Federal Aid in Sport Fish Restoration
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Annual Performance Report

2016

Connecticut Inland Fisheries

Diadromous Fish Restoration and Enhancement

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State of Connecticut
Department of Energy and Environmental Protection
Bureau of Natural Resources
Inland Fisheries Division

Grant Title: Diadromous Fish Enhancement and Restoration

Period Covered: January 1, 2016 to December 31, 2016

Job 1: Atlantic Salmon Restoration
Job 2: Shad and River Herring Restoration
Job 3: American Eel Restoration
Job 4: Sea-run Trout Enhancement
Job 5: Fish Passage
Job 6: Administration

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Cover photo: Recently retired Kensington State Fish Hatchery Supervisor, Al Sonski weighing salmon fry.

JOB 1: ATLANTIC SALMON RESTORATION

Summary

Since 2014, efforts have shifted from restoration of Atlantic salmon in the Connecticut River basin to maintenance of a legacy population in targeted streams in Connecticut (Connecticut River tributaries: Farmington and Salmon rivers). Approximately 64,003 fry were stocked into selected areas. One adult salmon returned to Connecticut, compared to six in 2015. The total number of adult returns to the Connecticut River basin was five, compared to 22 in 2015. Returning adults were captured, tagged, and released to continue their migration upstream. All other state and federal partners ended their participation in Atlantic salmon restoration in 2013, but their efforts may generate adult returns until 2018.

Early in 2017, the Inland Fisheries Division and the Marine Fisheries Division merged into one Fisheries Division. Although this report summarizes work done in 2016, it is being written in 2017 and the text will reflect the new agency organization.

Background

The State of Connecticut is a member of the Connecticut River Atlantic Salmon Commission (CRASC), created by Congress in 1983 to promote the restoration of Atlantic salmon and other diadromous fishes to the Connecticut River in a cooperative manner with the other basin states (MA, VT, NH) and the federal agencies of the U.S. Fish & Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS). CRASC makes policy decisions about the nature of the restoration program. Its Technical Committee, made up of biologists from each partner agency, is responsible for carrying out the program, including such tasks as developing stocking plans, spawning plans, sharing of resources, etc. Member State agencies carry out the day-to-day activities within their states to follow these plans. The CTDEEP/ Fisheries Division is responsible for such activities, which are funded by the F-50-D federal aid project. This report summarizes the activities that occurred in 2016.

The effort to restore Atlantic salmon to the Connecticut River basin extended from 1967 to 2013. In 2012, the USFWS announced that it would no longer raise Atlantic salmon in its hatcheries to support the Connecticut River Restoration Program. Details of the past program and the factors leading to the termination of the program can be found in previous years' reports. The CTDEEP adopted a new approach to Atlantic salmon in its state: it will no longer actively work to restore a self-sustained population but instead maintain a 'legacy population' in small, discreet areas of good habitat within the Farmington and Salmon River watersheds, both tributaries of the Connecticut River. Although no other CRASC partners are engaging in similar activities in the other states, the CRASC still monitors salmon movements in other parts of the watershed.

For many years, this project has been conducted by the DEEP's Inland Fisheries Division. At the end of 2016, the Inland Fisheries Division and the Marine Fisheries Division were merged into one division- the Fisheries Division. Despite the fact that much of the work reported herein was accomplished when the Inland Fisheries Division still existed, the text refers to the Fisheries Division to be up-to-date.

Approach

To maintain a legacy population of Atlantic salmon in Connecticut, the Fisheries Division (FD) engaged in the following basic approach, which is listed below in more-or-less chronological order during the past year:

- We stocked salmon fry (a few weeks old) into the waters of targeted streams in the state (watersheds of the Connecticut River tributaries: Farmington and Salmon rivers) in suitable habitat using both FD staff and volunteers from the public.

Students from the Science and Technology Magnet High School of Southeast Connecticut prepare to stock salmon fry in the Salmon River in East Hampton.

- We operated the Rainbow Fishway (Farmington River, Windsor) and the Leesville Fishway (Salmon River, East Haddam) during the spring from April through mid-July. The Rainbow Fishway was operated in the fall from early October to mid-November, but due to extremely low river flows the Leesville Fishway was not operated during the fall. Although the fishways pass a variety of fish species, they serve as capture sites for returning adult salmon. No salmon were trapped at the fishways in 2016. One adult salmon was netted from the Salmon River downstream of the Leesville dam in July. The fish was visually inspected to determine sex, color (bright, dark, or intermediate), size (salmon vs. grilse), and condition (wounds, presence of parasites, fin damage, hatchery fin clips, or other distinguishing marks). It was then tagged with an individually numbered Floy tag in both the dorsal and adipose fins and released upstream of the Leesville dam in cooler water. Upstream river areas were posted to notify anglers of the possible presence of adult salmon.

Steve Gephard and Bruce Williams releasing an adult salmon in the Salmon River upstream of the Leesville dam on July 1, 2016.

- In the fall, we conducted electrofishing surveys of the fry-stocked streams to assess the growth and survival of the stocked fish, as well as produce an estimate of how many smolts originating from fry stocking would emigrate to sea the following year.

During the fall electrofishing survey of East Branch Salmon Brook in Granby staff captured a young-of-year salmon parr believed to have originated from natural reproduction of sea-run salmon released at the Rainbow dam in 2015.

- We assisted staff from other programs in the FD to spawn domestic adult salmon held at the Kensington State Fish Hatchery (KSFH). These salmon spend their entire lives in the hatchery and develop eggs without going to sea. Those eggs are used to produce fry for stocking in Connecticut, future KSFH broodstock, adult fish for the sport fishery, and educational purposes.
- After the adult domestic broodstock were spawned, FD staff released them into the Naugatuck and Shetucket rivers, Mt. Tom Pond, and Crystal Lake. These releases support a popular sport fishery that provides important recreational opportunities to anglers (see the annual progress report for Federal Aid Project F57-R35, Study 1, Job 3) and also promotes awareness to the

effort to restore and conserve wild Atlantic salmon in Connecticut and elsewhere in New England. KSFH also raises smaller salmon specifically for the sport fishery.

FD seasonal resource assistant Mike Steeves stocking a domestic broodstock salmon in the Naugatuck River.

- The program worked closely with the Connecticut River Salmon Association and its "Salmon-in-Schools" program to promote education about Atlantic salmon and aquatic resources. Eyed salmon eggs were provided to schools so that students could incubate, hatch the eggs, and stock the resultant fry.

Students from the Academy of Aerospace and Engineering Elementary School prepare to stock salmon fry using plastic bags.

Key Findings

- A total of 64,003 fry was stocked in the spring. This was a significant decrease from last year's total of 390,667. The decrease was the result of both planned program reductions and poor egg and fry survival in the 2015-16 production year. The fry were produced at KSFH and the Tripp Streamside Incubation Facility (TSIF) at the Tributary Mill Conservancy in Old Lyme, a registered non-profit organization that hatches fry for the program on a volunteer basis. The TSIF receives eyed eggs from KSFH. Table 1 (Appendix A) lists the locations and dates fry were stocked. Figure 1 (Appendix A) shows the number of fry stocked in 2016 in comparison to past years.

- A total of 11 individuals, plus two school groups (24 students) provided 133 volunteer hours to help stock fry.

- Emigrating salmon smolts were monitored in the Rainbow fishway viewing window using both real-time counts and digital videography. A total of 88 smolts was observed passing the window (2015 = 61). The majority of the smolts are believed to have emigrated via the downstream bypass, but no sampling or monitoring was conducted at the bypass during 2016.

- A total of five salmon returned to the Connecticut River Basin (2015= 22, five-year mean= 62). Only one salmon was documented returning to Connecticut. It was netted on the lower Salmon River and released upstream of the Leesville dam. No length or scale data was collected, but based on visual observations it is believed to have been an adult male that originated as a stocked fry and migrated to sea as a smolt in 2014.

- The Salmon River adult return exhibited a smolt-to-adult return rate of approximately 0.01%.

- Fry stocked in 2015 and 2016 were sampled as parr by electrofishing, September 9 - October 16 (37 plots in 16 streams) to assess survival and growth and to estimate next year's smolt production. Results show that survival of fry in 2016 was 19% lower than the long term average in the Farmington River tributaries and 91% lower than average in the Salmon River tributaries. No fry were stocked in the Salmon River in 2016. Survival of parr stocked as fry in 2015 was 46% lower than the long term average in the Farmington River tributaries, 23% lower than average in the Salmon River tributaries, and 75% lower than average in the Salmon River TMA. Due to staff constraints no sampling was conducted in the West Branch Farmington River TMA. A summary of these data is presented in Table 2 (Appendix A).

- Staff attempted to evaluate spawning success in the areas where salmon redds were found in the fall of 2015. No young-of-year salmon were found in these areas on the Farmington River, but one was found near a redd site on East Branch Salmon Brook in Granby. No fry were stocked in that stream in 2016 and it is assumed that the parr was the product of natural spawning by sea-run salmon released at the Rainbow dam in 2015.

- An estimated 6,681 and 2,367 smolts are expected to migrate out of the Farmington and Salmon rivers, respectively, in the spring of 2017, based on size and density data from 2016 electrofishing surveys.

- A total of 80 female and 78 male domestic broodstock was spawned at KSFH, producing 535,198

eggs. All eggs were eyed at KSFH and will be used to produce fish for the recreational fishery, future broodstock for KSFH, the "Salmon-in-Schools" education program, streamside incubators at the TSIF, and fry production at KSFH for the Legacy Salmon Program.

- In late December staff transferred a total of 98,500 'eyed' eggs from KSFH to TSIF. Incubation will be completed at TSIF and all fry produced are scheduled to be stocked in the Salmon River watershed.

- A total of 1,731 salmon was stocked into the Shetucket River (365), Naugatuck River (366), Mt. Tom Pond (500), and Crystal Lake (500) to support popular sport fisheries. A majority of these fish (1,570) were raised at KSFH specifically for the sport fishery, and were either 2+ years old (1,070) or 1+ years old (500). The remainder (161) were either post-spawn or barren 3+ KSFH broodstock.

Discussion

The number of fry stocked in 2016 was lowest in the history of the program. The decrease was the result of both planned program reductions and poor egg and fry survival. Prior to the beginning of the 2015 spawning season the water chiller at KSFH failed and was unrepairable. Without the resources to immediately replace it, the decision was made to incubate the majority of the eggs on ambient (10^{o}C) well water. This accelerated development, causing premature hatching and developmental problems. Egg-to-fry survival at KSFH dropped from an average of 40% to 12%. A limited number of eggs from KSFH were initially incubated on colder water at the Burlington State Fish Hatchery, then transferred to either TSIF or the Salmon-in-Schools program. These eggs survived well and exhibited typical egg-to-fry survival rates. The chiller was replaced in the spring of 2016 and all eggs taken in 2016 are being incubated on chilled water.

Fall electrofishing surveys showed record low survival for fry and parr in Connecticut streams. This was probably the result of extreme drought conditions and higher than average summer and winter temperatures in 2015 and 2016. This coupled with reductions in fry stocking means that very few smolts will be produced in Connecticut over the next two years.

Recommendations

1. Continue to stock fry in the manner done since 2014.
2. Continue to document returning adult salmon at the Rainbow and Leesville fishways.
3. Continue to provide support for the "Salmon in Schools" program.
4. Continue to provide fish for the Atlantic Salmon Trophy Fishery.

5. Continue public outreach activities about Atlantic salmon and the Legacy Program.

Acknowledgements

The authors wish to acknowledge the contributions of their co-workers in the project during 2016: Kirk McPherson, Bill Murdock, Nate Rocha-George, Patrick Wendt, and Shalyn Zappulla. We would also like to acknowledge the important assistance given by the many volunteers—too numerous to list—who helped stock salmon fry. We are grateful for the major contribution from Sandra and Scott Tripp of the Tributary Mill Conservancy for incubating salmon eggs. The Salmon-in-Schools program would not be possible without the hard work of the Connecticut River Salmon Association and in particular Dick Bell. We would like to give a special thanks to FD staff member, Al Sonski. In July 2016, Al retired after twenty-seven years of dedicated service as the manager of the Kensington State Fish Hatchery. Al's expertise and devotion to the job will be sorely missed. His waders will be filled by Jamie Hayes who will now manage both the Kensington hatchery and the Burlington State Fish Hatchery.

Appendix A

Table 1. Summary of fry stocking, 2016.

DATE	STREAM	LOCATION	# FRY	FRY/UNIT
FARMINGTON RIVER WATERSHED				
3-18■	W.Br. Farmington River	Rt.219 - Greenwoods	9,242	35
3-18■	W.Br. Farmington River	East side Greenwoods Isl.	2,703	28
4-27	Belden Bk.	Confluence - falls	6,606	25
4-29	W. Br. Salmon Bk.	Gorge – Moosehorn Bk.	5,711	25
5-03	W. Br. Salmon Bk.	Simsbury Rd. - gorge	3,839	25
5-05	Sandy Bk.	2nd Rt.183 Xing – Mass line	5,966	25
5-05	Morgan Bk.	Confluence - E.West Hill Rd.	4,108	25
5-10	W. Br. Farmington River	Morgan Bk. – Church Pool	3,132	17
			---	
watershed total			**41,307**	
SALMON RIVER WATERSHED				
3-17■	Dickenson Creek	Mouth – Viaducts	5,816	50
3-17■	Dickenson Creek	Viaducts - Old Bridge	8,223	41
3-17■	Jeremy River	Norton Mill - Rt.2	6,262	35
3-17■	Blackledge River	Parker Rd. - Jones Hollow	2,395	20
			---	
watershed total			**22,696**	
GRAND TOTAL			**64,003**	

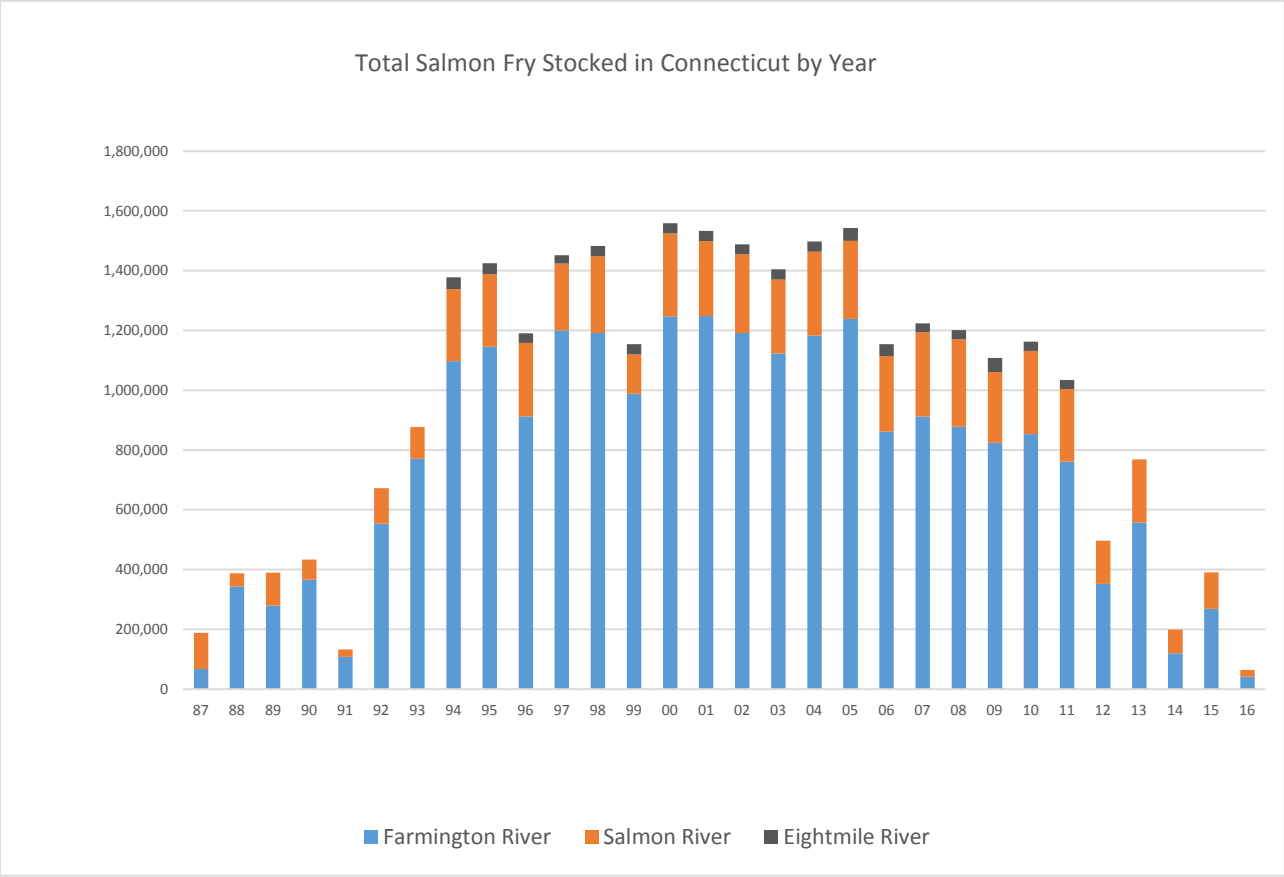
Kensington State Salmon Hatchery fry = 29,362

■ Tripp Streamside Incubation Facility fry = 34,641

Table 2. Summary of growth and survival of Atlantic salmon fry stocked in Connecticut, 2016.

Watershed	0+ Survival (%)			1+ Survival (%)			0+ Length (mm)			1+ Length (mm)		
	2016	2015	Mean[1]	2016	2015	Mean[1]	2016	2015	Mean[1]	2016	2015	Mean[1]
Farmington River												
W. Branch TMA	n.a.	n.a.	n.a.	n.a.	3.57	2.03	n.a.	n.a.	n.a.	n.a.	199	189
tributaries[2]	31.59	38.93	38.92	6.68	9.42	12.37	85	92	86	148	147	142
Salmon River												
TMA	n.a.	2.27	3.13	0.73	1.50	2.90	n.a.	88	102	164	177	171
tributaries	1.87	14.03	20.94	6.09	3.94	7.94	73	79	82	149	158	148

Figure 1. The number of Atlantic salmon fry stocked into three drainages in the State of Connecticut, 1987 – 2016.



Job 2 Shad and River Herring Restoration

Summary

American Shad and river herring runs were monitored throughout Connecticut in 2016. In general, American Shad runs remained the same while river herring runs varied when compared to 2015. River herring runs statewide this season were far below modest gains experienced 2011-2014. Biological sampling of Alewife was conducted at one key index site in Connecticut this season. Staff successfully transplanted pre-spawn adult American Shad and Alewives to support restoration goals. Staff recommends that the harvest prohibition for anadromous river herring in Connecticut waters be extended through March 2018.

Background

Alewife (*Alosa pseudoharengus*) and Blueback Herring (*Alosa aestivalis*) are two closely related (and hard to distinguish) species of anadromous herring. Collectively, they are referred to as 'river herring'. American Shad (*Alosa sapidissima*) is another anadromous herring closely related to the river herring. All three species are members of the family Clupeidae and are often referred to as 'clupeids' or 'alosines'. Shad can be as large as 20 inches and nine pounds, are popular food fish, and support both recreational and commercial fisheries (in the Connecticut River). River herring grow no larger than 12 inches and currently do not support any fisheries in Connecticut but are extremely important as a forage species to many other species. The only well-established shad run in Connecticut is in the Connecticut River. Other staff with the DEEP's Fisheries Division monitor the population and provide important data to the DEEP, Atlantic States Marine Fisheries Commission (ASMFC), and the Connecticut River Atlantic Salmon Commission (CRASC) for the management of this population. Those activities are not covered by this report. This project pursues restoration actions to restore runs to targeted tributaries of the Connecticut River as well as to other Connecticut watersheds such as the Housatonic, Naugatuck, Quinnipiac, Shetucket, and Quinebaug rivers. River herring runs exist in dozens of streams statewide but since the late 1980s, the runs have experienced sharp declines. Such declines have been observed along the East Coast. DEEP has prohibited the taking of river herring from any waters in Connecticut since 2002 as a way to slow the decline. The Fisheries Division monitors river herring runs and engages in restoration activities similar to those conducted for shad—often in the same streams. The activities conducted in 2016 for the restoration of both shad and river herring are summarized in this report. An important tool in the restoration of shad and river herring is the provision of fish passage at dams, which is not included in this report but in a separate report covering Job 5 of the same federal-aid project.

Early in 2017, the Inland Fisheries Division and the Marine Fisheries Division merged into one Fisheries Division. Although this report summarizes work done in 2016, it is being written in 2017 and the text will reflect the new agency organization.

Approach

To restore American Shad and river herring to streams within Connecticut, the Fisheries Division (FD) engaged the following basic approach:

We surveyed streams in Connecticut to determine which streams currently support shad and river herring runs and possess suitable habitat. Most streams have been previously surveyed but each year we identify streams or stream segments for which we lack information.

We monitored the runs of shad and river herring in many streams to: (1) enumerate the runs or otherwise characterize it for the purposes of tracking progress toward restoration goals for each specific stream, and (2) determine the status of river herring and assess progress in rebuilding runs following the population declines since the late 1980s.

Staff wiring an electronic fish counter at the exit of the Latimer Brook fishway. This counter aids in the enumeration of the Alewife run in this brook.

We transplanted pre-spawned adults from healthy runs to streams where the run requires rebuilding. We transplanted pre-spawned adult Alewives from Bride Lake into targeted habitat in other streams to promote production of juvenile Alewives and accelerate the pace of restoration in these streams. We transplanted pre-spawned adult American Shad from the Holyoke Dam Fishlift, Hadley, MA into targeted habitat in other streams to promote production of juvenile shad and accelerate the pace of restoration in these streams. Blueback Herring were not transplanted this year due to a lack of fish at the donor location. We helped support the transplantation of shad from the Greeneville Dam Fishlift, Norwich, CT to upstream habitat in the Shetucket River watershed. Most of this activity in the Shetucket River has

been assumed by Norwich Public Utilities (NPU), operator of the Greeneville Dam Fishlift, but the FD remains available if NPU is not able to conduct enough trips.

Norwich Public Utilities staff collecting American Shad from the Greeneville fishlift which will be transported by truck upstream.

Staff collected biological data from Alewives at the Bride Lake trap, East Lyme, CT and used them to develop population structure data for this population as an index for Alewife populations in the state.

Staff monitored the fall emigration of juvenile shad and river herring at key locations in the state to assess the reproductive success of the spring spawning season. Staff also cooperated with researchers by providing access to fish and samples of tissue to expand our technical knowledge of shad and river herring populations and behavior.

The FD promulgated regulations to best manage shad and river herring stocks, including annual regulations relative to the harvest of river herring based upon annual assessments. The DEEP has extended the river herring closure annually since 2002 because the annual assessments have concluded that no significant recovery has occurred.

Staff participated in several committees and working groups concerning river herring and also cooperated with researchers who are studying factors that influence river herring abundance.

Key Findings

- Alewife and Blueback Herring run strength was not much different than the poor runs of 2015. Some were up slightly and some were down slightly but there was no overall change.
- All evidence suggested that both Alewife and Blueback Herring run strength is very low throughout the state when compared to modest gains experienced in 2011-2014.
- Counts for Alewives were below long-term averages at eleven of the fourteen monitored fishways. Counts for Blueback Herring were lower than long-term averages at six of ten

fishways. Table 1 in Appendix A provides the counts of river herring at key Connecticut fishways (and the Holyoke Dam Fishlift in MA) and compares them to last year's counts.

- American Shad runs in Connecticut showed no clear trend relative to 2015. Some increased and some decreased. Table 1 in Appendix A provides the counts of American Shad at key Connecticut fishways (and the Holyoke Dam Fishlift in MA) and compares them to last year's counts.
- Staff collected biological data from 284 Alewives at Bride Lake to support long-term monitoring of age and growth characteristics.

Seasonal staff of the Diadromous Program collecting a scale sample from the Bride Brook fish run for aging.

- Adult Alewives were transplanted into the Naugatuck (1,000), East Branch Eightmile (400), Fall (400), and West (200) rivers as well as Fishing Brook (400) to accelerate the pace of restoration (total= 2,400 vs 1,800 in 2015).
- Adult American Shad were transplanted into the Farmington (1,070), Naugatuck (72), and Mattabesset (93) rivers to accelerate the pace of restoration (total= 1,235 vs. 741 in 2015). Significant trucking contributions to the Farmington River were made by the U.S. Fish and Wildlife Service.
- NPU staff transplanted 388 adult American Shad into the Shetucket River watershed above the Greeneville Dam (2015= 362).

  (See Table 2 in Appendix A for a list of all streams and numbers of fish.)
- Staff cooperated with Yale University to collect genetic samples of all Alewife stocked directly into Rogers Lake. This effort will continue in 2017 and will promote an understanding of the interaction between sea run and landlocked Alewife populations.

DEEP staff alongside Yale University researchers collecting genetic samples from Alewife prior to stocking into Rogers Lake.

- Staff participated in Northeast River Herring Working Group (NERHWG) meetings with counterparts from ME, NH, MA, RI, and NY. The purpose was to exchange technical information, develop standardized methodologies and databases, continue development of a regional guidance document and promote a regional approach to assessments and restoration. This involvement enhanced our understanding of river herring population trends in the region, shared technological approaches to river herring counting and monitoring, and helped us promote river herring conservation.
- Staff participated in the Technical Expert Working Group (TEWG) for River Herring, a coast-wide group of scientists, managers, harvesters, and conservationists all seeking to better understand river herring biology and promote conservation.
- Staff participated in multiple ASMFC American Shad and river herring Technical Committee meetings. These meetings gathered biologists from East Coast states and eastern Canada. Discussions at these meetings included what types of data collection could be standardized coast wide, how states might be able to adapt to new sampling strategies, and the review of States' sustainable fisheries management plans for American Shad and river herring. Coast-wide consensus is critical to promote relevant research and monitoring that will provide guidance to agencies for effective conservation and restoration.
- Staff collaborated with the Connecticut River Watershed Council to develop and promote a citizen science based effort to monitor river herring runs in Connecticut River's tributaries. This effort provided run data for Connecticut tributaries as well as provided great public outreach for diadromous fishes.
- The Commissioner of the DEEP extended the prohibition of taking all anadromous river herring in all waters of Connecticut from April 1, 2016 to March 31, 2017 based upon the assessment of the runs conducted in 2015.

Discussion

The 2016 run for both river herring species was again disappointing. Alewife run strength throughout the state at all monitored locations were much like last year's returns and in almost all cases well below long-term averages. Bride Brook, which hosts one of our state's premier Alewife runs, continued to experience relatively large numbers of returning fish when compared to other runs but for the first time since 2010 fell short of its long term average. Alewife data in Table 1 show that six out of 14 runs actually exhibited increases from 2015. However, these increases were inconsequential, e.g. 29 up from 15 or 5 up from 1. Considering that these runs should number in the tens of thousands, such "increases" are illusionary.

Blueback Herring runs throughout the state continue to be very low compared to historic means. Blueback Herring returns to Wethersfield Cove and the Salmon River were very low when compared to modest gains experienced in 2014. The spawning and production of juveniles of river herring in inland waters appears to be successful. After releasing pre-spawned Alewife into Millpond on the Falls River in Essex, large numbers of young-of-year were observed emigrating to sea. Evidence continues to point to activities in the ocean as the cause of the depression of stock size. Yet river herring runs appear to be increasing in Maine and other areas within the Gulf of Maine. Meanwhile, runs in Rhode Island and parts of New York as well as areas in North Carolina remain depressed like the runs in Connecticut. This suggests that factors in the ocean may not have the same influence on all stocks.

The Connecticut River American Shad run was similar to last year. The Holyoke Dam fishlift saw a slight decrease from last year but falls within the range of the previous five years, which is part of a recent rebound. This trend is contrary to slight decreases at monitored dams in Connecticut. Numbers of American Shad elsewhere in the state varied greatly and provide no clear or obvious trend. However, the Connecticut River population has remained large, despite significant declines since the 1990s while other runs in Connecticut are being restored from extremely low numbers. Expectations for runs that number less than 1,000 must be different than those that exceed 400,000.

Recommendations

No modifications to this job are recommended at this time. Based upon the results of the 2016 monitoring of the river herring runs in Connecticut, staff will be recommending to the DEEP Commissioner that the harvest prohibition for anadromous river herring in Connecticut waters be extended from April 1, 2017 to March 31, 2018.

Acknowledgements

The Fisheries Division thanks the many people who have assisted in the program to restore American Shad and river herring in Connecticut during 2016. Seasonal employees were Kirk McPherson, Pat

Wendt, Nate Rocha, Billy Murdock, and Shalyn Zappulla. Others who assisted during the year included Ken Sprankle (USFWS), Jeff Lortie, and Pete Barber (NPU), Town of East Lyme- Public Works Dept., Holyoke Gas and Electric Dept., and Steve Leach of Normandeau (contractor for Holyoke Gas & Electric).

Appendix A

The following tables include data referenced in the report.

Table 1. Passage of American Shad and river herring at key fishways in Connecticut, 2016 vs. 2015.

Fishway	American Shad		Alewife		Blueback Herring	
	2016	2015	2016	2015	2016	2015
Mianus Pond Dam *(Mianus River, Greenwich)*	NP	NP	11,899	8,897	3,980	9,745
Kinneytown Dam *(Naugatuck River, Seymour)*	3	0	5	1	0	0
Harry Haakonsen at Wallace Dam *(Quinnipiac River, Wallingford)*	0	2	1,246	1,292	114	165
Branford Water Supply Ponds *(Queach Brook, Branford)*	NP	NP	1,512	538	NP	NP
StanChem Dam *(Mattabesett River, Berlin)*	23	15	192	31	0	18
Rainbow Dam *(Farmington River, Windsor)*	141	315	0	0	0	18
Holyoke Dam *(Connecticut River, Holyoke, MA)*	385,930	412,656	NP	NP	137	87
Mary Steube at Lower Mill Pond *(Mill Brook, Old Lyme)*	NP	NP	406	134	NP	NP
Brides Lake *(Bride Brook, East Lyme)*	NP	NP	147,552	218,076	NP	NP
Latimer Brook *(Latimer Brook, East Lyme)*	NP	NP	4,228	4,926	NP	NP
Greeneville Dam *(Shetucket River, Norwich)*	2,682	1,919	1,456	502	115	10
Taftville Dam *(Shetucket River, Norwich)*	119	161	0	0	0	0
Occum Dam *(Shetucket River, Norwich)*	71	5	0	0	0	0
Tunnel Dam *(Quinebaug River, Preston)*	9	37	29	15	6	5
Hallville Pond Dam *(Poquetanuck Brook, Preston)*	NP	NP	15	32	NP	NP

NP= species not present in this location

Table 2. Summary of transplantation of American Shad and river herring, 2016.

Date	Recipient Stream	Town	Donor Stream[1]	Shad[2]	Alewife[2]	Blueback herring[2]
5 May	E. Branch Eightmile	Salem	Bride Brook		400	
5 May	Fishing Brook	Old Saybrook	Bride Brook		400	
5 May	Falls River	Centerbrook	Bride Brook		400	
6 May	West River	New Haven	Bride Brook		200	
6 May	Naugatuck River	Beacon Falls	Bride Brook		1,000	
9 May	Shetucket River[3]	Taftville	Shetucket R.	100		
10 May	Shetucket River	Sprague	Shetucket R.	100		
11 May	Shetucket River	Sprague	Shetucket R.	100		
11 May	Shetucket River	Sprague	Shetucket R.	88		
27 May	Farmington River	Windsor	Connecticut R.	87		
1 June	Farmington River	Windsor	Connecticut R.	81		
1 June	Farmington River[4]	Windsor	Connecticut R.	71		
2 June	Naugatuck River	Beacon Falls	Connecticut R.	72		
2 June	Farmington River[4]	Windsor	Connecticut R.	120		
3 June	Farmington River[4]	Windsor	Connecticut R.	120		
7 June	Farmington River[4]	Windsor	Connecticut R.	126		
8 June	Farmington River[4]	Windsor	Connecticut R.	131		
9 June	Farmington River[4]	Windsor	Connecticut R.	75		
10 June	Farmington River[4]	Windsor	Connecticut R.	121		
14 June	Farmington River[4]	Windsor	Connecticut R.	70		
15 June	Mattabesset River	Berlin	Connecticut R.	93		
17 June	Farmington River[4]	Windsor	Connecticut R.	68		
			TOTALS	1,623	2,400	0

[1]Bride Brook- collection site is a fish trap located at the outflow of Bride Pond, East Lyme, CT; Connecticut River - Collection site is the Holyoke Dam Fishlift, Holyoke, MA; Shetucket River – Collection site was the Greeneville Dam Fishlift, Norwich, CT.

[2]These numbers represent the fish that actually survived the trip, with numbers of mortalities subtracted from the original load.

[3]All Shetucket River stockings were performed by NPU staff with DEEP support. American Shad and river herring were taken from the Greeneville Dam Fishlift and transplanted upstream of the Taftville Fishway. This effort is helping support restoration goals in the Shetucket River watershed and compensating for low shad and river herring passage at the Taftville and Occum fishways.

[4]These trucking runs were performed by USFWS in support of Connecticut's restoration plans.

Job 3: American Eel Restoration

Summary

American Eels need help getting around dams in Connecticut. In 2016, over 28,352 eels were passed around 25 dams with the help of specialized eel passes. Ongoing research helps us understand more about eels and how to help them. Monitored eel passes passed fewer eels in 2016 than in 2015, including Fishing Brook (5,347 vs. 11,979) and Greeneville (879 vs. 3,959).

Early in 2017, the Inland Fisheries Division and the Marine Fisheries Division merged into one Fisheries Division. Although this report summarizes work done in 2016, it is being written in 2017 and the text will reflect the new agency organization.

Background

American Eel (*Anguilla rostrata*) is a unique fish native to Connecticut. It is catadromous (hatches in saltwater, migrates to freshwater to feed and grow, returns to saltwater to spawn and die) and many of the issues and challenges with its management are similar to the anadromous species like salmon, shad, and river herring. The species is highly sought after as food by people in other nations but is only a minor source of food for Americans. However, the species is highly prized by American anglers as bait for saltwater fish such as striped bass. In addition to its value to humans, it is a very important species both as predator and prey in freshwater and saltwater ecosystems. Although this species is widely distributed and common in Connecticut, its numbers have been declining sharply in recent years, both in Connecticut and along the entire East Coast. Two petitions to list the species under the U.S. Endangered Species Act have been filed and rejected within the past decade. It is important for the CT DEEP to protect American Eels in Connecticut waters and allow the fish to access more of its historical habitat.

Approach

To restore American Eel runs to streams within Connecticut, the Fisheries Division (FD) has engaged the following basic approach:

- We conducted annual monitoring of the run of 'glass eels' (transparent young eels recently arrived from the ocean) at an established index site and provided those data to the Atlantic States Marine Fisheries Commission (ASFMC) as part of a mandated annual compliance report.
- We also conducted annual monitoring of populations of 'yellow eels' (pigmented older eels that have been in the streams for several years) at established index sites to track the population size from year-to-year.

- We promoted the installation of 'eel passes' to allow upstream passage around dams in cases when the dams appear to be significantly restricting access to upstream habitat and assisted with the operation, monitoring and compilation of passage data at selected eel passes in the state.
- When necessary, eel passes were modified, removed, repaired, or reinstalled. With the catadromous eel, the spawning run occurs in the fall with adult fish ('silver eels') moving toward the sea. We count migrating silver eels at selected facilities where we have the proper equipment. Adult male silver eels do not exceed 16 inches in length which allows staff to estimate the percent of female silver eels (those greater than 16 inches in length) seen emigrating at these facilities. Many facilities pose dangers to migrating eels so staff work cooperatively with dam owners to develop, test, and operate devices, systems, and procedures that would allow the safe downstream passage of adult eels and prevent them from entering hydroelectric turbines, water company treatment plants, and other facilities in which eels could be killed or injured.
- Much is still unknown about the behavior of eels and therefore staff cooperate with researchers on the study of eel behavior and populations that would enhance our knowledge of the species and our ability to protect it.

Specific Projects in 2016:

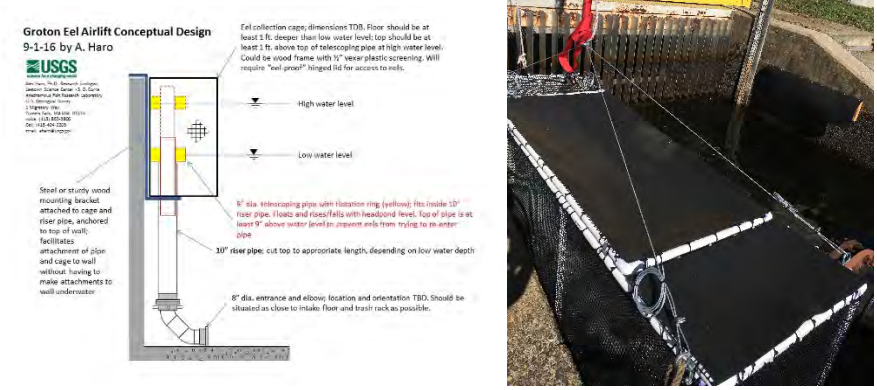
Sawmill Brook Culvert- As part of an emergency repair to a perched culvert over Sawmill Brook (I-91 Middletown), FD staff required the inclusion of an eel pass to allow eels to reach upstream habitat. Staff provided technical guidance to the Department of Transportation (DOT) as it designed an innovative eel pass. To provide eel passage up a steeply sloped nine-foot drop, DOT installed prefabricated concrete panels cast with native gravels of varying sizes imbedded into the concrete's surface. The gravel decreases the water velocity and provides climbing substrate for migrating eels. The panels are angled slightly towards the center (V-shaped) to provide a suitable passage zones for eels of all sizes over many different flows.

Cargill Falls Eel Pass- A new eel pass was constructed at the Cargill Falls Dam (Quinebaug River, Putnam). This eel pass has similar features to the Sawmill Brook Culvert Eel Pass including the use of stone as the climbing substrate embedded into freshly poured concrete.

The Norton Mill Dam- This dam on the Jeremy River (Colchester) was removed in 2016. This removal will improve access for eels to over 17 miles of habitat.

Groton Reservoir Adult Eel Trap- Staff helped design, install, and operate a silver eel airlift system for downstream passage at the entrance of the Groton water supply treatment plant, in a partnership with Groton Public Utilities (GPU) and U.S. Geological Survey (USGS). Young eels can enter this water supply reservoir in the spring but adult eels cannot safely emigrate to the sea to spawn in the fall because the water level is always below the spillway level. This results in all silver eels entering the water treatment plant and dying. Staff have been working with GPU staff for several years to address this problem and proposed a new "airlift system" that had previously been successfully tested in the experimental flume

at the USGS's Conte Anadromous Fish Research Center in Turners Falls, MA. A ten-inch diameter PVC pipe was mounted vertically against a wall of the intake structure with the bottom (entrance) resting on the floor of the water supply intake structure – about ten feet below the surface of the reservoir—and the top (exit) about nine inches above the water surface. A large compressor pumped air into the base of the pipe and forced the water inside to rush upward and out of the top of the pipe like a drinking fountain. This creates an attractive current to the eels, which enter and are pushed up the pipe with the water. The top of the pipe is encased in a screened cage to trap the eels but all the water is returned to the reservoir, with no lost water to the GPU (see the schematic of the system and a photo of the airlift on the next page).



(left) Conceptual design of the Groton Eel Airlift. (right) The Groton Silver Eel Airlift and trap is positioned in front of the water treatment plant's intake grate.

Key Findings

- The young-of-year (YOY) eel run at the Fishing Brook Eel Pass occurred for 65 days in 2016 (2015 = 102 days). During this time, 5,347 YOY eels were captured (2015 = 11,979) and passed upstream; equating to a catch-per-unit-effort (CPUE) of 2.89 (2015= 5.39) (Table 1).

- Ten rivers were sampled for American Eel with electrofishing gear during the season. Population estimate data are found in Table 2.

- Upstream passage of eels was provided at 26 dams by means of a specialized eel pass or a compatible fishway designed for anadromous species (Figure 1).

- Through partnerships with municipalities, non-governmental organizations, hydropower companies, and others, 28,352 American Eels were counted passing upstream of barriers at nine different eel passes (Table 3). It should be noted that there are many other eel passes in the state where eels pass but are not counted. This number represent the eels that were

documented to be passed over dams.

- The Greeneville eel pass passed 879 eels in 2016 (2015 = 3,959).

- A total of 386 migrating silver eels was counted in the fall at monitored fishways using digital imagery. Approximately 64% of these eels were estimated to have been greater than 16" in total length, and thus likely females (Table 4).

- Connecticut DOT installed the prefabricated eel pass at the Sawmill Brook Bridge culvert (see photo's below) but no monitoring was done to verify numbers of eels that used it.

Left- One of the pre-fabricated 9' x 4' concrete substrate panels prior to installation as part of the eel pass. The large gravels will provide passage for large eels. Right- The completed eel pass in the outlet of the perched culvert. Note that the left side panels contain larger gravel than the right side and the water is deeper in the center than along the edges; conditions that provide many passage options for migrating eels.

- The Cargill Falls Eel Pass was completed too late in the year to provide passage to eels in 2016.

- No monitoring was done to document numbers of eels passing up the Jeremy River after the Norton Dam was removed.

- The Groton silver eel airlift captured 63 silver eels during the fall operating period. The eels were released downstream of the facility, free to make their spawning run to the Sargasso Sea.

Discussion

Monitoring of the glass eel run is mandated by the ASMFC to generate important population data, coast-wide. ASMFC's American Eel Management Board is currently working off of Addendum IV to the Interstate Fishery Management Plan. The Addendum established a 907,671 pound coast-wide quota for yellow eel fisheries, reduces Maine's glass eel quota to 9,688 pounds (2014 landings), and allows for the continuation of New York's silver eel weir fishery in the Delaware River. While these changes do not directly impact activities in Connecticut, the fact that all eels along the East Coast belong to one large population, conservation efforts in one state benefit eels in all states.

Electrofishing surveys allow staff to track upstream responses to improvements in eel passage. The electrofishing site on the East Branch Eightmile River is located approximately 3.5 km upstream of Ed Bills Dam which was removed in 2015. Since removal, the eel population estimate within the electrofishing sample stretch has more than doubled in one year and the average total length of the eels in the sample decreased showing that younger eels are migrating into the river's habitat above the former dam site.

The protection of silver eels remains an important objective of this project and the initiative to work cooperatively with the owners of water supply reservoirs is showing great promise for developing custom-designed protective measures at various locations across the state.

Recommendations

No modifications to this job are recommended at this time.

Acknowledgements

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A continual debt of gratitude to Dr. Alex Haro of the United States Geological Survey's Silvio Conte Anadromous Fish Research Center for his insights regarding eel pass designs and his on-going research investigating downstream passage of silver eel in Connecticut. Dr. Haro was instrumental in the design, construction, and oversight of the experimental silver eel airlift at Groton Utilities.

Additionally we would like to thank: Sandra Tripp of the Tributary Mill Conservancy for operating the eel pass on Mill Brook, Mary and Bob Otterson for granting staff access to the Fishing Brook Eel Pass, Norwich Public Utilities (NPU) staff for their help in passing eels at their projects, FirstLight Power Resources (FLP) for their efforts in American Eel passage on the Quinebaug, Shetucket, and Housatonic rivers. We also thank the South Central Regional Water Authority for maintaining the eel pass on Mill River. Groton Utilities provided staff and equipment in their support of the experimental silver eel airlift system.

Appendix A

The following tables are referenced in this report.

Table 1. Young-of-Year American Eel data, Fishing Brook Index Site, 2016.

Date	*Hours Fished*	*Temperature (C)*	*Discharge (cfs)*	*YOY Eels*	*CPUE*
1-April	Deploy	4	8.8	n.a.	n.a
4-April	70.0	5	17.8	101	1.438
8-April	95.5	10	20.1	13	0.136
11-April	71.5	8	10.9	25	0.350
12-April	24.0	9	11.4	50	2.083
13-April	24.5	10	12.3	16	0.653
14-April	23.5	10	10.5	10	0.426
18-April	96.5	12	7.9	228	2.360
20-April	47.5	14	8.0	1,228	25.855
21-April	24.0	16	7.9	675	28.125
22-April	24.0	14	7.4	175	7.292
25-April	72.5	13	7.7	490	6.761
26-April	24.0	15	8.8	43	1.786
27-April	24.5	16	9.1	2	0.085
28-April	23.5	10	8.2	14	0.611
29-April	24.0	13	7.7	7	0.301
2-May	72.5	12	7.2	35	0.488
3-May	23.5	13	9.6	1	0.046
4-May	24.5	11	10.0	14	0.569
5-May	28.0	10	10.9	15	0.536
6-May	19.0	10	9.6	29	1.523
9-May	71.5	12	7.8	546	7.640
10-May	25.5	14	7.5	31	1.207
11May	28.0	16	7.2	29	1.027
12-May	23.0	14	7.0	46	2.007
13May	24.0	14	7.5	138	5.769
16-May	73.0	15	6.5	227	3.103
17-May	21.0	17	6.2	47	2.222
18-May	22.5	18	6.3	60	2.667
19-May	24.0	19	6.1	220	9.167
20-May	23.5	18	6.1	47	1.986
23-May	72.0	18	7.8	154	2.133
24-May	26.0	20	7.6	100	3.846
25-May	23.5	18	6.3	33	1.418
27-May	46.5	19	5.7	58	1.254
30-May	76.0	22	8.2	77	1.013
31-May	23.0	20	6.6	7	0.305
1-June	22.0	20	6.6	40	1.834
2-June	24.5	21	6.0	19	0.756
3-June	22.0	22	5.7	79	3.573
6-June	76.5	21	7.3	69	0.901
7-June	21.0	21	6.3	75	3.571
8-June	28.0	22	5.7	33	1.188
9-June	20.5	20	no data	2	0.098
13-June	96.5	18	6.1	11	0.111
14-June	22.0	17	6.8	3	0.114
15-June	27.0	20	6.6	7	0.257

continued on next page

Fishing Brook Eel Pass YOY data, 2016 (continued).

Date	*Hours Fished*	*Water Temperature (C)*	*River Discharge (cfs)*	*Number of YOY Eels*	*YOY CPUE*
16-June	24.0	21	6.4	12	0.503
17-June	26.0	21	6.3	7	0.258
Total	*1,850.0*			*5,347*	
Mean	*38.5*	*15*	*8.2*		*2.945*

Table 2. Population estimates of American Eel in index stations in streams sampled by electrofishing, 2016.

Stream	Town	Sample Length (m)	Population estimate[1] 2015	2016
Farmill River	Shelton	76	68	118
Eight Mile River	Oxford	72	22	23
Blackledge River	Hebron	45	35	14
E.Br.Eightmile River	Salem	62	17	43
Halfway Brook	Newtown	80	0	0
W.Br. Aspetuck River	New Milford	85	0	0
Terry Brook	Hazardville	50	17	25
Gulf Stream Brook	Somers	82	5	1
Sawmill Brook	Willimantic	85	4	1
Stonehouse Brook	Chaplin	85	0	0
Beaver Dam Brook	Eastford	72	0	0

[1]This is an estimate of the number of eels living in the sampled section of stream, without any effort to standardize for area size between streams or extrapolate numbers to estimate population size for the entire length of the streams. The electrofishing is done using a multiple pass – depletion method. This is done annually to compare data for each site with that data for previous years. This allows us to monitor trends over time and space and look for responses to eel passage efforts.

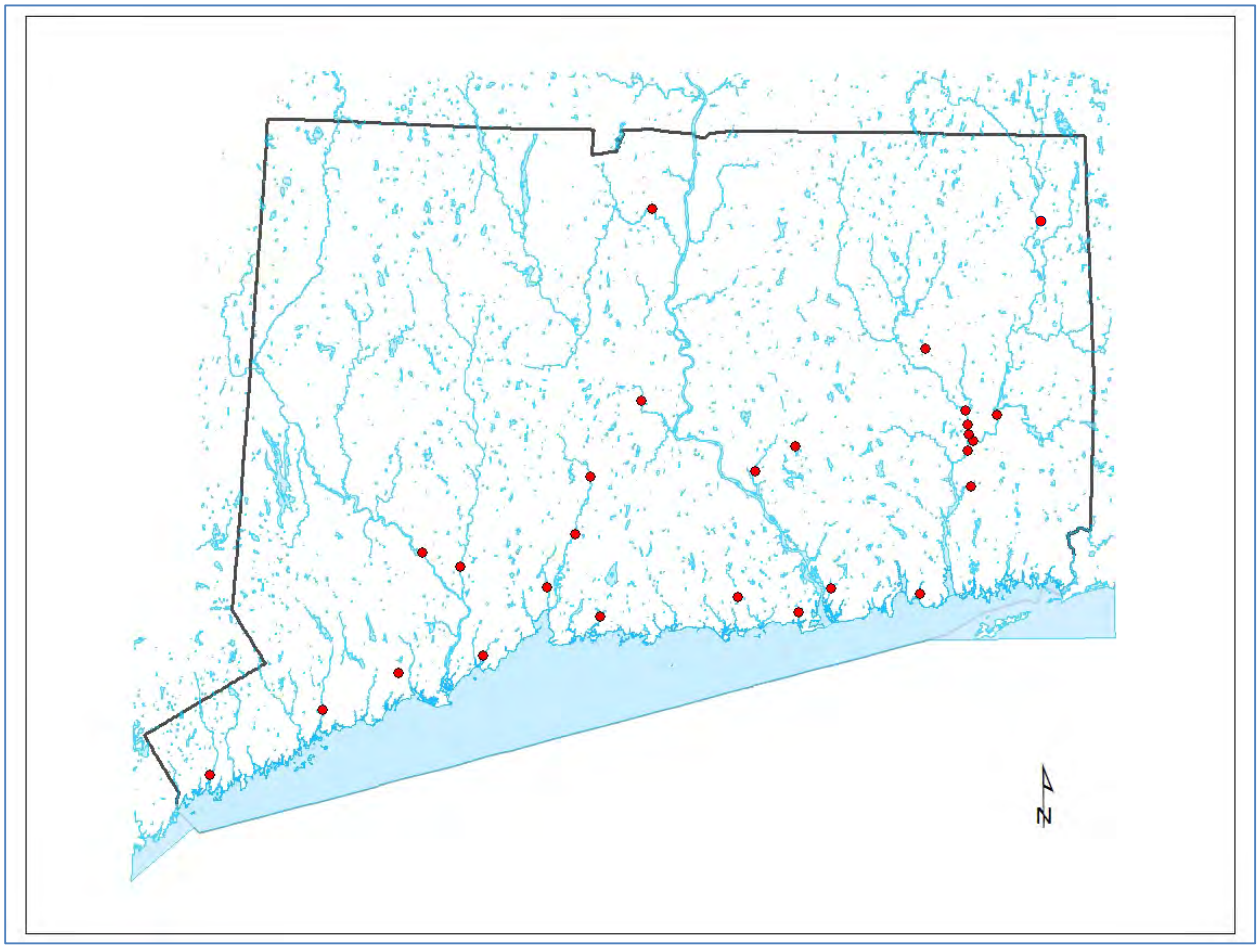
Table 3. Numbers of American Eel passed upstream of barriers at eel pass traps, 2016.

				Number of Eel	
Eel Pass	River	Town	Operator	2015	2016
Mill River	Mill River	Hamden	RWA[1]	569	763
Rainbow Dam	Farmington	Windsor	DEEP	689	828
Fishing Brook	Fishing Brook	Old Saybrook	DEEP	12,335	5,347
Greeneville Dam	Shetucket	Norwich	DEEP	3,959	879
Scotland Dam	Shetucket	Scotland	FirstLight	3,816	72
Tunnel Dam	Quinebaug	Preston	Firstlight	11,500	20,463
			Total	28,909	28,352

Table 4. Number of migrating silver eels counted at monitored fishways, 2016.

	2015		2016	
Fishway	N	% > 16”	N	% > 16”
Rainbow Dam	44	100	71	100
StanChem Dam	140	N.A.		Not monitored in 2016
Moulson Pond	127	46	182	52
Bunnells Pond		Not monitored in 2015	133	62
	311	~47[2]	386	64

Figure 1. Map of eel passes in Connecticut as of December, 2016. Number of locations= 26.



Job 4: Sea-run Trout

Summary

Sea-run Brown Trout are popular game fish that attract many anglers. These fish appear in coastal streams in Connecticut in low numbers and this project seeks ways of increasing their numbers by stocking special strains of trout in different streams and with different life stages. Results are examined to see if one technique works better than another. The Fisheries Division imported a strain of sea-run trout from Europe in 2014 - 2016.

Early in 2017, the Inland Fisheries Division and the Marine Fisheries Division merged into one Fisheries Division. Although this report summarizes work done in 2016, it is being written in 2017 and the text will reflect the new agency organization.

Background

Brown trout (*Salmo trutta*) is native to Europe, not New England. But the species was introduced into Connecticut streams during the late 1800s and stocking from State hatcheries continues to the present. Natural reproduction occurs in many streams and wild populations now exist. It was realized many decades ago that some of these trout migrate into Long Island Sound, where they live and mature and then return to streams to spawn. This anadromous form of Brown Trout is common in Europe and in New England the fish are referred to as 'sea-run trout'. The native species of trout, Brook Trout (*Salvelinus fontinalis*), also had a sea-run form but such individuals are no longer found in the state and rarely found south of the Gulf of Maine due to their need for cold seawater. Sea-run Brown Trout, which can tolerate the warmer water of Long Island Sound, may grow as large as Atlantic salmon and are highly valued as a sport fish. The Department's predecessor agency sought to establish runs of sea-run Brown Trout beginning in the early 1960s with the introduction of sea-run strains of Brown Trout from Europe (Jones 1963). This effort was discontinued due to limitations of the hatchery system and poor returns in the late 1970s. However, small numbers of sea-run Brown Trout continued to appear in our streams and be caught by anglers.

An effort to enhance those runs—both in terms of the numbers returning and the number of streams to which they return—was begun in 2001 using the existing strains of hatchery trout in Connecticut. Meeting the stocking requirements (number, life stage) was accomplished by our trout hatcheries. Hatchery staff were familiar with the strain of trout and knew how to produce the required numbers and life stages. Very few of these fish were returned to the creel as adult sea-run Brown Trout. In 2014, based on the limited success of domestic strains, the Fisheries Division (FD) imported a strain of sea-run Brown Trout directly from Europe. This project represents a pilot study to test the performance of this strain of fish to generate adult returns from Long Island Sound and to assess the feasibility of using this strain and these techniques to support a trophy recreational fishery. This report summarizes the activities of this effort within the past year.

For many years, this project has been conducted by the DEEP's Inland Fisheries Division. At the end of 2016, the Inland Fisheries Division and the Marine Fisheries Division were merged into one division- the Fisheries Division. Despite the fact that much of the work reported herein was accomplished when the Inland Fisheries Division still existed, the text refers to the Fisheries Division to be up-to-date.

Left: Maintainer Joe Ravita prepares the eyed Iijoki strain sea-run Brown Trout eggs for topical disinfection. Right: After disinfection, the eyed eggs are placed into incubation trays at Burlington State Fish Hatchery.

Approach

To enhance runs of sea-run trout in Connecticut streams, FD engaged the following basic approach:

- All required Federal and State permits governing the importation of eyed eggs from another country were secured prior to importation of any fish.
- We imported a strain of known sea-run (anadromous) Brown Trout, a sea-run strain from the Iijoki River in Finland that represented a low risk for certifiable diseases. These were imported as eyed eggs and hatched and reared at the Burlington State Fish Hatchery (BSFH). The numbers of eggs imported for the 2014 and 2015 cohorts (as referenced throughout this report) were reported in past years' reports. For the 2016 cohort, approximately 37,000 eyed sea-run Brown Trout (Iijoki strain) eggs were imported to BSFH from Taivalkoski Hatchery, operated by the Finnish Game and Fisheries Institute.
- We experimented with different rearing regimes at BSFH to determine what conditions produced the most and highest quality smolts from this strain of fish with which we had no prior experience.
- We evaluated the quality and condition of the fish while in BSFH by measuring the fish, evaluating fin condition, and assessing their smolt-like characteristics (as appropriate). This was done in February on a subsample of 200 pre-smolts from the 2014 cohort and in August with a subsample of 500 fish from the 2015 cohort.
- We collaborated with researchers to monitor and assess the physiological performance of the strain to determine if the fish were undergoing smoltification. In February, March, and April, pre-smolts of the 2014 cohort were sampled (20 per month; non-lethal gill biopsy) from freshwater at BSFH to measure gill Na+/K+-ATPase (NKA) activity, a well-accepted measure of smoltification. In May, 12 trout from this cohort that were deliberately not stocked were

sampled at BSFH to measure gill NKA activity and blood plasma chloride levels. The following day, 24 trout were transferred to saltwater tanks (30 ppt) located in the fisheries lab at the University of New Haven (UNH). Following 24 hour saltwater exposure, 12 trout were sampled (lethal biopsy) for gill NKA activity and blood plasma chloride level. The remaining trout were held an additional 20 days (21 day saltwater exposure) in saltwater tanks and were sampled (lethal biopsy) for gill NKA activity and blood plasma chloride level.

- A holding fence was installed across Latimer Brook at a point approximately 400 meters downstream from the smolt release site. This was done to ensure the smolts remained in the stream for a minimum of five days after stocking to increase the chances they would 'imprint' to Latimer Brook and therefore home back to the stream as adults in future years.
- All the remaining 2014 cohort at BSFH (N= 3,082) were released as age-2+ smolts into Latimer Brook in early March above the holding fence.
- Five days after the smolt release, the holding fence was removed.
- We stocked some fry and parr of the 2015 cohort into suitable habitat in specially targeted coastal streams as necessary to reduce fish density at BSFH and improve rearing conditions for the pre-smolts. The fish were released into suitable habitat in hopes that these stockings would also generate adult returns.
- We evaluated the survival of all stocked fish by conducting follow-up electrofishing surveys to assess the density and size of the fish that remained in the streams. Ideally, it would be good to enumerate young trout as they leave for Long Island Sound but since these trout may leave at many times of the year including times of high flows, that technique is not practical. Instead, we document the fish that remain in the streams in the late summer and compare that to the number of fish we stocked in the spring. Using those data, we attempt to quantify fish mortality and emigration. Many of the fish we stocked are marked with fin clips so we look for these marks when we sample streams.
- All trout in the 2015 cohort were inspected in the hatchery for fin clips and re-clipped if necessary.
- We evaluated adult returns by looking for adult sea-run Brown Trout: (1) in streams using electrofishing surveys, (2) in fishway traps, (3) on video taken in fishways without traps, and (4) by receiving catch reports by anglers. When we can obtain scale samples from adult sea-run trout, we analyze them to learn more about their ages and time spent in both fresh and saltwater.

For clarity, Iijoki sea-run Brown Trout (trout) will be reported referencing the cohort year in which they were imported as eyed eggs (e.g. 2014 cohort).

Key Findings

2014 Cohort

- Only two smolts sampled at BSFH were found to have 'fatal fin condition' (pectoral or caudal fins that are eroded beyond a pre-determined critical level) prior to release.
- Physiological assessment of age-2+ trout found that there was high variability in both parameters gill NKA activity and blood plasma chloride) measured.
- Gill NKA activity of age-2+ trout seemed to peak in March, but was not significantly higher than activity measured in April or May.

- Blood plasma chloride levels were higher for age-2+ trout held in saltwater for 24 hours than those held in freshwater.
- For age-2+ trout, blood plasma chloride levels were lower for trout held for 21 days in saltwater than trout held for 24 hours in saltwater.
- One fish that was stocked as age-1+ parr into Dickenson Creek in May, 2015 was captured in the fall as a 2+ parr.

Smolt holding fence being installed across Latimer Brook at the tail-end of a small unregulated pond. This site was located 400 meters downstream of the release site and was removed five days after smolt stocking.

2015 Cohort

- No stockings of the 2015 cohort occurred in 2016.
- A total of approximately 12,000 trout was held at BSFH for production of age-2+ smolts, targeted for release in 2017.
- Physiological assessment of age-1 trout found that there was high variability in both measured parameters (gill NKA activity and plasma chloride).
- Plasma chloride levels were higher for age-1 trout held in saltwater for 24 hours than those held in freshwater.
- No fish was found to have 'fatal fin condition'.
- Approximately 37% of the fish sampled during the fin evaluation were found to have incomplete fin clips (left ventral fin).
- Results of electrofishing sampling indicate that of the parr stocked in the fall of 2015, 0.5% survived to the fall of 2016 in the Farm River and 6.3% survived to the fall of 2016 in the Shunock River.

The 2014 and 2015 cohorts had received fin clips as 0+ fall parr before being moved to raceways outdoors. Many of these fish were observed to have either no or partial fin clips the following summer. All trout were inspected and given the fin clip if necessary. In the future clipping will occur in the fall at age-1+.

2016 Cohort

- Hatch-out mortality of the eyed eggs at BSFH was low (< 5%).
- Totals of 6,660 and 5,343 parr were stocked into the Farm River (East Haven) and Shunock River (North Stonington), respectively, in September to reduce rearing densities in BSFH.
- A total of 15,000 parr were retained and transferred to outside rearing ponds at BSFH for smolt production.

Discussion

2014 Cohort

The February assessment of fin condition determined that none of the smolts had fatal fin condition. This confirms favorable rearing conditions at BSFH. A balance must be struck between maximizing the quantity and the quality of trout reared. Increasing the density of trout in raceways will increase the numbers of fish ultimately produced but higher densities result in poor fin condition, decrease in growth, and even inhibition of smoltification. Therefore, it is possible that more fish in a raceway may result in fewer smolts and fewer adult returns from sea. The goal is to raise as many fish as possible but still produce good quality smolts (in terms of size, fin condition, and smoltification).

The first smolts from the 2014 cohort were released as age-2+ smolts on March 9th and 10th into Latimer Brook, approximately 3.8 kms above the Latimer Brook Fishway Trap and 4.8 kms above the head-of-tide. They averaged 212 mm in total length, which corresponded to the target size. Of the 56,000 eggs imported, only 3,082 survived to become smolts. Most of the losses occurred at the fry stage as workers at BSFH struggled to discover the best raceway conditions to efficiently feed these fish belonging to a strain of trout that behaved differently from strains of brown trout with which we had

previous experience. The experience gained with the 2014 cohort has already benefitted the succeeding cohorts and many more smolts are expected to be stocked in future years.

The holding fence erected 400 m downstream of the release site worked well. This fence prevented smolts from immediately emigrating from the stocking location. Anadromous salmonids like trout and salmon memorize or 'imprint' to the chemistry of their home stream and are able to return to that same stream as mature adults by following the trail of the familiar scent emanating from the mouth of the stream. There was a concern that if the fish immediately moved downstream after stocking, they could be in Long Island Sound in a few hours and may not have time to imprint to Latimer Brook. By erecting the fence, fish were held in Latimer Brook for a minimum of five days. The fence was removed on March 14th at which time over 100 smolts were observed actively migrating downstream. Reports from anglers fishing the lower river indicated that some smolts had moved over 4 km downstream within a 24 hour period. The last angler to report catching a smolt in the lower river was on March 23rd.

Physiological evaluations (performed by Dr. Steve McCormick, USGS/Conte Lab, and Dr. John Kelly, UNH) focused on gill NKA and blood plasma chloride. Gill NKA activity is commonly used as an indication of a salmonids ability to osmoregulate in saltwater; a higher activity level may indicate that a fish will successfully transition from freshwater to saltwater. Blood plasma chloride levels are a measure of a fish's stress. Stress levels in fish can be attributed to many factors including local intra-specific density and migrations from freshwater to saltwater. Understanding the trends in gill NKA and blood plasma chloride levels of the fish being raised in the hatchery may guide future hatchery practices.

Two of the physiological test subjects after a 21 day exposure in 30 ppt saltwater. The heavy dark spotting seems to be characteristic of Iijoki trout.

For trout sampled from freshwater at BSFH, gill NKA activity was highly variable and did not appear to be correlated with total length. There was not a large increase in NKA activity over the course of the samples though there was an increase in NKA activity from February to March and a slight progression to lower activity after March. For trout sampled from saltwater, NKA levels increased with the duration of saltwater exposure. Blood plasma chloride levels were highly variable and may have been correlated with the trout's total length; more so for trout held in saltwater than freshwater. Blood plasma chloride levels were higher for trout held in saltwater for 12 hours than trout held in saltwater for 21 days with

chloride levels in trout held for 21 days approaching the lower chloride levels of the trout held in freshwater.

Although the results of the physiological testing may have been made more robust with a larger sample size, the results appear to support early March as the best time to release age-2+ smolts. They also suggest that individuals of this strain could successfully make the transition from freshwater to saltwater especially if each smolt was allowed to choose how rapidly it moved into saltwater.

Studies in the 1960s indicate that the majority of the adult sea-run brown trout in Connecticut spent more than two years at sea but some trout in Europe return after less than one year at sea. The Latimer Brook Fishway and trap was operated for two weeks (11/30-12/14) during the fall of 2016 to allow the capture of any adult sea-run trout returning to Latimer Brook. The fall operating season of the fishway was greatly reduced due to severe drought. No Iijoki strain trout were captured in the Latimer Fishway. No other strain of sea-run brown trout were reported from other fishways or from anglers.

A total of three trout released as 0+ parr into the Shunock River in the fall 2014 were recaptured as 2+ trout in the fall of 2016 during electrofishing surveys. These trout did not emigrate to saltwater. It is impossible to determine the number or percentage of trout that did emigrate to saltwater. Of the 0+ parr released into the Farm River in the fall of 2014, none were recaptured in the fall of 2016. One trout released in the spring of 2015 as a 1+ parr was recaptured in the 2016 fall electrofishing sample.

An age-2+ parr of the 2014 cohort stocked as a 0+ parr in 2014 and captured during the fall 2016 electrofishing sample in Shunock River.

2015 Cohort

All remaining trout of this cohort continued to be raised at BSFH in stream water. No smolts were produced nor were any trout from the 2015 cohort released in 2016.

In May, 24 trout of this cohort (age-1+) were sampled at BSFH to measure gill NKA activity and blood plasma chloride levels. The following day, 24 trout of this cohort were transferred to saltwater tanks (30 ppt) located in the fisheries lab at the UNH. After 24 hour saltwater exposure, all 24 trout were sampled (lethal biopsy) for gill NKA activity and blood plasma chloride level.

NKA activity and blood plasma chloride level increased in those trout held in saltwater compared to those sampled from freshwater. It is interesting to note that compared to the older 2014 cohort, this cohort's NKA activity was higher and blood plasma chloride levels were lower for those held in saltwater for 24 hours. This indicates that fast-growing Iijoki trout may be able to successfully transition to saltwater at age-1+. It is unknown if these trout would choose to make that transition.

The lack of fatal fin condition in the sampled fish of this cohort confirms good rearing conditions in the BSFH.

Fin clips are critical to the assessment of this project but over 30% of the trout sampled for fin condition were found to have either an incomplete fin clip or no fin clip at all. This suggests that the trout are too small as 0+ parr to effectively clip their fins. All trout of this cohort that were found to have a poor or absent fin clips were re-clipped in the fall. A sample of this cohort will be assessed for fin condition again before stocking in March, 2017.

2016 Cohort

Keeping densities of trout within pre-determined levels is critical to maintain good fin condition and overall health. Adjustments in density have to be made once mortality in the incubation, hatching, and early feeding stages are tallied. To reduce densities in hatchery raceways, in September staff released 16,222 parr into the Farm and Shunock rivers using live cars. The 15,000 trout remaining at BSFH were transferred to outside rearing ponds in November.

2017 Cohort

The process to import 35,000 eyed Iijoki strain trout eggs from Finland in 2017 was begun in December. The results of this importation (2017 cohort) and the monitoring of the 2014, 2015, and 2016 cohorts will be included in the 2017 report.

Recommendations for 2017

2014 Cohort

1. Monitor returns of immature sea-run Brown Trout (termed "finnocks" in Europe) to the Latimer Brook Fishway Trap and with electrofishing surveys and angler reports.

2015 Cohort

2. Conduct fin condition assessment prior to March smolt release.
3. Stock the remaining ~10,000 age-2+ smolts in Latimer Brook and Menunketesuck River.
4. Continue the use of holding fences five days to encourage imprinting.
5. Monitor emigration by visual observations and/or angler reports.
6. Monitor returns of immature sea-run Brown Trout to the Latimer Brook and Chapmans Pond (Menunketesuck River) fishway traps and with electrofishing surveys and angler reports.

2016 Cohort

7. Retain up to 15,000 parr in BSFH for 2017 smolt production.
8. Stock age-1 parr as needed to achieve rearing objectives at BSFH.
9. Continue monitoring growth (length and weight) and fin condition of trout at BSFH prior to release.
10. Wait until the fall 2017 to fin clip fish as larger age-1+ parr.

2017 Cohort

11. Import 35,000 eyed Iijoki strain eggs from Taivalkoski Hatchery, Finland in 2017, as done in the past.

References

Jones, Robert. 1963. Sea-run brown trout study. Federal Aid in Sport Fish Restoration – Final Report: 1963. F-15-R (CT). CT Board of Fisheries, Hartford, CT. 32 pp.

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Continued thanks are due for the staff at the Burlington State Fish Hatchery, in particular Program Specialist Richard VanNostrand, Hatchery Supervisor Jamie Hayes, and Maintainer Joe Ravita. It is due to their hard work and adaptability that the mortality in the second year of egg importation was so greatly reduced.

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Thanks also are due to Derrick at Aquatic Wildlife in Manchester, CT for fulfilling our large frozen baby brine shrimp order!

Job 5: Fish Passage

Summary

Staff operated and maintained nine State-owned fishways and assisted partners with the operation and maintenance of another 52 fishways in the state. Five new fish passage projects were completed, opening a total of 36.5 miles of diadromous fish habitat.

Early in 2017, the Inland Fisheries Division and the Marine Fisheries Division merged into one Fisheries Division. Although this report summarizes work done in 2016, it is being written in 2017 and the text will reflect the new agency organization.

Background

The primary reason that diadromous fish runs in Connecticut either disappeared or greatly declined was the construction of dams. There is no precise estimate of how many dams still remain in Connecticut but it is believed that the number is greater than 4,000. The DEEP/ Fisheries Division (FD) seeks to restore runs of diadromous fishes, specifically Atlantic Salmon (see Job 1), American Shad, Alewife and Blueback Herring (see Job 2 in this report), American Eel (see Job 3), and sea-run trout (see Job 4). The FD cannot achieve its goals with these species without aggressively pursuing fish passage at many targeted dams in the state. Fish passage may include the removal of the dam (or other form of barrier) or the construction of a fishway at the barrier. This report summarizes the activities conducted during the past year in respect to fish passage. This includes planning for new fish passage projects or operating and maintaining existing fishways. Funds from this project are not directly used to pay for the construction of fish passage projects. Those funds come from other sources. Project funds are used to plan, design, coordinate and develop fish passage projects.

For many years, this project has been conducted by the DEEP's Inland Fisheries Division. At the end of 2016, the Inland Fisheries Division and the Marine Fisheries Division were merged into one division- the Fisheries Division. Despite the fact that much of the work reported herein was accomplished when the Inland Fisheries Division still existed, the text refers to the Fisheries Division to be up-to-date.

Approach

To provide fish passage at barriers within Connecticut, the FD has engaged the following basic approach:

We surveyed streams in Connecticut to determine if they currently support diadromous fish runs and if there are barrier dams on these streams. These surveys also allow us to assess the quantity and quality of upstream habitat and determine if it is suitable for diadromous fishes. We also reviewed dam databases to determine the location and nature of barrier dams. The review of all of these data allowed us to determine where fish passage projects are needed to promote practical restoration efforts. We

attempted to rank possible fish passage projects to develop a prioritized strategy for pursuing fish passage projects in the state. There are no funds available within our Division's budget to pay for fish passage projects so we worked with partners (other State agencies, municipalities, Non-Governmental Organizations) to develop fish passage projects (including identifying likely sponsors and funders for projects) and provided technical assistance throughout the duration of the project, during both design and construction phases. Project staff operated, maintained, and monitored the use of State-owned fishways, including conducting fish counts at dams to determine how many of which species used the fishways. Staff also assisted with the operation, maintenance, and monitoring of non-State-owned fishways as possible and appropriate, focusing on technical assistance. We evaluated or assisted with the evaluation of fishways, as possible and appropriate, and assisted researchers with their work that will expand our knowledge of fish passage.

Key Findings

There are currently 61 fishways in the state that were built to pass anadromous fish species. (These are species that migrate inland from the Atlantic Ocean via Long Island Sound to spawn). Figure 1 shows their locations on a map. In this section, we report on the operation of the existing fishways and the construction of new fishways or dam removals during 2016.

Major Fishways- There are nine fishways that are located at dams on large rivers. These fishways are used by many different species and are monitored daily with viewing windows and cameras except for the Leesville Dam Fishway, which is monitored through the use of a fish trap. These fishways are listed in Table 1. Monitoring of these fishways documented use by nine diadromous species (2015= ten species). Table 2 summarizes fish counts for these and other fishways in the state.

Fishway evaluation studies continued for the eleventh year at the Taftville fishway on the Shetucket River and the tenth year at the Tunnel Fishlift on the Quinebaug River. The numbers of American shad passed in 2016 at Taftville and Tunnel were 119 and 9, respectively. Both were decreases from 2015 numbers. At Taftville, First Light Power failed to open the attraction water pipe for the entire season due to operator error. At Tunnel, concerns over the condition of the main cable that lifts the hopper resulted in much fewer lifts than normal. Studies will continue at both sites in 2017.

Operation of State-owned Fishways- There are nine State-owned fishways in Connecticut, including the Rainbow and Leesville fishways referenced above under 'major fishways'. The Rainbow and Leesville fishways pass multiple species whereas the others predominantly pass just river herring and sea-run trout. Table 3 summarizes their operation during 2016. It should be noted that the spring of 2016 was unusually dry and the fish counts at the fishways may have been lower because of that. Furthermore, due to the drought, there was insufficient water in many streams to operate some fishways in the fall.

The State-owned Gorton Pond Fishway is located on the Pattagansett River in East Lyme.

Operation of Non-State-owned Fishways- Most of the fishways in Connecticut are owned by municipalities or private entities. Some are located at large dams with hydroelectric projects licensed by the Federal Energy Regulatory Commission (FERC). These were referenced above under "Major Fishways". The construction, operation, and maintenance of these fishways are required by the FERC licenses but the FD provides some oversight. Most of these non-State fishways are located at smaller dams, not used for hydroelectric generation, and on small rivers or brooks. Most of them do not have counting windows or any means of counting fish. Often their primary targeted species are river herring (see separate report, Job 2). Some of these owners take primary responsibility for operating and maintaining the fishways while others rely on the FD. In the latter case, the requirements are minimal, consisting of periodic checks, clearing of debris, and miscellaneous observations. The FD also provides some technical oversight at fishways that are operated by the owners, to ensure effective performance. Table 4 in the Appendix summarizes the operation of the 52 non-State owned fishways in 2016.

Construction of New Fish Passage Projects- No funds from this federal-aid project are used to construct new projects. However, because this project helps plan and promote new projects, it is appropriate to report on their progress and completion:

> Norton Mill Dam Removal (Jeremy River, Colchester)- This was the first dam on the Jeremy River, about 1.5 miles upstream of the confluence of the Jeremy and Blackledge rivers, where the Salmon River is formed. The 11-ft high dam powered a specialty paper mill until its closure in the 1960s. Both mill and dam had fallen into disrepair and in 2014, The Nature Conservancy (TNC) received a "Hurricane Sandy Resiliency" Grant (Round I) to remove the dam. TNC worked with the dam owners and the Town to develop a project that also protected the footings of an upstream town bridge and set the stage for the Town to take ownership of the old mill building, demolish it, and eventually turn the property into a Town Park. The project was completed in December. This reconnected 17 miles of upstream habitat and allows migrants coming from the Connecticut River and passing through the Leesville Fishway to ascend the entire Salmon River and Jeremy River to where natural falls historically blocked their migration. Project staff worked closely with the project partners and provided oversight to stream reconstruction.

The Norton Mill Dam prior to removal. Note the rock outcrop on the right.

The same view as in the previous photo, after removal. Note rock outcrop.

- **Carpenters Dam Removal (Quinnipiac River, Meriden)**- This Town-owned concrete dam was partially breached but continued to block the migration of many fish at most water levels. It also represented a public safety risk. The U.S. Fish & Wildlife Service (USFWS) received mitigation funds from the settlement of an upstream Super Fund site and used it to address environmental issues along the river. It provided funds to Save the Sound (STS) to remove this dam and the next upstream dam (Clark Brothers Dam, see below). The entire project was completed in one week in August. Between this and the Clark Brothers Dam removal, this project opened up 5.5 miles of upper river habitat, allowing fish to leave Long Island Sound at New Haven Harbor, swim through the Haakonsen and Hanover Pond fishways and get nearly to the headwaters near I-84.

The contractor removing the Carpenters Dam with the use of a 'hoe ram'.

Clark Brothers Dam Removal (Quinnipiac River, Southington)- This privately-owned dam in the Milldale section of Southington was only four feet high but still blocked fish migrations. It also aggravated flooding of a nearby commercial building. The owner was pleased to work with STS to remove the dam in one day in August. Along with the Carpenters Dam removal, this opened up 5.5 miles of the Quinnipiac River watershed to migratory fishes.

The first breach of the Clark Brothers Dam.

Upper Pond Dam Fishway (Goodwives River, Darien)- This is the second dam on the Goodwives River and the Town owns the first dam (Rings End Dam), which also has a fishway. Upper Pond is a privately-owned dam that the Town agreed to rebuild, dredge the pond behind the dam, and install a fishway as part of a long-term strategy of intercepting sediment coming down the river before it reaches Gorham Pond. The Town will maintain access rights to dredge behind Upper Pond Dam and operate and maintain the fishway. FD staff provided guidance on fishway design, construction oversight, and development of an Operation and Maintenance Plan. The fishway is a steeppass fishway with one intermediate resting pool and a tall intertidal entrance. The target species are river herring and sea-run trout. The spillway to the right in the photo below was also outfitted with an eel pass designed by FD staff. This fishway provides connectivity to an additional mile of stream habitat.

The Upper Pond Fishway is at the head-of-tide on the Goodwives River.

Chapman Pond Dam Fishway (Menunketesuck River, Clinton)- This is the first dam on the Menunketesuck River at the head-of-tide. The dam was acquired by the DEEP as part of a 100-acre purchase of high quality coastal land abutting Chapmans Pond and subsequently designated the Menunketesuck Wildlife Management Area. Funds for fishway construction were made available through a Supplemental Environmental Project and the DEEP entered into a contract with the Connecticut River Coastal Conservation District to design and build this fishway. The project includes a trapping area in the exit pool, a video chamber with a viewing window and camera, and an eel pass. The target species are river herring, sea-run trout, Sea Lamprey, and American Eel. The site will be part of the experimental stocking of sea-run Brown Trout from Finland (see job 4). The project was completed at the end of 2016 and the fishway will be operated in 2017. However, small tasks like the provision of

electricity to the video chamber, the installation of an educational sign, and a new gate remain to be completed in 2017. This project improved access to 2.5 miles of upstream habitat.

The Chapmans Pond Fishway entrance is back-flooded at extreme high tides. Dave Ellis, to the right, is standing on an intermediate resting pool. Above that, the fishway bends around the corner to enter the headpond through an elaborate trapping and videography station. The large concrete box in the foreground will house an eel pass ramp and trap that had not been installed when this photo was taken.

Planning for Future Fish Passage Projects- Technical and planning assistance was provided to partners for over a dozen fish passage projects in the planning stages including: Noroton River Culvert Fishway, Flock Process Dam removal, Old Papermill Pond Dam removal, Derby Dam Fishway, Millpond and Dolan dam fishways, Rainbow Dam Fishlift design, Springborn Dam Removal, Blackledge Dam Removal, Scotland Dam Fishlift. Such planning is accomplished in many ways but one prominent avenue has been the meetings of the Riverine Migratory Corridor Committee, convened by the DEEP to support the work of the Long Island Sound Study. This committee is comprised of staff from DEEP, the USFWS, NOAA Restoration Center, and the Natural Resources Conservation Service along with representatives from Non-Governmental Organizations involved in fish passage including TNC, STS, watershed associations, land trusts, and others. The committee, co-chaired by program staff and staff from DEEP's Bureau of Water Planning and Re-use, helps update databases, transfer technology and information, coordinate projects, and identify needs.

Consultation with Permitting- State statutes give the DEEP authority to require dam owners to

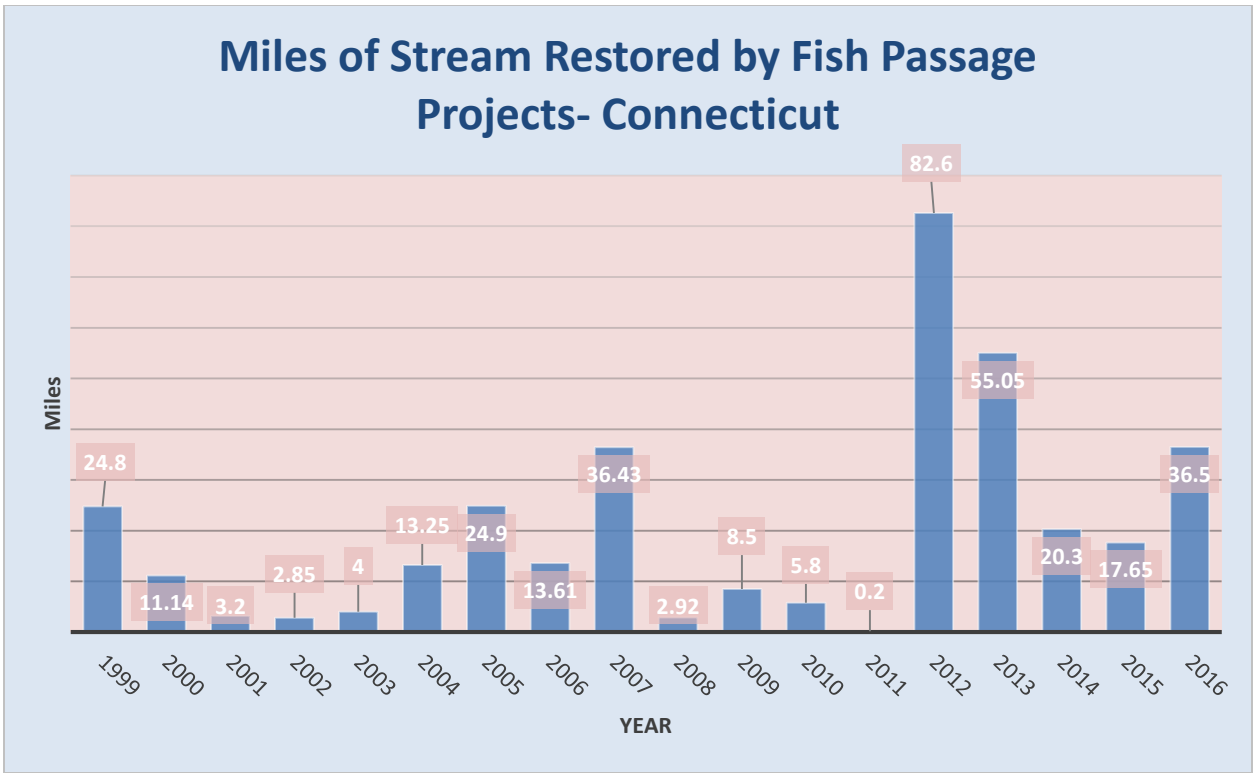
install a fishway at a dam (if warranted) when the dam owner applies for a dam repair permit from the CTDEEP's Inland Water Resources Division—recently re-organized as the DEEP's Water Planning and Management Division (WPMD). The FD provides recommendations to the WPMD regarding the need for fish passage at the dams referenced in the applications. Twenty-one permit applications were reviewed for fish passage needs during the year (2015= 11). One fishway (Stillman Pond, Bridgeport) and three eel passes (Coventry Lake, Coventry; Gay Cemetery Pond, Montville; Sherwood Mill Pond, Fairfield) were recommended as permit conditions.

Discussion

The operation and maintenance of fishways in Connecticut during 2016 proceeded in a rather routine manner and was effective in supporting fish passage and diadromous fish restoration. Assessments of how each species fared during the year is beyond the scope of this job and the reader is referred to one of the other job reports (e.g. salmon, shad and river herring) to learn about such assessments. There continues to be a need to improve passage of anadromous fish at the Tunnel and Taftville dams in the Shetucket River system. Lessons continue to be learned and adjustments made. Improved performances of all fishways on this system are expected beginning in 2017 now that the upstream Scotland Dam has converted to true run-of-river operation, as required by the FERC and the CTDEEP's 401 Water Quality Certificate.

The completion of fish passage projects in 2016 opened up 36.5 miles of anadromous fish habitat, compared to 17.65 miles in 2015 (see graph below). This accomplishment would have been impossible if the FD was responsible for all of these projects. Instead, the development of partnerships with various NGOs allows many projects to proceed concurrently. The establishment of these partnerships and the work of the Riverine Migratory Corridor committee help build capacity in our state to develop and complete these projects.

The number of permit review and consultations for fish passage related to dam repair permits almost doubled from last year. This is likely due to new legislation that requires dam owners to conduct regular dam inspections and submit the reports to the DEEP's Dam Safety Program. Based upon those reports, the Program may instruct the dam owner to initiate needed dam repairs, which prompts the permit applications and consultations. This increase in consultations will probably continue for the foreseeable future.



Many exciting new projects are in the planning stages and the future for more habitat re-connectivity, and therefore fish run restoration, looks promising if federal grants (beyond Wallop-Breaux grants) continue to be available.

Recommendations

No modifications to this job are recommended at this time.
Continued cooperation with NGOs, federal, and municipal partners along with colleagues in the DEEP's Bureau Water Planning and Land Re-use is recommended.

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The authors wish to acknowledge the contributions of their co-workers in the project during 2016: Robert 'Kirk' McPherson, Patrick Wendt, Nate Rocha-George, Billy Murdock, and Shalyn Zappulla.

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APPENDIX A.

Table 1. A list of the major fishways in Connecticut which multiple species use and are counted.

Name	River	Town	Style	Owner	Comments
Rainbow	Farmington	Windsor	vertical slot	CTDEEP	hydro dam owned by FRPC[1]
Leesville	Salmon	East Haddam	Denil	CTDEEP	Trap only
Greeneville	Shetucket	Norwich	Lift	NPU[2]	hydro
Taftville	Shetucket	Norwich	Denil	FirstLightPower	hydro
Occum	Shetucket	Norwich	Denil	NPU[2]	hydro
Tunnel	Quinebaug	Preston	Lift	FirstLightPower	hydro
Haakonsen[3]	Quinnipiac	Wallingford	Denil	Town	Wallace Dam
Kinneytown	Naugatuck	Seymour	Denil	Enel, Inc.	hydro
StanChem	Mattabesset	Berlin	Denil	StanChem	video

[1] Farmington River Power Company [2]Norwich Public Utilities [3]Harry O. Haakonsen Fishway at Wallace Dam

Table 2. Number of diadromous fish passed upstream at Connecticut fishways where enumeration is conducted, 2016 (continued on next page).

		Location									
		R	*L*	*G*	*Tv*	*O*	*T*	*K*[3]	*HH*	*HP*	*SC*
ANADROMOUS SPECIES											
1.	Atlantic salmon (*Salmo salar*)										
	Wild sea-returns	0	0	-	-	-	-	-	-	-	-
	Released broodstock	-	-	25	N.C.	21	0	12	-	-	-
2.	American shad (*Alosa sapidissima*)	151	-	2,669	119	71	9	3	0	0	36
3.	alewife (*Alosa pseudoharengus*)	0	0	1,456	0	0	35	5	1,246	25	303
4.	blueback herring (*Alosa aestivalis*)	0	0	115	0	0	0	0	114	0	0
5.	gizzard shad (*Dorosoma cepedianum*)	0	0	121	0	0	8	11	44	5	87
6.	sea lamprey (*Petromyzon marinus*)	494	669[2]	0	0	0	0	46	119	37	13
7.	striped bass (*Morone saxatilis*)	0	0	11	0	-	0	0	0	-	-
8.	sea-run brown trout (*Salmo trutta*)	2	0	0	N.C.	0	0	0	0	0	3
9.	sea-run tiger trout (*S. trutta x S. fontinalis)*	0	0	0	N.C.	0	N.C.	0	-	0	0
10.	white perch (*Morone americana*)[1]	0	0	23	0	-	0	0	5	0	1
11.	hickory shad (*Alosa mediocris*)	0	-	0	0	-	0	0	-	0	0
CATADROMOUS SPECIES											
	American eel (*Anguilla rostrata*)[4]	828	N.C.	879	N.C.	4	20,463	N.C.	N.C.	N.C.	N.C.

Notes:

G = Greenville Fishlift, HH= Harry Haakonsen Fishway, HP= Hanover Pond, K = Kinneytown Fishway, L = Leesville Fishway, O = Occum Fishway, SC= Stan Chem Fishway, R = Rainbow Fishway, Tv = Taftville Fishway, T= Tunnel Fishway,

Symbols and abbreviations used:

0 = Species could pass, but did not.

- = Species either not present in the river system or not typically expected to use this facility.

* = Species not able to use this facility.

N.C. = Species use the facility but are not counted.

[1]White perch have been included with the anadromous species even though anadromous and non-anadromous populations exist.

[2]Estimated passage based on the number nests observed upstream of dam.

[3]Species most likely undercounted due to camera malfunctions 53% of the passage season

[4]These are typically immature eel passing upstream through fishways designed for anadromous species.

Table 2. Number of diadromous fish passed upstream at Connecticut fishways where enumeration is conducted, 2016 (continued).

	Location							
	M	*B*	*LB*	*MS*	*BB*	*H*	*MP*	*BP*
ANADROMOUS SPECIES								
1. Atlantic salmon (*Salmo salar*)								
Wild sea-returns	-	-	-	*	*	-	1	-
Released broodstock	-	-	-	*	*	-	-	-
2. American shad (*Alosa sapidissima*)	-	-	-	*	*	-	10	-
3. alewife (*Alosa pseudoharengus*)	11,940	1,514	4,226	406	148,596	15	83	4,113
4. blueback herring (*Alosa aestivalis*)	3,455	0	-	*	*	-	3,421	0
5. gizzard shad (*Dorosoma cepedianum*)	0	0	-	*	*	1	-	16
6. sea lamprey (*Petromyzon marinus*)	0	-	-	*	*	-	40	2
7. striped bass (*Morone saxatilis*)	-	-	-	*	*	-	-	-
8. sea-run brown trout (*Salmo trutta*)	0	0	0	*	*	0	0	1
9. sea-run tiger trout (*S. trutta x S. fontinalis)*	0	0	0	-	*	*	-	0
10. white perch (*Morone americana*)[1]	-	-	-	*	*	-	-	1
11. hickory shad (*Alosa mediocris*)	-	-	-	*	*	-	-	-
CATADROMOUS SPECIES								
American eel (*Anguilla rostrata*)[2]	*	*	*	*	*	N.C.	N.C.	N.C.

Notes:

B = Branford Fishway, BB = Brides Brook Fishtrap, Bunnells Pond Fishway, H= Hallville Fishway, LB = Latimer Brook Fishway, M = Mianus Fishway, MS = Mary Steube Fishway, MP= Moulson Pond, Symbols and abbreviations used:

0 = Species could pass, but did not.

- = Species either not present in the river system or not typically expected to use this facility.

* = Species not able to use this facility.

N.C. = Species use the facility but are not counted.

[1]White perch have been included with the anadromous species even though anadromous and non-anadromous populations exist.

[2]These are typically immature eel passing upstream through fishways designed for anadromous species.

Table 3. Summary of the operation of State-owned fishways in Connecticut, 2016.

				DATES			
Name	River	Town	Style	Open	Close	Total days (last year)	Notes
Rainbow	Farmington	Windsor	vertical slot	April 14 Oct. 3	July 8 Nov. 10	123 (109)	Live counts and videography
Leesville	Salmon	E. Haddam	Denil	April 11 no fall	July 21 operation	101 (104)	Trap only;
Lees Pond	Saugatuck	Westport	steeppass	March 22	Aug. 30	161 (128)	Repairs to catwalk; no fall operation
Bunnells Pond	Pequonnock	Bridgeport	steeppass	April 8 Sept. 1	July 20 Dec. 15	208 (78)	Videography; fall operation for silver eels
Tingue	Naugatuck	Seymour	Bypass channel	N.A.	N.A.	0 (0)	No operation due to issues
Gorton	Pattagansett	E.Lyme	Denil	March 15	May 27	73 (56)	
Latimer Brook	Latimer Brook	E. Lyme	steeppass	March 11	May 26	76 (56)	
Trading Cove Bk	Trading Cove Bk	Montville	steeppass	April 30	June 29	60 (45)	new safety rail installed
Beaver Swamp	Beaver Swamp Bk	E. Lyme	steeppass	April 14	June 29	76 (~30)	

Table 4. Summary of the Operation and Maintenance of Municipally or Privately-owned fishways in Connecticut during 2016.

(Fishways are listed in geographical order, beginning in the west and progressing eastward and inland.)

	Name	Stream	Town	Owner	Design[1]	Height (ft)	Species[2]	Current Year's Activities		Comments
								Operation	Maintenance	
1	Mianus* Pond	Mianus River	Greenwich	Town	SP	20	ALE, BBH,GS	Routine	none	Electronic fish counter & camera operated
2	Rings End	Goodwives R.	Darien	Town	SP	8	ALE	Routine	none	
3	Davis Pond	Silvermine R	Norwalk	Condo assoc.	BP	6	ALE, BBH, SRT AE	Routine	none	
~~4~~	Walker	Silvermine R	New Canaan	Private residence	P&W	2	AE** (Trout, minnows)	Routine?	none	no contact or monitoring
5	Cannondale	Norwalk R.	Wilton	Private residence	Nature-like bypass	3	AE** (Trout, minnows)	Routine?	none	dam continued to deteriorate
6	Wood Dam*	Saugatuck R.	Westport	Aquarion Water Comp.	SP	3	ALE, BBH, GS, SRT	Routine	routine	Electronic fish counter operated
7	Dorr's Mill	Saugatuck R.	Westport	Private business	P&W	3	ALE, BBH, SRT, AE	Routine	none	beaver dam appeared on spillway in fall
8	Coleytown bypass	Saugatuck R.	Westport	Private business/ residence	Nature-like bypass with diverter	4	ALE, BBH, SRT, AE	Routine	Seasonal installation of guidance boom	screw anchor on island failed
9	Low	Saugatuck R.	Weston	Private residence	P&W	4	ALE, BBH, SRT, AE	Routine	none	house sold
10	Grossman	Aspetuck R.	Westport	Private residence	P&W	3	ALE, BBH, SRT, AE	Routine	none	headgate missing
11	Newman	Aspetuck R.	Westport	Private residence	P&W	3	ALE, BBH, SRT, AE	Routine	none	
12	Trout Brook Valley	Hawley Br.	Weston	Aspetuck Land Trust	P&W	4	AE	Routine?	none	
13	Perry Bog	Trib to Mill R.	Fairfield	Town	P&W	4	ALE, AE	Routine?	none	
14	Pequonnock Apron	Pequonnock R.	Bridgeport	Town	P&W	2	ALE	Routine	none	

15	Kinneytown *	Naugatuck R.	Seymour	Kinneytown Hydro Comp.	D	27	AS, ALE, BBH, GS, SL, SRT	Routine	none	videography
16	Waterbury Mall	Mad R.	Waterbury	Waterbury Mall	Instream P&W (underground)	9	AE** (Trout, minnows)	Routine	none	
17	John Dees	Mad R.	Waterbury	Waterbury Mall	Instream P&W	6	AE** (Trout, minnows)	Routine	none	May not be functional but not needed
18	Clark Pond	Indian River	Milford	Town	P&W	5	ALE, BBH, GS, SRT, WP, AE	Routine	none	
19	Harry O. Haakonsen *	Quinnipiac	Wallingford	Town	D	4	AS, ALE, BBH, GS, SL, SRT	Routine	modified roof to counting house	Videography
20	Hanover Pond	Quinnipiac	Meriden	Town	D	20+	AS, ALE, BBH, GS, SL, SRT	Routine	none	construction begun on powerplant
21	East Haven Diversion Dam	Farm River	East Haven	Water Company	SP	2	ALE, BBH, SRT	Routine	none	
22	Branford Water Supply Ponds*	Queach Br.	Branford	Town	SP	14	ALE, BBH, SL, SRT	Routine	none	Electronic fish counter operated
23	Landon	West River	Guilford	Town	SP	3	ALE, BBH, SL, SRT	Routine	none	
24	Capello Pond	East River	Guilford	Homeowners assoc.	D	3	ALE, BBH, SL, SRT	Routine	none	
25	Lower Guilford Lake	East River	Guilford	Lake Assoc.	HYB- BP & SP	11	ALE, BBH, SL, SRT, AE	Routine	none	Electronic Fish Counter operated
26	Hummers Pond	Fence Creek	Madison	Private/condo assoc.	D	4	ALE	Routine	none	
27	Chalker Millpond	Chalker Millpond Stream	Old Saybrook	Town	P&W	3	ALE, AE	Beaver blockage prevented operation	none	
28	Fishing Brook	Fishing Brook	Old Saybrook	Old Saybrook Land Trust	SP	4	ALE, BBH	Routine	none	
29	Crystal Lake	Fishing Brook	Old Saybrook	Town of Old Saybrook	BP	4	ALE, BBH, AE	Routine	none	Continuing beaver problems
30	Tiley-Pratt	Falls River	Essex	Private residence	P&W	4	ALE, BBH, AE	Routine	Routine	

31	StanChem*	Mattabesset R.	Berlin	StanChem	D	4	AS, ALE, BBH, GS, SL, SRT	Routine	None	Viewing window with camera
32	McLean	Bissell Br.	Granby	McLean Game Refuge	P&W	3	ALE, AE	Routine?	none	
33	Nod Brook Culvert**	Nod Brook	Avon	State DOT	Culvert-offset baffle	1	AE (Trout, minnows)	Routine?	none	
34	Sandy Brook Culvert	Sandy Brook	Colebrook	Town of Colebrook	Low flow passage zone w/rock cribs	2	ATS, AE, trout	Routine?	None	
35	Sandy Brook	Sandy Brook	Colebrook	Private	P&W	6	ATS, AE	Routine?	none	
36	Moulson Pond*	Eightmile River	Lyme	Private & LLCT	HYB- BP, P&W, SP	11	ATS, AS, ALE, BBH, SL, SRT	Routine	replaced foot bridge	Video fish counting system
37	Mary Steube*	Mill Brook	Old Lyme	Old Lyme Conserv. Trust (OLCT)	SP	9	ALE, SRT	Routine	none	Continuing beaver problems
38	Upper Millpond	Mill Brook	Old Lyme	Private/OLCT	SP	9	ALE, SRT	Routine	none	Continuing beaver problems
39	Rogers* Lake	Mill Brook	Old Lyme	Town	SP	4	ALE	Routine	none	
40	McColloch	Rowland Br.	Old Lyme	Private	P&W	3	ALE, AE	Routine	none	
41	Blackhall	Blackhall	Old Lyme	Private	P&W	2	ALE	Routine?	none	
42	Brides Brk*	Brides Brk	East Lyme	Town	Notch	1	ALE	Routine	none	Electronic fish counter operated
43	Jordan Millpond	Jordan Brook	Waterford	Town	SP	9	ALE, SRT	Routine	patched hole in rest pool	Electronic fish counter operated
44	Greeneville*	Shetucket R.	Norwich	City	LIFT	20	AS,ALE,BBH,GS WP,SRT	Routine	none	videography
45	Taftville*	Shetucket R.	Norwich	FirstLight	D	20	AS, ALE, BBH, GS, SRT	9th year of study	none	videography, AWS not operated
46	Versailles Pond	Little River	Sprague	Fusion Comp. bankrupt	D	20	AS, ALE, BBH, GS, SRT	No operation due to rotted baffles	replacement of all baffles with aluminum	assisted TU, also new trash rack
47	Occum	Shetucket R.	Norwich	City	D	18	AS, ALE, BBH, GS, SRT	Routine but no eel pass	none	Videography

48	Tunnel*	Quinebaug	Preston	FirstLight	LIFT	21	AS, ALE, BBH, GS, SRT	8th year of study	flashboards replaced	Videography; cable frayed; reduced lifting
49	Hallville*	Poquetanuck B.	Preston	E.CT Conser. District	SP	12	ALE, SRT	Routine	none	Videography
50	Lantern Hill**	Lantern Hill Bk	Ledyard	Mashantucket Indian Nation	P&W	4	ALE**	Routine?	none	
51	Vargas Pond	Stony Brook	Stonington	Town	SP	20”	ALE	Routine	none	
52	Wequetequock Pond	Anguilla Brook	Stonington	Private	P&W	6	ALE, SRT, AE	Routine	None	

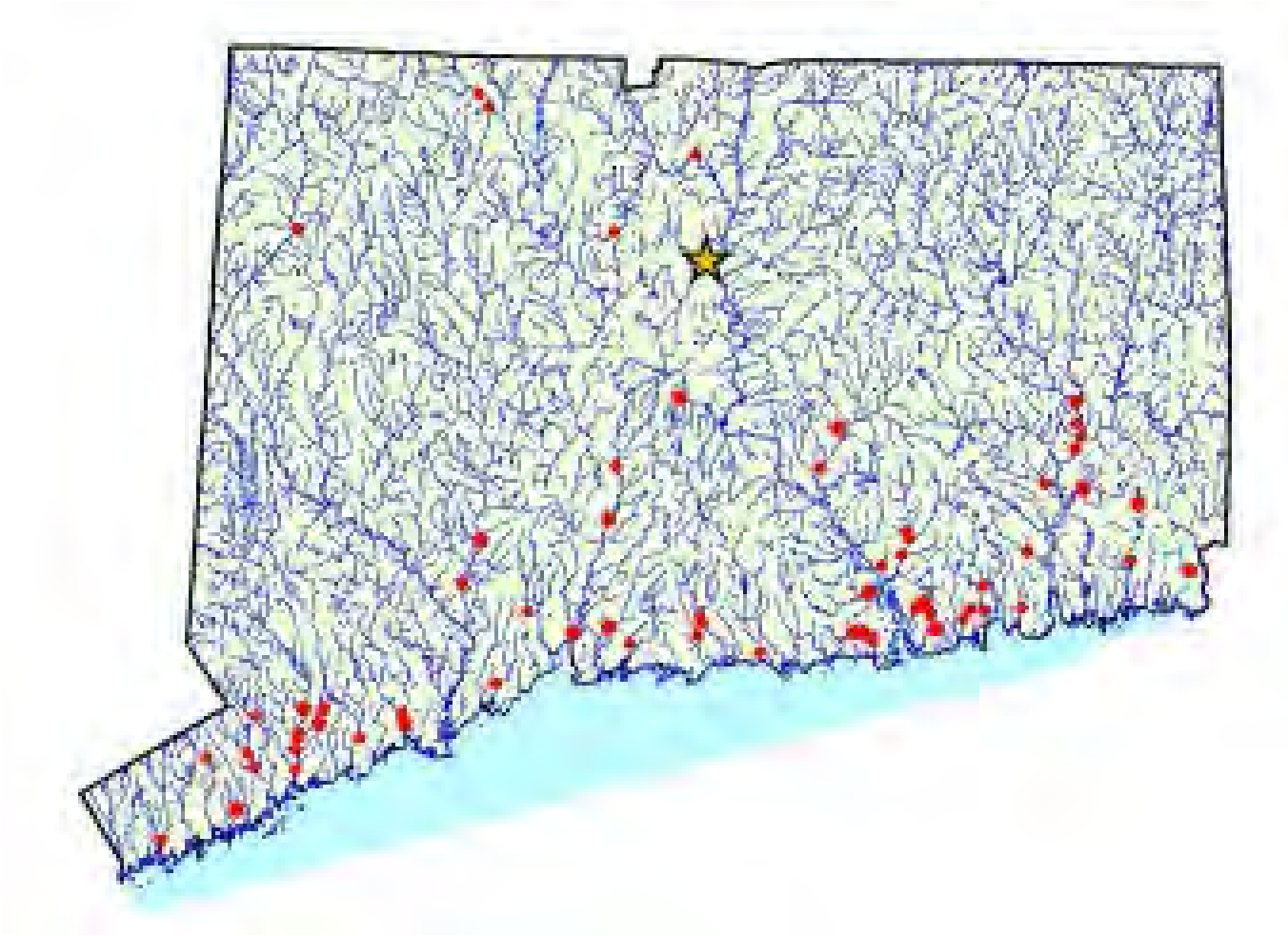
* Fish counts are made; data reported in Table 1.
** This fishway is intended for future anadromous fish passage but runs have not reached to the base of the barrier yet.

[1] *Design codes*: SP= steeppass, D= Denil, P&W= pool-and-weir, BP= bypass channel, LIFT= fish lift (elevator), HYB= hybrid (combination of two of more of these designs).

[2]*Species codes*: ATS= Atlantic salmon, AS= American shad, ALE= alewife, BBH= blueback herring, GS= gizzard shad, WP= white perch, SL= sea lamprey, SRT= sea-run trout, AE= American eel. (Note that eel passage refers only to the fishway and not to eel passes located at the same location.).

Note that this table includes only fishways in the state that pass diadromous fish species or are expected to do so in the future. Inland fishways that do not benefit diadromous fish species are not included.

Figure 1. Locations of fishways in Connecticut as of the end of 2016. The gold star represents the location of state capital Hartford. The total number of fishways is 61. Fishways completed at the end of 2016 are not shown on this map but will appear in next year's report.



Job 6: Administration

Summary

Staff performed a host of administrative duties necessary to operate the Diadromous Fish Restoration project. Many are mundane, routine activities but essential nonetheless. Attendance at many meetings that promote the objectives of the project is also important. Staff also spent considerable time educating and informing the public about what the project does to restore diadromous fishes to Connecticut.

Early in 2017, the Inland Fisheries Division and the Marine Fisheries Division merged into one Fisheries Division. Although this report summarizes work done in 2016, it is being written in 2017 and the text will reflect the new agency organization.

Background

The DEEP/Fisheries Division has an agreement with the U.S. Fish & Wildlife Service to use a federal aid grant to restore and enhance runs of diadromous fishes to Connecticut waters. Activities within federal aid project F-50-D, Diadromous Fish Restoration and Enhancement, are designed to maintain a small run of Atlantic salmon (see separate report, Job 1), and restore runs American shad, alewife and blueback herring (see separate report, Job 2), and American eel (see separate report, Job 3), and establish runs sea-run trout (see separate report, Job 4) as well as provide fish passage at migratory barriers, which benefits all species (see separate report, Job 5). Another key activity of this effort is public outreach. Successful management of these species requires the support and cooperation of the public, especially stakeholders along the targeted waters. However, many of these species have been extirpated or are very uncommon in Connecticut for most of the lifetimes of present-day residents and they know little about them and the technical approach needed to restore the runs. It is important that staff with the Division share the knowledge they have to inform and educate the public about these fish resources and the efforts to restore them.

In addition, the staff need to stay current with the latest scientific information, techniques, technologies, and approaches to diadromous fish restoration. Training and attendance at workshops and meetings are critical to accomplish this.

Diadromous fish are highly migratory species that cross jurisdictional lines. Most of the efforts of this project are impacted by similar efforts in other states and even other countries. The DEEP is a partner in multi-state fishery management organizations, including the Connecticut River Atlantic Salmon Commission and the Atlantic States Marine Fisheries Commission. It is important that staff represent the Division and the Department on these organizations.

For many years, this project has been conducted by the DEEP's Inland Fisheries Division. At the end of 2016, the Inland Fisheries Division and the Marine Fisheries Division were merged into one division- the Fisheries Division. Despite the fact that much of the work reported herein was accomplished when the Inland Fisheries Division still existed, the text refers to the Fisheries Division to be up-to-date.

Accomplishing all the work in the project, as outlined in this and the other five associated reports takes considerable administrative time. Tasks include budgeting, purchasing, hiring, and associated paperwork.

Approach

To provide administrative support and public outreach for diadromous fish restoration in Connecticut, the Fisheries Division (FD) has engaged in the following basic approach:

- Perform hiring, purchasing, budgeting, and other administrative duties necessary to carry out the activities of the project.
- Attend meetings and participate in the business of state, interstate, and regional committees and commissions to promote the objectives of this project and coordinate the activities of the project with those of cooperating agencies and groups.
- Support the Connecticut River Salmon Association's "Salmon-in-Schools" program.
- Attend training, technical, and educational meetings and workshops to learn more about diadromous fishes and the latest technologies available to restore and manage them.
- Assist partners to advance diadromous fisheries management and research programs.
- Respond to requests to give talks and presentations, provide tours of project facilities, and disseminate information to the public in general.

Key Findings

There is an endless list of administrative tasks that are performed annually to allow the project to function: budget preparation, purchase requests, hiring seasonal employees, paperwork for vehicles, timesheets, etc. A full accounting of these tasks is not necessary but it is acknowledged that they take up a significant portion of staff time.

Staff served on a variety of state, interstate and regional committees and commissions , e.g.: Connecticut River Atlantic Salmon Commission and its Technical Committee and Sub-committees dealing with Atlantic Salmon, American Eel, River Herring, and Sea Lamprey; U.S. Atlantic Salmon Assessment Committee; Atlantic States Marine Fisheries Commission's Fish Passage Work Group and the American Eel Technical Committee, Northeast River Herring Work Group, Technical Expert Working Group for River Herring, and North Atlantic Landscape Conservation's Connecticut River Pilot Core Team. One project

member (Gephard) served on one international regional fisheries management organization (North Atlantic Salmon Conservation Organization).

All staff attended various training and educational events.

Staff assisted the U.S. Fish and Wildlife Service and other partners in the Connecticut River Atlantic Salmon Commission with the reading of salmon scales, and engaging in other projects of mutual benefit.

Staff again worked with the Connecticut River Salmon Association to launch another year of the Salmon-in-Schools program. Staff spoke at an orientation program and helped distribute around 17,000 salmon eggs. This year, the program was active in 62 schools with 85 tanks and expected to reach around 5,900 students.

Staff gave eleven talks and demonstrations to groups, hosted four fishway open houses, provided remarks at four dam removal dedications and one testimonial, participated in two training sessions, and lead four educational paddles/cruises. Staff provided interviews to reporters from radio stations, newspapers, blogs, and magazines regarding diadromous fish restoration.

A full list of public outreach activities is provided in Table 1 in the Appendix. During the spring fish migration season, staff produced and distributed a weekly diadromous fish report and distributed it to many interested people across Connecticut and elsewhere via email. Many of these recipients are fishway volunteers. Staff also hosted a weekly on-line radio show (iCRV, http://icrvradio.com/) that was devoted to diadromous fish report, updates, and discussions of biology and conservation.

Steve Gephard talking about diadromous fish live on the radio/internet.

Discussion

Public outreach is important work, both as a means of letting the public know how their monies are being spent but also keeping them informed about how to best support and assist with restoration work. Staff receive much positive feedback from the project's public outreach and believe that it is effective in both educating the public and soliciting its support for the Division's activities.

The Division promoted and hosted several events around the state to observe World Fish Migration Day, May 21, 2016. This included a flotilla event at the mouth of the Connecticut River.

Recommendations

No modifications to this job are recommended at this time.

Acknowledgements

Many people within the Department work behind the scenes to support the work of this project and they are too numerous to list. But special thanks must go to Tony Petrillo (Bureau of Natural Resources), Sharon Gdovin, Mary Morgillo (Financial Management Division), Laura Fontanella, Madeline Ortiz and Joanne Kelley (Fisheries Division), Doug Patterson (Engineering and Field Support Services Division). Staff interacts with a diverse group for public outreach but within the Department, thanks go to Dennis Schain and other staff with the Public Affairs office. Special thanks go to Bob Jones, Dick Bell, Jim Carroll, Elizabeth Kendall and their colleagues with the Connecticut River Salmon Association for their effective Salmon-in-Schools program. In addition, we are grateful for the support of Dave Williams of iCRV radio.

Appendix

Table 1. Summary of public outreach activities for project staff during 2016. Page 1 of 4.

1/6/2016	Gephard	What's Next for the Connecticut River	Essex Land Trust	Essex	30		2 hours	general meeting
1/13/2016	Gephard	wild salmon redds in Farmington River	WSHU radio	Fairfield	N.A.	http://wshu.org/post/salmon-spawning-again-ct-ecological-cautionary-tale	1 hour visit, reduced to short piece on radio	radio interview
1/27/2016	Gephard	Dam Removal in CT	Three Rivers Community College Environmental class	Norwich	25		1.5 hours	classroom
2/17/2016	Gephard	wild salmon redds in Farmington River	Al Jereera radio	Washington DC	N.A.		1 hour conversation, reduced to short piece on radio	radio interview
2/23/2016	Gephard and Ellis	river herring runs in CT River	Connecticut River Watershed Council	Haddam	15	also recruited volunteers	3.25 hours	general meeting
2/25/2016	Gephard and Ellis	river herring runs in CT River	Connecticut River Watershed Council	East Hartford	20	also recruited volunteers	3.25 hours	general meeting
3/9/2016	Tim Wildman	Sea-Run Brown Trout	CFFA	East Hartford	60		1.0hrs	meeting
3/23/2016	Gephard and Ellis	training for river herring volunteers	Connecticut River Watershed Council	Middletown	20	trained volunteers	4 hours	general meeting
4/7/2016	Gephard	river herring closure	WTIC Radio	Hartford	N.A.	over the phone interview	15 minute conversation reduced to short piec on radio	radio interview

4/8/2016	Gephard	opening day fishing season	WTNH TV	Old Lyme	N.A.	on camera interview	15 minute conversation reduced to short piec on TV	TV Interview
4/9/2016	Gephard	Pond Lily Dam Removal	Save the Sound	New Haven	50	dedication/celebration event, represented Department	2	dedication
4/22/2016	Ellis	Bride Brook counter and river herring	DEEP- WPLR- Water Planning & Mgmt	East Lyme	3		1.5 hours	tour
4/27/16+	Gephard	Diadromous Fish runs	iCRV radio	Essex	N.A.	weekly radio show, Wednesday mornings 8:00 - 8:30 am, various topics and guests; April 27 - July 20	0.5 x 13= 6.5 hrs	radio show
5/4/2016	Gephard	Fish passage	DEEP- Wildlife Division	Derby	12	Part of Master Conservationist training at Kellogg	1 hr	classroom
5/5/2016	Williams & Rainbow Staff	Rainbow Fishway Tour	The Academy of Aerospace and Engineering	Windsor	10		1.5 hours	tour
5/7/2016	Gephard	Hyde Pond Dam Removal	Save the Sound	Stonington	45	dedication/celebration event, represented Department	1.5 hours	dedication
5/8/2016	Williams & Rainbow Staff	Rainbow Fishway Tour	Smith Middle School	Windsor	110		1.5 hours	tour
5/19/2016	Gephard	Connecticut River shad	Haddam Hist Society	Haddam	50	shared stage with retired shad netters	3	general meeting
5/20/2016	Gephard	White Rock Dam removal	TNC- RI Chapter	Westerly, RI	30	dedication/celebration event, represented Department	1 hr	dedication
5/21/2016	Gephard	Fish Migration	DEEP/Princeton Hydro	Old Lyme	20	part of World Fish Migration Day	3 hr	paddle/flotilla
5/21/2016	Wendt	Fish Migration	DEEP	Wallingford	20	part of World Fish Migration Day	5 hr	open house Haakonsen Fishway

5/21/2016	McPherson	Fish Migration	DEEP	East Lyme	10	part of World Fish Migration Day	5 hr	open house Latimer Brook fishway
5/21/2016	Williams	Fish Migration	DEEP	Windsor	30	part of World Fish Migration Day	5 hr	open house Rainbow Fishway
5/26/2016	Tim Wildman	Sea-Run Brown Trout	Conn/RI Coastal Fly Fishers	Groton	30		1 hr	meeting
5/30/2015	Williams & Rainbow Staff	Rainbow Fishway Annual Open House	general public	Windsor	78		5 hours	Open House
6/4/2016	Williams & Rainbow Staff	Rainbow Fishway Tour	Windsor Historical Society	Windsor	24		2 hours	tour
7/28/2016	Gephard	Fish restoration, Quinnipiac River	USFWS/Audubon	Cheshire	15	part of STS dam removal projects	2 hours	general meeting
8/17/2016	Gephard	Fish of the Connecticut River	RiverQuest	Haddam	25		3 hrs	river cruise
9/8/2016	Gephard	Fish restoration, Quinnipiac River	Hammonasset Chapt Trout Unlimited	Meriden	20		3 hrs	general meeting
9/12/2016	Gephard	Connecticut River estuary	DEEP	Old Lyme	15	special paddle for Jim Fleming's trade group	5 hrs	paddle/flotilla
9/22/2016	Gephard	Connecticut River swallows	DEEP	Old Lyme	6	special paddle for retiring Clark Chapin, State Senator	4 hrs	paddle/flotilla
10/5/2016	Gephard	Ed Bill Dam Removal	TNC- CT Chapter	Lyme	25	part of a volunteer vegetative planting event; represented DEEP	3.5 hours	dedication
10/13/2016	Gephard/Wildman	CRSA New Teacher Orientation	Connecticut River Salmon Assoc.	Newington	40	annual training event for Salmon-in-Schools Program	3 hours	classroom

10/13/2016	Gephard	Fish Passage Projects in CT	USFWS- Federal Aid Hosted by DEEP	Stonington & East Lyme	40	part of an annual meeting	1 hour	tour
10/13/2016	Gephard	Tom O'Dell, testimonial	Town of Westbrook	Westbrook	50	represented DEEP and spoke of Tom, who played key roles in Sciongay land acquisition, etc.	2 hours	reception
10/15/2016	Gephard	downstream fish passage at hydro dams	biologists visiting from LUKE, Finnish natural resource agency	multiple	3	toured six hydroelectric facilities in CT and MA	12 hours over two days	tour
10/27/2016	Gephard	Fish of the Connecticut River	Connecticut Audubon	Old Lyme	40		2 hours	general meeting
11/4/2016	Gephard	Dam Removal in CT	independent journalist	Colchester	N.A.	part of tour of Norton Dam Removal Project	1 hour	interview for article
				total =	971			