

# Fish Passage on the Merrimack River and its Tributaries – Challenges & Opportunities

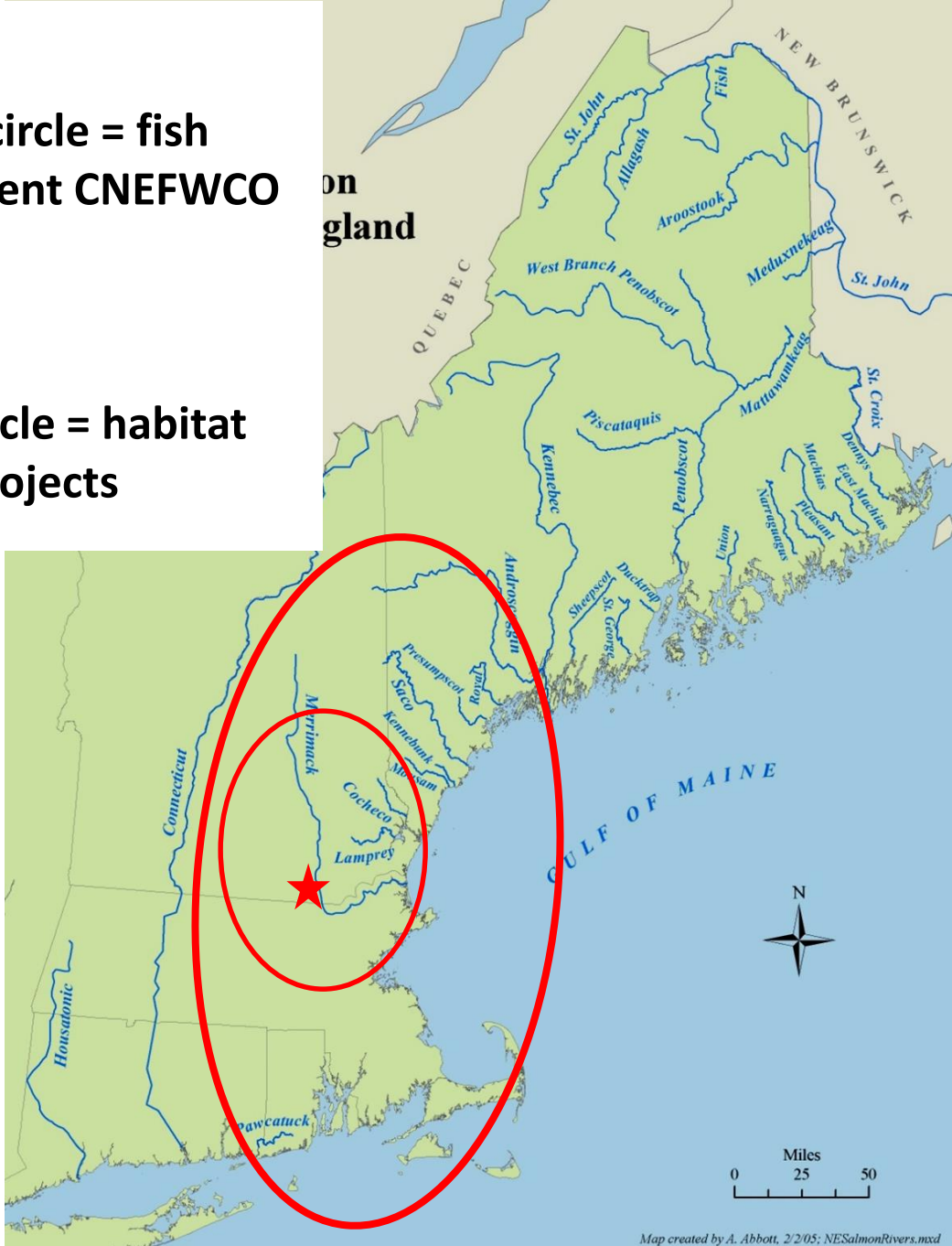


Michael Bailey



**Inner circle = fish management CNEFWCO on land**

**outer circle = habitat projects**



Map created by A. Abbott, 2/2/05; NESalmonRivers.mxd



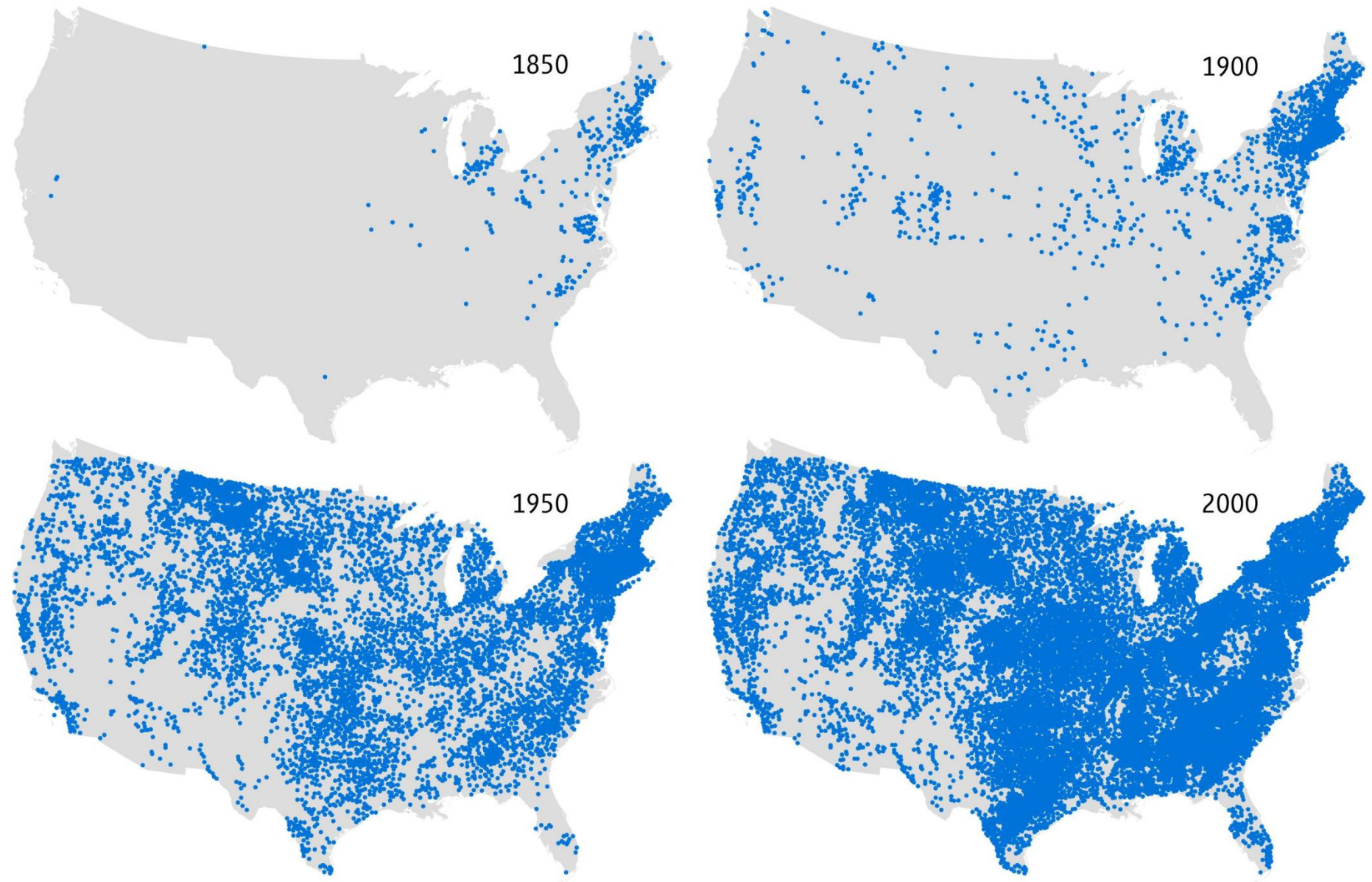
A photograph showing a dam with a large waterfall. In the foreground, a small motorboat with three people wearing life jackets is on the water. The dam is made of stone and has a large concrete pillar. The text "Central New England FWCO" is overlaid on the right side of the image.

# Central New England FWCO



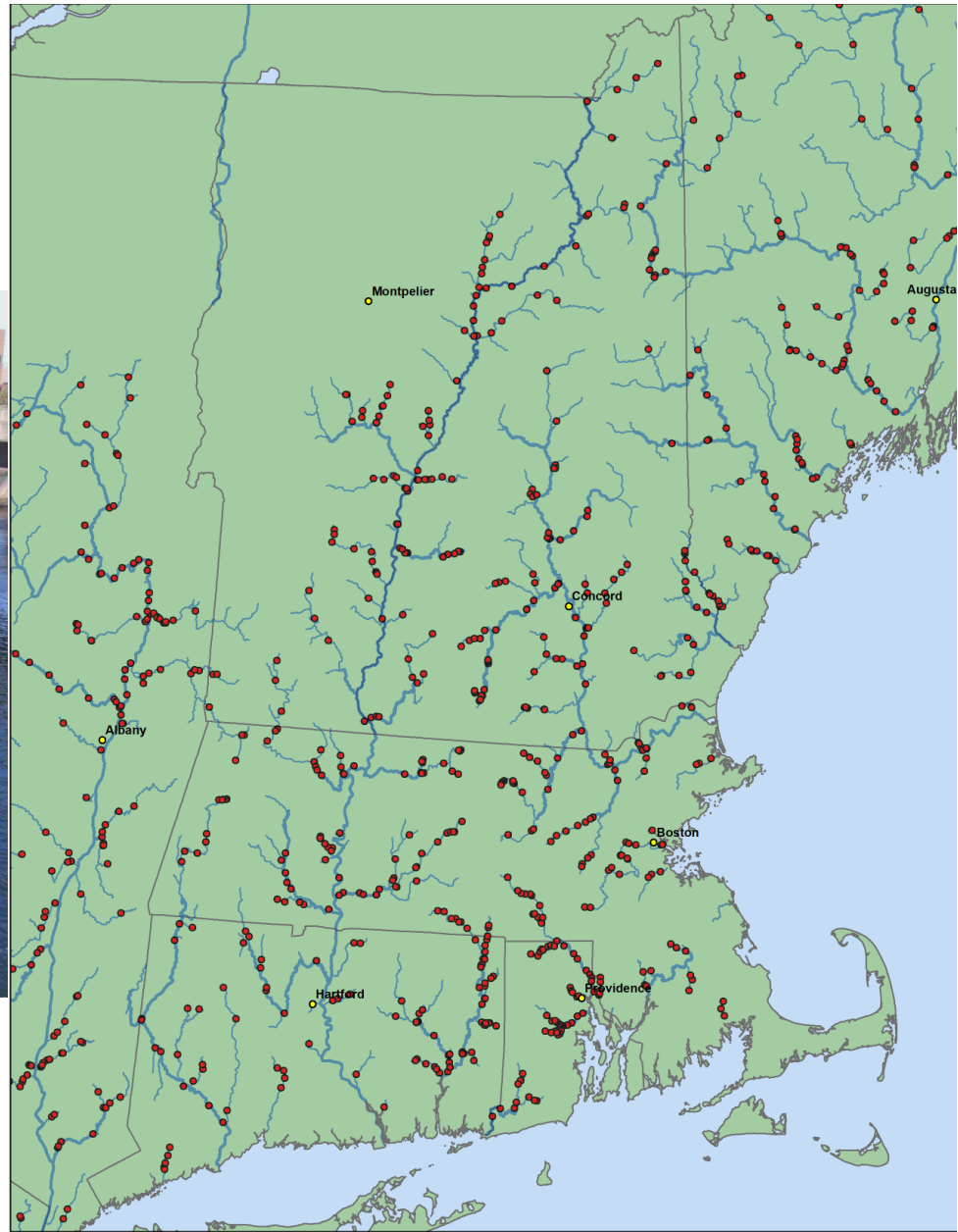


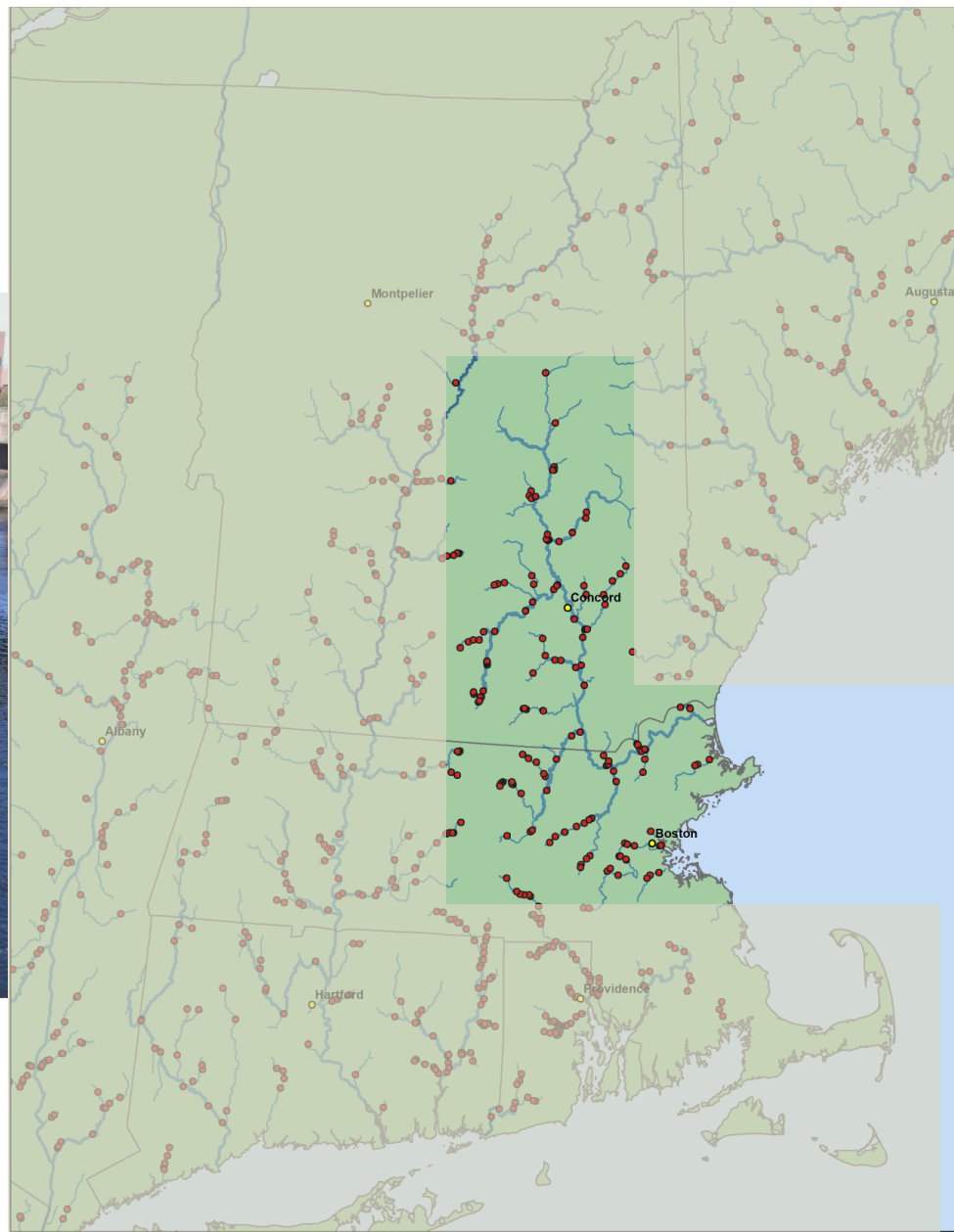
## Growth of U.S. Dams and Reservoirs



SOURCE: JAMES P. M. SYVITSKI *ET AL.*, *PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY A* **369**, (2011)







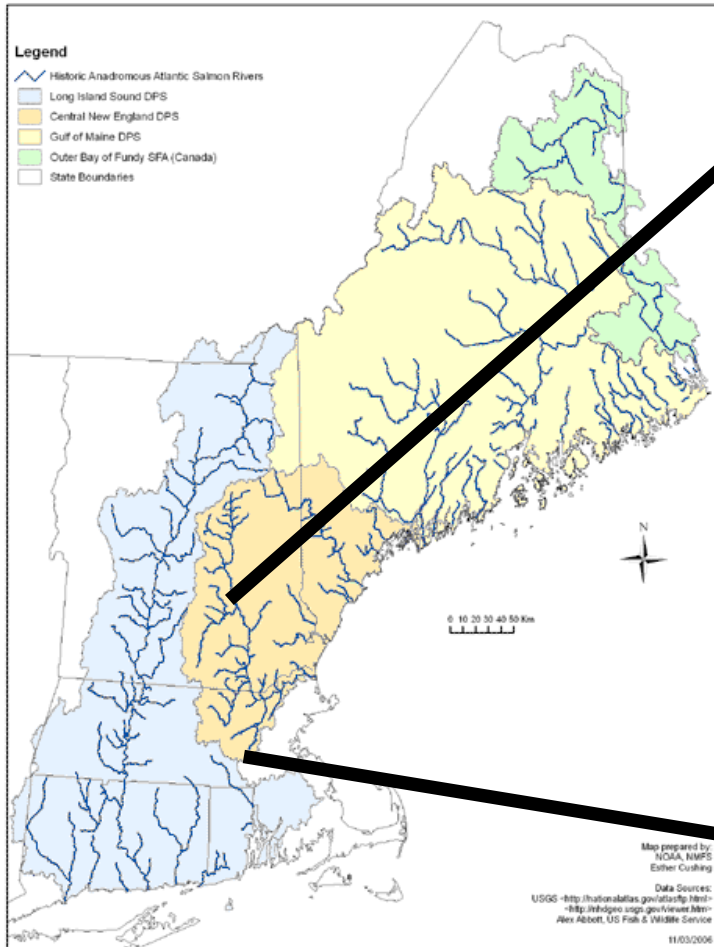
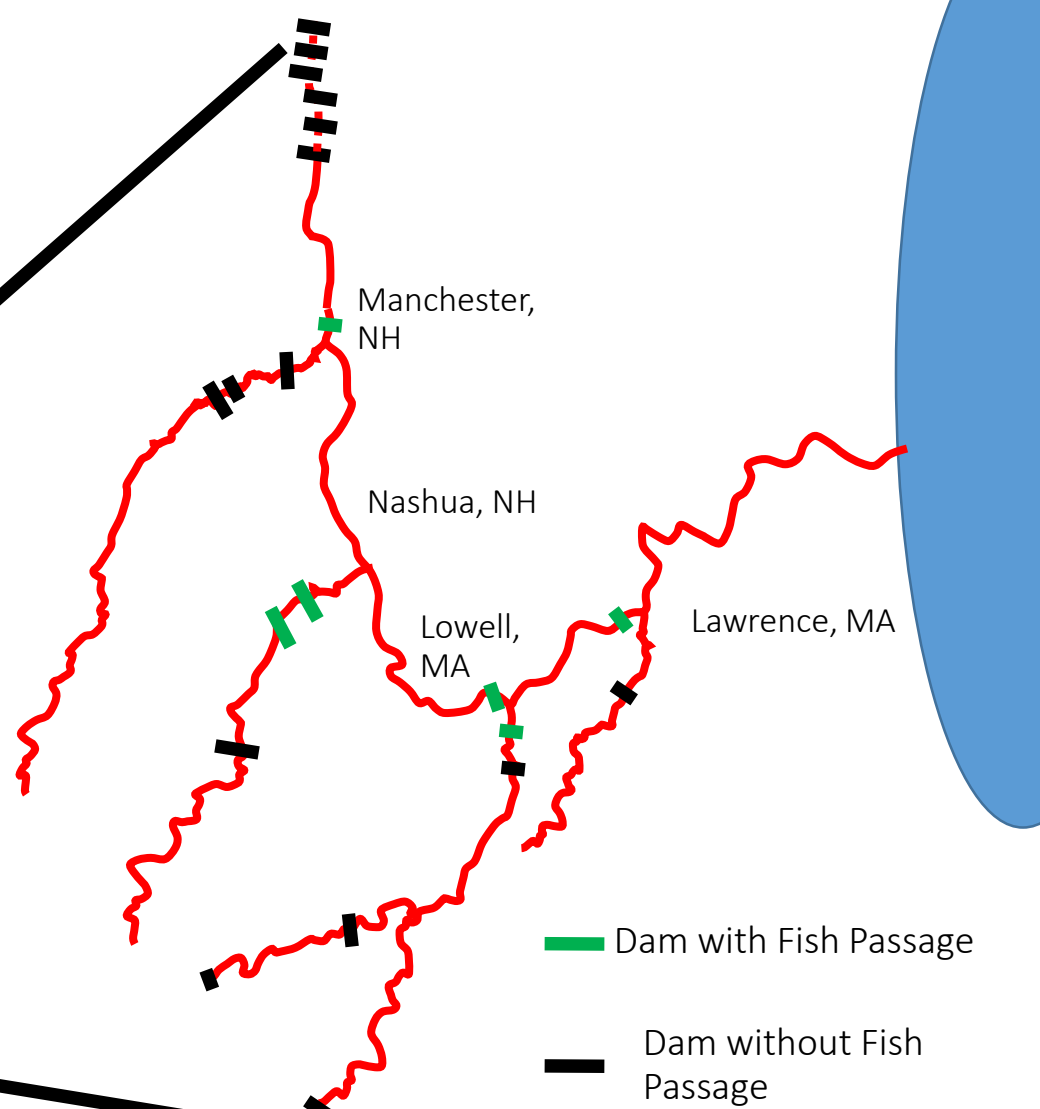


Figure 41.1 River systems used to define the Atlantic salmon stock areas.



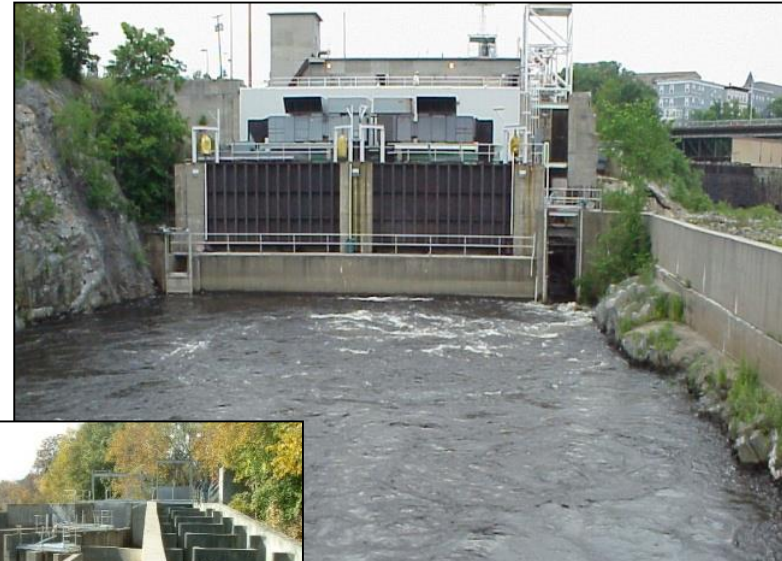


- Nearly all habitat is above multiple dams
- Most passage structures have limited assessment
  - Different owners
  - Different re-licensing schedules
  - Most hydro electric
- Lots of different types of passage structures
  - Most lack studies

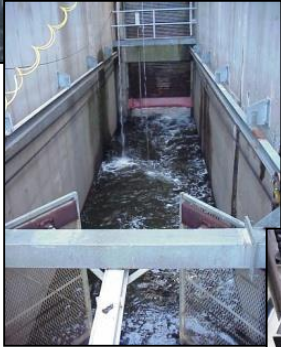
# MAINSTEM



Pawtucket Dam



Essex Dam





# MAINSTEM



Amoskeag Dam



# MAINSTEM



Hookset Dam



# Shawsheen



# CONCORD



Middlesex Dam - Remnant





# CONCORD



Centennial Dam



# CONCORD



Talbot/Billerica Dam







# NASHUA

Jackson Mills Dam







# NASHUA

Mine Falls Dam





# NASHUA

Pepperell Dam





Dams are not  
the only reason  
for restoration  
need!



# River Herring Restoration in the Merrimack River



# Past Restoration Efforts: Inadvertent

1960s –  
1980s

Lake treated  
with copper  
sulphate

The Telegraph - Aug 3, 1964 [Browse this newspaper](#) [Browse all news](#)

## Algae Treatment For Winnisquam Stopped for Fish

LACONIA, N.H. (AP) — The State Fish and Game Department reports it has suspended copper sulphate treatments of the water in Lake Winnisquam for a 10-day period, while a state investigation into recent fish kills in the lake continues. The copper sulphate treatments were being used to control the growth of algae in the lake.

Fish and Game Director Ralph G. Carpenter says the fish deaths have apparently stopped. But he adds it may be weeks until laboratory reports can determine the cause of the fish kills.

Two extensive kills have been reported — the first involving about one-half ton of fish, mostly bass. The first began July 10, and the second started July 23. Both followed copper sulphate treatments.

in the 1963 second quarter. It was because of a lesser provision for federal income taxes. First-half earnings increased to \$68,658,624, or \$1.44 a share from \$48,700,411, or \$1 a share in the 1963 first half.

### Even Keel

Roger M. Blough, U.S. chairman, said steel construction and economic activity likely to remain on an even keel for the rest of the year.

Steel production dipped during the week to 2.27 million from 2.32 million the previous week. It was the eighth decline in nine weeks but the decline



C-8 THE SUNDAY TELEGRAPH January 24, 1988

## There's hot ice fishing on Lake Winnisquam

Anybody looking for some hot lake trout action this winter should try Lake Winnisquam, according to veteran bait shop man Al Defice, who lives right on the big lake.

Defice, proprietor of the Ball Shop in Winnisquam, emphasizes that it is still early and that not all the fishermen have arrived yet. "But we probably end up with 100 houses out there in a week or two, when the season really gets going," Defice said. "It's early yet. We've only been at it for two weeks."

Defice, who answers to "Junior," says that Winnisquam is a place to consider for landing trout, which here the smallest that are once more returning to the waters.

"Winnisquam has made quite a comeback," Defice said. "Ice fishing here has come back very well. And the lake trout has come back too strong."

The bait shop owner said that lake trout action has been consistent. It has been consistent with averages of about four pounds. But Defice thinks it's only going to get better. The only problem is that, as Defice says, it is still a little bit hard to pinpoint what depths are best for taking the lakies.

"I'd say that they're most inclined to be between 15 and 60 feet of water," he said.

"The smelt are moving around all over the lake now because the water is cold, and the fish are chasing them."

Lake trout are known for being voracious eaters who will hit at anything that moves.

Winnisquam is quite a story, having once become virtually dead as a fishing site because the state miscalculated on how much copper sulfate would be required to take off excess algae several years ago. The over-abundance of the sulfate killed the algae. This also helped eliminate the plankton, which was the daily bread for the smelt, which was the daily bread of the lake trout and salmon. The chain reaction in the food chain virtually wiped out all fish, except the white perch, whose numbers are now going down while lake trout and salmon populations rise.

Peter Broszky, hatcheries and stock program supervisor of the N.H. Fish and Game Department, says that one can't say for sure that the copper sulfate butchered the algae. "But it probably did," he said.

Broszky told us that Fish and Game is currently resurveying the Granite State's streams and ponds for the first time in several years to determine fish stock levels of trout and salmon. The criteria are: 1. public accessibility; 2. fishing pressure based on such factors as population; and 3. quality and productivity of the water.

The Fish and Game official said that many of the waters of southern New Hampshire have already been surveyed, but he wanted to confirm that one would be added within two years.

more fish (within two years), no. Our hatcheries are at peak production now."

However, Broszky did note that the larger trout streams could be expected to be expected for more fish. Fish to be evaluated for stocking are the brook, brown and rainbow trout, and the Pacific and landlocked salmon. Pacific salmon would be allocated for spots of the streams and ponds could be expected to be completed this year.

One thing I don't understand about the New England fishing scene: Nobody likes to use leeches as bait here. I have yet to find a bait shop that deals in leeches, and I'm telling you, they're great. When I was in Minnesota, whose lakes cast in some of the most plump piscatorial specimens in North America, dealers would go crazy trying to get enough leeches for the walleye season—open in May.

Nobody loves those leeches like the walleye, either. You haven't lived until you cast three-year live in the water of dusk, right off the lake shore, and watch a hungry walleye snatch the critter and hook himself.

Leeches provide great movement on the hook. Once I snagged a four-pound walleye on a leech, and from that point on I never used anything else for that particular fish. I know you're not going to be wild about hearing this, but leeches keep quite nicely in your fridge.

The Lake Winnisquam Ice Fishing Derby to Meredith will be held Feb. 6, 7, and 8. Catherine Markiel and George Demarais

decide to fish it, it may just settle an old family score.

It seems that Markiel, who lives in Nashua and Demarais, a Hollis resident, both caught huge salmon at the Bilo Derby at Lake Ontario last summer. But Demarais learned that when it comes to competition, family lines don't matter much. You see, Demarais and Markiel are first cousins, and Demarais was one of the prime movers in developing Markiel's fishing island. But in the Bilo derby, pupil turned on teacher.

Markiel snagged a 24-pound, 2-ounce salmon at Ontario, good for the lofty rating of 21st place out of some 14,000 anglers. Demarais was almost as good, netting a 34.5 salmon. But Markiel was \$1,500, and Demarais won only the title—being good sport. "Unfortunately, I bumped him out of the derby," chuckled Markiel.

Demarais, though, said that he was not bothered about finishing out of the money. "I'm the one who brought her up there to fish," he said. "She had a good teacher."

Markiel's salmon was landed on a dogger and squid in 90 feet of water about two miles off shore. The fish required 13 minutes to bring in. "He dove right to the bottom," Catherine said. She's now laying the fish mounted, a process that takes several months. The fish is 44 inches long.

The coasts, both of whom say that they will probably fish at Winnisquam, have found Lake Ontario, another place that came back from the grave to yield fish, to their liking for quite awhile now. Both are somewhat cynical about Granite State fishing potential.

"It's tougher to fish the lakes around here," Markiel said. "I don't think the stocking program is as good around here. I don't think it offers as much as New York does."

"It's just not worth it (in New Hampshire)," added Demarais. "They don't want to spend the money for stocking."

However, both said that they would probably fish in the Winnisquam derby.

Jim Flanders, husband of nationally ranked Bass 'n' Gal fisherman Sandy Flanders, believes that the wife still hasn't reached her full potential as an angler. Sandy, who has only been fishing for about four years, was the only New Englander out of 140 women who competed in a recent tournament, is still learning about the fish and its ways, according to her husband.

"Her versatility is just beginning to be developed," he said. "As she finds out the bass habits, she's going to get better. She works awfully hard at it. But she has great instincts."

Sandy took up fishing after years of watching her hubby go for bass. She learned from observing Jim, but he takes little credit for her development. "The only claim I can make is exposing her to it," Jim said. "All I did was introduce her to the sport."

The women pro bass fishermen, though, are still not making much money on their circuit, at least compared to the men. According to Jim Flanders, the annual winnings of a male bass angler can be \$30,000.

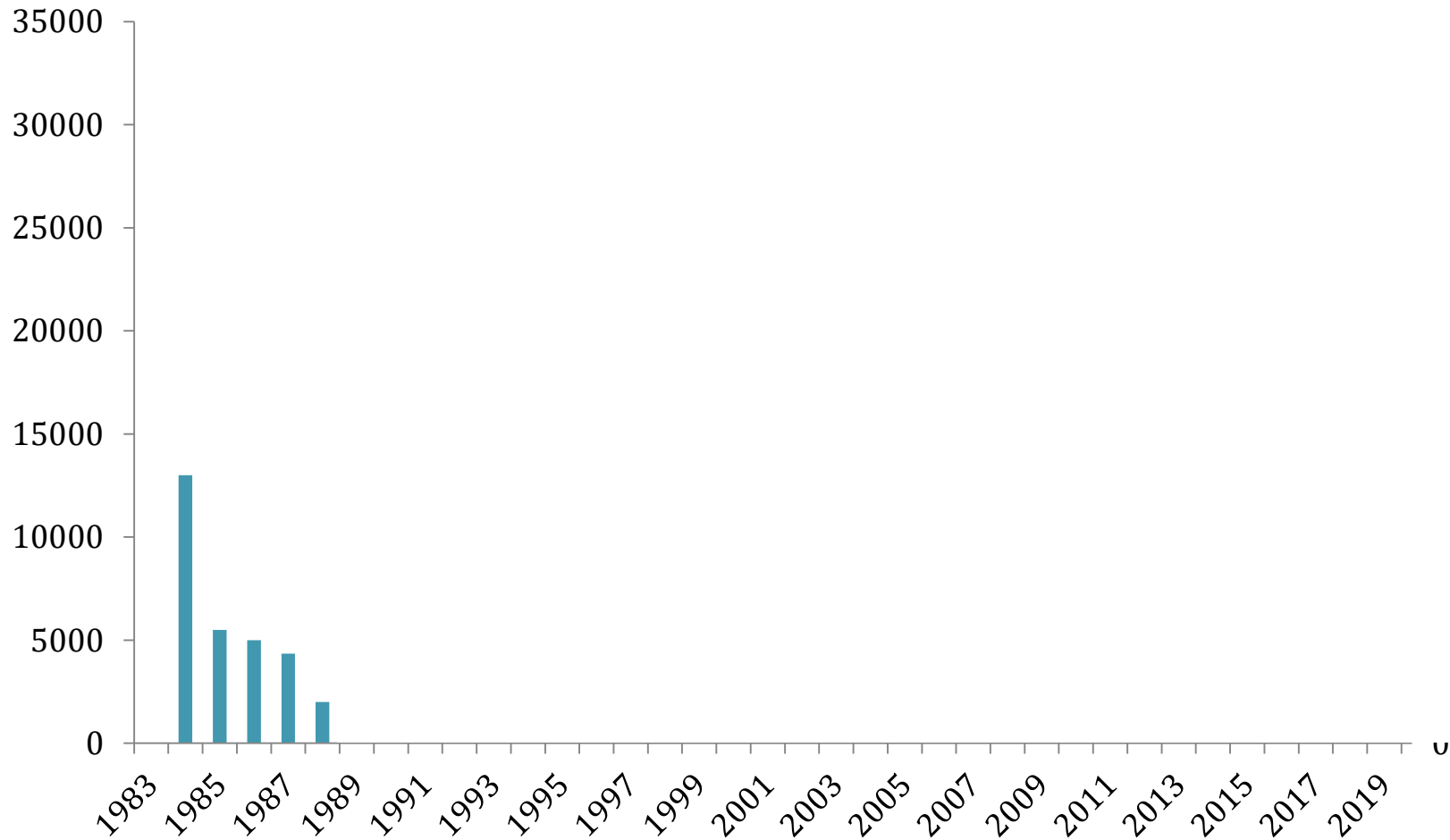
(Bill Wagner is a Telegraph sports correspondent.)

1980s

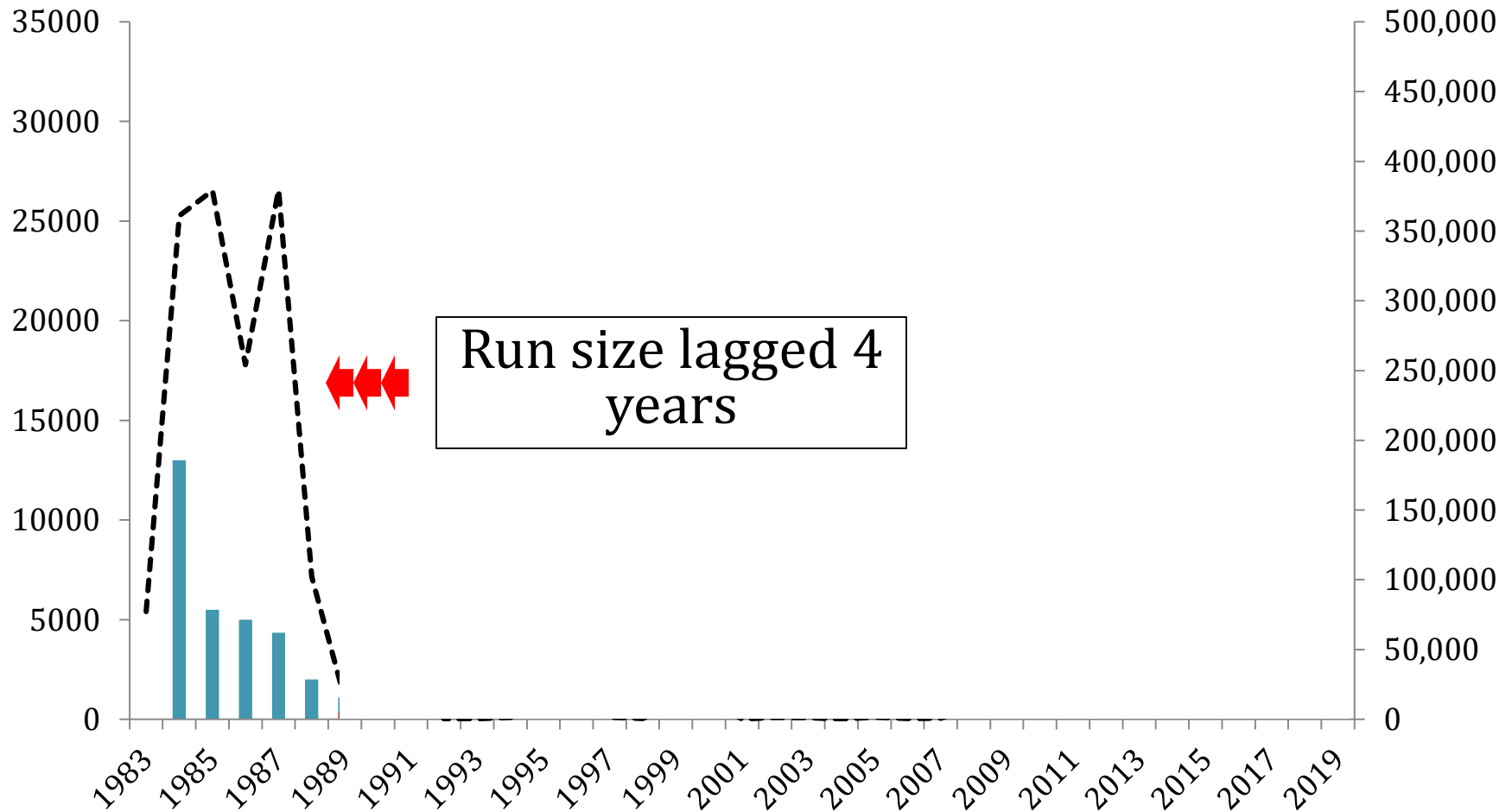
Stocked "Alewife" for a food source for cold water fisheries and to export nutrients



# Past Restoration Efforts

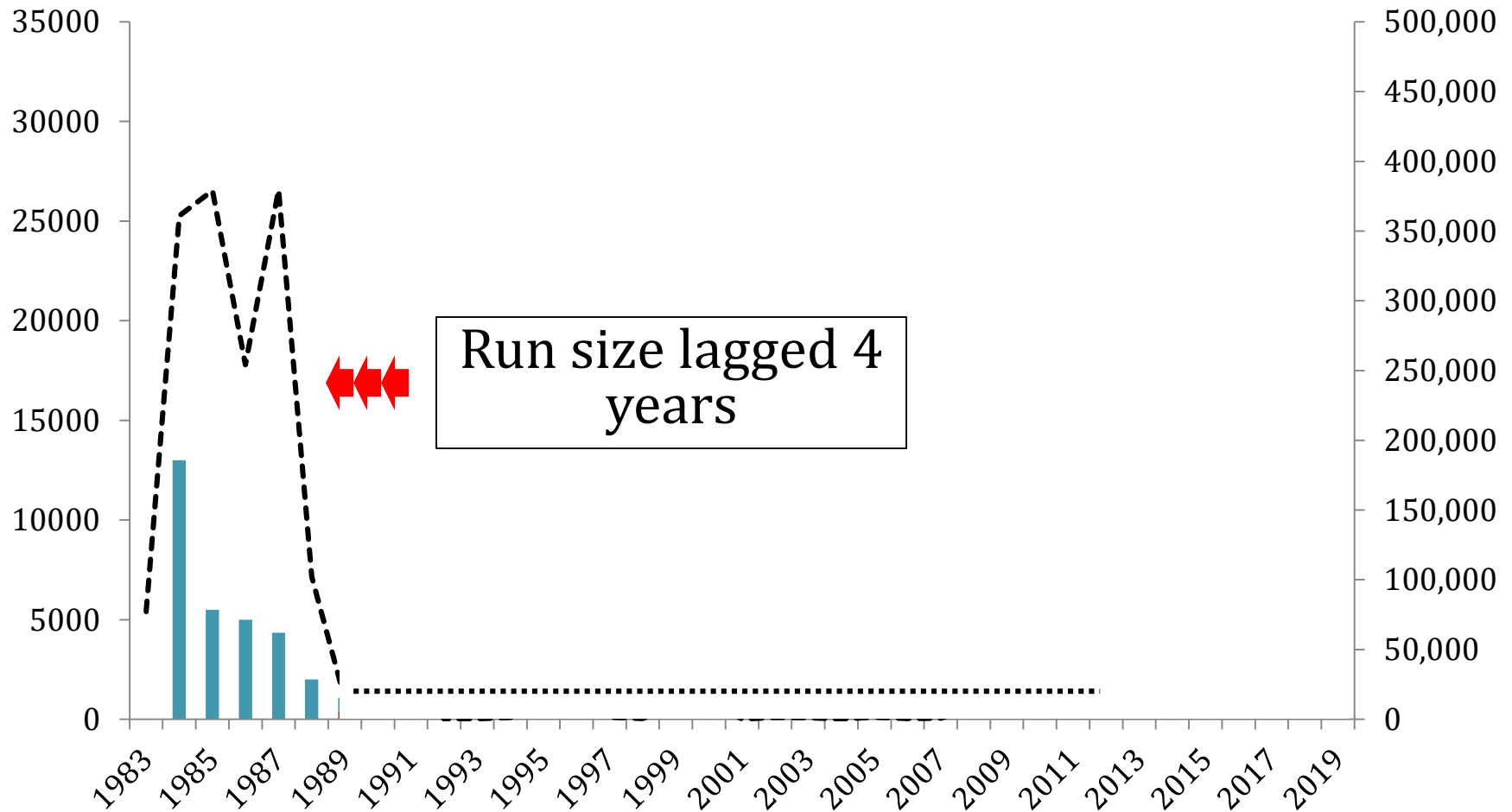


# Past Restoration Efforts: SUCCESS!!





# Past Restoration Efforts: CRASH!!

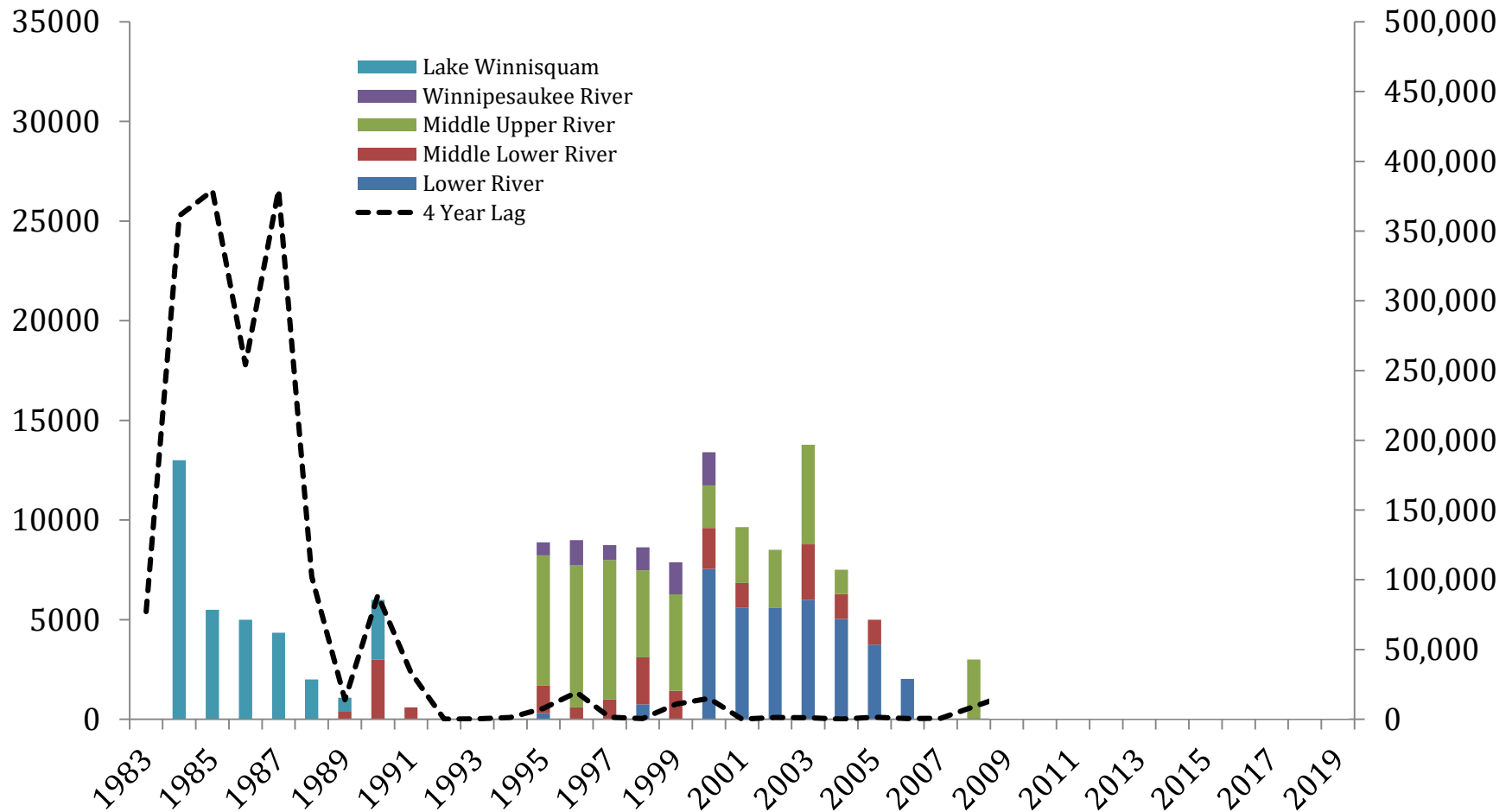


# Past Restoration Efforts: Crash

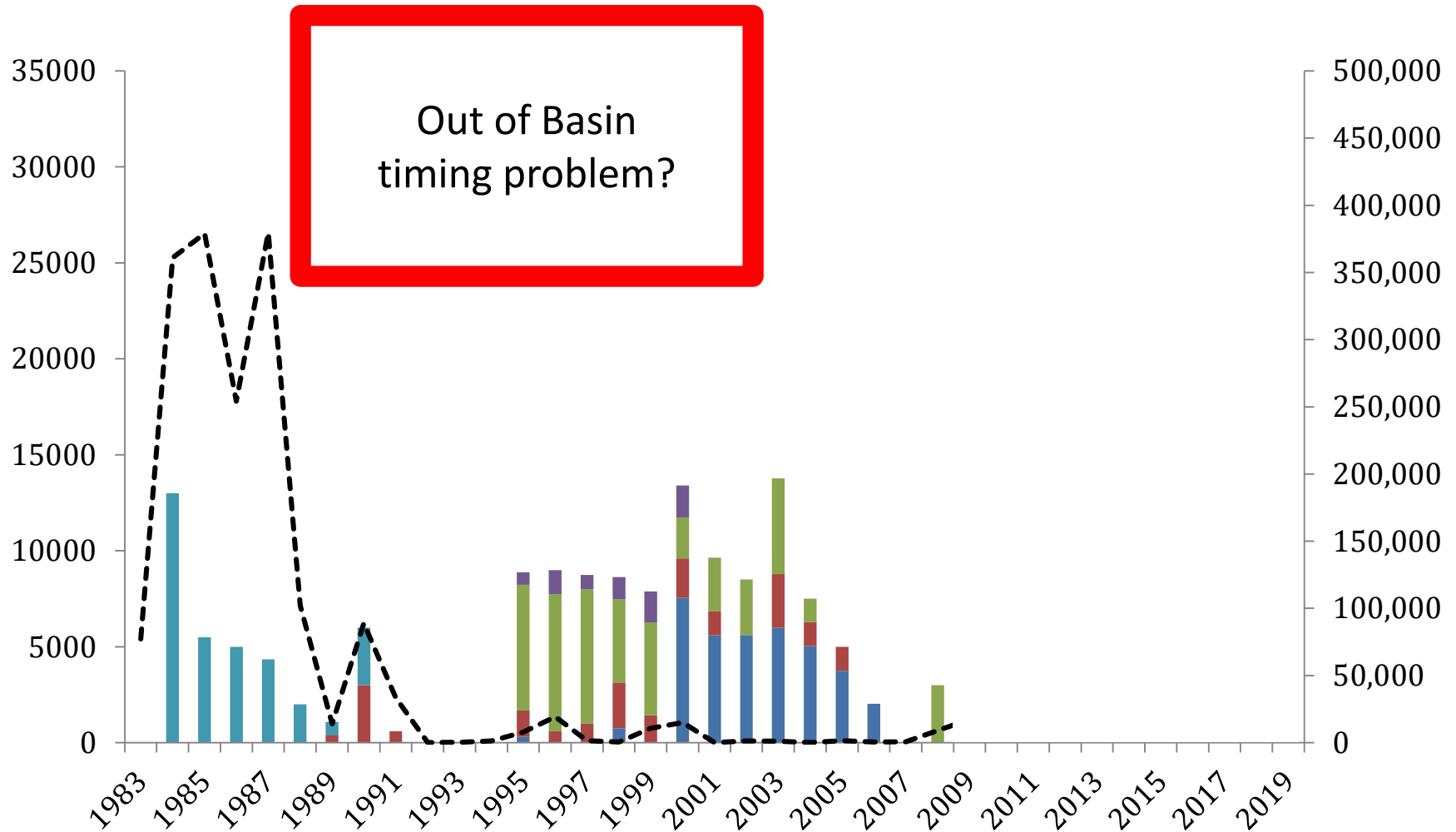
- Several fishways that were built were never used
  - Have not been evaluated
  - Often trigger numbers and regulatory process do not line up with ecology
- Merrimack River was not included in benchmark stock assessment due to its “non-reflectance of natural abundance trends”



# Restoration Efforts have continued



# Restoration Efforts have continued





# Restoration “story”

- Stocking Winnisquam created the large run of fish
- Stopping of stocking caused the crash
- There is little value in stocking mainstem habitat

# Restoration “story”

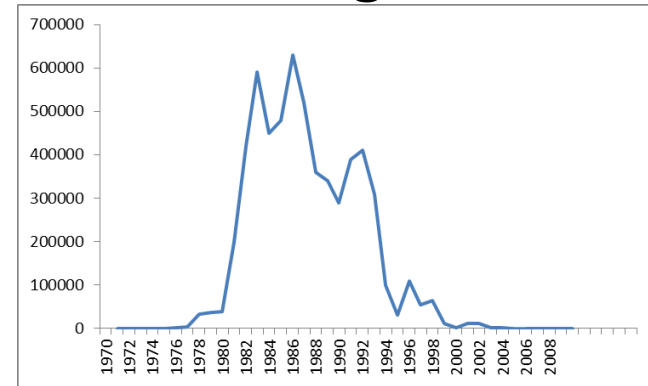


- No age data on fish
- No genetic data
- No information on downstream population
- No information on passage efficiency
- No information on passage on pre-1980s operations
- No information on species composition
- No information on species interaction
- No information about the black box

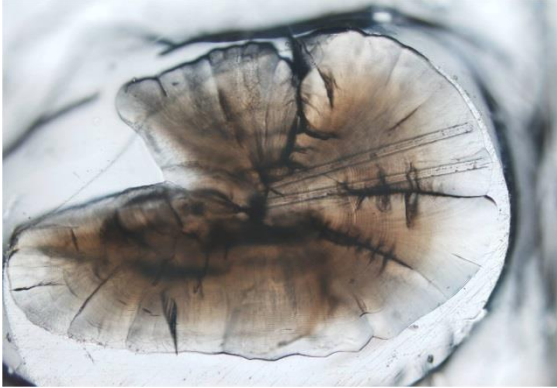


# Uncertainly in the “story” use hindsight to look forward

- ‘recovery’ was confounded by a new fishway and stocking
- ‘crash’ was concomitant with Connecticut River herring crash
  - Striped Bass recovery
  - Unknown impact from other factors
- Access to mainstem habitat of limited value
  - Have to be ready for success
  - Tributary passage needs to match need
  - Lots of people means lots to reservoirs, difficult to manage



# Today's efforts



Alewife



Blueback Herring



Paul J. Diodati  
Director

Commonwealth of Massachusetts

Division of Marine Fisheries

251 Causeway Street, Suite 400

Boston, Massachusetts 02114

(617)626-1520

fax (617)626-1509



Deval Patrick  
Governor  
Richard K. Sullivan,  
Jr.  
Secretary  
Mary B. Griffin  
Commissioner

April 8, 2014

Mr. ??? Olson  
Centennial Island Hydro Co.  
PO Box 356  
Methuen, MA 01844

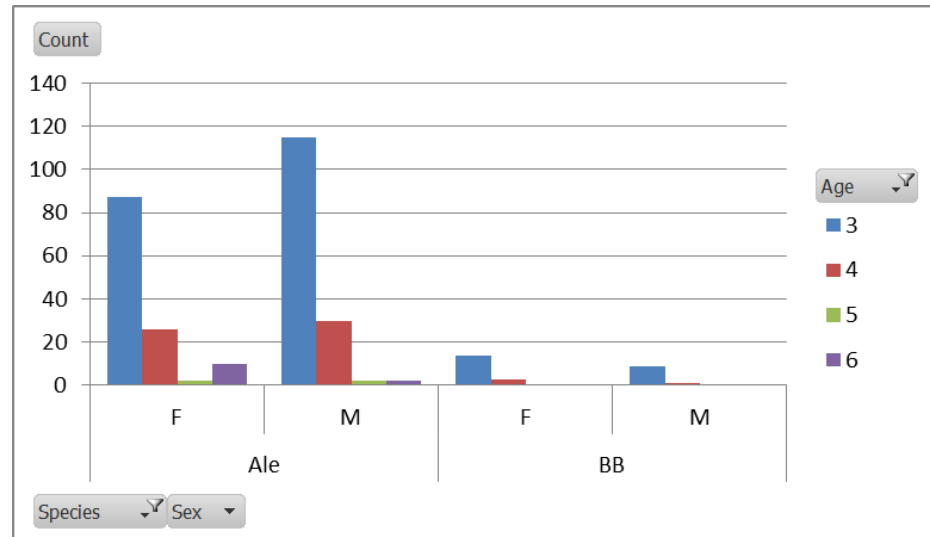
Dear Mr. Olson,

In anticipation of the 2014 season for migratory fish passage, the U.S. Fish and Wildlife Service, and the Massachusetts Divisions of Marine Fisheries and Fish and Wildlife seek the cooperation of Centennial Island Hydro Company to improve fish passage at your facility. In recent years, multiple issues that limit fish passage have been identified at Centennial Island. Some of these problems have been addressed; however, others are ongoing and need our collaborative efforts to discuss and correct.

In the spring of 2013 representatives of the fisheries agencies performed a site inspection and found that the denil fishway at Centennial Falls was not passable to migratory fish. Issues limiting passage included screening below the powerhouse, missing baffles in the five lowest slots of the fishway, failure to adjust entrance boards and proper attraction flow, and debris blocking several baffles. We have attached photographs from this visit to illustrate these issues. In addition to FERC responsibilities for fish passage, the owners of fishways are responsible under Massachusetts General Laws (Chapter 130 §19) to repair, operate, and maintain fish passage. This statute also provides authorization for the Director of the Division of Marine Fisheries to establish Operations and Maintenance (O&M) plans for fishway. We suggest such a plan is needed to maintain annual fish passage, provide your facility with a defined seasonal framework and technical information on how to best maintain proper flows and the physical integrity of the structure. Our goals are to provide you with technical assistance to improve the status of fish passage at Centennial Falls and prepare an O&M plan to facilitate annual upkeep of passage.

In the past several years our agencies have made significant progress towards diadromous fish restoration in the Merrimack River watershed. This includes large scale efforts to improve access to spawning habitat for river herring and other diadromous species through fish passage improvements in the main stem Merrimack River and dam removal investigations in tributaries. This spring a feasibility analysis has been initiated on options for providing passage at the Talbot Mills Dam and improving passage at Middlesex Falls in the Concord River. In this context it is important that fish passage facilities at Centennial Falls are operating correctly in order to maximize the restoration potential of the Concord and Merrimack Rivers.

We request that Centennial Island Hydro provides us with an update on facility planning for providing fish passage in 2014 and arrange to meet with our staff on site in May. Please contact Ben Gahagan at 978-282-0308 if you have any questions and to discuss meeting this spring.





# Trap and Transfer and Sustainability

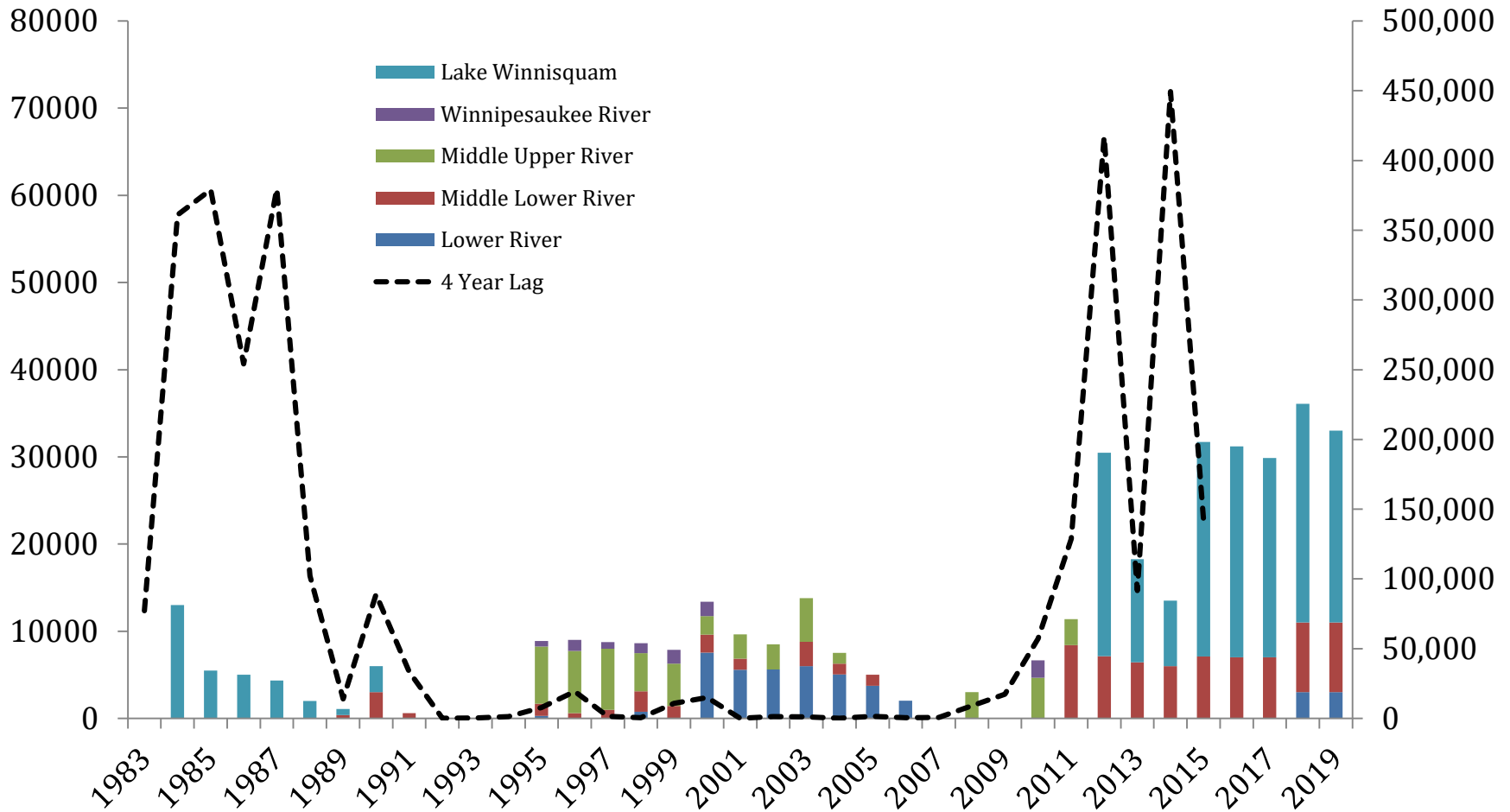


- Amoskeag Fishways in Manchester has a trap and truck facility.
- There is potential for fish passage at a number of dams in the Merrimack River watershed.

Where are we now?  
In 2012 we shifted priorities with  
partners

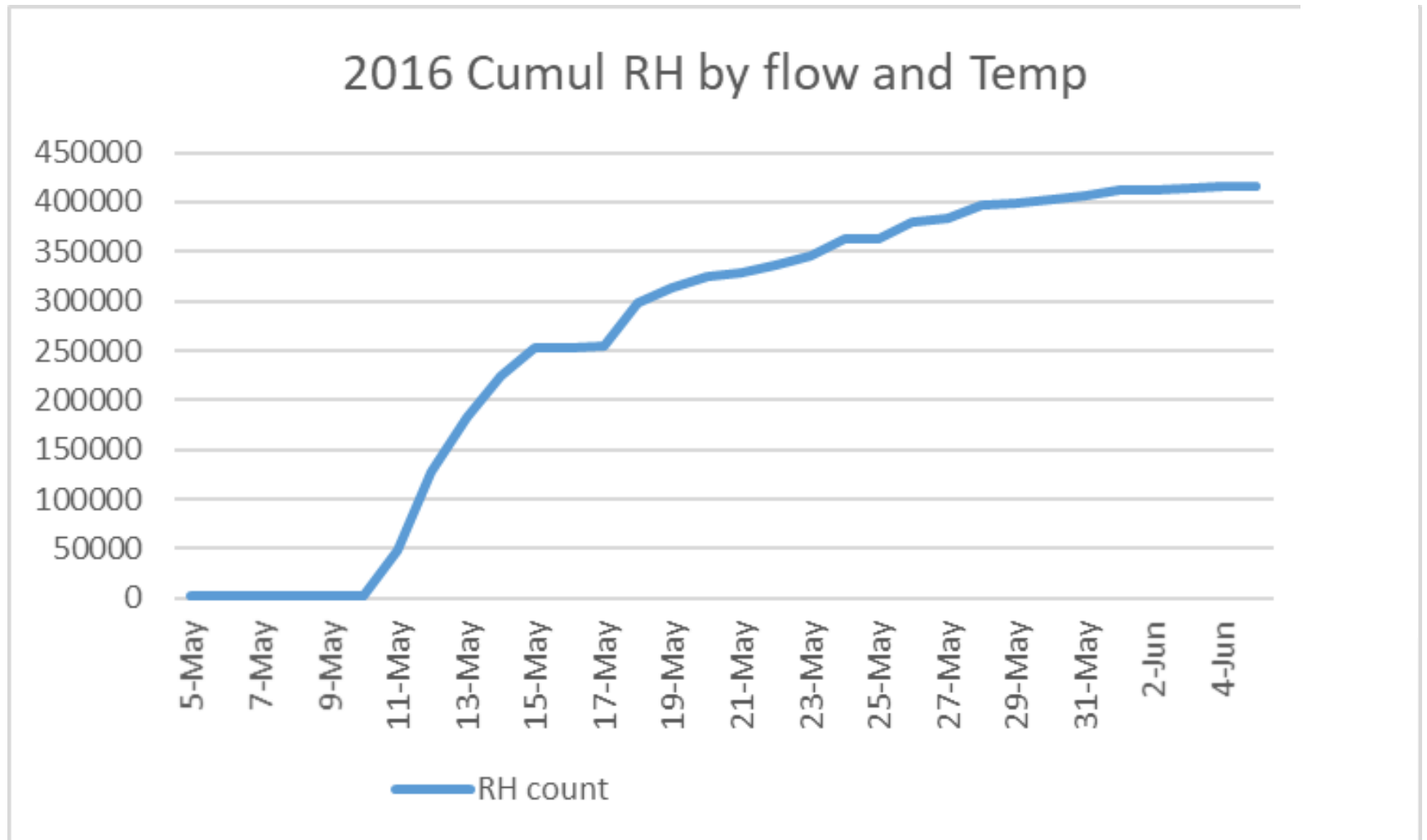


# Where are we now?

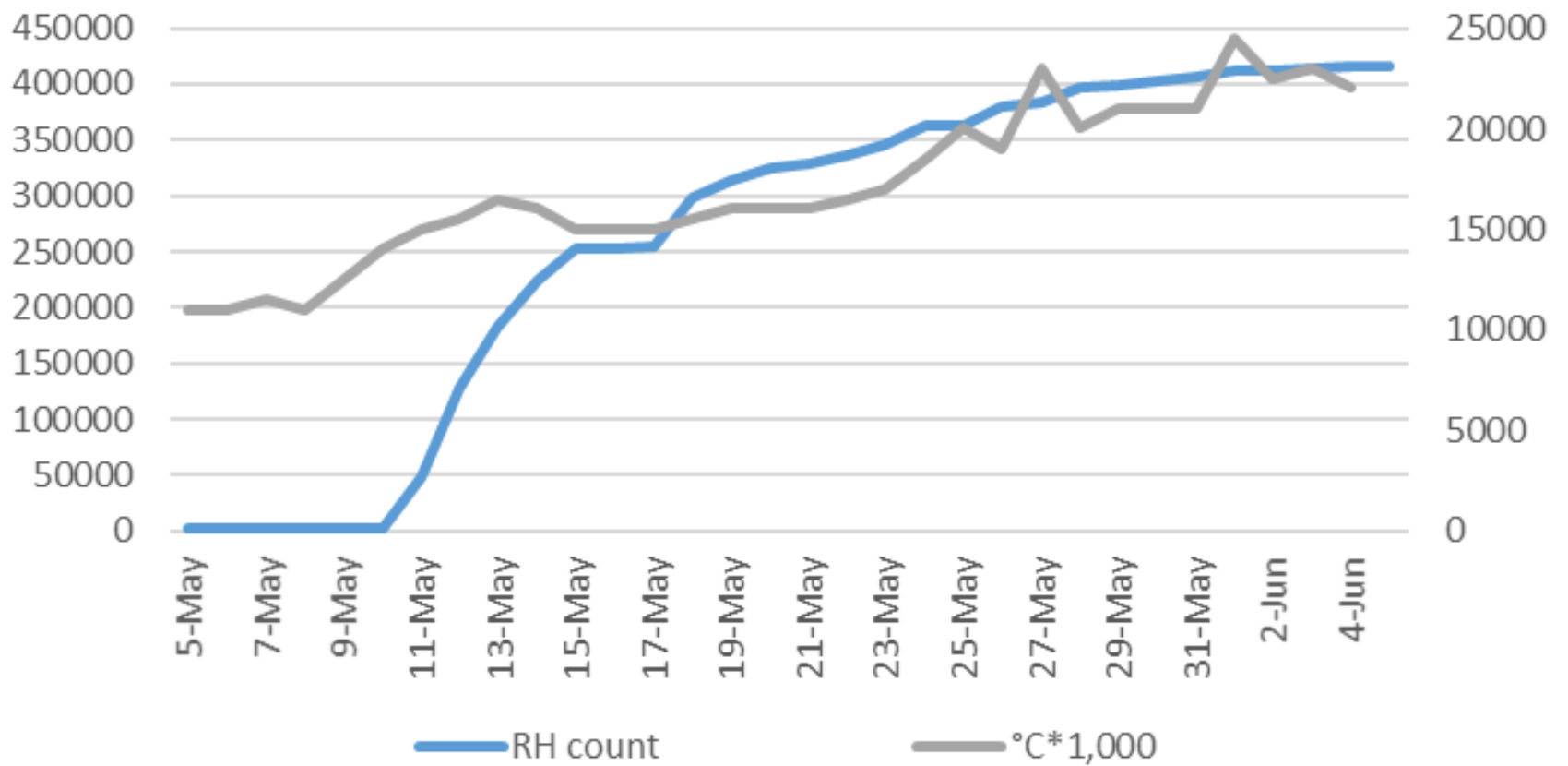




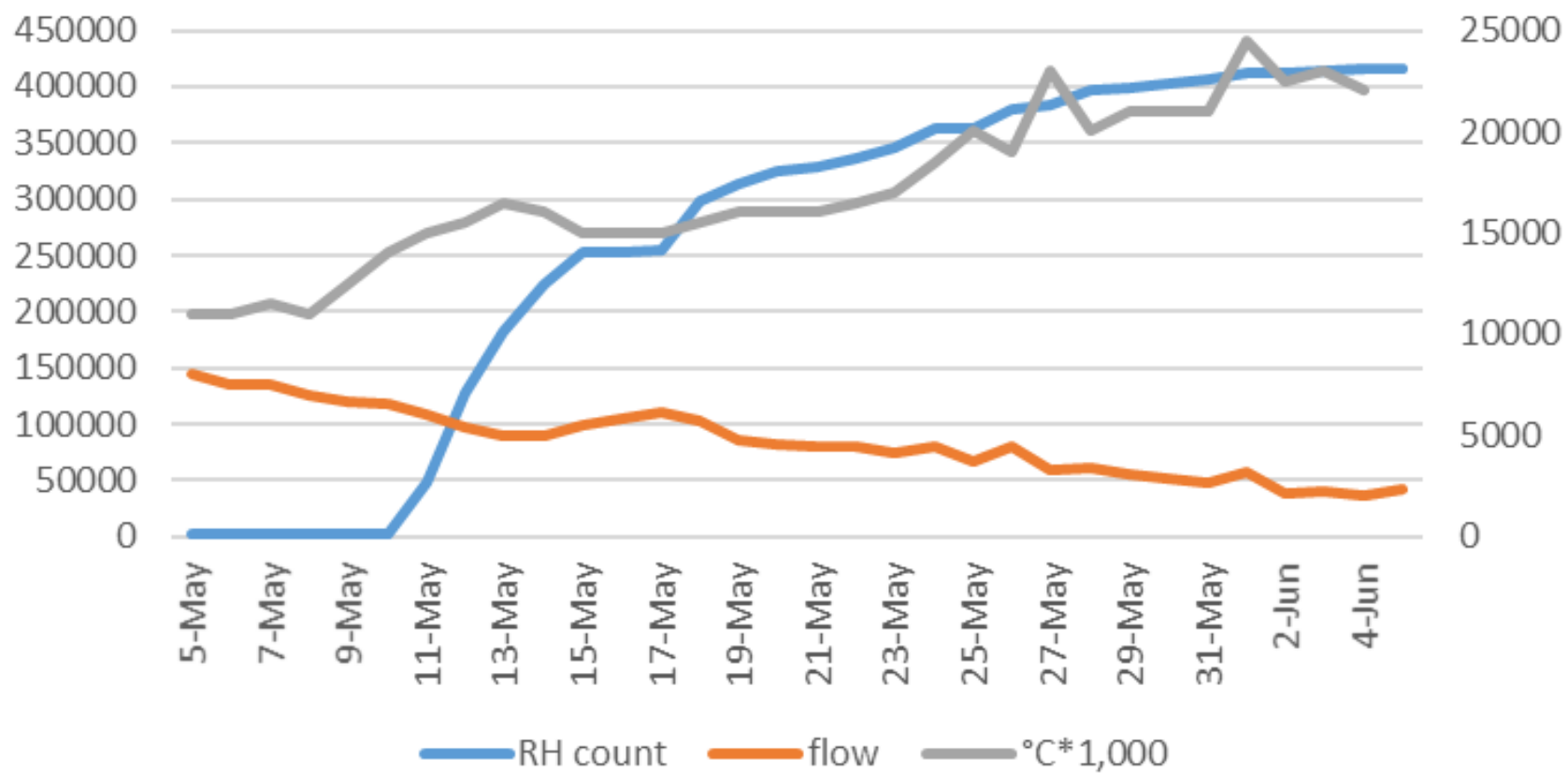
# Essex Dam – 1<sup>st</sup> on the system



## 2016 Cumul RH by flow and Temp

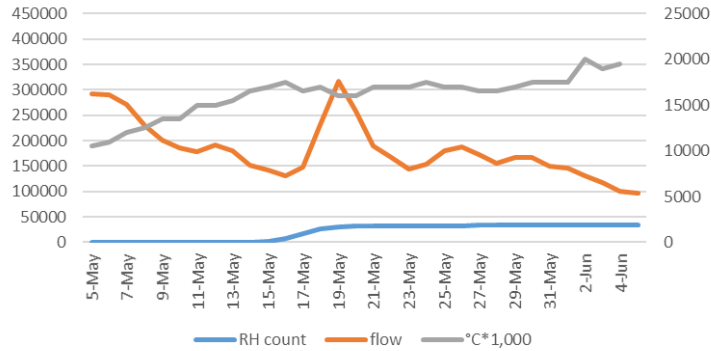


## 2016 Cumul RH by flow and Temp

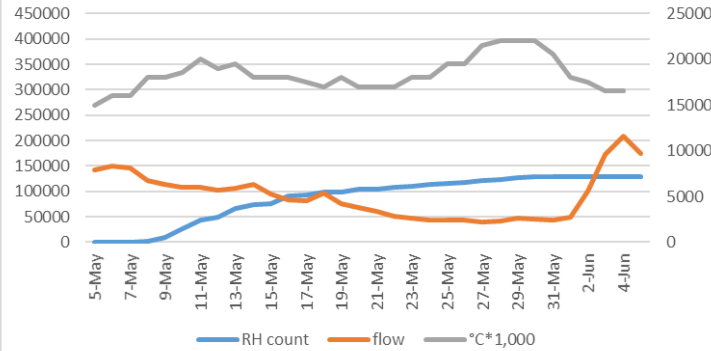




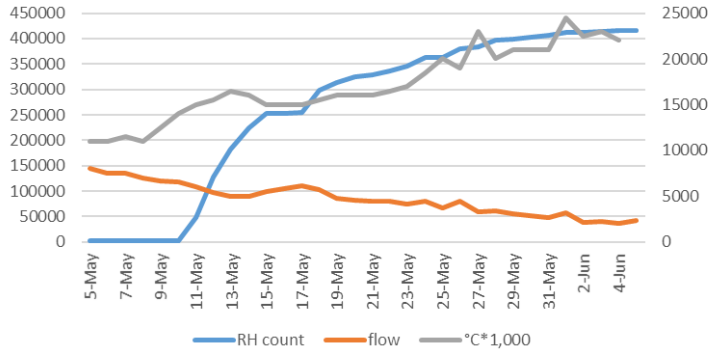
2014 Cumul RH by flow and Temp



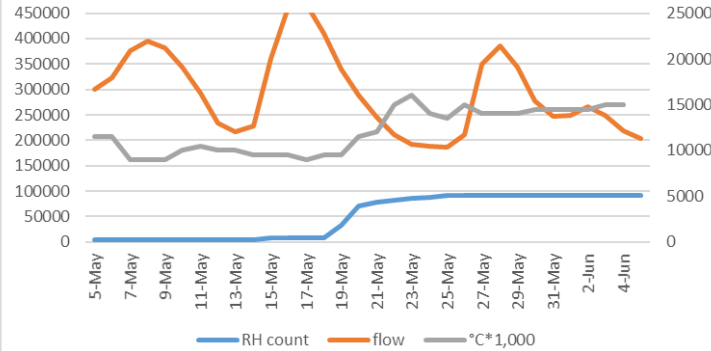
2015 Cumul RH by flow and Temp



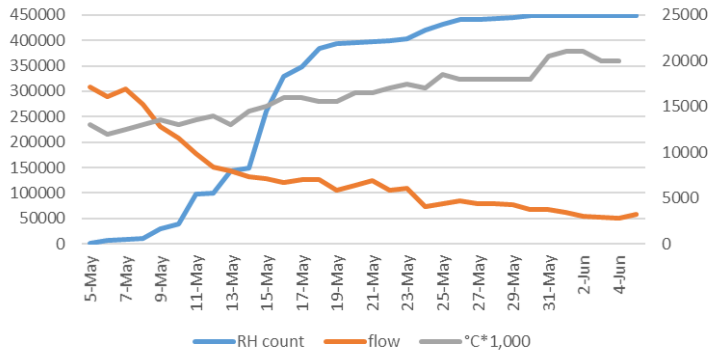
2016 Cumul RH by flow and Temp



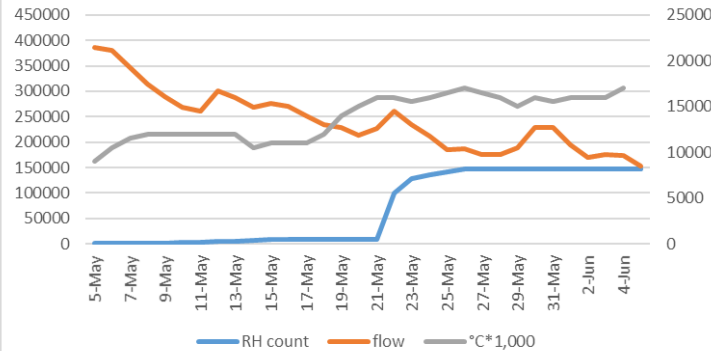
2017 Cumul RH by flow and Temp



2018 Cumul RH by flow and Temp



2019 Cumul RH by flow and Temp



# Essex Dam

- New data for old dam
- Huge daily capacity (100,000+ per day)
- Flow and temperature dependent
  - Re-licensing
  - Timing
- Small window of opportunity
  - Climate variability

# Sustainability

- High counts of fish is not necessarily equal to sustainability or population health
- time line of active restoration
  - How long to truck fish?
    - Forever?
    - Legislation or Under agreement?
  - How stable are donor stocks?
  - What happens if you walk away?





# Questions?

Thanks to Merrimack  
River Partners

