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 of the Connecticut River Atlantic Salmon Commission (CRASC) that ended in October 2023. The Cooperative consists of 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.

The Federal 2024 Omnibus Appropriations Bill included funding for the Cooperative, previously known as 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 reviewed and approved projects and activities for funding at their November 6, 2024 meeting. A wide range of projects, equipment, and funding for staff were supported, addressing priorities and needs of the Cooperative and covering relevant topics such as research, population assessment and monitoring, resource utilization, equipment needs, as well as public outreach and engagement (Table 1).

Table 1. List of projects, activities, equipment targeted for funding by the Cooperative 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**

Over the course of 2025, agreements were completed, staff funded, and equipment purchased for all approved and identified items in Table 1, with one exception. Without a reason being given, the submitted draft agreement (Assessing River Herring Habitat and Productivity) with the University of Massachusetts was denied at the Department of Interior level in May 2025. The denial was appealed with no success in June. As a result, two new proposals were submitted to the recently completed CRC grant agreement: 1) two paid interns, 5 months, for the CTRFWCO in 2026 and 2) an additional year of Vernon and Bellows Falls Fish ladder counts (for 2026 season). Both were approved by the Cooperative to utlize the remaining balance of FY24 funds.

The Federal 2025 Appropriations Bill included funding for the Cooperative, for a fourth year, with the same language, for the same amount $700,000. The Cooperative announced a request for proposals among the existing approved applicants for FY24 as well as among its member agencies in August 2025, with submissions due end of September to the Coordinator. A total of 9 submissions were received, as detailed in Table 2. The Technical Committee reviewed and developed its recommendations for the Cooperative in November 2025. The FY25 table provided includes the final funding decisions and adjusted amounts though it falls outside of the reporting period (approvals made on December 16, 2025 Cooperative Meeting).

Table 2. List of projects, activities, and equipment targeted for funding by the Cooperative utilizing FY25 Federal Budget appropriation of $700,000.

Activity	Location(s)	Request Amount	Approved Amounts*
Continue funding GS11 Fishery Biologist at CTRFWCO (Corey Eddy) for FY26	USFWS CTR FWCO	$120,000	$120,000
Blueback Herring hatchery culture for restoration evaluation and research	USFWS and UMass-USGS Coop Research Unit	$70,335	$70,000
eDNA laboratory equipment and supplies for VTDFW	VTDFW	$70,000	$70,000
Funding support for FWS GIS development with other species GIS data and monitoring projects and watershed partnership coordination	USFWS	$84,000	$20,000
Shortnose Sturgeon relative abundance, acoustic tagging/tracking, movements - Holyoke to TF Dam	Conte Research Lab	$60,902	$60,902
Continue CRC support for outreach, planning, citizen scientist, creel surveys, and shortnose sturgeon research using eDNA	Connecticut River Conservancy	$234,111	$197,631
Fishway Turning Pool Hydraulic Study	Conte Research Lab	$75,000	$75,000
Analysis and Pubklication of Critical Data on Swimming Performance of American Eel	UMass with USGS Conte Research Lab	$28,820	$28,820
Evaluation of small hydropower in the Connecticut River watershed in support of restoration and management goals	American Rivers	$93,975	$57,647
	Total	$837,143	$700,000
* Decisions on funding finalized at December 2025 Cooperative Meeting			

To obtain updates on any of approved and funded activities (cooperative agreements, purchases, other) please contact ken_sprankle@fws.gov.

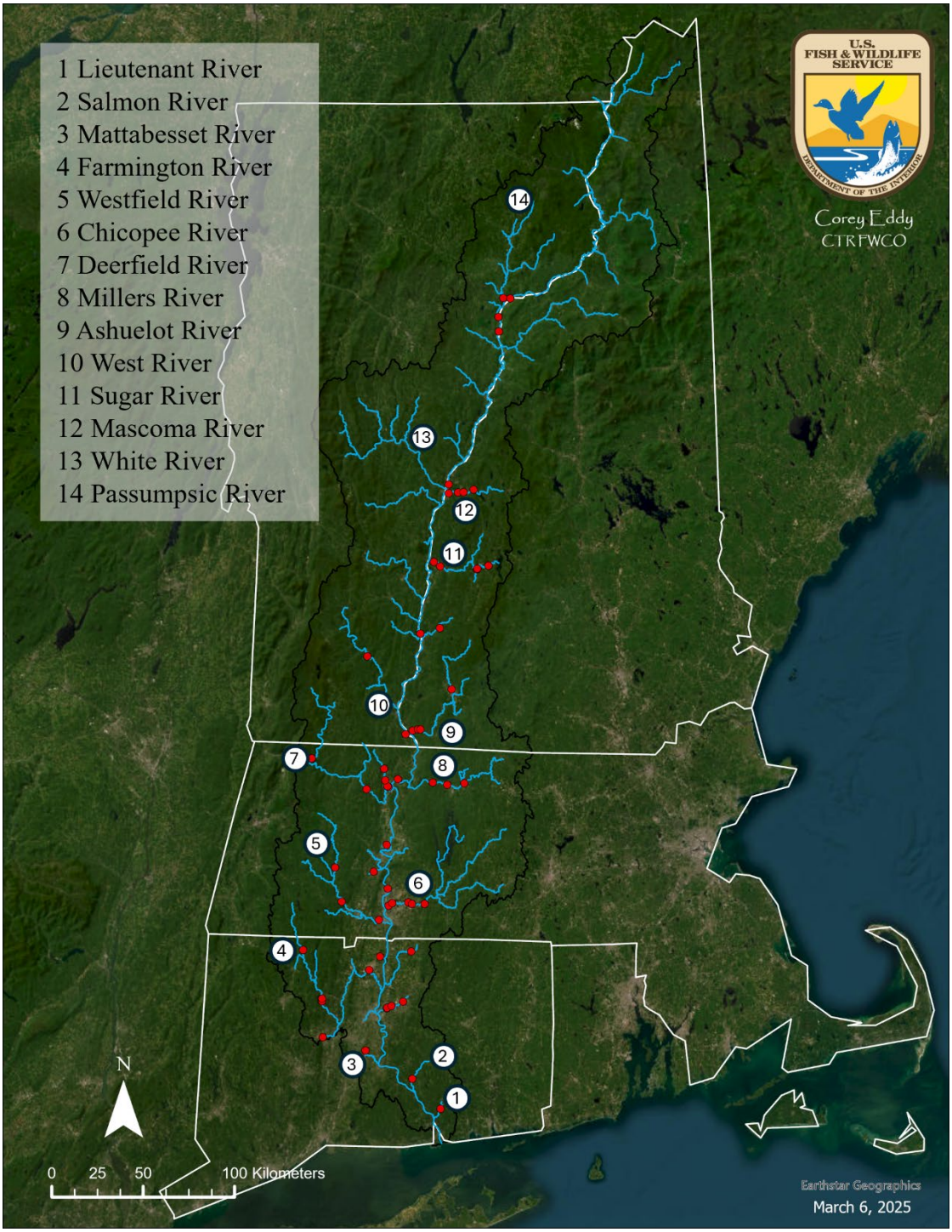


Figure 2. Connecticut River basin with select tributaries and dams, from the new GIS Anadromous Fish barrier and access map created in 2025: (https://fws.maps.arcgis.com/apps/instant/exhibit/index.html?appid=a429753165834e7685173a67a426ca20).

Coordination and Technical Assistance Funding

The Connecticut River Fish and Wildlife Conservation Office (CTRFWCO) receives $30,000 from the four state fishery agencies to help support the office's work using a Memorandum of Understanding. 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 $348,000 for FY25. In addition, the FY24 CRASC Federal Budget allocation of $700,000, that was placed in the CTRFWCO budget was used per the approved spending plan by the Cooperative (Table 1), including expenditures in this report period.

Table 3. Federal fiscal year 2025 (report period) funds utilized and administered by the CTRFWCO.

Station Base FWS Budget	Four State Agreement	CT River Program Federal Budget allocation	Total
$348,000	$24,590	$700,000	$1,072,590

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, and 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 data presented 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

River Herring Spawning Stock Assessment and Monitoring

In 2025 the adult population assessment program for river herring began on April 9, 2025, utilizing boat electrofishing as the sampling gear, for the 12th year of data (methods details in Sprankle and Desmarais 2018). Study objectives of the project include: 1) obtain a minimum whole fish sample of 80 Blueback Herring and Alewife for otoliths, scale samples and ovaries, 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.

Table 4. An annual summary of the CTRFWCO's river herring population assessment program's effort, catch, and laboratory processing total by species (2013-2025).

	2013	2014	2015	2016	2017	2018	2019	2021	2022	2023	2024	2025
Number of sample dates	18	21	20	25	26	23	27	25	28	28	28	30
Total sample runs	81	124	114	145	145	147	147	118	173	151	155	167
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	80,584
Total bluebacks captured	714	2,593	1,448	1,586	2,650	2,396	3,456	1,813	1,433	1,932	852	2,185
Total alewives captured	107	220	258	586	200	366	243	128	470	149	62	234
Blueback Herring otolith/scale – lab	501	655	622	730	1,192	991	1,473	929	903	1,094	682	1,419
Alewife otolith/scale - lab	103	188	165	461	190	284	217	114	356	141	61	198

In 2025 a record high 30 dates were sampled with a second highest number of sample runs and electrofishing seconds (Table 4). The high level of effort yielded improved overall catches compared to the very low catch rates documented in 2024. Relative abundance is best represented by our catch-per-effort metric that accounts for variable sampling effort among years, and is reported later.

Sampling was initiated on 4/9/25 in Wethersfield Cove, with a single Alewife sampled. Subsequent weekly sampling among locations through early April produced very few Alewife, in spite of good conditions (i.e., moderate flow, cool temperatures). Alewife catch rates improved in mid-April, notably higher than 2024. Blueback Herring were captured in very low numbers starting in mid-April with consistent catches not observed until the last week of April, which was consistent with 2024.

When a sampling run produces high catch rates (~>60 fish collected, which only occurs with Blueback Herring in less than the standard 500 seconds, the run is shortened. This situation occurred on 8 runs in 2025, improving on the record low 2 runs that occurred in 2022 and 2024. The Blueback Herring 2025 season annual aggregate relative abundance was 2.37 fish per minute (standard error 0.31), based on 137 sampling runs (Figure 3). This is a statistically significant increase from 2024, but remains a concerning low level for our short time frame of monitoring. This 2025 rate is based on using catch data starting on 4/21/25 when Blueback Herring were caught with consistency (i.e., more than 2 for day entire day) and is consistent with previous years approach for data use. For the period 2013 to 2024, the annual mean catch rate is 3.41 fish per minute, which has not been exceeded in the past five years.

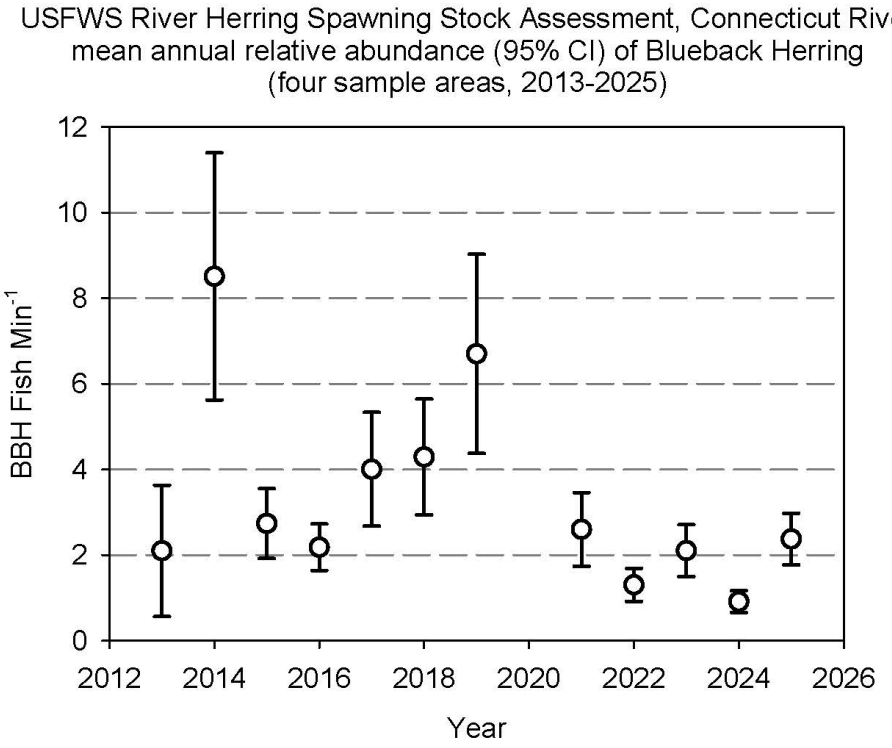


Figure 3. Annual catch-per-unit effort (fish per minute) for Blueback Herring among four standard index areas (Wethersfield Cove, Farmington River, Westfield River and Chicopee River).

Relative abundance of Blueback Herring varied over space and time at the site level (Figure 4). Blueback Herring catch rates over the sample season had notable improvements, compared to recent years, in over much of the season in the Chicopee and Farmington River. While the improvement to rates in the Farmington, after several years of low rates were good to observe, at Wethersfield Cove, a site with historically consistent catch rates, they were surprisingly low and variable. One observation was the high-water levels in the month of May that had the Cove inundated for a protracted period not observed in previous Mays (Figure 4). The high level of the main stem in May and early June in Connecticut also created more consistent backwatering of our lower Farmington River sites, which may have created a more attractive spawning environment and also benefitted habitat quality and quantity at the Chicopee River site.

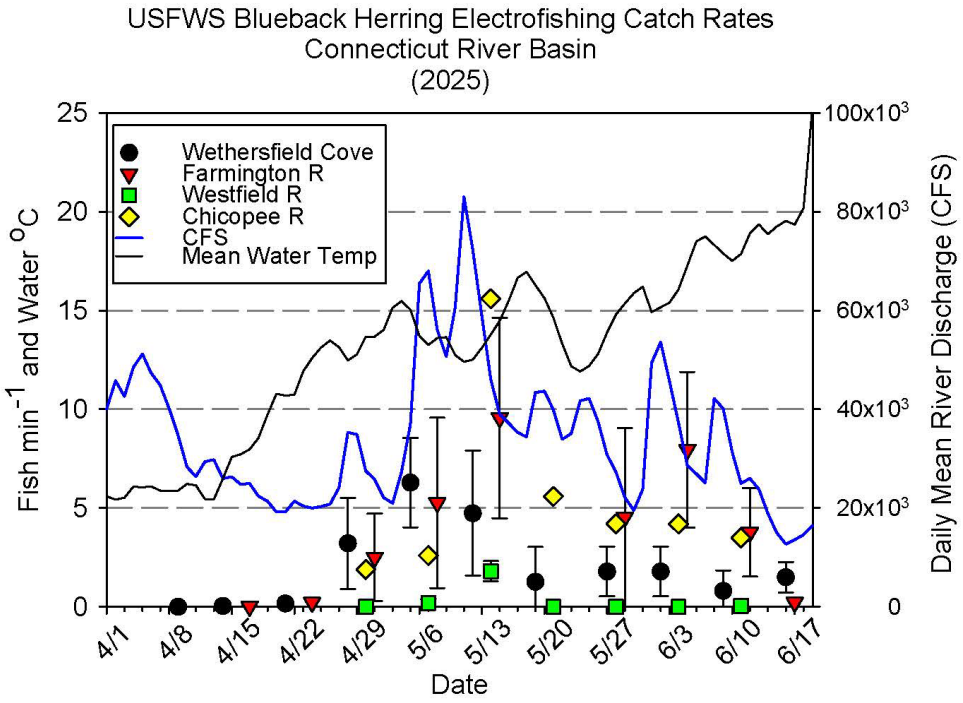


Figure 4. Adult Blueback Herring relative abundance expressed as mean fish captured per minute ± standard deviation, by sample area and date for 2025 season. Reported daily mean water temperature (black line; USGS Thompsonville) and daily mean river discharge (blue line; USGS Thompsonville, CT).

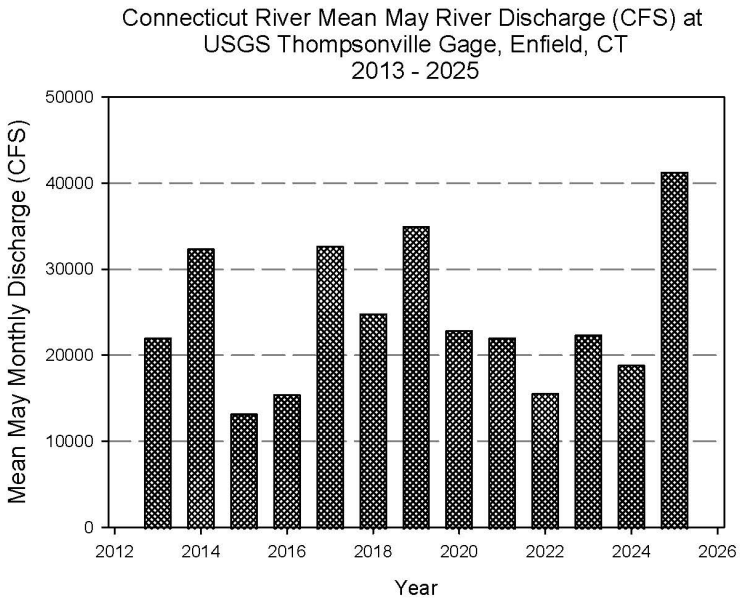


Figure 5. Comparison of mean river discharge (CFS) for the month of May (2013 to 2025), at the Thompsonville USGS Gage.

A summary of Blueback Herring annual mean total lengths (mm) is shown by sex and year in Figure 6, with no detected trend over time. The mean total length of male (257.4 mm) and female (275.4 mm) Blueback Herring was intermediate for the assessment time series in 2025 (Figure 6). There was no detectable trend with these data by sex.

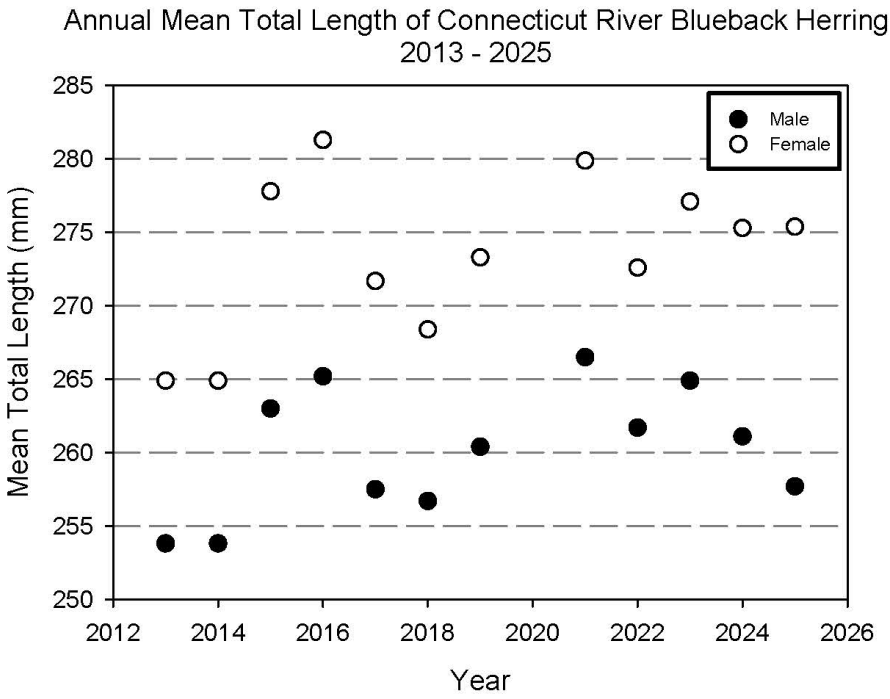


Figure 6. Annual mean total length (mm) of Blueback Herring sampled by sex, all sites combined. Linear regression relationships are not significant P > 0.10.

The age structure of Blueback Herring sampled in 2025 was not completed at the time of this report due to the early retirement of the sole staff biologist in April. The 2025 otolith samples for both species will be examined and finalized by spring 2026 using a long-term dedicated volunteer. The current age data for Blueback Herring sampled from 2013 to 2024, contains 9,745 observations (combined sexes) with males making up 68% and females 32% of this sampling (Table 5). Age-4 fish, on average, have been the

dominant age class for both sexes. However, age structure in any single year can be affected by the presence of either a strong or weak year class as noted earlier.

Table 5. The age structure of Blueback Herring sampled by the CTRFWCO Assessment Program, from otolith aging, for the years 2013 – 2024 inclusive.

	Blueback Herring 2013 - 2024					
	Both Sexes		Males		Females	
Age	N	%	N	%	N	%
2	56	0.6	56	0.8	-	
3	2,566	26.3	1,898	28.5	668	21.7
4	3,244	33.3	2,233	33.5	1,011	32.8
5	1,973	20.2	1,284	19.3	689	22.3
6	1,274	13.1	804	12.1	470	15.2
7	482	4.9	303	4.5	179	5.8
8	122	1.3	66	1.0	56	1.8
9	23	0.2	14	0.2	9	0.3
10	5	0.1	3	0.0	2	0.1
Sum	9,745		6,661		3,084	

Age structure of the adult run, by sex, provides necessary information to help interpret shifts in general population measures, such as fish length data and year class strength. 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 and have been shown in prior annual reports (Sprankle 2024). 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).

In 2025, all retained Blueback Herring (n = 1,419) and Alewife (n = 198) were processed in the laboratory 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. A Pancreatin (a digestive enzyme) bath was used to clean scales prior to slide mounting (n=8 per slide, fish). Jackie Stephens (USFWS Pathways Biologist at the time) provided methods, training, and oversight of our study's scale reading using her manual with the seasonal interns (Stephens 2023). The Stephens' protocol manual uses a training scale set, followed by a test set, with other manual text and scale images to improve accuracy and precision. A standard microfiche reader (microcolor 1100) was used independently by our two seasonals to examine slide-mounted scales to determine spawning history (i.e., 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 versus repeat spawner remained fairly consistent when comparing 2025 to 2024 (Figure 4). There was also one male and female blueback that were identified as a 4 repeat in 2025, that cannot be depicted in the figure.

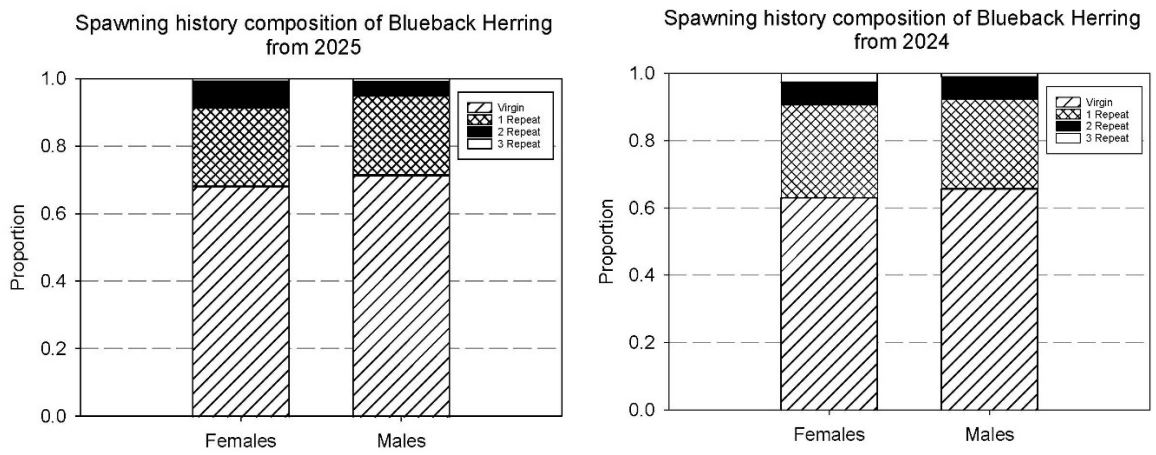


Figure 7. Left panel, spawning history, by sex, of all Blueback Herring laboratory processed from all sites in 2025 (n = 1,281) and right panel, same data for 2024 (n = 682).

Female Blueback Herring ovaries 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 (Figure 8: Wethersfield Cove). These data and other field data on spawning timing of females have been developed into a peer review manuscript by Dr. Eric Schultz (University of Connecticut) submitted to the American Fisheries Society (contact Ken for reprint of this research).

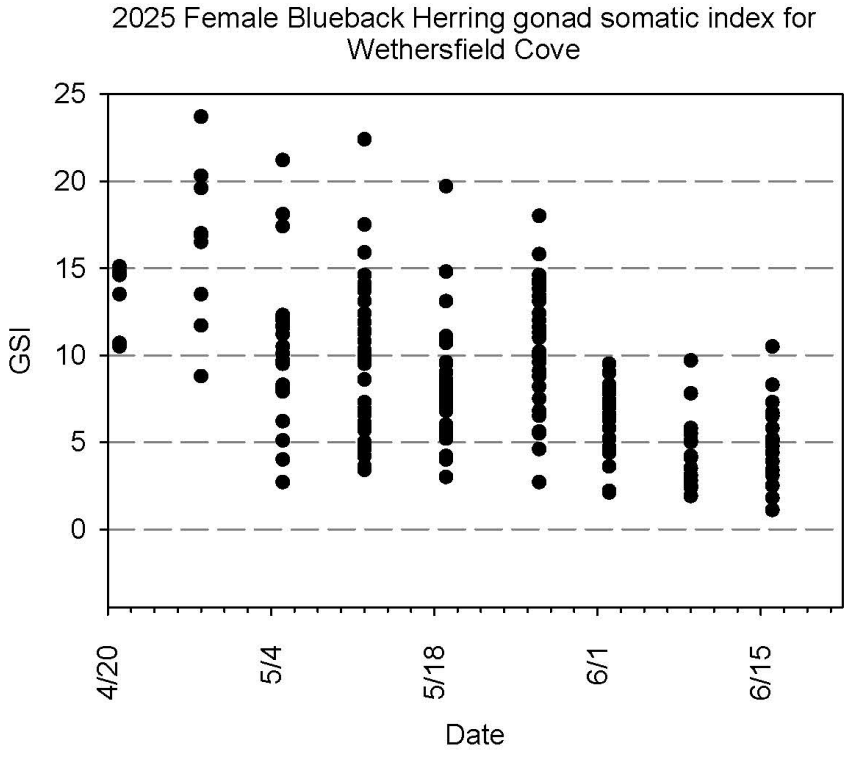


Figure 8. A plot of spring 2025 Blueback Herring female gonadosomatic index (ovary weight/total weight*100) as a percentage value over time, for Wethersfield Cove.

Alewife population assessment data was improved by the increase in sample size in 2025, but is still limited when compared with Blueback Herring (Table 4). This fact is illustrated by the analyses of catch

rates of Alewife (Figure 9) when compared to the Blueback Herring (Figure 4). In 2025, female Alewife sampled were shorter than the long-term mean (2013-2024) and had a higher degree of variability than in years prior to 2023 (Table 6). Male Alewife were also shorter than the mean of 2013 to 2024 (Table 6). As with Blueback Herring, age structure remains to be completed from 2025 samples. Spawn history determinations were completed for 2025.

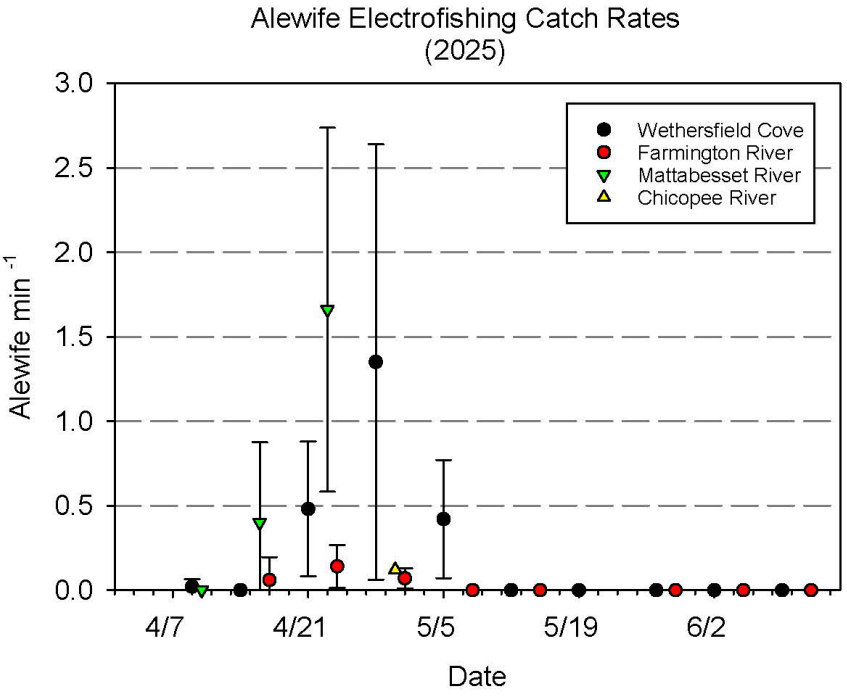


Figure 9. Adult Alewife relative abundance expressed as mean fish captured per minute ± standard deviation, by sample area and date for 2025 season. The Mattabesset River was sampled last on 4/23/25 as, after that week, sampling of the Chicopee and Westfield rivers began, which is consistent with the design of the study to focus on assessing Blueback Herring.

Table 6. Mean annual total length (mm) of Alewife sampled at all sites by year from 2013 to 2025, with sample size and standard deviation.

	Females			Males		
Year	N	TL (mm)	SD	N	TL (mm)	SD
2013	64	287.7	16.2	39	261.6	15.8
2014	53	276.1	15.5	168	266.2	10.8
2015	70	287.9	12.4	188	273.1	11.7
2016	162	286.4	19.0	424	270.7	18.0
2017	77	278.4	21.5	123	265.0	18.4
2018	132	280.0	18.1	234	269.5	14.9
2019	64	291.3	15.0	179	274.4	11.0
2021	54	276.2	13.8	73	264.8	9.5
2022	155	286.0	11.1	303	272.4	9.1
2023	60	292.1	13.1	89	277.7	11.0
2024	31	266.6	43.0	31	245.9	42.5
2025	49	275.1	43.6	149	263.6	25.4
	Mean =	282.0		Mean =	267.1	

Cooperative River Herring Migration and Movement Study

Working in partnership with CTDEEP's Diadromous Fisheries Program and the USGS Conte Research Laboratory, we continued the second and final field year of this research project. In the month of March 2025 and into early April, a total of 35 acoustic receivers were deployed in the same locations of 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. The two receivers off Bride Brook, in Long Island Sound, were deployed and one receiver was placed near the outlet to Bride Lake. The CTDEEP also had their large receiver arrays in Long Island Sound that bracket the Connecticut River's mouth (including Brides), and across to Long Island, New York.

The objectives of our study include, for both Alewife and Blueback Herring:
1) Determine rates, timing, and extent of upstream migration, residency, and downstream migration following river entry; 2) Determine environmental and biological factors that influence migration and movements; 3) Determine use of main stem habitat versus cove and tributary habitats and 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; 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.

In July and August 2025, all in-river receivers, except one, were successfully retrieved and the data was downloaded and uploaded to the Mid-Atlantic Acoustic Telemetry Observation System (MATOS) data sharing platform. We also retrieved an extensive set of detections from the MATOS network, spanning from Canada to New Jersey. Aaron Heisey (USGS) organized meetings to review data and analytical plans. During this time, we refined objectives and approaches for our first paper on "in-river movements and migration," including detections in the Long Island Sound array representing fallback behavior. This first paper focus has a large amount of data unique to a large river system. We observed a low second-year return rate of tagged Alewife and Blueback between the two freshwater study areas in spring 2025.

At Bride Lake, 3 of 59 (5.1%) tagged Alewife from 2024 were detected in late March and April 2025. In the Connecticut River, 2 of 43 (4.7%) tagged Alewife from 2024 were detected in early April and only 2 of 98 (2%) tagged Blueback Herring were detected in April. One tagged Blueback Herring showed a rapid upstream migration to Wethersfield Cove in 2024, followed by another directed outmigration. It was detected off Massachusetts, then New Jersey in winter, and returned to the Connecticut River near its tagging site. The fish repeated a similar in-river movement pattern, returning to Wethersfield Cove for 19 straight days in April and two days in early May, before migrating out again (Figure 10). Regional coordination calls among river herring researchers conducting acoustic tagging studies revealed similar "low" second year adult returns in 2025 compared to prior years (Henry Leggett, personal communication, Smithsonian Research Station Maryland).

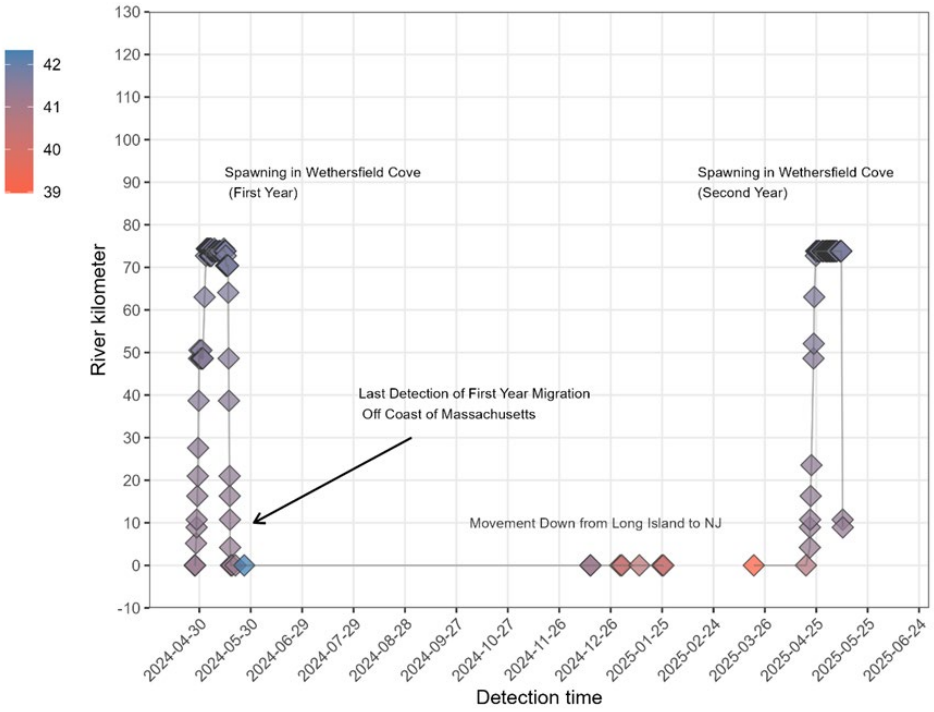


Figure 10. Detection history of individual blueback herring (A69-1604-35923) tagged in 2024 and returning the Connecticut River in 2025 (Aaron Heisey).

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 (i.e., fish per minute) 2) 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. 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 2025, Corey Eddy coordinated our sampling effort from August 26 to September 29. We collected data on 376 juvenile American Shad over 11 sample dates. The government shutdown on October 1 and did not reopen until mid-November, too late to resume sampling. Due to the shutdown, we will compare data only for the same time frames. Data from 2025 were being entered into database system for future analyses at the time of this report.

Program Results

The Connecticut River Fish and Wildlife Conservation Office collected and reported information relating to the activities and accomplishments occurring in the Connecticut River basin relative to diadromous fisheries restoration efforts. Note 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 324,172 American Shad were passed upstream of the Holyoke Dam, Massachusetts (river km 138) in 2025 through its two fish lifts, which is a 25% decrease from 2024 (Figure 11). The mean annual passage count at Holyoke for the period 1980-2024 is 320,592 (±SD 128,147). The Holyoke Fish Lift opened on 4/14/25. The lifts were closed sporadically over the season given high flows and/or high turbidity conditions. Dates of closures include 4/28, 5/6 to 5/14, 6/1 to 6/3, and partial day closure on 5/20. The spring upstream passage season concluded on 6/30/25 when the lifts were closed to install modifications intended to protect Shortnose Sturgeon during upstream passage for the reminder of the summer and fall operational period (through 11/14/25).

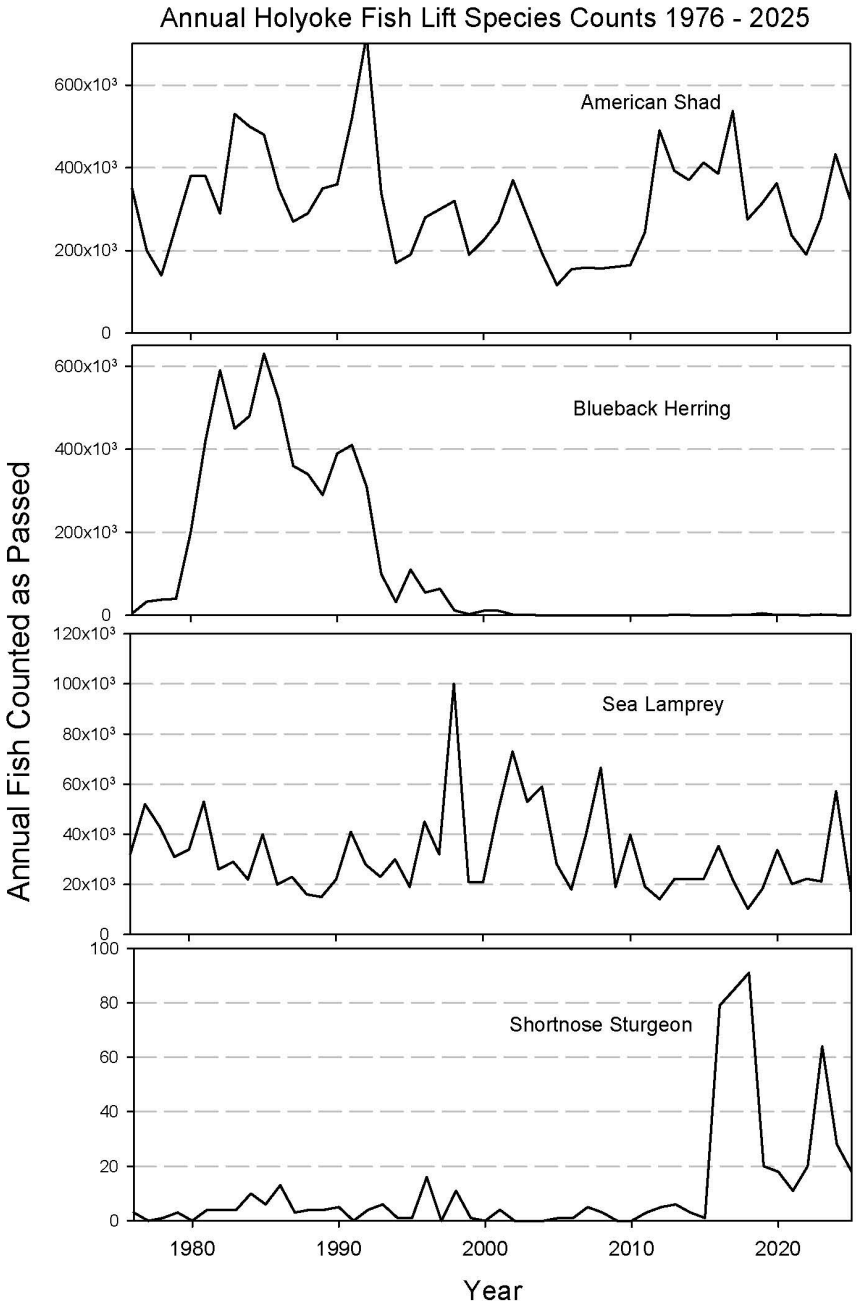


Figure 11. Select summary of Holyoke Fish Lifts annual passage counts for American Shad, Blueback Herring, Sea Lamprey and Shortnose Sturgeon (1976-2025). Fish passage counts are affected by structural and operational changes at both dams and fishways and by environmental conditions (temperature and flow/spill) within and among years.

In 2025, main stem river discharge was lower than average for the month of April and then substantially higher than average over the month of May and into mid-June, coinciding with the typical peak passage (Figure 12). These flow conditions created unfavorable fishway attraction and entrance conditions for fish passage for that period. These conditions were the opposite of the discharge conditions in 2024. Water temperatures were within an expected range of variability that comes with higher flows with the rate of daily increase reduced. Later, in mid-June as flows decreased to near average and lower levels, water temperatures increased to seasonal levels accordingly (Figure 13). Note in Figure 13 that the mean statistic is based on only two years of data.

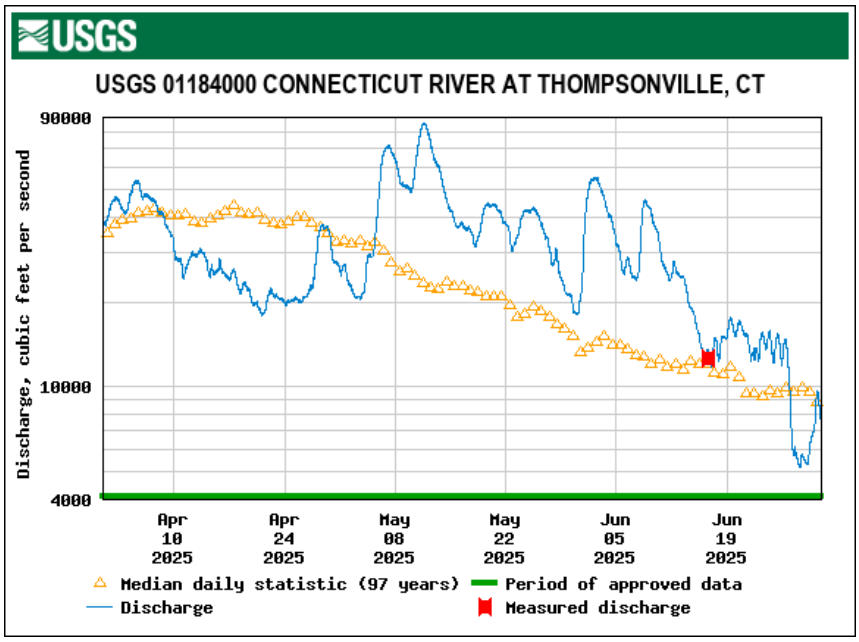


Figure 12. Mean daily river discharge measured at USGS Thompsonville Gage, with long-term mean values also shown for April through June 2025.

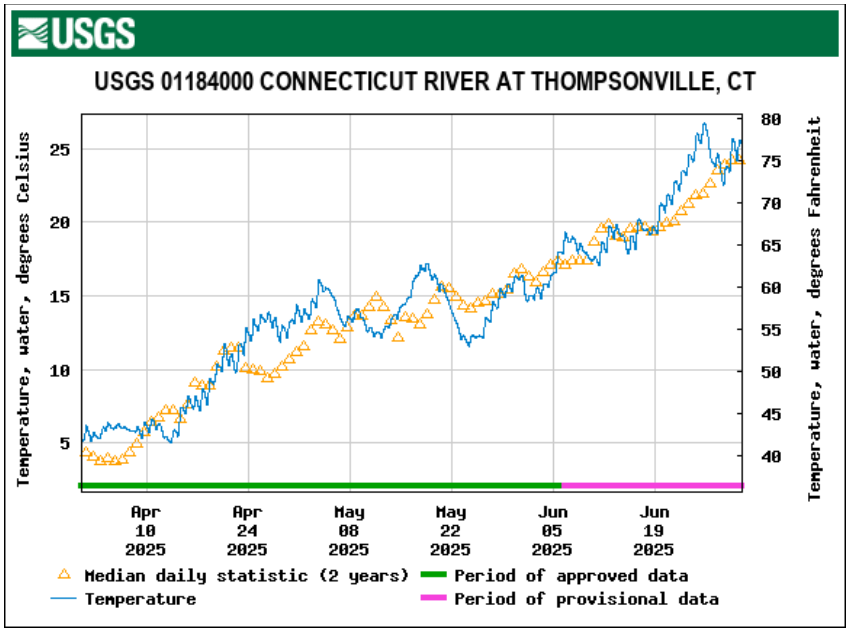


Figure 13. Mean daily water temperature measured at USGS Thompsonville Gage, with 2 year median values also shown for April through June 2025.

The highest single passage event for American Shad occurred on 5/16 with 40,519 passed, with a total of four dates passing > 30,000 American Shad (Figure 14).

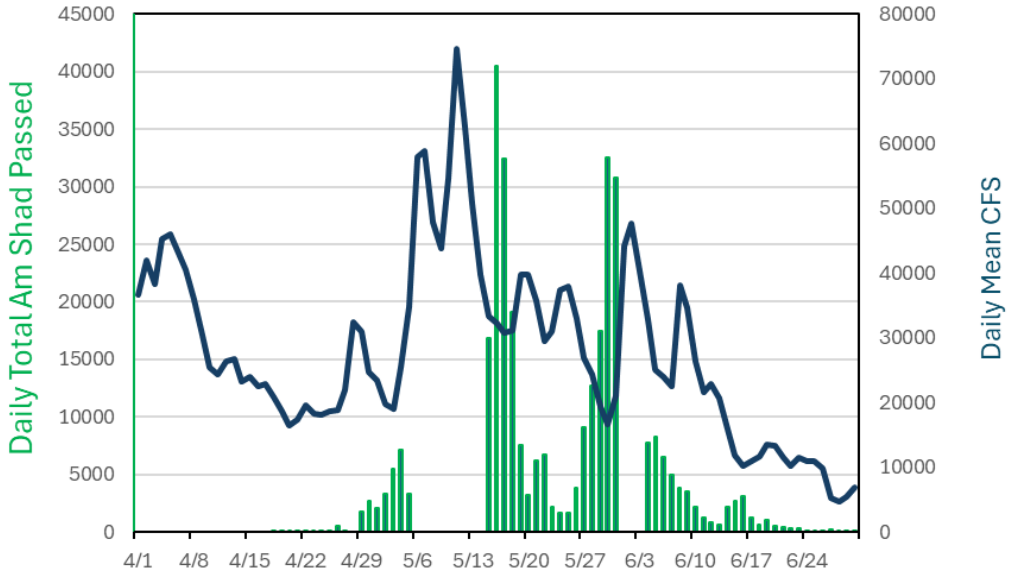


Figure 14. Daily American Shad passage counts from Holyoke Fish Lifts with mean river discharge blue; USGS Holyoke gage) for the period April 1 to June 30, 2025.

Holyoke Gas and Electric (HGE), in coordination with the state and federal agencies, facilitated fish trap-and-haul facility use in 2025. 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 7).

Table 7. Summary of fish captured at the Holyoke Trap and Transfer Facility in 2025, by date, species, agency and number. Destinations include Conte Lab (USGS) for experiments and then release and FWS North Attleboro for fry production for restoration stockings in MA and RI. RIDEM moved shad to the Ashuelot River for restoration. Verdantas is a hired consultant, moving shad for restoration as part of an agreement CTDEEP has with FirstLight Power (transferred to the Shetucket River, CT).

Date	Species	Conte Lab	CTDEEP	USFWS	RIDEM	Verdantas*
5/19	American Shad		100			
5/20	American Shad	19				
5/21	American Shad			81		
5/22	American Shad		100			
5/27	American Shad	80		70		70
5/28	American Shad	80	100			60
5/29	American Shad	80		57		60
5/30	American Shad					50
6/4	American Shad					100
6/5	American Shad	25				100
6/9	Sea Lamprey	132				
6/10	American Shad				40	
6/11	American Shad				42	
6/12	Sea Lamprey			152		
6/12	American Shad				75	
Sum	American Shad	284	300	270	157	440
Sum	Sea Lamprey	132	300	152		

Firslight Power's three fish ladders at their Turners Falls Project (Cabot Station Ladder, Spillway Ladder and Gatehouse Ladder) opened on 4/22/25, following the requested Cooperative's Fish Passage Operations Plan for 2025. The first American Shad observed passing was on 4/23 at Spillway Ladder, with the first shad passing from Gatehouse Ladder on 4/26. Fishway counts were provided at regular intervals by FirstLight Power with a total of 30,062 American shad passing the Gatehouse Ladder at Turners Falls Dam in 2025, versus the 71,309 passed in 2024 (Table 8). American Shad passage counts were 28,268 at Cabot Ladder and 21,839 at Spillway Ladder in 2025. 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, Cabot and Spillway ladders were closed on 7/7/25.

Overall, the 2025 shad 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 9.3%, which is a notable decrease from 2024, and may be partially explained by differences in river discharge rates between years in the passage season. The 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 highlights that there is 1.4 times the amount of shad habitat upstream of the Turners Falls Dam versus the amount of habitat between Holyoke and Turners Falls dams. In addition, density dependent growth impacts have been documented for juvenile shad sampled in the Holyoke to Turners Falls reach, versus the upstream habitat reaches (Mattocks et. al 2019). These facts and additional management goals and objectives of the CRASC Plan provide a clear rationale for the basis to achieve the defined passage performance criteria of the Plan and its Addendum on Fish Passage Performance (CRASC 2017, as amended CRASC 2022).

Great River Hydro's (GRH)Vernon Dam (Vernon, Vermont) fish ladder was opened on 4/43/25 and closed on 7/15/25, following the Cooperative's fishway operations schedule. A total of 17,002 American Shad were counted passing Vernon fish ladder through 7/7/25, including some periods of camera/image outages. Based on the Turners Falls Gatehouse Ladder American Shad passage (30,062) this translates to 56.6% of the shad passed at the Gatehouse Ladder counted passing the Vernon Ladder (Table 8). Main stem river discharge, as measured at a USGS Gage one kilometer downstream of GRH's Bellows Falls Dam during the fish passage season, is shown in Figure 15. The discharge in this section of the main stem showed slightly higher than average flows in late May and early June and then a switch to a regulated discharge pattern created by GRH's operations.

Bellows Falls Fish Ladder was opened on 5/10/25 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 2025, count data have not been reviewed at the time of this report.

The Connecticut DEEP did not operate the Rainbow Dam fish ladder on the Farmington River in 2025 (first year closed was 2023). This decision is based on concerns of 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 addressed by the citizens of the State of Connecticut to fund, maintain and operate. In 2025, discussions with a group of conservation organizations including American Rivers, the Farmington River Watershed Association, and Save the Sound and the State of Connecticut occurred with Stanley Black and Decker on aquatic resource issues and possible future options for the dam.

Table 8. Annual American Shad fishway passage counts for Holyoke, Turners Falls and Vernon Projects on the main stem river, and the West Springfield Project (Westfield River) for the period 1980 – 2025.

Year	Holyoke Dam Passed	Turners Falls Dam Passed	TF % of Holyoke Total	Vernon Dam Passed	Vernon % of TF Total	Westfield River, W. Springfield Dam Passed
1980	376,066	**298**	0.1			
1981	377,124	200	0.1	**97**	48.5	
1982	294,842	11	0.0	9	81.8	
1983	528,185	12,705	2.4	2,597	20.4	
1984	496,884	4,333	0.9	335	7.7	
1985	487,158	3,855	0.8	833	21.6	
1986	352,122	17,858	5.1	982	5.5	
1987	276,835	18,959	6.8	3,459	18.2	
1988	294,158	15,787	5.4	1,370	8.7	
1989	354,180	9,511	2.7	2,953	31.0	
1990	363,725	27,908	7.7	10,894	39.0	
1991	523,153	54,656	10.4	37,197	68.1	
1992	721,764	60,089	8.3	31,155	51.8	
1993	340,431	10,221	3.0	3,652	35.7	
1994	181,038	3,729	2.1	2,681	71.9	
1995	190,295	18,369	9.7	15,771	85.9	
1996	276,289	16,192	5.9	18,844		**1,413**
1997	299,448	9,216	3.1	7,384	80.1	1,012
1998	315,810	10,527	3.3	7,289	69.2	2,292
1999	193,780	6,751	3.5	5,097	75.5	2,668
2000	225,042	2,590	1.2	1,548	59.8	3,558
2001	273,206	1,540	0.6	1,744		4,720
2002	374,534	2,870	0.8	356	12.4	2,762
2003	286,814			268		1,957
2004	191,555	2,192	1.1	653	29.8	913
2005	116,511	1,581	1.4	167	10.6	1,237
2006	154,745	1,810	1.2	133	7.3	1,534
2007	158,807	2,248	1.4	65	2.9	4,497
2008	153,109	4,000	2.6	271	6.8	3,212
2009	160,649	3,813	2.4	16	0.4	1,395
2010	164,439	16,422	**10.0**	290	1.8	3,449
2011	244,177	16,798	**6.9**	46	0.3	5,029
***2012**	490,431	26,727	**5.4**	10,386	**38.9**	10,300
2013	392,967	35,293	**9.0**	18,220	**51.6**	4,900
2014	370,506	39,914	**10.8**	27,706	**69.4**	4,787
2015	412,656	58,079	**14.1**	39,771	**68.5**	3,383
2016	385,930	54,069	**14.0**	35,513	**65.7**	5,940
2017	537,249	48,727	**9.1**	28,682	**58.9**	6,000
2018	275,232	43,146	**15.7**	31,724	**73.5**	5,752
2019	314,353	22,575	**7.2**	12,862	**57.0**	4,064
2020	362,423	41,252	**11.4**	13,897	**33.7**	5,549
2021	237,306	21,052	**8.9**	9,701	**46.1**	incomplete count
2022	190,352	23,576	**12.4**	13,763	**58.4**	1,288
2023	277,367	33,782	**12.2**	29,372	**86.9**	incomplete count
2024	433,009	71,309	**16.5**	50,938	**71.4**	4,544
2025	324,172	30,062	**9.3**	17,002	**56.6**	not available
Mean	320,670	20,147		11,060		3,635
SD	126,716	19,262		13,511		2,163
Low	116,511	11		9		913
High	721,764	71,309		50,938		10,300

* Vernon Ladder issue fixed for 2012

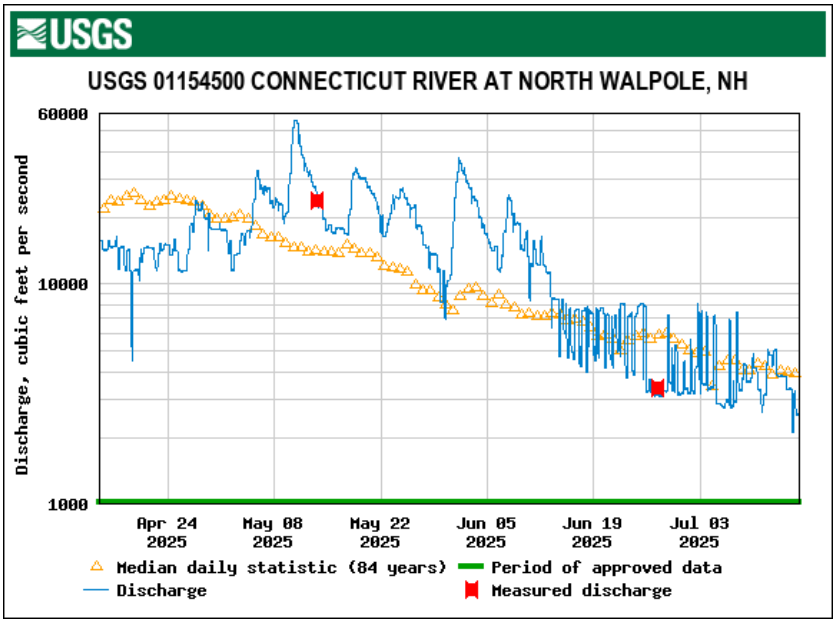


Figure 15. Daily average river discharge from first gage upstream of Vernon Dam, located 1 km downstream of Bellows Falls Dam for 4/15/25 through 7/15/25.

Shortnose Sturgeon

A total of 18 Shortnose Sturgeon (SNS) were trapped and passed upstream at Holyoke Fish Lift in 2025. This is a decrease from the 28 fish trapped and passed in 2024 (Figure 17). The lift operations, dedicated for sturgeon passage, is defined as 7/1 to 11/15, and operates Monday to Friday, from 9:00 am to 3:00 pm (4 lifts in that period). Nine of these fish were passed in the "upstream passage season" (spring months) that has a 7-day a week and high frequency lift schedule. Shortnose Sturgeon passage operations started on 7/7/25 and concluded on 11/14/25 with suspended lift operations on 8/5 and 8/6 for operational reasons and on 9/22 through 9/26 and 10/1 for canal drawdown/inspections and last on 11/11.

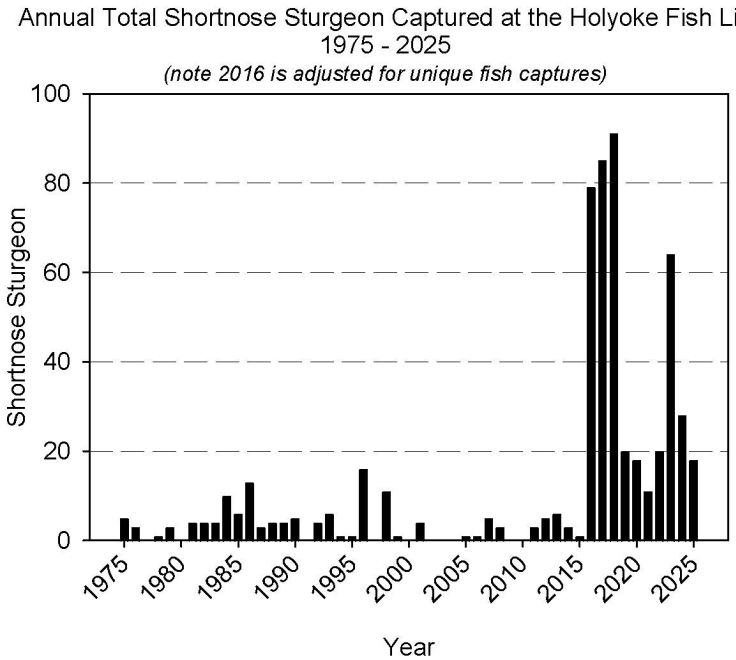


Figure 16. Annual totals of Shortnose Sturgeon (SNS) captured at the Holyoke Fish Lift, 1975-2025. Fish have only been approved by NOAA for regular upstream passage, since 2017, when downstream protective measures to address sturgeon were fully operational.

In May 2025, Holyoke Gas and Electric submitted a Final Report developed by Kleinschmidt Associates "2024 FINAL POST-CONSTRUCTION SHORTNOSE STURGEON MONITORING REPORT YEAR 5 OF 5" to the FERC. The report states "*The objective of the study was to determine the effectiveness of upstream passage of Shortnose Sturgeons at the Holyoke Dam*." The report also states, "*The 2024 study concluded a five-year study effort to better understand sturgeon movement at the dam with the specific objectives to determine the percentage of Shortnose Sturgeons present at the dam that successfully enter the fish lift and pass upstream; and determine if migration delays are occurring for Shortnose Sturgeons encountering the Holyoke Dam*."

The final study report provided data and results detailing that in 2024, a total of 28 SNS were lifted, only 5 or which had PIT tags. Over the 2024 study period, a total of 46 PIT tagged SNS were detected inside the spillway lift entrance flume (upstream of the entrance gate), but downstream of the elevator bucket. Their report states a calculated "*internal passage efficiency of 8.7%*" based on their use of 4 PIT tagged fish lifted from a pool of 46 PIT entered. However, as noted above they report 5 PIT passed, which translates to 10.8%. In either case, this is a very low rate for fish that are "inside" (having already entered) a fish passage structure. This report also states that given the stated passage rate of 8.7% "*an estimated 321"* SNS would have been in the entrance portion of the passage system [1/.087 = 11.49 as multiplier to known total passed [n = 28]. The report also states "*Overall, the results of the 2024 study were similar to those of the 2023 study*." The data and results were consistent across study years.

The low rate of fish passage efficiency may be explained by the fact the lift is operated on a schedule of Monday to Friday, from 9:00am to 3:00pm or a total of 25 hours a week. The PIT tag data for fish inside the entrance suggests approximately 11.7% of tagged fish "enter or are present" between the hours of 8:00am and 3:00pm. The following Figure 2-23 was taken from the HGE Final Report and illustrates the fact fish entries are at their lowest detection values when the lift is operational.

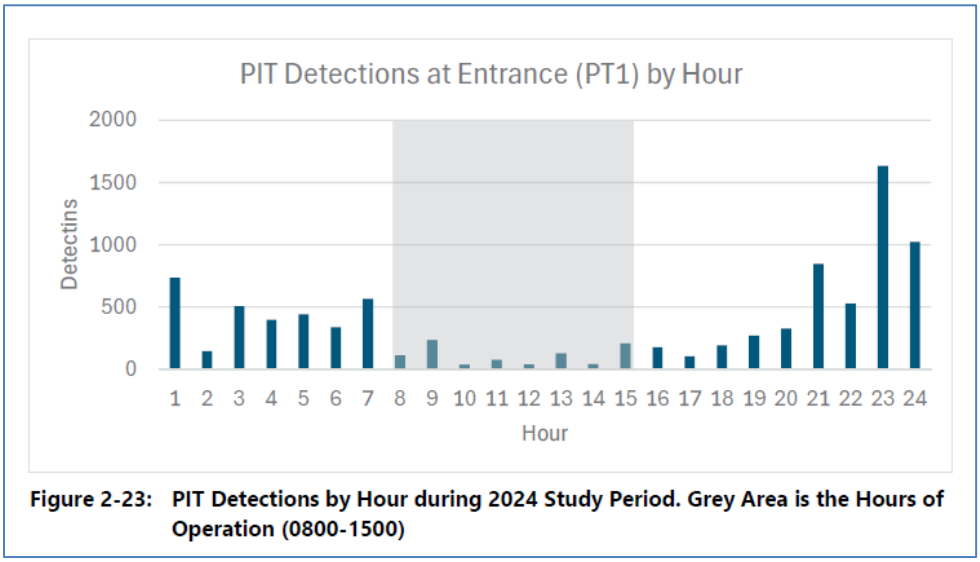


Figure 2-23: PIT Detections by Hour during 2024 Study Period. Grey Area is the Hours of Operation (0800-1500)

The USFWS submitted comments seeking to have the fish lift operated from 6:00am to 8:00pm with the supporting information paraphrased in a February 2025 email to HGE on the draft version of the report. The HE Final Report suggested that SNS may be using the entrance in the off-lifting hours as velocity

refuge (attraction water not operated) and also questioned the motivation of fish, given that summer and fall are outside of the spring spawning. Additional discussion and/or study would help to address the questions and speculations and there may be some creative approaches to consider. NOAA Fisheries, as the lead federal agency, have legislated responsibility for such an endeavor.

Blueback Herring

The Holyoke Fish Lift counted 144 Blueback Herring passed in 2025 which is a decrease from the 723 Blueback Herring passed in 2024. As stated in past reports, 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. As noted earlier in this report, our USFWS monitoring project detected a very minor increase in abundance in 2025 versus 2024. There has not been a statistical correlation with our assessment program and HFL passage counts (recall, we sampled 2,185 Blueback Herring in our program). River herring run counts in other parts of Connecticut were reported as improved in 2025 for both Alewife and Blueback Herring. We have no reason to believe there is a fish passage issue at Holyoke for this species.

Sea Lamprey

In 2025, HFL passed 17,149 Sea Lamprey, down notably from the 57,186 passed in 2024 (Figure 11). Sea lamprey do not return to their system of origin as adults seeking to spawn unlike our other anadromous species. 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 5,153 Sea Lamprey subsequently passed upstream of Turners Falls Dam (through Gatehouse Ladder), 30% of the number passed at Holyoke, which is lower than the 57% observed in 2024. This may be partially explained by the much higher May and June flows in 2025, as noted earlier. A total of 4,156 Sea Lamprey passed upstream of Vernon Dam (81% of the Gatehouse Ladder total). The difference in rates is perplexing.

Striped Bass

A total of 518 Striped Bass were passed at HFL, which is up from the 458 fish passed in 2024.

American Eel

The American Eel passage count at Holyoke Dam, which used four specially designed ramp/traps in different project locations (tailrace fish lift entrance, spillway entrance, upper stilling basin, and South Hadley shore of bypass reach), totaled 6,481 in 2025, a substantial reduction from the 18,687 passed in 2024 (Figure 17). The tailrace entrance, upper stilling, and spillway entrance eel ramps were installed and operational on April 24, 2025. The South Hadley bypass ramp, that required substantial repairs, was operational starting on July 15, 2025. These facilities were operated through November 3, 2025, with some exceptions. The Holyoke Gas and Electric Report on American Eel passage will be available in the winter of 2026 and will compare catch rates among the trap locations and provide details on other statistics.

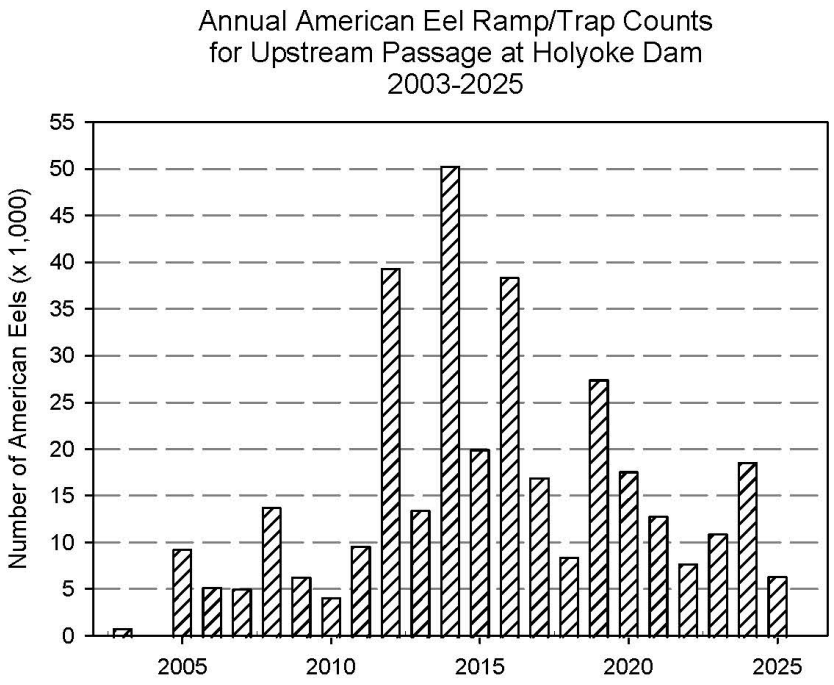


Figure 17.Annual American Eel ramp/trap counts reported by Holyoke Gas and Electric, at Holyoke Dam, for the period 2003-2025.

Gizzard Shad

A total of 83 Gizzard Shad were counted at the Holyoke Fish Lift in 2024, which is consistent with past years count data.

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Appendix A

Meeting agendas for the Connecticut River Migratory Fish Restoration Cooperative.

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:
Justin Davis
Peter Aarrestad (Alt.)
CT Public Sector
Thomas Chrosniak
MADFW:
Mark Tisa
Todd Richards (Vice Chair)
MA Public:
Andrew Fisk (Chair)
NHFG:
Stephanie Simek
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: November 6, 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 **November 6, 2024, from 10:00 a.m. -12:40 p.m.** that will be held in person only at the USGS Conte Research Laboratory.

Agenda

1. 10:00-10:10 Call to order, introductions, agenda review, June 18, 2024 meeting notes review (*Andy Fisk*)
2. 10:10-10:40 **Decisional:** FY24 Federal Funds and recommended project funding of the Technical Committee (*Ken Sprankle/All*)
3. 10:40 – 11:05 **Informational:** Presentation "Shortnose Sturgeon eDNA Survey and Results (*James Garner-UMASS and Kate Buckman- CT River Conservancy*)
4. 11:05 – 11:35 **Discussion**: Shortnose Sturgeon items – implications for current project operations and relicensing *(All)*
    a. Summer 2024 strandings at Turners Falls
    b. eDNA data & ongoing monitoring
5. 11:35-11:50 **Informational:** Update on Connecticut River Anadromous Fish Habitat Plan and GIS tool (*Corey Eddy and Bill McDavitt*)
    a. Schedule for completion, review, and adoption
6. 11:50 -12:05 **Informational:** Technical Committee Report summaries (*Lael Will*)
    a. Fishway counts updates for 2024
    b. River Herring
    c. American Shad
    d. Fish Passage
    e. American Eel
    f. Sea Lamprey
7. 12:05-12:20 **Informational:** Special Resource Study Report update, required as part of federal funding (*Lisabeth Willey, USFWS*) and Connecticut River Watershed Partnership update (*Markelle Smith, CRWP Director)*
8. 12:20-12:25 **Informational**: Technical Committee Research and Management Forum to be developed for late February or early March. (*Ken Sprankle*)
9. 12:25-12:40 Public comment period

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

Cooperative Members:

CTDEEP:
Justin Davis
Peter Aarrestad (Alt.)
CT Public Sector
Thomas Chrosniak
MADFW:
Mark Tisa
Vice Chair, Todd Richards (Alt.)
MA Public:
Chair, Andrew Fisk
NHFG:
Stephanie Simek
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
VTFW:
Chair, Lael Will
MADMF:
Joe Holbeche
NHFG:
Matthew Carpenter
NMFS:
Bill McDavitt
USGS:
Brett Towler
USFWS:
Kenneth Sprankle

DATE: October 22, 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 **October 22, 2024, from 10:00 a.m. -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, Chair)*
2. 10:10-10:20 Summary of Proposed Projects for FY24 Coop federal funds. (*Ken Sprankle*)
3. 10:20-10:30 Review updated 2024 fishway count data. (*Ken*)
4. 10:30-10:50 Fish Passage Subcommittee. (*Bill McDavitt*)
   A. Mainstem project updates.
   B. Tributary project updates.
5. 10:50-11:20 River Herring Subcommittee. (*Kevin Job, Ken*)
   A. 2024 Alewife and Blueback Herring Migration and Movement Study (CTDEEP, USGS, USFWS) progress to date.
   B. Update on New England Fishery Management Council's – Atlantic Herring Committee Amendment 10 Process relative to river herring bycatch.
   C. Atlantic States Marine Fisheries Commissions River Herring Benchmark Stock Assessment Report, key findings, recommendations.
   D. 2024 plans for Blueback Herring collections, trap and truck restoration and Conte research on fish passage.
6. 11:20-11:45 Sturgeon Subcommittee. (*Micah Kieffer*)
   A. Shortnose Sturgeon eDNA survey 2024 results from Bellow Falls, VT to Northfield, MA. (*James Garner, UMass Amherst and Kate Buckman CT River Conservancy*)
   B. Summary of other in-river sturgeon research and passage evaluation study activities. (*Micah*)
7. 11:45-12:00 Other Subcommittee updates. (*Corey Eddy, Lael, Bill, Ken*)
   A. American Eel – age structure/parasite study.
   B. Sea Lamprey – 2024 activities (eDNA, nest surveys).
   C. Habitat – Status of GIS and Draft Plan.
   D. American Shad – ASMFC sustainable fishery plans (MA and CT), Juvenile Assessments.
8. 12:00-12:20 USGS Conte Fish Research Laboratory, brief summary of research projects. (*Brett Towler*)
9. 12:20 Other business.
   A. Development of one day, 2025 February or March, Technical Committee Research and Management Forum. (*Ken*)

Appendix B.

Cooperative's Technical Committee – Connecticut River Research and Management Forum, held on February 25, 2025.

Connecticut River Migratory Fish Restoration Cooperative
Technical Committee's

Connecticut River Research Forum

February 25, 2025

U. S. Fish and Wildlife Service Regional Office, Hadley, MA

Agenda

9:00-9:30	Registration ($25 – cash or check only, day of), coffee and tea, visit Poster Area
9:30-9:40	Opening remarks (Rick Jacobson, Asst. Regional Director Fisheries - USFWS and Cooperative Technical Chair Lael Will)
9:40-10:10	**Timing is everything: An operational regime to balance energy and ecosystem values on the Connecticut River.** Katie Kennedy[1], Sarah Pfeifle[2], Rick Palmer[2], Melissa Grader[3], Jeff Crocker[4], Eric Davis[4], Betsy Simard[4], and John Ragonese[5]
10:10-10:30	**Stock-recruitment and density dependence of American Shad in the Connecticut River.** Steven Mattocks[6], Brian Keleher[6], and Kenneth Sprankle[3]
10:30-10:50	**Ancient fish, New Technology: Using eDNA to Expand Knowledge of Shortnose Sturgeon.** Kate Buckman[7] and James Garner[8]
10:50-11:10	**Using multi-decadal datasets to evaluate climate-related shifts in blueback herring phenology and juvenile counts in the Connecticut River.** Meghna Marjadi[17], Allison Roy[9], Adrian Jordaan[8], Michelle Staugdinger[8], Kenneth Sprankle[3], and Jacqueline Benway Roberts[10]
11:10-11:30	**Tracking The Run: Migratory Timing and Behavior of Adult Blueback Herring in the Connecticut River.** Aaron Heisey[11], Kenneth Sprankle[3], Matthew Goclowski[10], Kevin Job[10], Jacqueline Benway Roberts[10], Kyle Hubbard[11], and Theodore Castro-Santos[11]
11:30-11:50	**Counting eggs before they hatch: comparing metrics of spawning seasonality in Connecticut River Blueback Herring.** Eric Schultz[12], Konstantine Ganais[13], Foivos Mouchilianitis[13], and Kenneth Sprankle[3]
11:50-12:40	**Lunch –** provided with registration fee
12:40-1:00	**Evaluating bias and precision of past spawning estimations for Connecticut River Blueback Herring population assessments.** Jacqueline B. Stephens [8,3], Adrian Jordaan[8], David Perkins[3], Allison Roy[9], and Kenneth Sprankle[3]
1:00-1:20	**American shad migration on the Connecticut River: rates of movement, passage, and delay at the Holyoke Dam.** Corey Eddy[3], Theodore Castro-Santos[11], and Kenneth Sprankle[3]

Page 1 of 3

1:20-1:50 **Comparing the Novel East Coast Fish Ladder to the Conventional Denil: Insights from Shad and Lamprey Passage Trials.** Kevin Mulligan[11], Bjorn Lake[14], Nick Anderson[14], Kevin Molongoski[11], Kyle Hubbard[11], Alex Haro[11], Brett Towler[11], Kenneth Sprankle[3], and Casey Brown[2]

1:50-2:10 **Passage performance up pegboards: Implications for sea lamprey conservation and control.** Theodore Castro-Santos[11], John Burns[11], Dylan F. S. Morse[11], Aaron Heisey[11], and Elsa Goerig[11]

2:10-2:30 **Comparing Juvenile River Herring Diets and Growth in Littoral and Pelagic Lake Habitats.** Julian Burgoff[8], Adrian Jordaan[8], Allison Roy[9], and Jason Stolarski[6]

2:30-2:50 **Environmental DNA (eDNA) Calibrations for Fisheries Management: Enhancing River Herring Abundance Monitoring with Spatial, Temporal, and Environmental Insights.** James Garner[8] Michelle Staudinger[8], John Sheppard[15], Allison Roy[9], Eva Kozol[8], Ashley Eaton[16], Jeremy C. Anderson[8], and Adrian Jordaan[8]

2:50-3:00 Closing remarks, Lael Will

Poster Presentations

- **Development of a simple life table model to estimate eel populations for restoration projects.** Alex Haro[11]
- **Evaluation of a pneumatic lift for transport of upstream-migrating juvenile eel (Anguilla).** Alex Haro[11], Aaron Heisey[11], Eric Truebe[18], and Jon Truebe[18]

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Note – This conference is open to the public and will be held in person at the U.S. Fish and Wildlife Service's Northeast Regional Office. This Office requires all those attending in person to be identified on a list in advance of the conference date.

Anyone planning or interested in attending in person please contact Ken Sprankle (ken_sprankle@fws.gov) to receive email update on forthcoming planning details (e.g., lunch order options) and for other planning needs at the facility. There will also be a remote attendance option that can be provided upon request. Contact Ken with any questions and to be on the update list.

U. S. Fish and Wildlife Northeast Regional Office address:
300 Westgate Center Drive
Hadley, MA 01035-9589
Main phone line 413-253-8200

"The U.S. Fish and Wildlife Service is committed to providing access to this meeting for all participants. Please direct all requests for sign language interpreting services, close captioning, or other accommodation needs to Ken Sprankle (413-548-9138, ken_sprankle@fws.gov], TTY 800-877-8339."

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
12/2/2025

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		6,440								Mary Stuebe passed
Mary Steube, Mill-*CT*	Final		15,447								
Mill Pond, Falls - *CT*	Final		1,325								
Moulson Pond, Eightmile-*CT*	9/4		12	1,781		6	21				
Leesville, Salmon-*CT*					1						summer mort in upstream trib
StanChem, Mattabesset-*CT*											data to be reviewed
Rainbow, Farmington-*CT*	not operated										not operated
W. Springfield, Westfield-*MA*											data to be reviewed
Holyoke, Connecticut-*MA*	Final	324,172	0	144	0	6,481	17,149	518	83	18	
Easthampton, Manhan-*MA*											no counter
**Turners Falls-Gatehouse, Connecticut-*MA*	Final	30,062	0	0	0	0	5,153	0	0		
Vernon, Connecticut-*VT*	7/7	17,002					4,156				note the lamprey count
Bellows Falls, Connecticut-*VT*											data to be reviewed
Total to basin, only first barrier counts		324,172	16,784	1,925	1	6,481	17,170	518	83	18	
Last year totals		437,553	28,063	728	0	18,687	60,525	458	73	28	

* 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.
Note that at Turners Falls Project (Dam/Canal) fish must use one of these two fishways first before having the opportunity to pass the final required ladder (Gatehouse).

This report is not considered final. The previous report was issues on 9/3, so some notable changes in counts have occurred. The final American Shad passage count at HFL is slightly over the long-term average (1976 - 2024) of 314,000. Down from the relatively high count observed in 2024 (Figure 1, next page). The Blueback Herring passage count at HFL was the lowest since 2016 at 144 fish a remarkably low number (functionally extirpated from upstream habitats) in 2025 (Figure 1). The Shortnose Sturgeon passage count was relatively low at 18 over the season. Based on studies conducted in 2023 and 2024, we have learned that approximately 21.5% or 8.7%, respectively, of SNS that "enter" the spillway entrance flume (meaning inside the passage system) are subsequently passed upstream over the season. Using those documented passage efficiencies (mean of 15.1%), there may have been approximately 6.6 times as many SNS in the lift system (118 fish). The number of Sea Lamprey passed at HFL was also notably low in 2025, below the annual average, refer to Figure 1. American Eel counts from the four eel passes used at Holyoke Dam was relatively low 6,481 fish in 2025 (Figure 2). The proportion of American Shad passing the Turners Falls Gatehouse Ladder and subsequently counted as passing Vernon Fish Ladder was 0.57 (or 57%).

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 achieving 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 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 versus 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. A peer-reviewed paper published in 2025, reviews lessons learned from the Connecticut River Salmon Program and provides well detailed critical analyses with the intent of informing other management and recovery programs (Gephard 2025).

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 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 Connecticut River Migratory Fish Restoration Cooperative, and its predecessors CRASC, and the Connecticut River Policy Committee (1967) 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, high dam density, East Coast river basins.