

Connecticut Fisheries Division

Inland Fisheries Research and Management



Federal Aid in Sport Fish Restoration F-57-R-41

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Katie S. Dykes, Commissioner



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



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4/1/2022 to 3/31/2023

Grant Title: Inland Fisheries Research and Management
Study 1: Coldwater Fisheries Management
Study 2: Warmwater Fisheries Management
Study 3: Inland Fisheries Coordination and Administration

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Study 1: Coldwater Fisheries Management
Job 1: Monitoring Fish Populations in Streams

Report Prepared by: Brian Eltz
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Overview: The Connecticut Department of Energy and Environmental Protection (DEEP) Fisheries Division primarily uses electrofishing equipment to monitor fish populations in streams and wadeable rivers. Because rivers and streams are dynamic systems that are subject to both natural variation (e.g., flood, drought, and natural changes in temperatures on a temporal and spatial scale) and anthropogenic factors (e.g., industrialization, impoundment, flow diversion, pollution [including thermal], agriculture, development, urban sprawl, and climate change), regular fish population data collection using consistent methods is important to make informed management decisions.



Figure 1. Staff conducting a backpack electrofishing sample.

Objectives of the stream monitoring job are:

1. Monitor streams where water quality or physical habitat has been improved or has become degraded.
2. Assess fish populations of long-term reference streams.
3. Conduct water temperature mapping of stream networks to locate sources of thermal loading.
4. Develop systems to map water temperature and other stream data including barriers/obstructions to fish movement.
5. Assess short- and long-term environmental trends by sampling a variety of reference streams on a regular basis and by re-sampling selected historical stream survey sites.
6. Assess important riverine trout fisheries on a rotational basis.

7. Standardize and archive stream survey data and make information available to the division’s Habitat Conservation and Enhancement program, other divisions within the DEEP, town land use commissions, and the public.

This report describes efforts related to these objectives during the study year. Under this job, the Fisheries Division collected data on 234 sites, via electrofishing, during 2022 (Table 1 and Figure 1).



Figure 2. Brook Trout, a core member of Connecticut’s coldwater fish community.

Key Findings

Table 1. Count of sample events by purpose for stream locations sampled with electrofishing in 2022. Note that several locations were sampled for more than one purpose and are binned accordingly.

Sample Purpose	Count
Sites adjacent to 2018-2019 wild Brook Trout resample	12
DEEP Water Protection & Land Reuse Water Planning and Management Division & Sites adjacent to 2018-2019 wild Brook Trout resample	1
DEEP Water Protection & Land Reuse Water Planning and Management Division (ambient monitoring, contaminants/fish tissue sampling to obtain information on bioaccumulates)	9
Fry/Fingerling Evaluation	18
Fry/Fingerling Evaluation & Long-term Monitoring	2
Habitat Conservation and Enhancement	2
Headwaters (efforts to document new wild Brook Trout populations)	16
Long-Term Reference (monitor long-term trends in fish populations)	3
Long-Term Reference & Fry/Fingerling Evaluation & Wild Trout Management Area	1
Old Stream Survey (assess previously documented wild Brook Trout populations)	108
Old Stream Survey & Long-term Reference	2
Old Stream Survey & Wild Trout Management Area	2

Special Study (UConn telemetry study & BioBlitz)	10
Trout Management Area (broodstock collection)	1
Wild Trout (assess wild trout)	38
Wild Trout Management Area (assess trout populations)	9
Grand Total	234

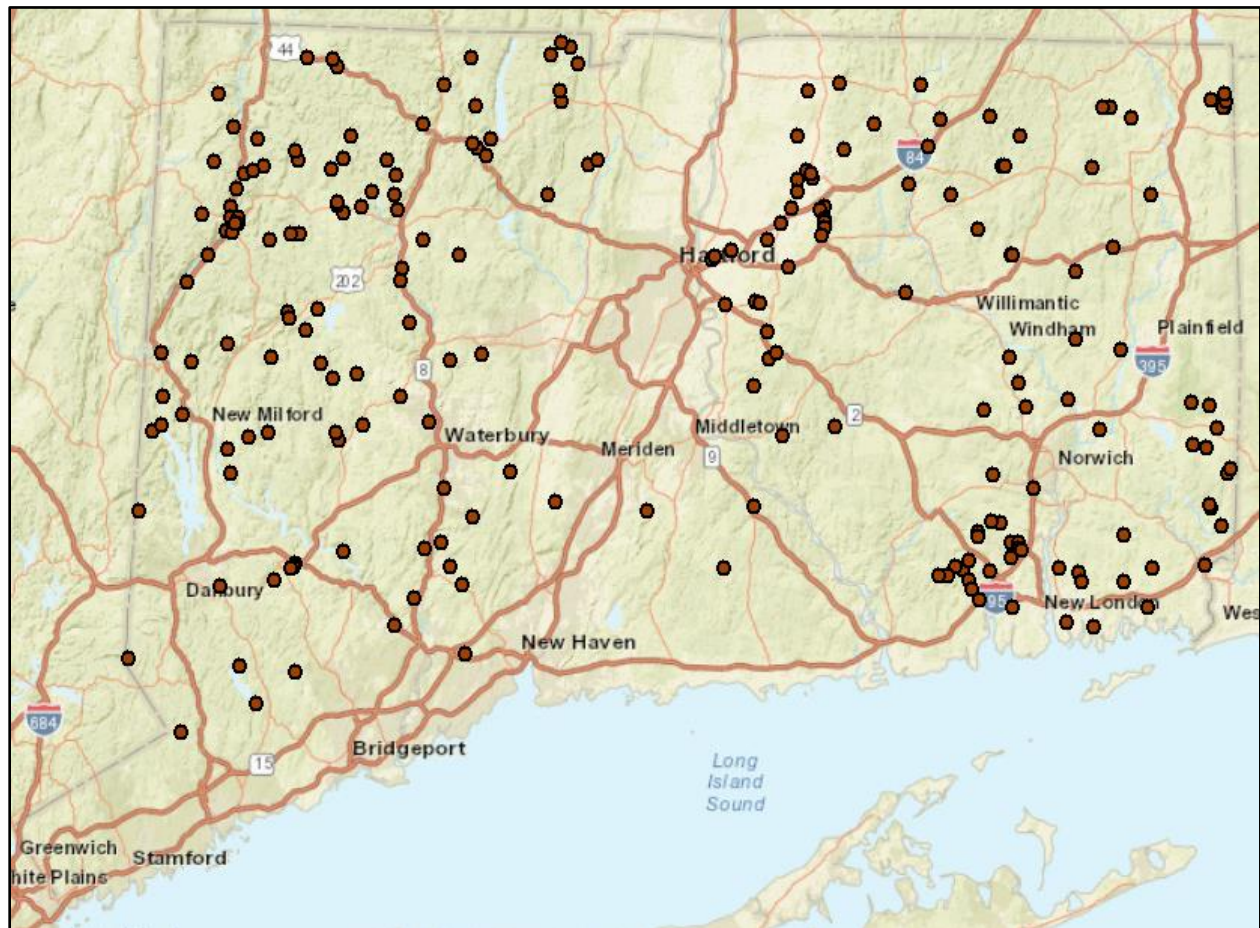


Figure 3. Locations of streams sampled in 2022 in support of this job.

Objective 1: Monitor streams where water quality or physical habitat has been improved or has become degraded.

- Two sites were sampled in collaboration with the Habitat Conservation and Enhancement and Diadromous Fish Restoration programs where in-stream habitat work was previously completed by Trout Unlimited in Salmon Creek, Lakeville, CT.
 - Two wild Brook Trout and 61 wild Brown Trout were detected at a 300-meter-long sample site and 12 wild Brown Trout and zero wild Brook Trout were detected at 358-meter-long sample site.

- Data will be compared to previous samples conducted prior to in-stream habitat work to determine if there are any changes.
- Nine sites were sampled in collaboration with DEEP Water Protection & Land Reuse Water Planning and Management Division for ambient monitoring and to determine the level of Per- and Polyfluoroalkyl Substances (PFAS) concentrations in fishes found in the Hockanum River (Vernon, Ellington, Manchester, and East Hartford).
 - Preliminary results show that fish tissue concentrations were elevated.
- Two sites were sampled in Deep Brook (one unnamed tributary and one mainstem site) and one in the Pootatuck River (both in Newtown) to evaluate previous in-stream enhancement work and monitor wild trout populations.
 - No wild trout were detected in the unnamed tributary and 12 wild browns were detected in the mainstem site.
 - Only one wild Brown trout was detected at the Pootatuck river site.

Objective 2: Assess fish populations of long-term reference streams.

- Fish populations were assessed in 7 long-term reference streams; Comstock Brook (Wilton), Trading Cove Brook (Montville), Salmon Brook (Glastonbury), and Steele Brook (two sites in Watertown). Salmon Brook is a WTMA Class 2. In addition, two sites sampled as Old Stream Survey sites in 2022 also serve as Long-term Reference sites; Jordan Brook (Waterford) and Tankerhoosen River (Vernon).
 - No trout were detected in Steele Brook where Brown Trout fry stocking ceased in 2020 due to a reduction in hatchery production.
 - A moderate increase in Brown Trout was observed at Salmon Brook where and experimental stocking of fry was carried out in December of 2021.
 - Future stockings and sampling will be carried out for up to five years to determine if fry stocking can elevate Brown Trout numbers that have reduced to almost zero in recent years.

Objective 3: Conduct water temperature mapping of stream networks to locate sources of thermal loading.

- Twenty-six thermographs (Figure 4) were deployed by project staff during 2021-2022; as of fall 2022 all located thermographs were pulled and only those in locations with wild trout were replaced and reset (11 total). All recovered temperature data will be uploaded to the SHEDS website (<http://ecosheds.org/>) for long term data storage and public access.

- Utilized Survey123 to collect site information regarding location of thermograph placement. Use of the application improved data collection, data entry, and data storage capabilities.

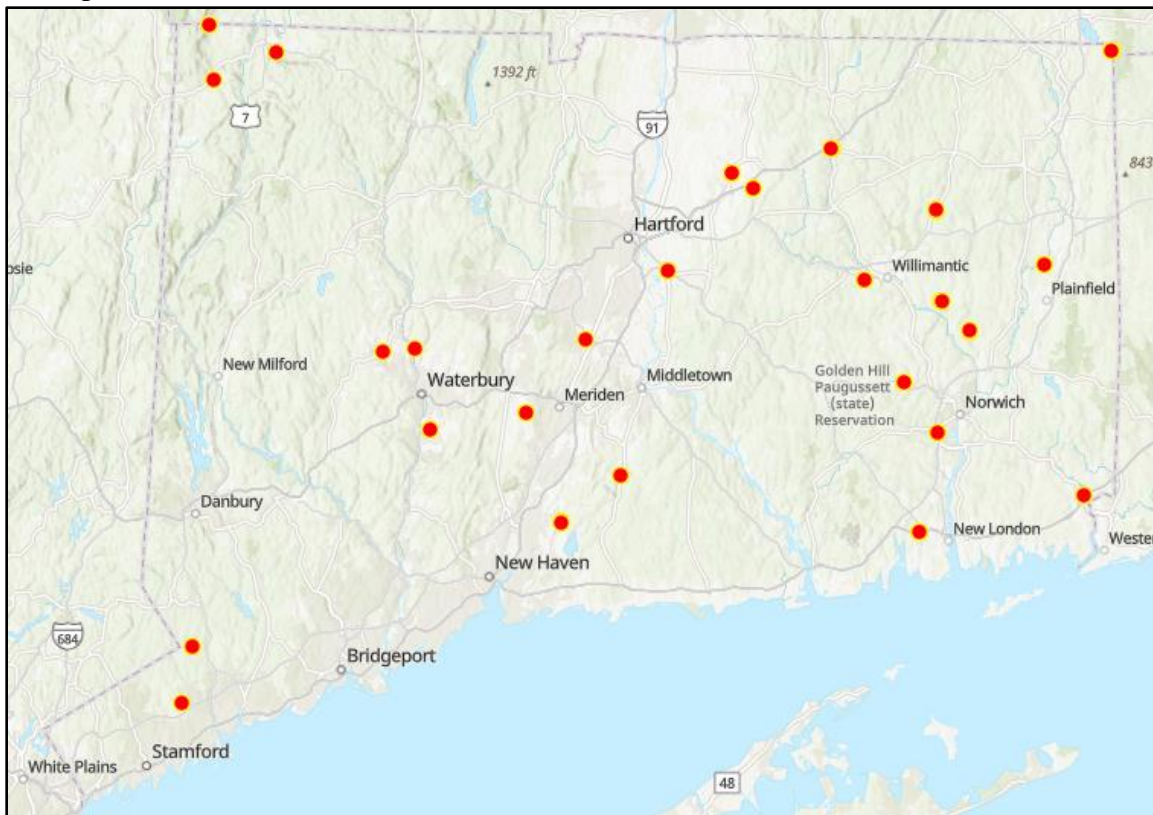


Figure 4. Locations of the 26 thermographs deployed by project staff in 2021-2022.

Objective 4: Develop systems to map water temperature and other stream data including barriers/obstructions to fish movement.

- The use of drone cameras with thermal imaging is being investigated to help identify coldwater habitat in the riverine environment. In addition, drones could be utilized to help inform identification of potential barriers/obstructions to fish movement.

Objective 5: Assess short- and long-term environmental trends by sampling a variety of reference streams on a regular basis and by re-sampling selected historical stream survey sites.

- No action taken towards this objective in 2022, but plans are being developed to resample historical stream survey sites in 2023 or 2024.

Objective 6: Assess important riverine trout fisheries on a rotational basis.

- Eleven sections of Wild Trout Management Class 3 areas that were previously stocked annually with Brown Trout fry were sampled in 2022. These same environments will be sampled for several consecutive or alternating years to assess and characterize the natural wild trout populations as Brown Trout fry stocking has been put on hold.

- All locations had fewer numbers of Brown Trout than when fry were stocked. Future sampling will shed light on natural reproduction in each system.

Objective 7: Standardize and archive stream survey data, and make information available to the HCE program, other divisions within the DEEP, town land use commissions and the public.

- All DEEP Fisheries Division data are compiled and entered into a centralized Microsoft Access database.

Moving Forward

- Revisit a subset of the streams that were documented as dry in 2016 to determine the long-term effects of droughts on fish communities.
- Resample 100 randomly chosen historic Stream Survey (1988-1995) sites to determine if there has been a shift in resident fish populations.
- Determine feasibility of using Survey123 to record fish sampling data collected in the field.
- Work with an expert in database management to combine recent and historical stream monitoring data (among other data types) into more user-friendly data products for staff and the public.



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Figure 2. A wild Brook Trout caught while stream electrofishing.

Overview: Wild [Brook Trout](#) and [Brown Trout](#) populations are important sustainable resources that also add quality and diversity to Connecticut fisheries.

The iconic Brook Trout is the only native trout (technically a char) historically found in Connecticut. Brown Trout, introduced to Connecticut waters over 100 years ago, have also established self-sustaining populations within rivers and streams. Continued sampling of the State's rivers and streams, coupled with routine monitoring of key sentinel streams, is necessary to document the effects of a changing environment and recreational fishing pressure on wild trout populations.

While there are thousands of miles of streams and rivers within Connecticut that contain self-sustaining populations of wild trout that are regulated by the statewide trout fishing regulations (5 trout per day, no size limit, no gear restrictions, season is from Opening Day of Harvest [2nd Saturday in April at 6am] until the last day of February and Catch and Release only from March 1st through Opening Day of Harvest), formally, Connecticut has three classes of [Wild Trout Management Areas](#) (WTMAs), each differentiated by regulation:

- **Class 1:** Catch and Release only year-round, use of a single barbless hook, artificial lure or fly only. These receive no stocking of hatchery fish. Monitoring and assessment are part of this job.
- **Class 2:** Two trout per day limit, 12-inch minimum size harvest season is from Opening Day of Harvest (2nd Saturday in April at 6am) until the last day of February and Catch and Release only from March 1st through Opening Day of Harvest. These may receive fish stocked as juveniles or adults. Reporting on fry/adult stocking is part of the trout stocking job.
- **Class 3:** Five trout per day limit, 9-inch minimum size harvest season is from Opening Day of Harvest (2nd Saturday in April at 6am) until the last day of February and Catch and Release only from March 1st through Opening Day of Harvest. These may receive fish stocked as juveniles or adults. Reporting on fry/adult stocking is part of the trout stocking job.

The objectives of the wild trout job are:

1. Monitor and assess fish populations in sentinel wild trout streams.
2. Assess fish populations of headwater streams, with emphasis on documenting previously un-sampled populations of native, wild Brook Trout, naturalized wild Brown Trout and other sensitive cold and/or coolwater fish species.
3. Systematically re-sample former Statewide Stream Survey sample sites that supported viable wild trout populations.
4. Re-introduce wild Brook Trout to sections of streams where local extirpation has occurred via natural or human-related causes.

Key Findings

Objective 1: Monitor and assess fish populations in sentinel wild trout streams

- Sampling occurred in five sentinel wild trout streams (typically referred to as Long-term sites) during 2022 (Comstock Brook [Wilton], Jordan Brook [Waterford], Tankerhoosen River [Vernon], Trading Cove Brook [Uncasville], and Salmon Brook [Glastonbury]), which is also a WTMA Class 2 (Appendix A).
- In addition, three WTMA Class 1 streams were sampled in 2022 (Deep Brook [Newtown, two sites], Hawley’s Brook [Easton], and Pootatuck River [Newtown]).

Objective 2: Assess fish populations of headwater streams, with emphasis on documenting previously un-sampled populations of native, wild Brook Trout, naturalized Wild Brown Trout and other sensitive cold and/or coolwater fish species.

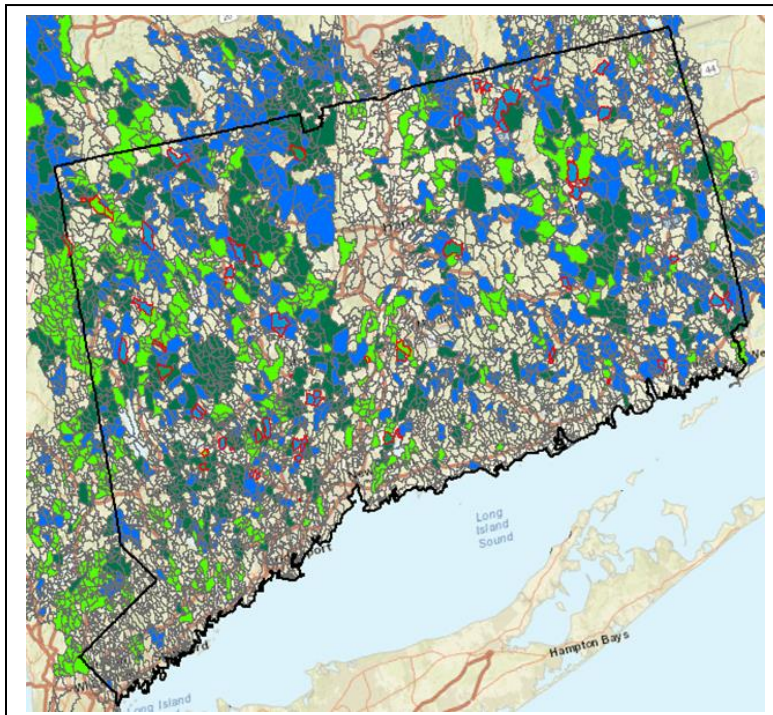


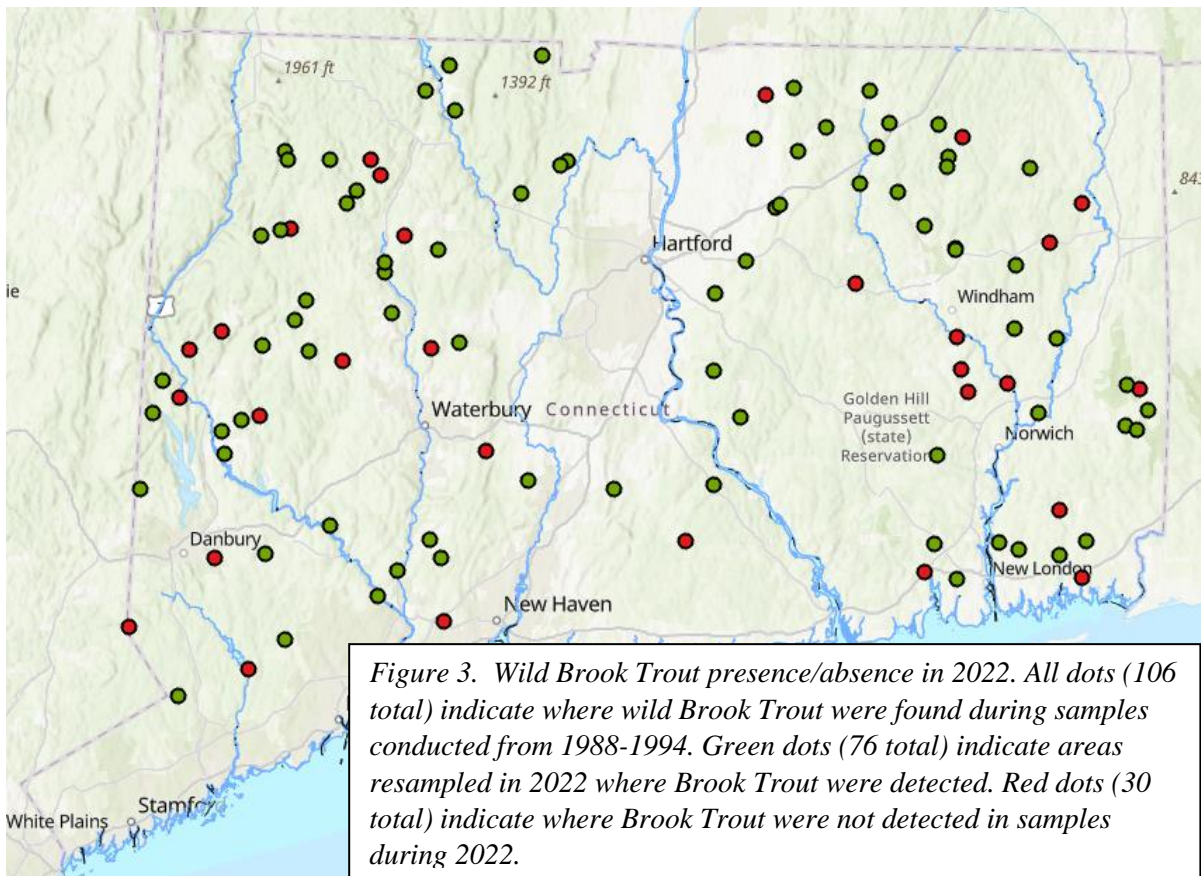
Figure 2. Eastern Brook Trout Joint Venture catchment layer showing where wild trout have been sampled or are predicted to be found. The blue patches indicate wild Brook Trout populations, the dark green patches indicate a mix of wild brook and brown trout populations, and the bright green patches indicate wild Brown Trout populations. The tan patches indicate where no wild trout have been sampled or are predicted to not be found. The red outlined patches indicate where sampling has occurred and there is a status change from what was predicted or found at an earlier time. Additional headwater stream data is currently being evaluated for inclusion in this map.

- To prioritize locations where headwater sampling occurred, the Fisheries Division utilized the [Eastern Brook Trout Joint Venture’s \(EBTJV\)](#) catchment/habitat patch layer (Figure 2) for site selection. Sites were selected from patches where Brook Trout populations were predicted to occur, where no sampling had previously taken place or data is older than 10 years. Additionally, patches were given higher priority if they were near patches where wild Brook Trout were previously sampled. Data will be uploaded to update the EBTJV layer.
- Sampled 16 new headwater stream locations in 2022 (Appendix A) where a total of three new wild Brook Trout populations were documented; no wild Brown Trout were detected at any new location. Additionally, no new Slimy Sculpin (a coldwater indicator) populations were documented.

Objective 3: Systematically re-sample former Statewide Stream Survey sample sites that

supported viable wild trout populations

- A systematic resample (random design) of 106 historic (1988-1994; Old Stream Survey sites in Appendix A) wild Brook Trout sites showed that occurrence differed between the two periods (historic vs. 2022); only sites with three or more individuals in the original survey were randomly chosen for the resample. Of the 106 locations resampled during 2022, the majority (76) retained at least one wild Brook Trout (Figure 3). But wild Brook Trout went undetected at the other 30 locations. This pattern was like what was observed during another recent resample conducted in 2018-2019 (Eltz and Beauchene 2020). The majority (20) of locations where wild Brook Trout went undetected in the 2022 resample had low (0.1 – 30 fish/km) to moderate (30.1 to 180 fish/km) densities, but some (6) had high (180.1 to 570 fish/km), and a few (4) had very high (> 570.1 fish/km) densities in the initial samples. Density rankings were based on quartile statistics generated from samples conducted 1988-1994 (Eltz and Beauchene 2020).
- In addition to the decrease in number of wild Brook Trout sites between both sample periods (2022 vs. 1988-1994), a decrease in density of wild Brook Trout was observed. Mean density decreased between the two sample periods (429 fish/km vs. 273 fish/km; early and late periods, respectively) and a paired T-Test of wild Brook Trout density (log10 transformation) showed a highly significant difference (<0.001) between samples from both periods. Overall, a decrease in the number of very high, high, and moderate densities of wild Brook Trout populations was observed, and the number of low-density populations increased (Figure 4).



- In 2021, 33 of the 39 locations where wild Brook Trout went undetected in 2018-2019 were resampled; one site (Blackledge River) was not resampled due to heavy beaver activity/swamp. We were unable to resample all 39 locations in 2021 due to high water flows that persisted into late summer/early fall. In 2022, the six remaining sites were resampled. Of all locations resampled from 2018-2019 that did not have Brook Trout present, only two sites (one from 2021 and one from 2022) had a wild Brook Trout present. Adjacent reaches and nearby tributaries were also resampled in 2021 and 2022 to document if wild Brook Trout were present nearby. Forty-two of the 121 adjacent reaches and nearby tributaries resampled in 2021 & 2022 where no wild Brook Trout were detected in the 2018-2019 resample had at least one wild Brook Trout present. Data from these sites will be compiled to determine where future restoration/transplant (Objective 4) efforts might be considered at locations where wild brooks appear to have been extirpated and conditions are still suitable for supporting wild Brook Trout.

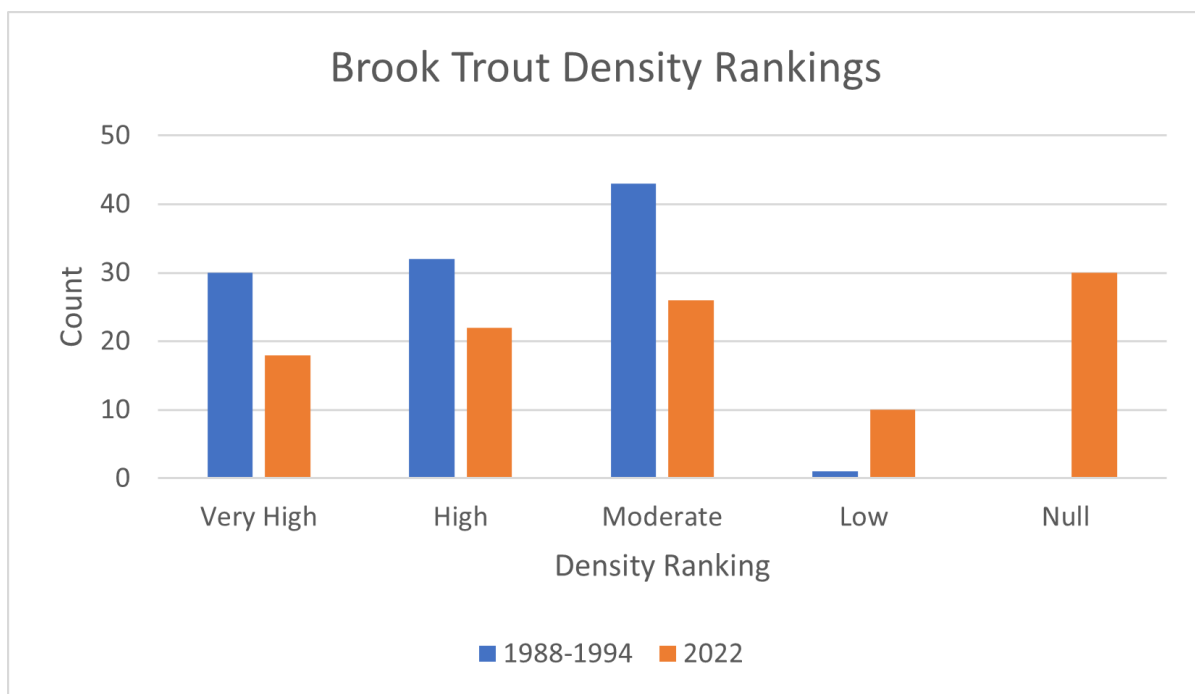


Figure 4. Count of density rankings between the two sample periods. A null ranking indicates wild Brook Trout were not detected in the sample.

Objective 4: Re-introduce wild Brook Trout to sections of stream where local extirpation has occurred via natural or human-related causes.

- No action taken towards this objective in 2022, but systematically re-sampled sites from 2018-2019 where no Brook Trout were detected are being considered for restoration.

Moving Forward

- Utilize recently developed [Connecticut's Plan for Conservation and Management of Wild Trout](#) to guide sampling and restorations efforts.
- Sample additional previously un-sampled headwater streams with priority on augmenting existing Eastern Brook Trout Joint Venture patch mapping.
- Continue to monitor sentinel streams to maintain the lengthy period of record.
- Continue to participate in local, regional, and national workgroups focused on the management of wild trout.
- Collaborate with the DEEP's Water Quality Monitoring Program's to contribute to [Connecticut's cold water stream habitat map](#).
- Continue to perform robust statistical analyses on long-term datasets.
- Perform in depth analysis on recently re-sampled historic Brook Trout sites to determine possible causes for losses in populations and densities.
- Determine next step(s) needed where wild brook trout populations are determined to be extirpated or have alarmingly low densities.
- Develop plan for re-sampling historic wild Brook Trout sites every 5 years.
- Continue to screen for gill lice, and other external parasites on all stocked and wild Brook Trout collected during fish community samples when encountered during the mid-summer to early fall period (Eltz 2020).
- Support regulation changes such as a statewide minimum length for trout and the creation of new WTMA Class 1 streams.

References

- Eltz, B, and M. Beauchene. 2020. A random revisit of the statewide stream survey project. Connecticut Department of Energy and Environmental Protection, Bureau of Natural Resources Fisheries Division. Accessed at https://portal.ct.gov/-/media/DEEP/fishing/fisheries_management/Trout-Research-and-Management/Probabilistic-Sampling-of-Wild-Brook-Trout-Occurrence-in-Stream-Survey-Samples-Final-05082020.pdf
- Eltz, B. 2020. A Summary of the Initial Screening for the Presence of Brook Trout Gill Lice (*Salmincola edwardsii*) in Connecticut. Accessed at https://portal.ct.gov/-/media/DEEP/fishing/fisheries_management/Brook-Trout-Gill-Lice-Sampling-Findings_Final.pdf

Appendix A

All locations sampled in 2022 with stream electrofishing equipment and number of wild brook and brown trout present. Waterbody names in **Bold** were locations where wild brooks were not detected during the 2018-2019 resample. Adjacent sites are locations sampled to determine if Brook Trout were present near the 2018-2019 resample sites where brooks went undetected. Headwaters are locations sampled to document new wild Brook Trout populations. The Long-term sites serve as sentinel wild trout sites. Old Stream Survey sites were randomly chosen for resampling to determine if Brook Trout occurrence had changed since first being sampled in 1988-1994. All Fry/Fingerling sites were sampled to determine if wild trout were present after Brown Trout fry stocking ceased, except for Salmon Brook (Glastonbury) where fry stocking is ongoing. The Farmington River TMA was sampled to collect broodstock for the Survivor Brown Trout program. Wild trout sites were sampled to determine if they would be suitable for a regulation change from harvest (five/day no size limit) to year-round-catch-and-release (WTMA Class 1). Contaminant sites were sampled to determine the amount of Per- and Polyfluoroalkyl Substances (PFAS) present in fish tissue samples. Special Study sites were sampled to collect stocked or wild Brown Trout for a telemetry study in the Housatonic River or for a BioBlitz (biological census). WTMA sites were sampled as sentinel sites or to determine if they could be upgraded from WTMA Class 3 to WTMA Class 1 designations. NNT stands for no name tributary.

AWQ ID	Waterbody Name	y lat	x long	Purpose	Num. Wild Brook Trout in sample	Num. Wild Brown Trout in sample
16467	Abbey Brook	41.9703	-72.4708	Old Stream Survey	0	0
16469	Aborn Brook	41.9308	-72.3675	Old Stream Survey	18	0
16476	Asmun Brook	41.4747	-72.7258	Old Stream Survey	60	11
18127	Beacon Hill Brook	41.46695	-73.00195	Wild Trout	1	48
16491	Bear Swamp Outflow	41.8022	-73.2742	Old Stream Survey	0	0

15680	Beaver Brook	41.951 3	- 72.995 8	Old Stream Survey	61	0
20785	Beaver Brook	41.913 75	- 72.973 16	Wild Trout	1	0
15172	Belden Brook	42.001 3	- 72.835 2	Wild Trout	60	5
15172	Belden Brook	42.001 3	- 72.835 2	Wild Trout	59	1
16501	Belden Brook	42.012 2	- 72.877 5	Wild Trout	89	0
16508	Bigelow Brook, NNT to	41.917 2	- 72.136 9	Old Stream Survey	0	0
16512	Birch Mountain Brook	41.761 9	- 72.502 8	Old Stream Survey	8	30
15237	Birch Plain Brook	41.342 8	- 72.062 8	Special Study	0	0
18927	Blackberry River	42.008 3	- 73.262 8	Wild Trout	4	4
20784	Blackberry River	41.998 4	- 73.214 92	Wild Trout	0	25
20784	Blackberry River	41.998 4	- 73.214 92	Wild Trout	2	20
16450	Blackmore Brook	41.95	- 71.813 6	2018-2019 resample	0	0
20814	Blackmore Brook, NNT to	41.949 62	- 71.815 63	Adjacent to 2018-2019 resample	1	0
15426	Bladens River	41.387 2	- 73.019 1	Old Stream Survey	23	0
16522	Bliven Brook	41.573 3	- 71.824 4	Old Stream Survey	32	0

20834	Bogue Brook	41.444 53	- 72.202 8	Headwaters	0	0
20833	Bogue Brook, NNT to	41.450 56	- 72.202 19	Headwaters	0	0
16525	Bonney Brook	41.813 3	- 73.373 3	Fry/Fingerli ng	49	0
18801	Bonney Brook	41.814 69	- 73.374 79	Fry/Fingerli ng	34	27
16527	Bradford Brook	41.888 9	- 73.276 7	Old Stream Survey	106	0
17846	Brandy Brook	41.959 8	- 71.833 5	Adjacent to 2018-2019 resample	0	0
15220	Broad Brook	41.916 4	- 72.488 3	Old Stream Survey	45	100
16530	Broad Brook	41.485 3	- 72.871 1	Old Stream Survey	18	0
16535	Buck Brook	41.622 8	-72.558	Old Stream Survey	2	0
16536	Bulymuck Brook	41.589 4	- 73.461 1	Old Stream Survey	0	0
16549	Byron Brook	41.606 7	- 72.061 1	Old Stream Survey	0	0
16028	Carse Brook	41.855 2	- 73.375 5	Fry/Fingerli ng	0	44
16557	Carse Brook	41.885 8	-73.41	Fry/Fingerli ng	0	0
16565	Cemetery Brook	41.879 7	- 72.022 2	Old Stream Survey	88	0
16567	Charters Brook	41.900 6	- 72.415 6	Old Stream Survey	82	9
15510	Cobble Brook	41.745 4	- 73.454 2	Fry/Fingerli ng	3	34

17464	Cold Brook	41.655 9	-72.153	Old Stream Survey	0	0
16583	Comstock Brook	41.212 5	- 73.462 2	Old Stream Survey/Lon g-term	15	0
16585	Cone Brook	41.665	- 71.977 2	Old Stream Survey	8	0
14162	Copps Brook	41.361 1	- 71.934 1	Old Stream Survey	0	0
15754	Copps Brook	41.407 5	- 71.928 2	Old Stream Survey	58	0
16594	Cranberry Meadow Brook	41.405 18	- 72.225 71	Wild Trout	85	1
20820	Cranberry Meadow Brook, NNT to	41.408 66	- 72.239 38	Headwaters	15	0
16602	Dark Hollow Brook	41.661 1	- 72.520 3	Wild Trout	79	0
14168	Deep Brook	41.409 6	- 73.285 5	WTMA	0	179
14172	Deep Brook	41.413 1	- 73.282 3	WTMA	0	12
15839	Deep Brook, NNT (aka Meeker Brook (Oil Creek))	41.407	- 73.288 2	Wild Trout	0	0
17129	Deep Brook, NNT to	41.392 2	- 73.315 3	Old Stream Survey	2	0
17129	Deep Brook, NNT to	41.392 2	- 73.315 3	Wild Trout	20	0
16609	Denison Brook	41.548 6	- 71.842 2	Old Stream Survey	162	0
16615	Drake Pond Brook	41.851 4	- 73.161 1	Old Stream Survey	5	0

16633	East Spring Brook	41.636 1	- 73.185 5	Old Stream Survey	0	0
15730	East Swamp Brook	41.386 2	- 73.400 3	Old Stream Survey	0	79
16639	Eldridge Brook	41.848 1	- 72.245 5	Old Stream Survey	13	0
16652	Farmington River	41.893 6	- 72.981 1	TMA	0	65
16656	Fenn Brook	41.566 9	- 73.325 5	Old Stream Survey	0	0
16659	Fenton River, NNT to	41.807	- 72.201 9	Old Stream Survey	16	0
14860	Flat Brook	41.406 2	- 72.074 7	Old Stream Survey	65	0
16669	Fort Hill Brook	41.338 1	-72.02	Special Study	0	0
20825	Fourmier River, NNT to	41.398 37	- 72.264 13	Headwaters	0	0
15268	Fox Brook	41.459 7	- 72.168 3	Headwaters	0	0
15992	Fox Brook	42.027	- 72.862 4	Wild Trout	29	19
16674	Fox Brook	41.889 2	- 73.136 9	Old Stream Survey	0	0
16675	Fox Brook	41.835 6	- 73.215 5	Adjacent to 2018-2019 resample	0	0
20817	Fox Brook	41.838 53	- 73.215 47	Adjacent to 2018-2019 resample	0	0
20832	Fox Brook, NNT to	41.462 56	- 72.182 7	Headwaters	0	0

14209	Fulling Mill Brook	41.502 1	- 73.047 1	Wild Trout	4	11
17489	Furnace Brook Refuge	41.821 1	- 73.371 5	Special Study	0	Present/ not measure d
16683	Furnace Brook, NNT to	41.976 7	- 72.294 4	Old Stream Survey	19	0
19409	Great Brook	41.391 3	- 72.039 69	Special Study	0	0
16704	Great Meadow Brook	41.6	- 71.837 5	Old Stream Survey	0	0
16705	Green Brook	41.86	- 72.311 4	Old Stream Survey	2	0
14720	Green Falls River	41.456 8	- 71.816 9	Wild Trout	32	1
18578	Green Falls River	41.519 72	- 71.809 45	Wild Trout	1	0
16708	Greenwood Brook	41.569 4	- 73.507 2	Old Stream Survey	1	0
16709	Grimes Brook	41.882 2	- 72.817 8	Old Stream Survey	60	0
15507	Guinea Brook	41.814 4	- 73.376 9	Fry/Fingerli ng	12	26
16103	Guinea Brook	41.823 99	- 73.430 09	Fry/Fingerli ng	0	0
16710	Guinea Brook	41.820 8	- 73.383 1	Fry/Fingerli ng	29	0
16713	Gulf Stream	41.979 2	- 72.421 9	Old Stream Survey	82	0
15509	Gunn Brook	41.806	- 73.390 3	Fry/Fingerli ng	35	4

20092	Gunn Brook	41.803 5	- 73.381 7	Fry/Fingerli ng	30	0
16191	Hall Meadow Brook	41.917 3	- 73.194 9	Wild Trout	52	0
16909	Hammonasset River, NNT to	41.407 5	- 72.604 2	Old Stream Survey	0	0
16725	Hancock Brook	41.659 4	- 72.987 5	Old Stream Survey	8	0
16726	Hart Brook	41.889 7	- 73.205 8	Old Stream Survey	1	0
15506	Hatch Brook	41.833 4	- 73.383 4	Fry/Fingerli ng	0	12
16731	Hawleys Brook	41.245 8	- 73.343 9	Old Stream Survey/WT MA	0	0
14227	Hemp Swamp Brook	41.429 4	- 73.076 6	Wild Trout	10	0
17781	Hetchel Swamp Brook	41.481 01	- 71.837 06	Wild Trout	0	0
16739	Hill Brook	41.712 5	- 73.247 2	Old Stream Survey	4	0
14229	Hockanum Brook	41.437 3	-73.051	Wild Trout	27	9
14238	Hockanum River	41.875 8	- 72.474 3	2018-2019 resample	0	7
14239	Hockanum River	41.865 9	-72.487	Contaminant s	0	0
14245	Hockanum River	41.782 2	- 72.591 6	Contaminant s	0	Present/ not measure d
15048	Hockanum River	41.866 6	- 72.464 8	Adjacent to 2018-2019 resample	0	6

16742	Hockanum River	41.813 3	- 72.514 7	Contaminant s	0	0
18719	Hockanum River	41.850 48	- 72.488 35	Contaminant s	0	0
19438	Hockanum River	41.872 18	- 72.466 08	Contaminant s/ Adjacent to 2018- 2019 resample	0	9
20733	Hockanum River	41.832 51	- 72.496 85	Contaminant s	0	0
20738	Hockanum River	41.772 07	- 72.622 48	Contaminant s	0	0
20740	Hockanum River	41.795 33	- 72.536 47	Contaminant s	0	0
20767	Hockanum River	41.775 61	- 72.619 55	Contaminant s	0	0
16747	Hollenbeck River	41.899 2	- 73.281 9	Old Stream Survey	16	0
16750	Hopp Brook	41.409 7	- 73.036 7	Old Stream Survey	89	0
17489	Housatonic River	41.821 1	- 73.371 5	Special Study	0	Present/ not measure d
18802	Housatonic River, Unnamed tributary to ("POWERHOUSE BROOK")	41.661 64	- 73.493 82	Fry/Fingerli ng	1	33
20130	Housatonic River-Kent Falls Refuge	41.777 08	- 73.419 38	Special Study	0	0
16758	Howell's Brook	42.007 8	- 73.004 2	Old Stream Survey	89	0

16762	Humaston Brook (Northfield Brook)	41.697 2	- 73.101 7	Old Stream Survey	1	0
20826	Hunts Brook, NNT to	41.437 89	- 72.150 24	Headwaters	0	0
20831	Hunts Brook, NNT to	41.419 69	- 72.151 12	Headwaters	10	0
15977	Indian Hole Brook	41.338 8	- 73.124 6	Old Stream Survey	3	0
14842	Indian Meadow Brook	41.930 5	-73.079	Wild Trout	21	0
16778	Ivy Mountain Brook	41.827	-73.205	2018-2019 resample	0	0
20818	Ivy Mountain Brook	41.877 4	- 73.224 37	Adjacent to 2018-2019 resample	0	0
15166	Jim Brook	41.847 5	- 72.883 1	Old Stream Survey	6	0
16786	Jordan Brook	41.360 5	- 72.147 4	Old Stream Survey/Long-term	82	0
15577	Kettletown Brook	41.427	-73.206	Old Stream Survey	5	14
16790	Kinneytown Brook	41.371 4	- 73.093 3	Old Stream Survey	4	0
17131	Lake Lillinonah, NNT to	41.518 9	- 73.383 9	Old Stream Survey	34	0
16295	Latimer Brook	41.369 5	- 72.200 2	Old Stream Survey	0	2
20821	Latimer Brook, NNT to	41.416 2	- 72.216 67	Headwaters	5	0
20822	Latimer Brook, NNT to	41.392 18	- 72.217 68	Headwaters	0	0
20823	Latimer Brook, NNT to	41.382 49	-72.213	Headwaters	0	0

17183	Leadmine Brook, West Branch	41.794 2	- 73.079 7	Old Stream Survey	0	0
16806	Lisbon Brook	41.570 6	- 72.009 7	Old Stream Survey	1	0
17379	Little River	41.291 9	- 73.369 2	Fry/Fingerling	4	37
16812	Little River, NNT to	41.757 5	- 72.047 8	Old Stream Survey	57	0
16819	Lowden Brook	41.602 81	- 71.865 57	Old Stream Survey	76	0
16833	McCarthy's Brook	41.597 5	- 72.127 5	Old Stream Survey	0	0
16838	Merryall Brook	41.650 8	- 73.445 3	Old Stream Survey	0	0
14804	Mill Brook	41.880 4	-73.331	Fry/Fingerling	0	0
15042	Mill Brook	41.872	- 73.363 4	Fry/Fingerling	16	8
15969	Mill Brook	41.876 2	- 73.349 6	Fry/Fingerling	31	30
16451	Mill Brook	41.937 5	- 71.959 5	2018-2019 resample	0	0
20819	Mill Brook	41.950 7	- 71.994 41	Adjacent to 2018-2019 resample	0	0
20363	Mill Brook Refuge	41.871 88	- 73.363 69	Special Study	0	0
20363	Mill Brook Refuge	41.871 88	- 73.363 69	Special Study	0	0
20363	Mill Brook Refuge	41.871 88	- 73.363 69	Special Study	0	0

20363	Mill Brook Refuge	41.871 88	- 73.363 69	Special Study	0	0
20827	Miller Pond, NNT to	41.438 11	- 72.139 7	Headwaters	0	0
20829	Miller Pond, NNT to	41.428 47	- 72.135 24	Headwaters	0	0
20828	Miller Pond, NNT to NNT to	41.430 01	- 72.138 24	Headwaters	0	0
20830	Miller Pond, NNT to NNT to NNT to	41.428 8	- 72.133 78	Headwaters	0	0
16857	Mohawk Pond Outflow	41.801 7	- 73.288 6	Old Stream Survey	6	0
15555	Morgan Brook	41.902 3	- 72.993 3	WTMA	4	26
16089	Morgan Brook	41.908 6	- 73.000 7	WTMA	4	8
20787	Mott Hill Brook	41.655 08	- 72.532 4	Wild Trout	41	0
16873	Mount Hope River	41.881 4	- 72.163 9	Old Stream Survey	6	39
19502	Mount Hope River	41.939 26	- 72.184 76	Old Stream Survey	30	21
15776	Mount Hope River, East Branch	41.881	-72.16	Old Stream Survey	1	2
16374	Mountain Brook	41.957 9	- 72.860 2	Wild Trout	1	27
16875	Mountain Brook	41.521 4	- 72.941 9	Old Stream Survey	0	0
16876	Mountain Brook	41.625 8	- 72.138 3	Old Stream Survey	0	0

16879	Muddy Gutter Brook	41.564 2	- 72.511 9	Old Stream Survey	76	0
14597	Myron Kinney Brook	41.553 3	- 71.861 9	Old Stream Survey	11	0
16067	Naugatuck River, East Branch	41.848 5	- 73.124 8	WTMA	0	0
17154	Naromiyocknowhusunkatank shank, NNT to	41.610 6	- 73.490 1	Old Stream Survey	17	0
16624	Naugatuck River, East Branch	41.830 8	- 73.119 7	WTMA	2	1
17145	Naugatuck River, NNT to East Branch	41.870 8	- 73.121 7	Old Stream Survey	0	0
16035	Nickelmine Brook	41.834 2	- 73.178 6	Old Stream Survey	2	0
14355	Nonnewaug River	41.557 5	- 73.212 2	2018-2019 resample	3	0
20421	Nonnewaug River	41.576 82	- 73.175 64	Adjacent to 2018-2019 resample	1	0
20320	North Brook	42.006 72	- 73.223 72	Wild Trout	47	0
17138	Nylbs Brook	41.688 3	- 73.265 6	Old Stream Survey	5	0
16933	Owens Brook	41.887 8	- 72.803 9	Old Stream Survey	12	0
20824	Pattagansett River	41.397 94	- 72.251 65	Headwaters	0	0
15543	Pease Brook	41.594 7	- 72.192 3	WTMA	4	0
16947	Peck Brook	41.676 9	- 72.049 2	Old Stream Survey	22	0

18684	Peg Mill Brook	41.524 57	- 71.804 75	Wild Trout	0	0
16079	Pendleton Hill Brook	41.478 1	- 71.835 4	Wild Trout	4	0
16965	Pickett Brook	41.760 8	-73.113	Old Stream Survey	21	0
16976	Polly Brook	41.403 9	- 72.184 2	Old Stream Survey	65	0
16980	Ponset Brook	41.479 7	- 72.557 8	Old Stream Survey	7	0
16095	Pootatuck River	41.412 4	- 73.281 7	WTMA	0	1
17132	Putnam Lake, NNT to	41.474 7	- 73.528 6	Old Stream Survey	12	0
20815	Quaddick Reservoir, NNT to	41.957 9	- 71.811 66	Adjacent to 2018-2019 resample	37	0
20816	Quaddick Reservoir, NNT to	41.965 55	- 71.814 03	Adjacent to 2018-2019 resample	0	0
16994	Race Brook	41.305 8	- 73.013 9	Old Stream Survey	0	0
17703	Railroad Brook	41.819 13	- 72.445 47	Wild Trout	45	6
18816	Railroad Brook	41.799 19	- 72.449 36	Wild Trout	25	0
18816	Railroad Brook	41.799 19	- 72.449 36	Wild Trout	26	0
20837	Railroad Brook	41.815 6	- 72.446 21	Wild Trout	56	1
20838	Railroad Brook	41.809 46	- 72.446 34	Wild Trout	87	6

20835	Railroad Brook, NNT to	41.817 26	- 72.445 13	Wild Trout	15	0
20836	Railroad Brook, NNT to	41.815 81	- 72.445 85	Wild Trout	6	0
20840	Railroad Brook, NNT to (Left Braid)	41.809 01	- 72.445 98	Wild Trout	0	0
20839	Railroad Brook, NNT to (Right Braid)	41.809 13	- 72.446 44	Wild Trout	3	0
17000	Red Brook	41.390 8	-71.973	Old Stream Survey	1	0
17001	Reed Brook	41.912 5	- 73.340 5	Fry/Fingerli ng	0	0
17102	Rickenback Brook	41.832 8	- 72.445 8	Old Stream Survey	6	5
15551	Roaring Brook	41.935 3	- 72.261 3	Old Stream Survey	22	0
17009	Roaring Brook	41.904 7	- 72.282 5	Old Stream Survey	15	36
17157	Rock Brook, NNT to	41.776 4	- 73.022 8	Old Stream Survey	2	0
17166	Round Pond Brook	41.3	- 73.545 6	Old Stream Survey	0	0
14436	Salmon Brook	41.719 1	-72.602	Long-Term & Fry/Fingerli ng & WTMA	0	2
14438	Salmon Brook	41.721 1	- 72.555 9	Old Stream Survey	190	0
20786	Salmon Brook	41.720 38	- 72.547 02	Wild Trout	148	0
16629	Salmon Brook, East Branch	42.020 3	- 72.847 5	Old Stream Survey	74	50

18852	Salmon Brook, West Branch	41.960 25	- 72.856 11	Wild Trout	46	11
18793	Salmon Creek	41.966 23	- 73.403 97	HCE	2	61
19740	Salmon Creek	41.927 93	- 73.378 51	HCE	0	12
14441	Salmon River	41.574 2	- 72.429 4	Water Bureau	0	0
16902	Sandy Brook, NNT to	41.977 34	- 73.045 88	Old Stream Survey	46	0
17032	Sawmill Brook	41.576 7	- 73.493 3	Fry/Fingerli ng	8	0
17035	Second Hill Brook	41.561 4	- 73.356 4	Old Stream Survey	31	0
15887	Shepaug River	41.701 9	- 73.290 4	2018-2019 resample	0	22
17460	Shepaug River	41.708 9	- 73.294 4	Adjacent to 2018-2019 resample	0	4
17160	Shepaug River, NNT to	41.656 1	- 73.320 6	Old Stream Survey	21	0
17185	Shepaug River, West Branch	41.794 7	- 73.322 8	Old Stream Survey	103	0
17629	Shunock River	41.410 14	- 71.844 63	WTMA	6	2
15035	Spruce Brook	41.747 2	-73.115	Old Stream Survey	30	0
14456	Steele Brook	41.580 5	- 73.070 3	Fry/Fingerli ng & Long- Term	0	0
14800	Steele Brook	41.610 5	- 73.115 3	Fry/Fingerli ng & Long- Term	0	0

17081	Stonehouse Brook	41.776 4	- 72.148 9	Old Stream Survey	2	0
19629	Stonehouse Brook, NNT to	41.777 38	- 72.149 56	Old Stream Survey	0	0
17087	Stony Brook	41.785 6	- 71.989 4	Old Stream Survey	0	0
17097	Tankerhoosen River	41.829 89	- 72.453 68	Old Stream Survey/WT MA	1	148
17105	Tatetuck Brook	41.283 05	- 73.281 94	Old Stream Survey	26	0
16219	Taylor Brook	41.950 2	- 72.004 5	Adjacent to 2018-2019 resample	0	0
17114	Theims Brook	41.732 8	- 72.316 9	Old Stream Survey	0	0
19933	Thompson Brook	41.401 93	- 72.044 27	Old Stream Survey	11	0
17119	Todd Hollow Brook	41.652 2	- 73.036 1	Old Stream Survey	0	0
15998	Town Farm Brook	41.547 7	- 73.388 9	Old Stream Survey	56	19
16192	Trading Cove Brook	41.501 2	- 72.116 1	Long-Term	83	34
17123	Trading Cove Brook	41.516 9	-72.18	Old Stream Survey	4	0
18874	Weekeepeemee River	41.567 2	- 73.218 05	Fry/Fingerli ng	1	2
19157	Weekeepeemee River	41.631 13	- 73.222 46	Fry/Fingerli ng	0	4
17163	West Aspetuck River, NNT to	41.672 5	- 73.389 7	Old Stream Survey	0	0

17592	White Brook	41.847 95	- 71.930 09	Old Stream Survey	0	0
20841	Williams Brook	41.446 77	- 71.973 31	Old Stream Survey	0	0
18448	Wintergreen Brook	41.685 95	- 72.534 6	Wild Trout	40	0
17207	Wood Creek	41.648 6	- 73.241 1	Old Stream Survey	17	0



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



Federal Aid in Sport Fish Restoration F-57-R-41
Annual Performance Report – F22AF01153
4/1/2022 to 3/31/2023

Grant Title: Inland Fisheries Research and Management
Study 1: Coldwater Fisheries Management
Job 3: Stream Angler Surveys

Report Prepared by: Brian Eltz
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Overview: Connecticut’s stream fisheries see continuous changes in angler participation, expectations, and attitudes towards these fisheries. Ongoing modifications to trout production at Connecticut’s state hatcheries have resulted in changes to stocking regimes. New statutes, regulations, stocking policies, and varying levels of law enforcement have occurred on Connecticut’s stream fisheries. In addition, fishing license sales continue to fluctuate annually. Statewide angler demographics (age, race, ethnicity, gender) are also changing and will likely lead to shifting demands on fisheries resources. Angler surveys will be required to evaluate the effects of these changes on Connecticut stream fisheries and to provide important data to sustainably increase fishing participation.

Standardization and coordination of survey methodologies is critical to ensure that data needs of stream management projects (see Projects 3-6) are met in an efficient manner. Development of alternative angler survey instruments, such as on-line surveys, trail cameras, and fishing show canvas surveys, may also be useful for evaluating statewide changes in angler attitudes and behaviors toward stream fishing. There is also a need to develop and implement expedient surveys that are capable of rapidly assessing (“rapid assessments”) angler utilization over many streams. Rapid assessments can assess general levels of angler activity at multiple resources during a limited time period. The difference between standard surveys and “rapid assessments” is that rapid assessments are providing a coarse-level assessment of a greater number of resources, during some short time period of interest (i.e., Opening Day weekend) – as



Figure 3. Angler posing with his catch - a stocked Rainbow Trout.

opposed to standard surveys, which provide more detailed/precise information from a smaller set of resources over an extended time period.

The increasing access to social media and computerized angler statistics (e.g., Connecticut's angler license database) affords the opportunity to solicit large numbers of constituents for the purpose of acquiring statewide angler attitude and use patterns.

Compilation and maintenance of historic survey information in a standardized, accessible format is needed to evaluate long term changes in angler usage and attitudes. A centralized angler survey database will also help streamline the process of evaluating public requests for changes to existing management policies. Finally, a centralized and easily accessible database will be particularly helpful in deciding where limited funds can be most efficiently spent to improve fishing quality.

Objectives of the stream angler surveys job are:

1. Develop and implement standardized survey methodologies for stream management needs.
2. Coordinate and conduct quantitative angler surveys (assessing catch, effort and angler attitudes) on important streams on an as-needed basis.
3. Develop a standardized quantitative methodology for "rapid assessment" of stream angler utilization and attitudes.
4. Evaluate the potential for collecting statewide angler information using alternative survey methods.
5. Maintain and archive stream angler survey databases and provide support to management projects.



Figure 4. Seasonal resource assistant interviewing an angler streamside.

This report describes efforts related to these objectives during the study year.

Key Findings

Objective 1: Develop and implement standardized survey methodologies for stream management needs.

- Work is ongoing to evaluate alternatives or modifications to traditional survey methodologies in order to gain efficiencies.

Objective 2: Coordinate and conduct quantitative angler surveys (assessing catch, effort and angler attitudes) on important streams on an as-needed basis.

- The passage of Public Act 21-12 by Connecticut legislature in October of 2021 eliminated the closed season for the sport fishing of trout in perpetuity. Traditionally, most trout stocked waterbodies were closed to fishing from March 1st through the 2nd Saturday of April at 6am, where the 2nd Saturday historically marked the Opening Day of trout fishing season.
- The Covid-19 pandemic limited the Division’s ability to conduct standardized angler surveys to assess the elimination of the closed season in 2022. Therefore, staff conducted angler counts at various waterbodies as time permitted to document angler usage in this new fishing period (a random, stratified design was not employed).
 - ArcGIS Survey123 was used to record angler counts at mostly trout stocked waterbodies from January 31st through September 15th, but no catch data were recorded to limit staff interaction with the public. For most waterbodies, multiple trout stocking sites or public access points were surveyed. ArcGIS Dashboard was used to present data throughout the survey period.
 - Most counts took place from April 1st through early July as time permitted.
 - A total of 1,821 surveys were conducted at 151 waterbody sections (Figure 3 and Appendix A); some waterbodies are broken up into discrete management sections. All waterbody sections were surveyed at least one time (average number of counts across all waterbodies was ~ 12).
 - Most surveys were conducted at rivers and streams (52%) as opposed to lakes and ponds (48%).
 - Daily angler usage was steady throughout the entire survey period (Figure 4).
 - A total of 3,082 anglers were counted over the entire period, of which 2,605 were an estimated age 16+ (86%) and 477 (14%) were an estimated age 15 or younger.

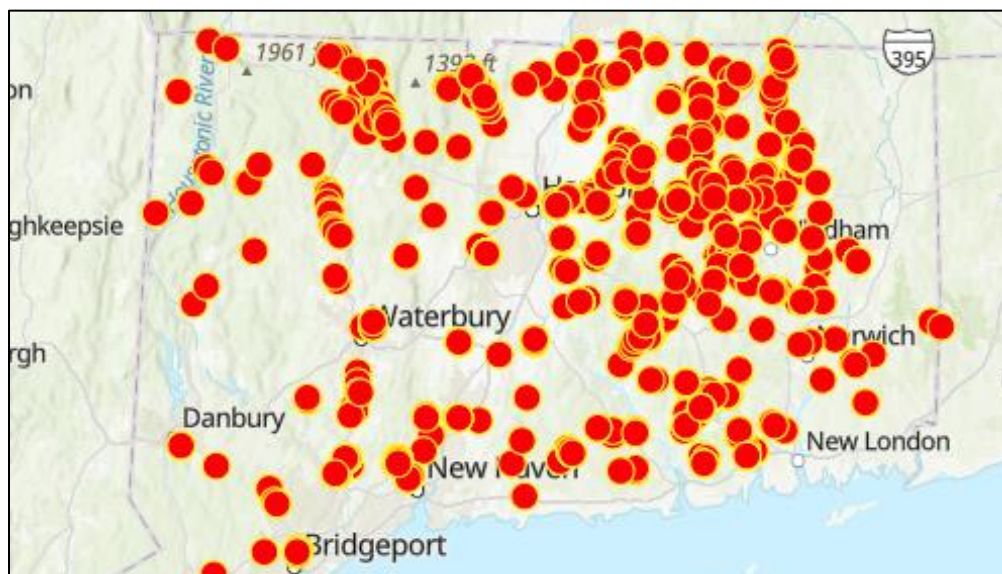


Figure 5. Locations where angler counts were conducted in 2022. Most waterbodies were surveyed at multiple locations throughout the survey period. This graphic was produced using ArcGIS Dashboard.

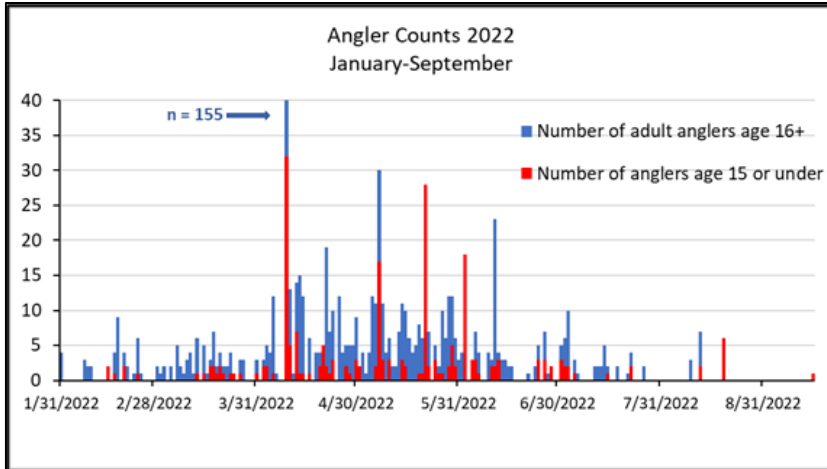


Figure 6. Daily sum of angler counts in 2022. Note most surveys were conducted from early April through early July. The Y-axis is truncated for visual interpretation. Opening Day (April 9th) count of anglers age 16+ was 155.

- In 2020, a new, simple metric was developed (Average number of Anglers observed at a waterbody section over the entire survey period Per Thousand Stocked Trout; **AAPTST**) to track and assess angler usage at trout stocked locations (Appendix A). Weekend and Weekday counts were weighted equally as many residents were not working or attending school due to

pandemic shutdowns. As well, time of day (daylight hours) was weighted equally. The metric may be useful in helping determine the effectiveness of trout stocking at all stocked waterbodies. But, for the metric to be beneficial, sampling methodologies and criteria need to be developed, such as angler access (amount and quality), number of surveys needed, time of day surveys need to be conducted, and day of week (weekday vs. weekend) surveys need to be conducted.

- A quartile exercise was utilized to help determine usage patterns (low, moderate, high, and very high) using the new **AAPTST** metric. Results from this exercise can be seen in Table 1. This ranking developed in 2020 was applied to angler use data collected in 2022.
- Together the metric and quartile exercise show that many stocked waterbodies may have been underutilized (those that had low to moderate usage) given the annual trout stocking allotments. But several waterbody sections had low survey counts (< 10), so this metric may not be applicable for all trout stocked locations surveyed in 2022.

Table 1. A quartile exercise was applied in 2020 to categorize angler usage patterns (low, moderate, high, and very high) based on the new, simple metric (average number of anglers per thousand stocked trout: **AAPTST**). This categorization was applied to data collected in 2022.

Quartile	AAPTST	Description
1 st	0 to 0.62	25 th percentile; low usage per thousand stocked fish
2 nd	0.63 to 1.19	50 th percentile; moderate usage per thousand stocked fish
3 rd	1.20 to 2.20	75 th percentile; high usage per thousand stocked fish
4 th	2.21 to 26.67	100 th percentile; very high usage per thousand stocked fish

- An intensive stream angler creel survey was designed and performed at four trout stocked rivers/streams (Skungamaug River, Blackledge River, Dickensen Creek, Jeremy River)

and one pond (Gay City Pond) in the eastern part of the state during the spring trout fishing season in 2023. The creel survey is intended to provide empirical estimates about recreational trout fishing effort (hours of fishing), catch (numbers of fish caught), harvest (number of fish taken), catch rates (the total number of fish caught per hour), and perceptions about new and future regulations. These data will be used in part to optimize management goals for trout production and distribution, including the timing and frequency of stocking events, allotments for each waterbody, and selection of stocking locations within each waterbody.

- We conducted angler counts and interviews using a stratified random design roving creel methodology (Malvestuto et al. 1978). The surveys began on 3/1/2023 and finished on 6/15/2023 and included weekdays, weekends, and holidays.
- Defined strata included: 1) weekday/weekend and 2) early spring (3/1/2023 – 4/7/2023), opening day for harvest (4/8/2023), and spring (4/9/2023 – 6/15/2023). The target was to capture 5% of the time in each strata.
- Survey days and start times were selected using Microsoft Excel’s random number generator function and the target was to capture 5% of the time in each strata.
- Each waterbody was stocked once in early spring and twice in late spring and stocking events were spaced at minimum two weeks apart for all waterbodies.
- The Blackledge River was split into two discrete sections (lower and upper) to ensure angler counts and interviews were completed within one hour of the start time assigned to each section.
- Results will be included in the following performance report.

Objective 3: Develop a standardized quantitative methodology for “rapid assessment” of stream angler utilization and attitudes.

- Work is ongoing to evaluate alternatives or modifications to traditional survey methodologies to gain efficiencies.
- Utilize FishBrain to gather usage and opinion information from Connecticut’s anglers.

Objective 4: Evaluate the potential for collecting statewide angler information using alternative survey methods.

- A survey was created using Survey123 for anglers to voluntarily submit catch (success or skunked) and trip information regarding Lake Trout after they were stocked in November 2020 (see Coldwater Job 4: Distribution of Hatchery Salmonids). It has proven useful for collecting volunteer angler information and may be utilized to capture angling information on rivers and streams in the future.

Objective 5: Maintain and archive stream angler survey databases and provide support to management projects.

- Data contained within multiple Rbase software databases have been exported to Microsoft Excel to facilitate future development of a single angler survey database as resources permit.

Moving Forward

- Continue to evaluate alternatives or modifications to traditional survey methodologies in order to gain efficiencies.
- Further develop methodologies and criteria for use with the AAPTST metric.
- Utilize ESRI Survey123 application software and mobile devices to record angler survey data collected in the field.
- Continue work that is underway to expand historic Opening Day angler hourly count data to estimate total angler count data for entire days for each waterbody surveyed.
- Develop SOP and long-term strategies for utilizing trail cameras to collect angler usage information.
- Research options for more sophisticated trail cameras in order to improve image capture and data retrieval.
- Develop a short duration intensive creel survey design and develop rotational waterbody loops for surveying each spring; build on the design utilized in spring 2023.
- Support a post-doc over a 2-year period to standardize and collate stream angler survey data into a relational database.

References

Malvestuto, S. P., W. D. Davies, and W. L. Shelton. 1978. An evaluation of the roving creel survey with non-uniform probability sampling. *Transactions of the American Fisheries Society* 107(2):255- 262.

Appendix A

Table A.1. Waterbodies surveyed in 2022. All waterbody sections were surveyed at least one time where anglers were counted during each visit. Angler counts and counts of boats at large lakes are likely underrepresented due to the inability to view all sections of a waterbody. The metric **AAPTST** is the average number of anglers observed at a waterbody section throughout the entire survey period, which was then divided by the annual trout stocking allotment and then multiplied by one thousand. This new metric is used here to determine angler usage (low, moderate, high, and very high) as it relates to the number of trout stocked annually. These categories of usage were developed using a quartile exercise in 2020 where results were shown in Table 1 above.

Waterbody 2022	Town	Total Trout Stocked in 2022	Date Range of Counts	Num Age 16+ Anglers	Num Age 15 & Under Anglers	Total Num Boats (Includes non-anglers)	Num of Count Surveys	Avg Number Anglers/Survey	Avg num angler per 1,000 stocked trout	Usage Categorization
Amos Lake	Litchfield	6,370	1/31-4/9	0	2	3	2	1.0	0.16	low
Angus Park Pond	Litchfield	1,209	4/4-7/9	12	1	0	9	1.4	1.19	moderate
Bartlett Brook	Lebanon	350	4/3-7/3	2	0	0	18	0.1	0.32	low
Bashan Lake	East Haddam	1,390	2/23-3/24	19	1	4	5	4.0	2.88	very high
Batterson Park Pond	Farmington	Not Trout Stocked	4/5-4/26	5	2	1	4	1.8	--	--
Beach Pond	Voluntown	3,835	3/31-5/24	2	0	2	2	1.0	0.26	low
Beacon Hill Brook	Naugatuck	360	4/26/22	0	0	0	1	0	0	low

Beaver Brook including Ponds	Franklin	918	4/3-7/1	7	0	3	14	0.5	0.54	low
Beaver Brook Park Ponds	Windham	565	4/3-6/24	12	2	1	12	1.2	2.06	high
Beaver Park Pond Lagoon	New Haven	1,200	4/9-9/15	21	0	0	39	0.5	0.45	low
Bicentennial Pond	Mansfield	810	3/8-7/3	10	4	0	15	0.9	1.15	moderate
Bigelow Brook (outside S.P.)	Ashford, Eastford	1,710	2/24-7/1	11	1	0	12	1.0	0.58	low
Bigelow Pond	Union	2,250	3/8-7/1	21	1	8	16	1.4	0.61	low
Birge Pond	Bristol	1,325	5/6-8/12	15	1	1	9	1.8	1.34	high
Black Pond Middlefield	Middlefield, Meriden	4,182	4/9/2	12	0	5	1	12.0	2.87	very high
Black Rock Pond	Thomaston	5,234	4/21/22	19	2	0	1	21.0	4.01	very high
Blackberry River	Canaan	2,655	4/9-4/12	0	0	0	2	0	0	low
Blackledge River lower	Marlborough	4,525	2/7-7/2	2	0	0	11	0.2	0.04	low
Blackledge River upper	Bolton, Hebron	730	6/4-6/27	0	0	0	3	0	0	low
Branch Brook	Thomaston	905	4/21/22	0	0	0	1	0	0	low
Broad Brook Mill Pond	East Windsor	520	3/7-5/16	1	0	0	9	0.1	0.21	low
Broad Brook Preston	Preston	930	4/9/2	1	0	0	1	1.0	1.08	moderate
Bunnells Pond	Bridgeport	1,665	4/27-8/19	23	3	0	14	1.9	1.12	moderate

Cedar Lake	Chester	4,898	3/12-4/16	14	0	5	4	3.5	0.71	low
Center Springs Park Pond	Manchester	1,223	2/17-7/21	36	12	1	65	0.7	0.60	moderate
Chatfield Hollow Brook	Killingworth	3,092	3/6-4/23	34	9	0	5	8.6	2.78	very high
Cherry Brook	Collinsville	Not Trout Stocked	4/9/22	0	0	0	1	0	--	--
Choate Brook	Preston	305	4/9/22	0	0	0	1	0	0	low
Christensen's Pond	Granby	810	3/2-3/31	0	0	0	4	0	0	low
Coginchaug River	Middletown	3,654	4/5/22	4	0	0	1	4.0	1.09	moderate
Colony Park Pond	Ansonia	540	4/9-9/15	93	7	0	40	2.5	4.63	very high
Crystal Lake	Ellington	5,228	1/31-4/28	24	2	10	12	2.2	0.41	low
Day Pond	Colchester	4,765	1/31-7/3	41	9	0	12	4.2	0.87	moderate
Dickenson Creek	Marlborough	2,203	3/7-7/3	0	0	0	17	0	0	low
East Aspetuck River	New Milford, New Preston	3,745	2/7-3/23	2	0	0	2	1.0	0.27	low
East Twin Lake	Salisbury	9,655	4/9/22	6	0	3	1	6.0	0.62	low
Eight Mile River	Salem, East Haddam, Lyme	2,872	2/28-7/3	3	0	0	12	0.3	0.09	low

Eight Mile River, East Branch	Salem, Lyme	840	2/14-7/3	3	1	0	19	0.2	0.25	low
Falls River	Essex	450	3/12-4/9	0	0	0	3	0	0	low
Farmington River Tariffville	Avon, Farmington, Simsbury	1,030	3/18/22	2	0	0	1	2.0	1.94	high
Farmington River Goodwin Dam to W.Br. TMA	Hartland, Barkhamsted	11,142	3/3-4/9	157	32	0	2	94.5	8.48	very high
Farmington River LowCvlle to RT 177	Avon, Canton, Unionville	15,714	7/26/22	1	0	0	1	1.0	0.06	low
Farmington River W.Br. TMA to LowCvlle	New Hartford, Canton	12,036	4/9-7/26	19	0	0	3	6.3	0.53	low
Farmington River West Br. TMA	Barkhamsted, New Hartford	6,740	3/3-5/5	37	0	0	4	9.3	1.37	high
Fenton River	Mansfield	5,125	3/8-7/3	25	2	0	12	2.3	0.44	low
Freshwater Pond	Enfield	550	2/7-9/13	0	0	0	15	0	0	low
Furnace Brook	Stafford	1,047	2/24-4/28	0	0	0	2	0	0	low
Gardner Lake	Salem, Bozrah	3,009	3/2-4/18	5	0	0	4	1.3	0.42	low
Gay City Park Pond	Hebron	465	5/29-7/3	8	4	0	9	1.3	2.87	very high
Great Hollow Pond	Monroe	5,400	4/9/22	44	28	2	3	24.0	4.44	very high

Hammonasset River	Clinton, Madison, Killingworth	5,320	4/9/2 2	0	0	0	1	0	0	low
Highland Lake	Winchester	9,087	4/9/2 2	2	0	1	1	2.0	0.22	low
Hockanum River above TMA	Ellington, Vernon	700	2/17- 7/21	2	0	0	65	0.03	0.04	low
Hockanum River below TMA	East Hartford	455	2/17- 7/21	3	0	0	61	0.05	0.11	low
Hockanum River TMA	Manchester	904	2/17- 7/21	39	2	0	64	0.6	0.71	moderate
Hop River	Bolton, Coventry	1,170	5/9- 7/2	2	0	0	5	0.4	0.34	low
Horse Pond	Salem	1,275	2/7- 5/24	28	14	0	28	1.5	1.18	moderate
Housatonic River Upper TMA	Cornwall	18,750	2/22- 3/1	3	0	0	2	1.5	0.08	low
Hunts Brook	Waterford	1,015	3/24- 4/20	2	0	0	3	0.7	0.66	moderate
Hurds Lake	Somers	Not Trout Stocked	2/27- 6/13	3	2	0	12	0.4	--	--
Indiantown Brook	Preston, Ledyard	1,557	4/9/2 2	3	0	0	1	3.0	1.93	high
Jeremy River	Colchester , Hebron	4,149	2/7 - 4/3	7	0	0	10	0.7	0.17	low
Keney Park Pond	Hartford	1,477	3/18 - 4/9	6	0	0	3	2.0	1.35	high
Kent Falls Brook	Kent	1,200	3/31/ 22	4	0	0	2	2.0	1.67	high
Kitt Brook	Canterbury	900	4/3 - 7/1	0	0	0	7	0	0	low

Lake Wintergreen	Hamden	1,395	4/27 - 9/15	124	41	63	39	4.2	3.03	very high
Lakewood Lake	Waterbury	Not Trout Stocked	4/21 - 9/15	18	3	0	10	2.1	--	--
Latimer Brook	East Lyme	1,958	2/7 - 5/1	22	6	0	27	1.0	0.53	low
Little River Cantby	Scotland, Hampton, Canterbury	3,712	4/3 - 7/1	7	2	0	14	0.6	0.17	low
Long Pond	North Stonington	3,034	1/31 - 2/14	0	0	0	3	0	0	low
Lower Storrs Pumping Station Pond	Mansfield	360	3/8 - 7/3	3	0	0	14	0.2	0.60	low
Macedonia Brook State Park	Kent	1,500	3/31/22	0	0	0	1	0	0	low
Mad River	Norfolk, Winchester	675	3/3 - 4/9	0	0	0	1	0	0	low
Mad River Impoundment	Winchester	915	4/9/22	0	0	0	1	0	0	low
Mansfield Hollow Reservoir	Mansfield	Not Trout Stocked	4/3 - 5/8	13	5	5	5	3.6	--	--
Mansfield Training Ponds	Mansfield	785	3/8 - 7/3	32	5	0	20	1.9	2.36	very high
Mashapaug Lake	Union	4,676	2/24 - 7/1	17	5	57	15	1.5	0.31	low
McGovern Pond	West Hartford	2,067	2/17 - 7/21	102	21	0	66	1.9	0.90	moderate
Mianus River TMA	Stamford	3,625	2/8 - 3/7	5	0	0	2	2.5	0.69	moderate

Middle River	Stafford	930	2/22 - 7/3	7	0	0	14	0.5	0.54	low
Mill River Open, Hamden	Hamden	4,075	4/9 - 4/14	5	2	0	2	3.5	0.86	moderate
Mill River Sleeping Giant SP	Hamden	2,980	2/8 - 4/14	1	0	0	2	0.5	0.17	low
Mill River TMA	Fairfield	2,265	2/8/2 2	1	0	0	1	1.0	0.44	low
Mirror Lake (Hubbard Park Pond)	Meriden	750	4/9 - 9/15	89	20	0	38	2.9	3.82	very high
Mohawk Pond	Cornwall	2,460	3/1/2 2	0	0	0	1	0	0	low
Mohegan Park Pond	Norwich	5,155	4/9/2 2	38	2	0	2	20.0	3.88	very high
Morgan Brook	Barkhamsted	300	3/3 - 5/5	1	0	0	4	0.3	0.83	moderate
Mount Hope River	Ashford, Mansfield	4,970	3/8 - 6/24	9	0	0	11	0.8	0.16	low
Mount Tom	Litchfield, Washington	2,800	2/17 - 2/22	9	0	0	3	3.0	1.07	moderate
Muddy Brook Sfld	Suffield	75	3/17 - 3/31	0	0	0	3	0	0	low
Muddy River	North Haven, Wallingford	1,935	4/10/ 22	0	0	0	1	0	0	low
Natchaug River	Eastford, Chaplin, Windham	9,236	4/6 - 7/1	64	3	0	17	3.9	0.43	low

Natchaug River Trout Park	Eastford	6,547	4/9 - 3/10	122	6	0	14	9.1	1.40	high
Naugatuck River Lower	Waterbury - Beacon Falls	3,320	3/3/2 2	0	0	0	1	0	0	low
Naugatuck River TMA	Harwinton , Litchfield	3,685	3/3 - 4/21	12	0	0	3	4.0	1.09	moderate
Naugatuck River Upper	Harwinton , Litchfield, Torrington	2,568	4/2 - 4/21	1	0	0	2	0.5	0.19	low
Oil Mill Brook	Waterford	Not Trout Stocked	2/16 - 3/2	1	0	0	7	0.1	--	--
Pattaconk Brook	Chester	540	3/12 - 4/16	0	0	0	3	0	0	low
Pattaconk Lake	Chester	890	3/12 - 4/16	7	3	0	3	3.3	3.75	very high
Pequonnock River Open	Trumbull, Bridgeport	2,255	4/9/2 2	11	4	0	1	15.0	6.65	very high
Pickett's Pond	Derby	1,175	4/9 - 9/15	136	68	0	37	5.5	4.69	very high
Quillian Reservoir	Ansonia	Not Trout Stocked	3/3/2 2	0	0	0	1	0	--	--
Quonnipaug Lake	Guilford	3,936	4/9/2 2	5	0	1	1	5.0	1.27	high
Railroad Brook	Vernon	Not Trout Stocked	2/24 - 7/21	2	0	0	38	0.1	--	--
Reservoir Brook	Portland	495	5/27 - 7/3	0	0	0	9	0	0	low
Roaring Brook Glast	Glastonbury	2,451	5/29 - 7/3	1	0	0	7	0.1	0.06	low

Roaring Brook Stafd	Stafford, Willington	1,095	2/27 - 7/3	14	0	0	13	1.1	0.98	moderate
Rogers Lake	Lyme, Old Lyme	6,258	2/22 - 3/24	3	0	0	8	0.4	0.06	low
Rogers Park Pond	Danbury	400	5/4 - 6/26	1	0	0	5	0.2	0.50	low
Rowan's Pond Butternut Park Pond	Middletown	560	4/9 - 9/15	74	16	1	40	2.3	4.02	very high
Saint Martha's Pond	Enfield	600	2/28 - 6/13	5	1	0	10	0.6	1.00	moderate
Salmon Brook E Branch	Granby, East Granby	3,768	3/2 - 5/12	6	0	0	6	1.0	0.27	low
Salmon Brook Glastonbury	Glastonbury	Not Trout Stocked	2/7/2022	0	0	0	1	0	--	--
Salmon Brook Pond	Glastonbury	300	2/17 - 7/21	4	0	0	55	0.1	0.24	low
Salmon Brook W Branch	Granby	780	3/2 - 4/5	0	0	0	4	0	0	low
Salmon River	Colchester	5,180	2/23 - 7/3	11	2	0	4	3.3	0.63	moderate
Salmon River TMA	Colchester	10,961	2/24 - 7/3	30	0	0	13	2.3	0.21	low
Sandy Brook	Colebrook	1,805	3/2 - 4/9	0	0	0	3	0	0	low
Saugatuck River Fly	Westport	2,720	2/8/22	0	0	0	1	0	0	low
Scantic River lower	East Windsor	2,017	3/9 - 5/16	5	0	0	6	0.8	0.41	low
Scantic River upper	Somers, Enfield	6,828	3/9 - 5/16	7	0	0	6	1.2	0.17	low

Schreeder Pond	Killingworth	4,550	3/26 - 4/23	50	10	0	5	12.0	2.64	very high
Skungamaug River	Coventry, Tolland	2,208	2/17 - 7/21	17	1	0	65	0.3	0.13	low
Somersville Mill Pond	Somers	495	2/28 - 6/13	9	0	3	14	0.6	1.30	high
Southford Falls Pond	Oxford, Southbury	3,780	4/9/22	64	17	0	2	40.5	10.71	very high
Stanley Quarter Park Pond	New Britain	1,280	2/17 - 7/21	43	7	0	59	0.8	0.66	moderate
Starret Pond	Redding	1,080	3/7/22	0	0	0	1	0	0	low
Stateline pond	Stafford Springs/ Monson, MA	Not Trout Stocked	2/22/22	0	0	0	1	0	--	--
Still River Clbrk	Barkhamsted, Colebrook	555	3/2 - 4/9	4	0	0	4	1.0	1.80	high
Stillwater Pond	Torrington	980	4/9/22	1	0	0	1	1.0	1.02	moderate
Stony Brook Sffld	Suffield	475	3/17 - 3/31	2	0	0	3	0.7	1.40	high
Stratton Brook Park Pond	Simsbury	4,685	3/18 - 7/26	37	13	0	5	10.0	2.13	high
Susquetonscut Brook	Franklin	660	4/4 - 7/1	0	0	0	10	0	0	low
Tankerhoosen River	Vernon	405	2/17 - 7/21	15	0	0	57	0.3	0.65	moderate
Tankerhoosen River WTMA	Vernon	Not Trout Stocked	2/24 - 7/21	8	0	0	41	0.2	--	--

Ten Mile River Lbn	Lebanon	810	4/4 - 7/1	1	0	0	9	0.1	0.14	low
Tyler Pond	Goshen	1,625	4/6/2 2	0	0	0	1	0	0	low
Upper Fultun Park Pond	Waterbury	835	4/9/2 2	0	0	0	1	0	0	low
Valley Falls Park Pond	Vernon	4,838	2/17 - 7/21	179	49	0	61	3.7	1	moderate
Walkers Reservoir	Vernon	919	2/17 - 7/21	53	2	0	57	1.0	1.05	moderate
Wangumbaug Lake (Coventry Lake)	Coventry	1,789	2/7 - 5/28	28	2	35	13	2.3	1.29	high
West Hill Pond	Barkhamsted	8,195	4/9/2 2	4	0	1	1	4.0	0.49	low
West River	Guilford	1,275	4/9/2 2	0	0	0	1	0	0	low
Wharton Brook Pond	North Haven	5,370	4/9 - 5/5	110	12	0	7	17.4	3.25	very high
Williams Pond	Colchester	Not Trout Stocked	4/27/ 22	2	2	0	1	4.0	--	--
Willimantic River above TMA	Stafford	2,041	2/22 - 7/3	30	0	0	23	1.3	0.64	moderate
Willimantic River below TMA	Tolland, Willington, Mansfield, Coventry, Windham	4,225	3/10 - 7/3	46	3	9	18	2.7	0.64	low
Willimantic River TMA	Tolland, Willington	3,102	3/12- 6/4	13	0	0	17	0.8	0.25	low
Wononskopomuc Lake	Salisbury	7,320	4/9/2 2	2	0	1	1	2.0	0.27	low

Yantic River	Lebanon, Bozrah	2,450	4/9/2 2	1	0	0	1	1.0	0.41	low
Yantic River TMA	Bozrah	3,323	4/9/2 2	4	0	0	1	4.0	1.20	high



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



Federal Aid in Sport Fish Restoration F-57-R-41
Annual Performance Report – F22AF01153
4/1/2022 to 3/31/2023

Grant Title: Inland Fisheries Research and Management
Study 1: Coldwater Fisheries Management
Job 4: Distribution of Hatchery Salmonids

Report Prepared by: Matthew Devine
Job Personnel: Matthew Devine, Co-Job Leader
Brian Eltz, Co-Job Leader
Mike Beauchene, Program Coordinator
Andrew Bade, Program Coordinator

Overview: Recreational fishing is a healthy outdoor experience that is important to the quality of life for many of Connecticut’s residents and is beneficial to the State’s economy. Trout anglers enjoy over 1.2 million days of fishing annually in Connecticut. These same anglers (approximately 109,000 adult anglers older than 16 years of age), spend roughly \$30.00/day pursuing trout, which contributes around \$36 million annually to the State’s economy (USFWS 2013). Accordingly, a major objective of the Connecticut Department of Energy and Environmental Protection’s (DEEP) Fisheries Division is to enhance and diversify recreational salmonid fishing opportunities. To support high-quality fishing experiences, the Fisheries Division’s hatchery system annually stocks between 900,000 and 1.3 million salmonids (trout fry, fingerling trout [often called yearlings], adult trout, Atlantic Salmon [fry and adults], and Kokanee Salmon fry) that are reared at three State fish hatcheries. Currently, Brown, Brook, Rainbow, and Tiger trout, along with Atlantic and Kokanee salmon (a landlocked form of the anadromous Pacific Sockeye Salmon) are raised for stocking in waters open to public fishing.



Figure 1. Brother and sister team up to stock trout in the Norwalk River on Free Fishing Day (May 15, 2023).

Objectives for the Distribution of Hatchery Salmonids are:

1. Continue using computer-based trout stocking schedules.
2. Distribute trout and salmon to areas that provide suitable habitat and are open to the general angling public.
3. Produce [Annual Fish Stocking Report](#) and construct a long-term database of annual allocations by site.
4. Continue to update [electronic stocking maps](#).
5. Quantify angler use of stocked areas as needed.
6. Finalize and implement a systematic method for allocating trout in lakes and streams.
7. Improve stocking site information for anglers by [posting maps of stocked streams](#) on the DEEP website.
8. Revise the existing [Statewide Trout Management Plan](#) (Beauchene and Eltz 2021), including the development of comprehensive trout stocking operational guidelines.

This report describes efforts related to these objectives during the study year.

Key Findings

Objective 1: Continue using computer-based trout stocking schedules.

- Microsoft Excel was used to organize all the trout and salmon stocking into pre-season, opening day, in-season, and late-season schedules. Hatchery staff performed stocking of the various waters within designated ranges of dates (1–2-week blocks) within each schedule.

Objective 2: Distribute trout and salmon to areas that provide suitable habitat and are open to the general angling public.

- In all, 102 lakes/ponds and 154 distinct riverine sections were stocked with catchable-size (> 6 inches) salmonids in 2022.
 - One waterbody (Muddy Brook) was dropped from the stocking program due to low angler usage.
 - One waterbody (Lake McDonough) was dropped from the stocking program because of increased boat launch fees making public access too exclusive.
 - Two waterbodies (Hockanum and Tankerhoosen rivers) were dropped from the stocking program due to the chemical polyfluoroalkyl substances (PFAS)

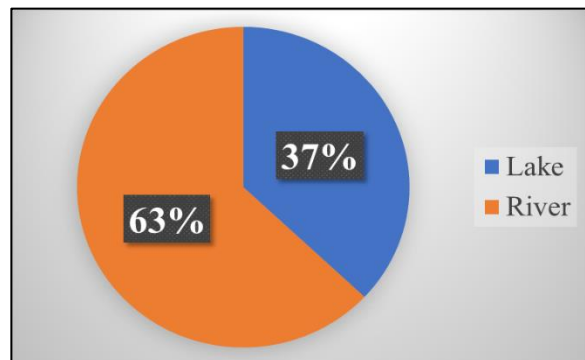


Figure 2. Percent of total catchable-size trout (> 6 inches) stocked in 2022 by habitat type.

detected in fish tissue and public health concerns. Fish tissue collection and analysis is ongoing.

- Approximately 594,611 catchable-size trout, 1,434 catchable-size Atlantic Salmon, 168,000 Brown Trout fry, 304,335 Atlantic Salmon fry, and 153,111 Kokanee Salmon fry were stocked in 2022 (see the [Annual Fish Stocking Report](#) for location specifics).
- The number of trout ≥ 9 inches (96% of total trout stocked) was 5.2% higher than the five-year average (2017-2021 average = 589,549). Of the total number of catchable-size trout stocked, 37% were released into lakes and ponds and 63% were released into rivers and streams (Figure 2). Size composition for catchable-size trout was 4% yearlings (6-9 inches), 64% adults (9-12 inches), 31.3% large-size trout (>12 inches; up from 17.2% in 2020 and 23.4% in 2021), and <1% retired broodstock (> 16 inches). Species composition was approximately 36.3% Brown trout, 41.0% Rainbow trout, 18.8% Brook trout, and 3.9% tiger trout.
- Due to mild winter conditions in 2022, and in anticipation of Opening Day of Harvest (OD) slated for April 8th, 2023, DEEP began stocking [Trout Management Areas](#) on February 9th and [Trout Management Lakes](#) on February 10th. This was roughly one week earlier to when these management waterbodies would typically get stocked.
- In 2021, the closed season on trout fishing was removed by the General Assembly (Public Act 21-12). In response to this, the Fisheries Division conducted a public opinion survey regarding how to regulate the former closed season and in 2023 moved forward with implementing a statewide Catch and Release season for trout from March 1st to 6:00 am on the 2nd Saturday in April. Of the total allotment of catchable-size trout distributed, 49% were stocked prior to OD, approximately 39% were stocked from OD to May 24th, and nearly 12% were stocked July through December.
- During fall 2022 (October – December), 1,434 [broodstock Atlantic Salmon](#) raised at the [Kensington State Fish Hatchery](#) (Berlin) were stocked into the following waterbodies: Naugatuck River (598 fish), Shetucket River from the Scotland Dam to Occum Dam (536 fish), Mount Tom Pond (150 fish), and Crystal Lake (150 fish).
- Over 23,000 standard adult Tiger Trout (9-12 inches) were stocked with 10,530 stocked into lakes and ponds (45%) and 12,652 stocked into rivers and streams (55%).
- The Seeforellen strain Brown Trout stocking program continued in 2022 after returning to the stocking program in 2021. The program had been previously dropped from production in 2016 due to budgetary constraints.
 - Over 6,000 were stocked at yearling size at East Twin Lake, Lake Wononskopomuc, and Saugatuck Reservoir (see the [Annual Fish Stocking Report](#) for details).
 - 5,725 were stocked in the fall as >12 inches adults into select coldwater and Trout Management lakes.
 - 252 broodstock Seeforellen strain Brown Trout were stocked into seven lakes (Mashapaug Lake, Crystal Lake, Squantz Pond, Black Pond (Woodstock), Long Pond, Beach Pond, and East Twin Lake).

- These fish were 2-3 years in age, and many were greater than 20 inches in length.
 - In coming years, age three and four broodstock will be liberated on an annual basis each winter.
- Also of note was the spring (2022) stockings of 1,925 >14 inches retired broodstock Brook Trout (avg. weight of 3-5 lbs.). Mohawk Pond received 500 and Black Pond received 825 fish in the spring, and each waterbody received 500 >14 inches Brook trout in the fall.
- Finally, close to 168,000 Brown Trout fry were spread within Class 2 and Class 3 [Wild Trout Management Areas](#) (waters are listed in the [Annual Fish Stocking Report](#)).

Objective 3: Produce Annual Fish Distribution Report and construct a long-term database of annual allocations by site.

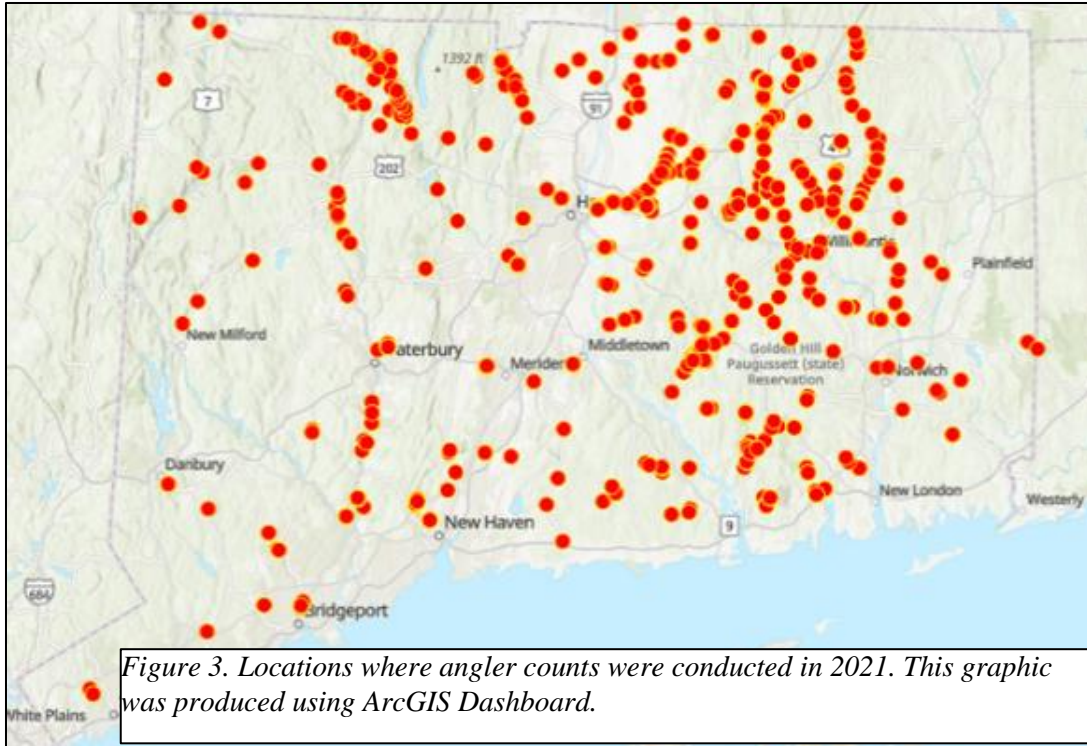
- The [Annual Fish Stocking Report](#) was completed and made available to the public in January 2022. This report includes stocking information for salmonids and all other fish species managed by the Fisheries Division (i.e., Walleye, Channel Catfish, Northern Pike, river herring, American Shad, sea-run Brown Trout, and Kokanee and Atlantic Salmon) throughout the State.
- Design of a relational database continues. Currently all data are stored within Microsoft Excel.

Objective 4: Continue to update electronic stocking maps.

- Public stocking maps (n = 13) were updated as needed and made available [online](#) including an interactive stocking map.
- Work continues to map easements with fishing access in ArcGIS and implement into the interactive stocking map.

Objective 5: Quantify angler use of stocked areas as needed.

- ArcGIS Survey123 was utilized to document angler usage at trout stocked waterbodies starting on January 31st, 2022 and running through September 15th. Angler counts were conducted routinely on both weekdays and weekends, as well as holidays.
 - In all, nearly 2,100 surveys were submitted from 1/31/2022 through 9/15/2022.
 - Just over half of the surveys were conducted at rivers and streams (52%) as opposed to lakes and ponds (48%).
- An intensive stream angler creel survey was designed and performed at four trout stocked rivers/streams (Skungamaug River, Blackledge River, Dickensen Creek, Jeremy River) and one pond (Gay City Pond) in the eastern part of the state during the spring trout fishing season in 2023. The creel survey is intended to provide empirical estimates about recreational trout fishing effort (hours of fishing), catch (numbers of fish caught), harvest (number of fish taken), catch rates (the total number of fish caught per hour), and perceptions about new and future regulations. These data will be used in part to optimize management goals for trout production and distribution, including the timing and



frequency of stocking events, allotments for each waterbody, and selection of stocking locations within each waterbody.

- We conducted angler counts and interviews using a stratified random design roving creel methodology (Malvestuto et al. 1978). The surveys began on 3/1/2023 and finished on 6/15/2023 and included weekdays, weekends, and holidays.
- Defined strata included: 1) weekday/weekend and 2) early spring (3/1/2023 – 4/7/2023), opening day for harvest (4/8/2023), and spring (4/9/2023 – 6/15/2023). The target was to capture 5% of the time in each strata.
- Survey days and start times were selected using Microsoft Excel’s random number generator function and the target was to capture 5% of the time in each strata.
- Each waterbody was stocked once in early spring and twice in late spring and stocking events were spaced at minimum two weeks apart for all waterbodies.
- The Blackledge River was split into two discrete sections (lower and upper) to ensure angler counts and interviews were completed within one hour of the start time assigned to each section.
- Results will be included in the following performance report.

Objective 6: Finalize and implement a systematic method for allocating trout in lakes and streams.

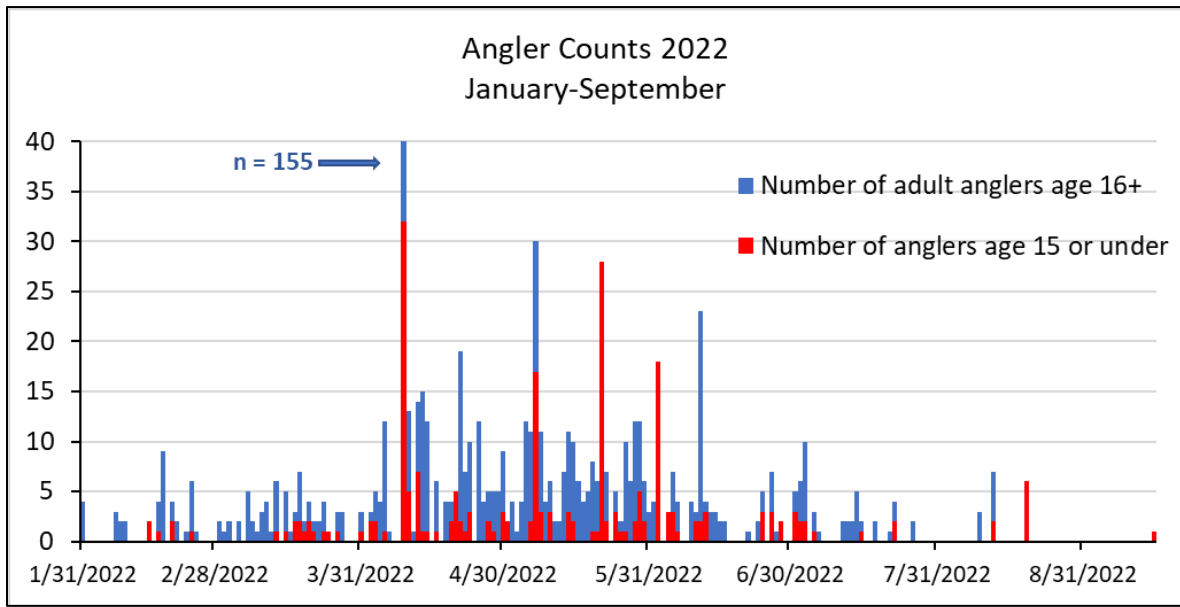


Figure 4. Daily sum of anglers observed during angler counts in 2022. Note truncated y-axis for visual interpretation. OD counts on 4/9/2022 for anglers age 16+ was 155.

- Annual stocking densities for all lakes/ponds and rivers/streams were determined in 2020. Additionally, waterbodies were sorted by management type, and then grouped and binned by waterbody size (total acreage). To determine acreage for river/stream sections, the length of a stocked river/stream section was multiplied by the average width to get total square feet, then divided by 43.560 to get a result in acres. Discrepancies in stocking rates (number trout/acre) were identified for all lakes/ponds and rivers/streams in 2021 and stocking densities were adjusted where needed. Areas of low angler usage continued to be identified through angler counts and beginning in summer 2023, fisheries staff will conduct a comprehensive rank and score assessment of all statewide stocking locations (i.e., every stocked location within a river/stream) based on criteria including angler access, stocking access, land ownership, and habitat conditions. Once complete, fisheries staff will then review and modify stocking locations and allotments towards optimizing trout distribution and angler success.

Objective 7: Improve stocking site information for anglers by posting maps of stocked streams on the DEEP website.

- To inform the public of catchable-size salmonid releases, stockings were advertised on [Facebook](#) (Wednesday and Friday) and both the [interactive trout stocking map](#) and the [trout stocking report](#) was updated daily for waterbodies that were open to fishing. Prior to removal of the closed season for trout fishing, stocked waterbodies were not advertised until close to Opening Day, which occurs on the 2nd Saturday in April. But in 2021, stocked waterbodies were advertised starting on March 5th. In 2022, stocking events were reported immediately after stocking using the outlets noted above. All lists and maps were updated as conditions changed.

Objective 8: Revise the existing Statewide Trout Management Plan, including the development of comprehensive trout stocking operational guidelines.

- Staff were previously requested to assist with development of content to formulate the base of the new plan, including information on program histories, milestones, and successes and failures, as well as develop key metrics for program evaluation, resources needed, and future directions. The [Connecticut's Salmonid Action Plan](#) (Beauchene and Eltz 2021) is now finalized.
- Updated trout stocking operational guidelines have been drafted and are currently in review by fisheries staff. The last trout stocking directive was completed in 1978.

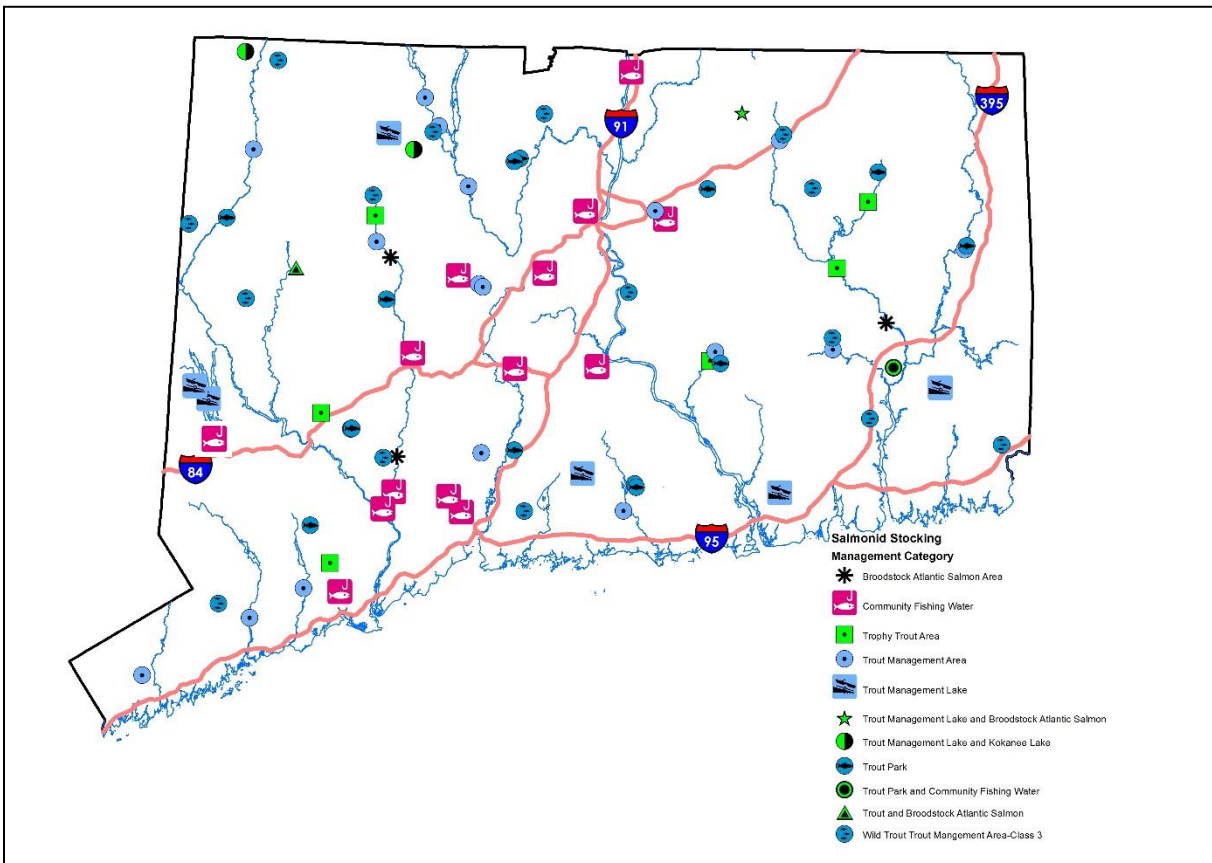


Figure 5. Locations of specialty areas stocked with trout and salmon. Refer to the 2022 Fishing Guide for specific regulations for each area.

Moving Forward

- Implement actions identified within the [Statewide Salmonid Action plan](#) (Beauchene and Eltz 2021).

- Review DEEP files to research permanent easements and angler access lease agreements.
- Research current property ownership and public access of stocking sites where there is some level of uncertainty and quantify the amount of lost/changed access where records exist.
- In all locations, review past stocking practices along with angler survey information, and utilize data collected through online surveys and stocking site assessments to help determine appropriate trout stocking timings and allocations.
- Develop a classification/categorization system for all stocked waterbodies and determine best stocking practices for each waterbody. Utilize waterbody size, angler access, angler usage, distance from population source, management type, historical stocking practices, and all other relevant information during the process.
- Review and evaluate all individual river/stream stocking sites in CT once every five years and investigate changes in land ownership and public fishing access opportunities as information becomes available.
- Develop an intensive statewide rotating stream creel survey on both management and non-management rivers/streams aimed at quantifying angler usage and optimizing trout hatchery production and distribution.

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



Federal Aid in Sport Fish Restoration F-57-R-41
Annual Performance Report – F22AF01153
4/1/2022 to 3/31/2023

Grant Title: Inland Fisheries Research and Management
Study 1: Coldwater Fisheries Management
Job 5: Broodstock Salmonid Management

Report Prepared by: Brian Eltz
Job Personnel: Brian Eltz, Co-Job Leader
Matthew Devine, Co-Job Leader
Mike Beauchene, Program Coordinator
Andrew Bade, Program Coordinator

Overview: The West Branch Farmington River, below the Goodwin Dam, is a federally designated Wild and Scenic River (14 miles) and regionally recognized trout fishery. In addition, the cold, hypolimnetic water released from Goodwin Dam creates the best tailwater resource in the state of Connecticut that supports a sizeable stocked and wild trout population throughout the year. To capitalize on this unique fishery resource, a year-round catch-and-release Trout Management Area (TMA) was designated for a 1.8 mile stretch of the river in 1988. The TMA quickly became increasingly popular with anglers, so to accommodate angler demand and to reduce angler congestion, the year-round catch-and-release TMA has been expanded twice over the years to now cover a total of 5.6 miles. The DEEP Fisheries Division electrofishes portions of the river annually to monitor the trout population or capture select wild and holdover, stocked Brown Trout to use as broodstock for the “Survivor strain” Brown Trout program. Offspring from this selective breeding program are used to stock this TMA as well as other rivers in Connecticut. Since the inception of the TMA, the numbers of wild Brown Trout in fall population samples have increased (from 2% to 45%) and now comprise a substantial component

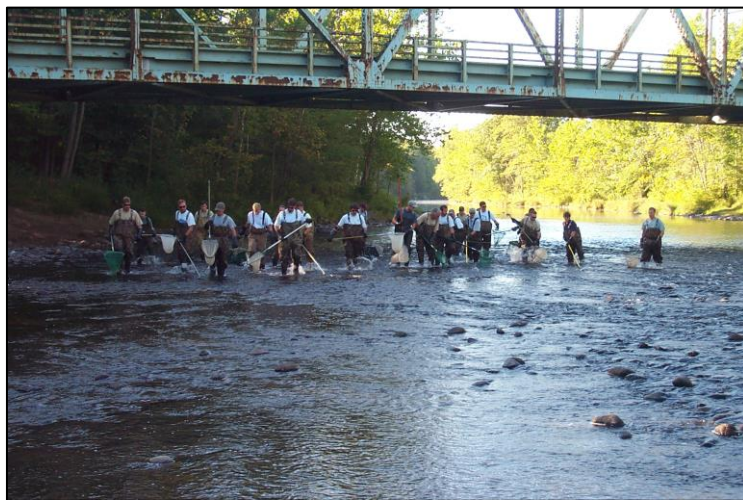


Figure 1. Sampling the West Branch Farmington River Trout Management Area to determine population estimates and collect broodstock.

of the annual angler catch. Through this job, the Fisheries Division strives to maintain the quality of this fishery to ensure future generations of anglers will be able to enjoy this incredible resource.

Landlocked kokanee salmon support a small but longstanding “niche” fishery in CT. These decades old, put-grow-and-take fisheries occur in our highest quality coldwater lakes and serve a small but avid group of dedicated anglers (kokanee fisheries generate an estimated 10 – 12K angler hours annually statewide). The continued success of these fisheries is dependent on the collection and manual spawning of holdover, sexually mature broodstock, raising fry at the Burlington State Fish Hatchery, and releasing fry into two to three lakes each spring.

Specifically, the objectives of the Broodstock Salmonid job are:

1. Improve survival of stocked/semi-domesticated Brown Trout (Survivor strain) in high quality trout fishing rivers and streams currently managed under special regulations (i.e., year-round or seasonal catch and release).
2. Continue to collect broodstock for the Survivor strain Brown Trout Program.
3. Develop a genetically sound plan for optimizing the Survivor program.
4. Provide quality fishing opportunities in special management areas.
5. Continue to evaluate trout populations in a subset of TMAs containing Survivor strain trout to provide a better understanding of how to best manage stocked or mixed (stocked and naturally reproduced fish) trout populations and to improve natural reproduction of Brown Trout in these areas.
6. Continue to assess new rivers/stream areas for their value to be managed with Survivor strain Brown trout populations.
7. Maintain Kokanee fisheries in West Hill Pond and East Twin Lake by stocking approximately 50,000 fry per year in each lake; stocking any surplus fry in Lake Wononskopomuc.
8. Explore the possibility of introducing Kokanee into a suitable coldwater lake in eastern CT.
9. Continue the collection of Kokanee broodstock.
10. Determine relative abundance and average lengths of mature Kokanee at each stocked lake.

Key Findings

Objective 1: Improve survival of stocked/semi-domesticated Brown Trout (Survivor strain) in high quality trout fishing rivers and streams currently managed under special regulations (i.e., year-round or seasonal catch and release)

Selective breeding and reintroduction of offspring from fish that grow and holdover in the river helps to conserve selection of wild adapted genes. Broodstock selection focuses on wild origin fish and fish with several years of riverine exposure as preferred brood animals, but fish stocked as little as 6 months prior to collection are often selected as brood.



Figure 2. Brown Trout collected from the Farmington River during fall sampling.

- In the Farmington River year-round TMA there is a protracted spawning season for Brown Trout (both wild and stocked holdovers) often lasting from late September through early January depending on stream conditions (water temperature and flow). This broad spectrum of spawning time is an adaptive trait of salmonids to protect the population against periodic fall drought and flood conditions that otherwise may wipe out an entire year class of wild fish. To mimic this process and maintain this genetically heritable trait, hatchery personnel spawn the selected broodstock over a 6-week time period as fish ripen in the hatchery environment.
- In 2022, Survivor strain offspring were stocked into the following waterbodies with special regulations (Table 1) where they have demonstrated better holdover potential than the domestic strain Brown Trout reared in Connecticut’s hatcheries.

Table 1. Locations where Survivor strain Brown Trout were stocked in 2022.

Date	Waterbody	Yearlings	Adults	Large Adults (>12")
4/18/2022	Farmington River (West Br. TMA)	0	0	1,100
4/29/2022	Housatonic River, Upper TMA	3,000	0	0
5/2/2022	Housatonic River, Bull's Bridge TMA	2,900	0	0
5/16/2022	Farmington River (West Br. TMA)	1,000	0	0
	Farmington River (LowCville to RT 177; TMA)			
7/11/2022		3,000	0	0
7/11/2022	Farmington River (RT 177 to RT 4)	3,000	0	0
	Farmington River (LowCville to RT 177; TMA)			
9/19/2022		3,600	0	0
9/20/2022	Pequabuck River, RTS 229-177	3,000	0	0
9/26/2022	Housatonic River, Upper TMA	0	0	3,000
9/27/2022	Housatonic River, Upper TMA	0	0	1,000
	Total	19,500	0	5,100

Objective 2: Continue to collect broodstock for the Survivor strain Brown Trout Program.

- Single pass electrofishing sampling was used to collect 160 broodstock Brown Trout (100-125 is the target) from the year-round catch-and-release Trout Management Area (TMA) of the West Branch Farmington River on August 31st. Fish Management and Hatchery personnel screened all fish captured while sampling and selected fish that were suitable for broodstock. The preferred candidate for broodstock is a wild fish (hatched within the river) that is several years old. Second preference is a multi-year holdover fish (determined by total length of the fish and year of elastomer tag or specific fin clip). Each spring (up until 2020), all Survivor Brown Trout received an adipose fin clip and unique elastomer tag color for future identification; now, only adult Survivors receive a unique annual fin clip (adipose, right pelvic, or left pelvic). The final preference is a fish that has been in the river at least 6 months (typically a spring stocked large adult Survivor). All fish are typically at least 13 inches in length and have evidence of viable gametes and strong secondary sex traits.
- The selected fish were transported to the Burlington Hatchery in a hatchery truck with aerated, insulated tanks. At the hatchery, the broodstock were isolated from other hatchery populations for fish disease/health measures.
 - Hatchery staff spawned 34 pairs (consisted of 34 females and 28 males; some males were used more than once) and collected 91,198 green eggs from these fish. Overall egg eye-up was determined to be 78%, which is lower than in previous years (by ~10%). All fish were spawned between October 19th and November 30th. The reduced eye-up was likely due to lower-than-normal summertime flow conditions in the TMA; for much of the summer, flows were close to half that of the median flows for that time of year.
 - These crosses will produce enough fish to meet all the production needs for 2024 spring yearlings (8,000), 2024 fall adults (4,000), 2024 fall large adults (500), and 2025 spring large age-2 adults (1,100).
 - All collected brood are returned to the river after spawning is completed.

Objective 3: Develop a genetically sound plan for optimizing the Survivor program.

- Development of a spawning methodology was added to the [Statewide Salmonid Action plan](#) in 2021.

Objective 4: Provide quality fishing opportunities in special management areas.

- The Farmington River TMA (year-round and seasonal) was stocked multiple times with Brook, Brown, Rainbow, and Tiger Trout throughout the spring along with stocking events in July and September ([Annual Fish Stocking Report](#)). In addition to the State's stocking efforts, cooperating groups (Metropolitan District Commission, Farmington River Anglers Association, and Trophy Trout Club) received permits from the DEEP to stock additional trout within the West Branch Farmington River.
- Also, management areas such as Trophy Trout areas, other TMAs around the state, Trout Parks, Trout Management Lakes, and Community Fishing Waters receive prescribed

allotments each year to provide unique fishing opportunities ([Annual Fish Stocking Report](#)).

Objective 5: Continue to evaluate trout populations in a subset of TMAs containing Survivor strain trout to provide a better understanding of how to best manage stocked or mixed (stocked and naturally reproduced fish) trout populations and to improve natural reproduction of Brown Trout in these areas.

- Staff assisted graduate students, Chris Sullivan and Sarah Manstan of UConn, in studies on the post-release movement, mortality, and thermal refuge use of Brown Trout in the Housatonic River TMA and the section between Furnace Brook and Kent Falls Brook.
 - During July and August of 2022, 47 Survivor Strain Brown Trout were tagged with acoustic transmitters.
 - Underwater cameras were also used to count thermal refuge-dwelling trout in six thermal refuge sites within the Housatonic River. A manuscript is in review detailing findings.
 - A manuscript detailing terrestrial predator visitation and predation patterns at four thermal refuges in the Housatonic River was published (Sullivan et al. 2023).
- In 2020 standard sampling locations were developed to determine strength of young-of-year (YOY) wild Brown Trout populations within the Farmington River West Branch TMA.
 - Three areas (Figure 3; the Chute – yellow star, top of the island above the Rt. 318 Bridge – red star, and the braid that runs along West River Road – green star)



Figure 3. Approximate YOY sampling locations on the Farmington River West Branch TMA in September 2020, Pleasant Valley, CT.

were sampled in September 2020 via backpack electrofishing gear to determine the efficacy of sampling for YOY along the stream margins.

- YOY Brown Trout were collected at all three locations. These sites will help determine annual variations in Brown Trout reproduction.
- A fourth location should be added in the Central Riffle area (New Hartford, CT) to get a better understanding of annual Brown Trout reproduction throughout the entire TMA.

Objective 6: Continue to assess new rivers/stream areas for their value to be managed with Survivor strain Brown Trout populations.

- No action taken towards this objective in 2022.

Objective 7: Maintain Kokanee fisheries in West Hill Pond and East Twin Lake by stocking approximately 50,000 fry per year in each lake; stock any surplus fry in Lake Wononskopomuc.

- [Developed and implemented Kokanee work plan](#) in 2021.
- Kokanee fry were stocked into: East Twin Lake, Salisbury (50,111), West Hill Pond, New Hartford/Barkhamsted (53,000), and Beach Pond, Voluntown, CT/Exeter, RI (50,000).

Objective 8: Explore the possibility of introducing Kokanee into a suitable coldwater lake in eastern CT.

- At Beach Pond (Voluntown) 50,000 fry were stocked (7th consecutive year of stocking) to re-establish the Kokanee population that disappeared after the introduction of Alewives (1960's).
 - Alewives were last detected in Beach Pond in the early 2000's via boat electrofishing. In addition, no Alewife were collected in vertical gill nets set during August 2011 and 2018.
 - Trap nets will be set around the lake during the fall of 2023 to assess recent stockings.



Figure 4. Fisheries Division Biologist Edward Machowski holding a nice male Kokanee in full spawning color from East Twin Lake (Salisbury), 2018. Thank you Ed for your long-standing work on the Kokanee project (as well as others) and good luck in retirement! May you stay forever young!

Objective 9: Continue the collection of Kokanee broodstock.

- At West Hill Pond, trap netting for the collection of broodstock salmon was completed during October 2022. Nets were fished from October 11th through October 12th and a total of 1,053 adult salmon (531 females; 522 males) were captured and transported to the Burlington Fish Hatchery. Of these fish, 940 were spawned (470 male/female pairs), producing 263,984 green eggs equating to 562 eggs/female. The percent eye-up of the eggs at Burlington Hatchery was high at 86.5% (similar to previous years) resulting in 237,114 eyed eggs. This will yield an ample number of fry for stocking both Kokanee management lakes (West Hill Pond and East Twin Lake) and one experimental Kokanee lake (Beach Pond) in the spring of 2023.
- No netting was needed at East Twin or Beach Pond because netting efforts at West Hill provided enough brood to meet production numbers.

Objective 10: Determine relative abundance and average lengths of mature Kokanee at each stocked lake.

- A subsample of 100 broodstock salmon from West Hill Pond (50 of each sex) were measured while being spawned at the Burlington Fish Hatchery. The average size of both sexes combined was 307 mm (males = 312 mm; females = 302 mm). The overall size of the Kokanee collected for spawning in 2022 were smaller in size to those found in 2021 (347 mm).
- At West Hill Pond, three nets were only fished for a total of one day (i.e., 24 hrs.) because the number of brood needed for spawning at the hatchery was rapidly met. It typically requires at least three days to meet the 225 male/female breeding pairs; therefore, Kokanee densities in the lake appeared to be higher than normal.

Moving Forward

- Grow out Survivor Brown Trout for stocking in fall 2023 and spring 2024.
- Evaluate the condition of the wild trout population in the Farmington River year-round TMA after sampling in fall of 2023. Determine if the wild trout production has reached a level where stocking of Survivor Brown Trout yearlings is no longer needed or can be reduced.
- Monitor angler feedback on the quality of fishing in the river through public meetings, social media comments and direct public interactions.
- Determine feasibility of utilizing Survey123 application to record fish sampling data collected in the field and as a means of electronic reporting by anglers catching kokanee, especially at Beach Pond.
- Closely monitor Alewife populations in both East Twin Lake and Lake Wononskopomuc via vertical gill netting.
- Monitor size of Kokanee at East Twin Lake to assess effects of competition with Alewives.
- Collect broodstock Kokanee each fall from West Hill Pond and/or East Twin Lake.

- Maintain the State’s Kokanee fisheries by the annual stocking of advanced Kokanee fry in East Twin Lake, West Hill Pond and Beach Pond.
 - No longer stock Kokanee fry into Lake Wononskopomuc unless alewives go undetected for several years.
- Monitor the populations within each of the stocked lakes, especially Beach Pond. Netting in Beach Pond should occur in the fall of 2023 to assess the developing fishery.
- Determine the best method for assessing the survival of June-stocked Kokanee fingerlings in West Hill Pond.
- Develop plan for reintroducing new genes into the Kokanee population every 5 years.

References

Sullivan, C.J., C.D. Rittenhouse, and J.C. Vokoun. 2023. Camera traps reveal that terrestrial predators are pervasive at riverscape cold-water thermal refuges. *Ecology and Evolution* 13:e10316. <https://doi.org/10.1002/ece3.10316>



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



Federal Aid in Sport Fish Restoration F-57-R-41
Annual Performance Report – F22AF01153
4/1/2022 to 3/31/2023

Grant Title: Inland Fisheries Research and Management
Study 1: Coldwater Fisheries Management
Job 6: Coldwater Lakes Management

Report Prepared by: Brian Eltz
Job Personnel: Brian Eltz, Co-Job Leader
Matthew Devine, Co-Job Leader
Mike Beauchene, Program Coordinator
Andrew Bade, Program Coordinator

Overview: Though most of Connecticut’s lakes and ponds are considered warmwater, several locations in Connecticut support coldwater lake fisheries, which include holdover Brown Trout and stocked Brook Trout. These fisheries play an important role in adding to the diversity of fishing opportunities provided to Connecticut’s anglers.



Figure 7. Photo of night boat electrofishing.

Over the past 30+ years, the Fisheries Division has studied various aspects of Brown Trout in many of the State’s coldwater lakes. During this period, management efforts largely focused on maintaining and enhancing holdover Brown Trout in select lakes through size and timing of trout stocked, fishing regulations (e.g., length limits, slot limits, and season closures), and forage fish assessment (i.e., landlocked Alewife). Management efforts worked to produce viable and, in some cases, notable fisheries for trophy Brown Trout. Throughout this management history, both habitat and biological changes have occurred within Connecticut’s [Trout Management Lakes](#) (TMLs). Data collected over the past ten years indicate that conditions in some of Connecticut’s coldwater lakes have become less favorable for producing holdover trout (e.g., declines in over summer habitat and loss/fluctuations of forage base). Continual assessment and management of the

limited number of Connecticut's coldwater lakes is crucial to adapt stocking strategies as adequate coldwater habitat changes.

In 2013, Fisheries Division biologists developed a [classification system based](#) on a lake's current potential for producing holdover Brown Trout and other coldwater fishes (e.g., Kokanee Salmon and Rainbow Smelt). Parameters used in the classification system include over summer habitat (i.e., volume of late summer cold, oxygenated water), forage abundance, and availability of thermal refugia. This classification system is now being used as a guideline in determining appropriate stocking and management options for each coldwater lake.

The objectives of the Coldwater Lakes Management job are:

1. Assess abundance and size distribution of Brown Trout and Alewives in Crystal and Highland lakes, and other important coldwater lakes as resources permit.
2. Obtain temperature and oxygen profiles on Connecticut's coldwater lakes to monitor potential changes in summer coldwater habitat (the season with the most severe/restrictive habitat conditions for coldwater fisheries resources in Connecticut).
3. Determine the need for continuing or changing special regulations for trout at Crystal and Highland lakes.
4. Assess other management options for producing quality Brown Trout fisheries in coldwater lakes, including stocking different sizes, strains and densities of trout.
5. Conduct angler surveys at Crystal and Highland lakes as resources permit.
6. Explore potential for forage fish introduction in a few selected coldwater lakes.

Key Findings

Objective 1: Assess abundance and size distribution of Brown Trout and Alewives in Crystal and Highland lakes, and other important coldwater lakes as resources permits.

- No nighttime electrofishing or alewife sampling took place at Crystal or Highland lakes in 2022. At Lake Wononskopomuc, trap netting was used to assess the spawning Brown Trout population using the Schnabel mark-recapture method (Everhart et al. 1975); confidence intervals were calculated using the Ricker method (1975). Three nets were set on October 17th; two nets were pulled on 11/18, and the final net was pulled on 11/21. Population estimates of Brown Trout were found to be higher than in 2013 (Table 1).

Table 1. Harvest regulations and population estimates for different size classes of Brown Trout from Lake Wononskopomuc in 2013 and 2023. Number of recaptured Brown Trout (R) is shown. ML is minimum length, and 95% Confidence Intervals are shown in parentheses. Note that an estimate for >22" was not run in 2013. Also, trap net gear selects for trout that are reproductively active (i.e., >12").

Year	Harvest regulation #s at size	Population Estimate							
		>12" (All)	R	>16"	R	>20"	R	>22"	R
2013	5 at no ML	213 (141-384)	15	177 (96-326)	10	94 (36-245)	4	N/A	N/A
2022*	5 at no ML	276 (174-436)	18	243 (149-395)	16	175 (102-299)	13	75 (39-143)	9

*The passage of Public Act 21-12 by Connecticut legislature in October of 2021 eliminated the closed season for the sport fishing of trout in perpetuity. Traditionally, Lake Wononskopomuc was closed to fishing from October 31st through the 2nd Saturday of April at 6am, where the 2nd Saturday historically marked the Opening Day of trout fishing season.

- The size distribution of Brown Trout captured via trap netting is shown in Figure 2.

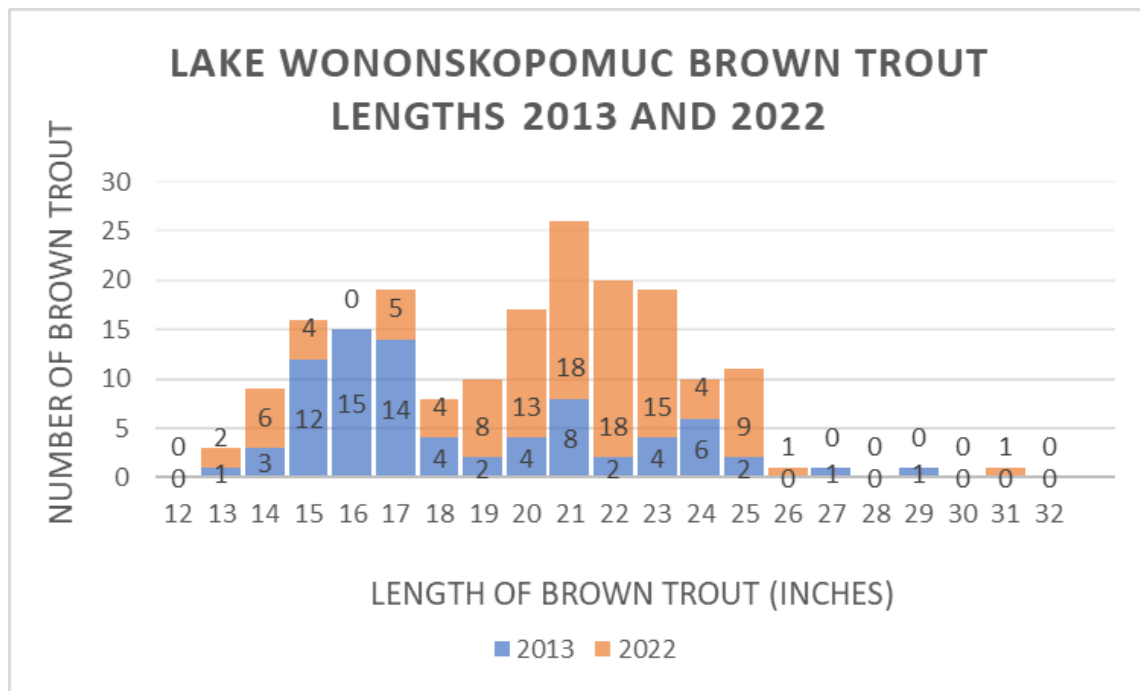


Figure 8. Size structure of Brown Trout collected during October-November 2022 and 2013 at Lake Wononskopomuc. Orange bars represent counts of Brown Trout collected in 2022 and blue bars represent counts Brown Trout collected in 2013.

Objective 2: Obtain temperature and oxygen profiles on Connecticut’s coldwater lakes to monitor potential changes in summer coldwater habitat (the season with the most severe/restrictive habitat conditions for coldwater fisheries resources in Connecticut).

- No work was performed during the 2022-23 working period towards this objective.

Objective 3: Determine the need for continuing or changing special regulations for trout at Highland and Crystal lakes.

- It has been proposed that special regulations should be dropped at Crystal Lake because the lake can no longer produce and support holdover Brown Trout. It may take up to two (2) years for this change in regulations to take place.

Objective 4: Assess other management options for producing quality Brown Trout fisheries in coldwater lakes, including stocking different sizes, strains and densities of trout.

- Work continued within the state’s hatchery system to rear the Seeforellen strain of Brown Trout for stocking in the late spring and fall/winter of 2023. This trout strain was brought back into hatchery production in 2019 because it is especially suited to management in Connecticut’s coldwater lakes. Its reported longevity and late maturity result in increased growth and overall size. A full plan for utilization of these Seeforellen Brown Trout has been created and was implemented beginning in 2021 (Appendix A).
 - For locations stocked with Seeforellen in 2022, see Table 2.

Table 2. Numbers, sizes, and lakes stocked with Seeforellen-strain Brown Trout in 2022.

Lake	Month of Stocking	Seeforellen Brown Trout Stocked		
		> 6 inches	> 12 inches	> 16 inches
Amos Lake	Dec.	0	1000	0
Black Pond, Meriden	Dec./Jan./Feb.	0	650	48
Beach Pond	Nov./Feb.	0	450	40
Crystal Lake	Nov./Jan.	0	450	40
East Twin Lake	May/Nov./Jan.	2,700	925	40
Highland Lake	Nov./Jan.	0	950	40
Lake Wononskopomuc	May	2,660	0	0
Long Pond	Nov./Feb.	0	450	40
Mashapaug Lake	Jan.	0	0	40
Saugatuck Reservoir	May	1,000	0	0
Squantz pond	Nov./Feb.	0	350	40
Wangumbaug Lake (Coventry Lake)	Feb.	0	0	41
West Hill Pond	Nov.	0	500	0
Total		6,360	5,725	369

Objective 5: Conduct angler surveys at Highland and Crystal lakes as resources permit.

- No work was performed at Highland and Crystal lakes during the 2022-23 working period towards this objective.
- Ice angler surveys were attempted at East Twin Lake, Mohawk Pond, and Lake Wonoskopomuc (Trout Management Lakes) as cold air developed in mid-January 2023.
 - Roving angler surveys with a stratified random design (Malvestuto et al. 1978) were conducted to determine angler effort, catch, harvest, and satisfaction.
 - Surveys were carried out from January 15th through February 7th at Lake Wonoskopomuc, from January 15th through February 18th at Mohawk Pond, and from January 15th through February 16th at East Twin Lake.
 - Safe ice never developed at Lake Wonoskopomuc throughout the survey period.
 - Safe ice (~3") developed in a cove at East Twin Lake for one day (February 4th).
 - Only one angler was counted and interviewed.
 - Somewhat safe ice developed at Mohawk Pond from January 17th (~3.5" with 40% ice cover) through February 13th (2 – 4.5" with 100% ice cover) but transitioned from safe to unsafe throughout the survey period (varying ice depths and cover due to frequent rain events).
 - Twenty (20) anglers were counted, and some interviewed throughout this period of "safe" ice.
 - Angler effort and catch and harvest rates will be calculated but should be considered dubious due to the poor ice conditions throughout the survey period.

Objective 6: Explore potential for forage fish introduction in a few selected coldwater lakes.

- No work was performed during the 2022-23 working period towards this objective.

Moving Forward

- Continue to monitor the abundance and size distribution of Alewives in East Twin Lake via vertical gill net and continue to monitor the effects of Alewife competition with Kokanee by monitoring growth of the salmon.
- Continue to monitor temperature and dissolved oxygen during late summer in the State's key coldwater lakes and adjust Brown Trout stocking numbers as needed.
- Assess newly initiated stockings of March season Trout Management Lakes with angler surveys or trail cameras including the two new Brook Trout Lakes.

- Add an objective to the current Sport Fish Restoration grant narrative; “Maintain quality fishing for Brook Trout in Mohawk Pond (Goshen) and Black Pond (Woodstock) by annually stocking adult Brook Trout into each location.”
- Revisit harvest regulations on Trout Management Lakes to support the potential fishery generated via the Seeforellen stocking and assessment plan (Appendix A).
- Consider removing Crystal Lake from the Trout Management Lake program as it no longer supports holdover Brown Trout production.

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Appendix A

Seeforellen Stocking and Assessment Plan

2021

Spring 2021:

- Fin clip all (24,000) yearling Seeforellen trout prior to stocking in Lake Wonoskopomuc and Saugatuck Reservoir.
- Stock yearling Seeforellen trout at prescribed rate into both Lake Wonoskopomuc (20,000) and Saugatuck Reservoir (4,000).

Fall 2021:

- Mark, via fin clip all (~6,000) adult (14"+) Seeforellens prior to stocking.
- Stock 14"+ Seeforellens into Long Pond (500), Highland Lake (1,500), East Twin (1,000), West Hill Pond (1,000), Crystal Lake (1,500) and Beach Pond (500).
- There will be some number (TBD) of broodstock available for stocking beginning in 2021. The locations for stocking these large fish will be determined once we know approximate number available.

Assessment in 2021:

- No assessment necessary in 2021.

2022

Spring 2022:

- Fin clip all (24,000) yearling Seeforellen trout prior to stocking in Lake Wonoskopomuc and Saugatuck Reservoir.
- Stock yearling Seeforellen trout at prescribed rate into both Lake Wonoskopomuc (20,000) and Saugatuck Reservoir (4,000).

Fall 2022:

- Mark, via fin clip all (~6,000) adult (14"+) Seeforellens prior to stocking.
- Stock 14"+ Seeforellens into Long Pond (500), Highland Lake (1,500), East Twin (1,000), West Hill Pond (1,000), Crystal Lake (1,500) and Beach Pond (500).

Assessment in 2022:

- No assessment necessary in 2022.

2023

Spring 2023:

- Fin clip all (24,000) yearling Seeforellen trout prior to stocking in Lake Wonoskopomuc and Saugatuck Reservoir.

- Stock yearling Seeforellen trout at prescribed rate into both Lake Wononskopomuc (20,000) and Saugatuck Reservoir (4,000).

Fall 2023:

- Mark, via fin clip all (~6,000) adult (14"+) Seeforellens prior to stocking.
- Stock 14"+ Seeforellens into Long Pond (500), Highland Lake (1,500), East Twin (1,000), West Hill Pond (1,000), Crystal Lake, (1,500) and Beach Pond (500).

Assessment in 2023:

- Intense angler survey at Wononskopomuc beginning in the spring of 2023 (OD through end of June). Also, initiate a fishing report card or Survey 123 at Wononskopomuc so anglers can report catch of marked or unmarked trout above and beyond our survey. If report cards are used, a suitable drop off spot will need to be discussed with the manager at the Town Grove boat launch.
- Consider fall angler surveys at other locations stocked with Seeforellen during the fall.
- Trap netting at Wononskopomuc beginning in late October of 2023.
 - o 2-3 trap nets checked 2 times/week by 2 fisheries staff.

Note: timing of netting in late October works well as we are finished with Kokanee broodstock collection and Seeforellen Brown Trout have historically shown later spawning times than Cortland strain Brown Trout, so late October through until weather turns too cold to safely net.

2024

Spring 2024:

- Fin clip all (24,000) yearling Seeforellen trout prior to stocking in Lake Wononskopomuc and Saugatuck Reservoir.
- Stock yearling Seeforellen trout at prescribed rate into both Wononskopomuc Lake (20,000) and Saugatuck Reservoir (4,000).

Fall 2024:

- Mark, via fin clip all (~6,000) adult (14"+) Seeforellens prior to stocking.
- Stock 14"+ Seeforellens into Long Pond (500), Highland Lake (1,500), East Twin (1,000), West Hill Pond (1,000), Crystal Lake (1,500) and Beach Pond (500).

Assessment in 2024:

- Intense angler survey at Saugatuck Reservoir beginning in the spring of 2024 (OD through end of June).
- Trap netting at Saugatuck Reservoir beginning in late October of 2024. Note: Based on data collected during the past two years (2023 and 2024), a full assessment of the Seeforellen stocking program will be presented which will provide recommendations on future stocking allocations and locations.



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



Federal Aid in Sport Fish Restoration F-57-R-41
Annual Performance Report – F22AF01153
4/1/2022 to 3/31/2023

Grant Title: Inland Fisheries Research and Management
Study 2: Warmwater Fisheries Management
Job 1: Monitor Warmwater Fish Populations in Lakes and Large Rivers

Report Prepared by: Christopher McDowell
Job Personnel: Christopher McDowell, Job Leader
Lillian Glynos, Primary Staff
Spencer Mallette, Primary Staff
Mike Beauchene, Program Coordinator
Andrew Bade, Program Coordinator

Overview: Lake, pond, and large river monitoring (Figure 1) is crucial to maintain up-to-date fish population data (e.g., population size structure and growth rates), identify changes in fish assemblages, and evaluate management strategies. Accordingly, the Fisheries Division has regularly monitored fish populations in Connecticut's lakes and large rivers via nighttime boat electrofishing since 1988. Waterbodies are revisited on a rotational basis because lakes and large rivers are dynamic systems that are subject to both natural variation and anthropogenic influences (e.g., winter drawdowns, herbicide applications, dredging, invasive species, shoreline development, changes in angler pressure, and



Figure 1. Nighttime boat electrofishing to obtain various fish species data is a core function of the warmwater fisheries program.

climate change), both of which alter their respective fisheries over time. The Connecticut River, which is also monitored by this program, is perhaps the most diverse inland fishery resource in the State of Connecticut. Running 70 miles from the Massachusetts border to Long Island Sound, it provides habitat for a wide variety of inland, marine, and diadromous fish species.

The objectives of the lake, pond and large river monitoring job are:

1. Regularly sample warm water fish populations from a variety of waterbodies including special management lakes, waterbodies with a variety of angler usage and habitat types, and sites with known perturbations.
2. Monitor growth and population structure of important warm water fish species in sampled lakes.
3. Evaluate the effects of introduced gamefish on resident fish populations.
4. Collect fish population data in previously unsampled lakes as resources permit.
5. Maintain warm water survey databases and provide support to special management projects.

Key Findings

Objective 1: Regularly sample warm water fish populations from a variety of waterbodies including special management lakes, waterbodies with a variety of angler usage and habitat types, and sites with known perturbations.

- Fourteen waters were sampled using standard protocols between April 26 and June 13, 2022, and again between October 5 and November 14, 2022 (Table 1).
 - This count refers specifically to all-species samples taken with the primary goal of lake and large river monitoring, as opposed to other project-specific samples (e.g., samples to generate Walleye and bass population estimates at Beach Pond).
 - The repeated samples in spring and fall were partly to help us better understand and account for seasonal differences in sampling efficacy.

Table 1. List of waterbodies sampled for the lake and pond program between April 26 and June 13, 2022, and again between October 5 and November 14, 2022.

<u>Waterbody Name</u>	<u>Town</u>
Bantam Lake	Morris/Litchfield
Black Pond	Meriden/Middlefield
Candlewood Lake	Danbury/New Fairfield/Sherman/New Milford/Brookfield
City Lake (aka South Norwalk Reservoir)	Wilton
Lake Kenosia	Danbury
Lake Zoar	Monroe/Oxford/Newtown/Southbury
Mashapaug Lake	Union
Moodus Reservoir (upper)	East Haddam

Mudge Pond	Sharon
Quaddick Reservoir (middle basin)	Thompson
Rogers Lake	Lyme/Old Lyme
Silver Lake	Berlin/Meriden
West Thompson Lake	Thompson
Winchester Lake	Winchester

Objective 2: Monitor growth and population structure of important warm water fish species in sampled lakes.

- Scale samples were taken from several different fish species during the spring 2022 lake and pond sampling. These samples are currently being processed for age and growth analysis, which will be carried out as time allows.

Objective 3: Evaluate the effects of introduced gamefish on resident fish populations.

- Work began in 2022 to develop a database of introduced gamefish stocking allocations, as well as collate historic and recent electrofishing data, to enable this type of analysis. Work is ongoing and additional progress will be reported in the next project segment.

Objective 4: Collect fish population data in previously unsampled lakes as resources permit.

- One waterbody, City Lake, Wilton (aka South Norwalk Reservoir) was sampled. See Appendix A for the report that was generated regarding the fish population from the sampling of this waterbody.

Objective 5: Maintain warm water survey databases and provide support to special management projects.

- All data collected during lake and pond sampling, as well other warm water sampling done to support special management projects (e.g., Channel Catfish relative abundance estimates, Walleye and bass population estimates), have been entered into the fish community relational database.
- As mentioned under Objective 3, progress was made to restore access to, and improve usability of, the fish community sampling data collected prior to 2018.
- The lake and large river survey also supported a special management project on Candlewood Lake by performing five nights of boat electrofishing to assess the fish community response to recent changes in aquatic vegetation.

Moving Forward

- Continue regular monitoring of Candlewood Lake to assess fish community responses to the loss of aquatic vegetation and inform further management actions.
- Continue sampling plan that includes supporting special management projects, rotationally sampling waters without special management, and sampling new waters as time allows.
- Explore options to improve database management, especially as it concerns using pre- and post-2018 fish community data in long term analyses given their different data structures.
- Increase focus on evaluating the impacts of introduced gamefish on resident fish species. Data management improvements should facilitate this work.
- Consider expanding program capacity through the hiring of additional seasonal staff in the western district to enable concurrent east and west district night samples.
- Update and/or create statistical programs that automatically perform basic fish community analyses to help standardize and reduce the turnaround time for fish community reports prepared for external partners.
- Develop a workflow for making fish community monitoring data publicly available at regular intervals.
- Critically reevaluate the sampling, processing, analysis, and data management protocols related to fish ageing. Explore the number of scales needed to make meaningful inferences and process improvements that could expand capacity to age and analyze them.

Appendix A



Christopher P. McDowell
Fisheries Biologist 2
Connecticut Department of Energy and Environmental Protection
Bureau of Natural Resources
Fisheries Division
Eastern District Headquarters
209 Hebron Road
Marlborough, CT 06447

January 17, 2023

Wes D'Angelo
Grounds and Supply Operations Supervisor
South Norwalk Electric and Water
164 Old Boston Road
Wilton, CT 06897

Dear Mr. D'Angelo:

Thank you for allowing us to sample the fish population in City Lake (aka South Norwalk Reservoir) on May 2, 2022. Please find attached with this letter a brief summary report of our findings.

Sincerely;

Christopher P. McDowell

Christopher P. McDowell 860-707-2767
christopher.mcdowell@ct.gov

Attachment: Summary Report for the May 2, 2022 Fisheries Sample of City Lake (aka South Norwalk Reservoir) by the Connecticut Department of Energy and Environmental Protection Fisheries Division.

209 Hebron Rd. • Marlborough, CT 06447
www.ct.gov/deep
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Summary Report for the May 2, 2022 Fisheries Sample of City Lake (aka South Norwalk Reservoir) by the Connecticut Department of Energy and Environmental Protection Fisheries Division

Background

- City Lake (aka South Norwalk Reservoir) is located in the town of Wilton, Connecticut and is owned and operated by South Norwalk Electric and Water (SNEW). It is SNEW's terminal reservoir. The reservoir is approximately 155 acres and runs relatively north to south. It is divided into four sections – A, B, C, and D. There is a water control structure at the southern end of the lake where water flows from the lake into Belden Hill Brook. Modifications have been made to the dam to raise it to increase storage capacity. City Lake receives water from Huckleberry Hills Brook, which comes out of Rock Lake. Currently, fishing is illegal, though water company staff have acknowledged that some fishing does occur. The reservoir is treated for cyanobacteria as needed during the summer months.
- A request to sample City Lake was made by SNEW staff to learn more about the fish population in the reservoir. In an effort to get an adequate “picture” of the State of Connecticut's freshwater fisheries resources, the Connecticut Department of Energy and Environmental Protection (CT DEEP) Fisheries Division samples a variety of freshwater lakes and ponds, which can include public waters, private water supply reservoirs and private lakes. Gathering data from all these different waterbodies allows us to assess the State's freshwater resources and make comparisons of fish population size, fish age and fish growth based on varying usage type (i.e. public waters see far more angling pressure than closed to fishing water supply reservoirs and private lakes and therefore the fish populations can be markedly different in terms of size and age structure).

Key Concepts

- The CT DEEP Fisheries Division samples lake fish populations using boat electrofishing following standardized sampling protocols. The electrofishing boat is deployed at night in the nearshore areas of a lake. The boat is piloted at slow speed (approximately less than one mile per hour) and DC current is pulsed into the water from an onboard generator through special stainless steel droppers that are suspended from two probes off the bow of the boat. Stunned fish are netted, counted and measured, and released back into the lake (electrofishing is mostly non-lethal).
- Relative abundance of fish species is expressed as catch-per-hour (CPH) of electrofishing time. CPH provides a standardized index of abundance that facilitates comparison of species densities among lakes or over time within a lake.
- For most species, CPH is calculated for two size-classes: fish that are “stock size” or larger (stock size is defined as the smallest size commonly caught by anglers), and those that are “quality size” or larger (quality size is defined as the size at which most anglers consider the fish desirable to catch). See Appendix A for definitions of stock and quality size for popular Connecticut fish species.
- Proportional Size Distribution (PSD) is an index of size structure that describes the percentage of stock-size fish that are also quality size or greater. This can be thought of as an index of the percentage of “big” fish within a population.
- Throughout this document, species are sorted into three categories that roughly correspond to their trophic level (i.e. their position within the “food chain”):
 - “Top-Level”: predators that reach large sizes and prey primarily on other fish.
 - “Mid-Level”: species that reach intermediate sizes and may consume fish prey.
 - “Low-Level”: smaller species that prey primarily on invertebrates.

Key Findings

- Five CT DEEP Fisheries Division employees arrived at City Lake on May 2, 2022 around 8:00pm, began the sample at 8:25pm, and completed the sample at 11:57pm. Six zones were sampled around the lake (see Appendix B). Each zone took between 22-39 minutes to sample. Total “on-time” (i.e. the time when the boat was actively putting electricity into the water to stun and capture fish) was 1.01 hours.
- Sampling conditions were considered fair by our team leader due to the water level being high and the water conditions being turbid due to an algae bloom, which resulted in a water clarity value of 1.5 meters as determined by Secchi disk.
- During the sampling period, six different fish species were captured (Table 1). Additionally, three hybrid Bluegill x Pumpkinseed sunfish were captured.
- Largemouth Bass, a highly sought after sport fish species within Connecticut and nationally, were present in below average abundance for both stock-size and quality size fish relative to the State average from public lakes open to fishing; however, the PSD was above the State average (Table 1).
- Chain Pickerel, a native predatory sport fish in Connecticut, were present in below average abundance for stock-size fish relative to the State average from public lakes open to fishing; however, quality-size fish were above average, as was the PSD (Table 1). For the three “mid-level” species captured in City Lake (i.e. Yellow Perch, Bluegill and Pumpkinseed), the stock-size, quality-size and PSD values were mixed relative to the State average for lakes open to fishing (Table 1). For Yellow Perch, stock-size and quality-size values were above State averages, but the PSD value was below State average. For Bluegill, they were below State average for stock-size, quality-size, and PSD. For Pumpkinseed, they were above State average for stock-size, but below for both quality-size and PSD.
- For Green Sunfish and the Bluegill x Pumpkinseed sunfish hybrids no stock-size, quality-size or PSD comparisons were made because, too few lakes in Connecticut contain these fish to create a statewide average.

- Appendix C contains a set of length-frequency graphs showing the size structure of the six species captured during the sample.
- No “low-level” fish species were captured in South Norwalk Reservoir. Low-level fish species include the following examples: White Sucker, Golden Shiner, American Eel and Banded Killifish.

Table 1. Stock size catch-per-hour (CPH), quality size CPH and proportional size distribution (PSD) of captured fish species in City Lake (aka South Norwalk Reservoir) during the May 2, 2022 night boat electrofishing sample relative to the State average for public lakes. Entries of “Average” indicate CPH was within $\pm 10\%$ or PSD was within ± 5 percentage points of State average. No “Low-Level” species were captured during the sample.

Species	Number Sampled	Stock Size CPH			Quality Size CPH			City Lake PSD Relative to State Average
		City Lake	State Average	Stock Size CPH Ranking	City Lake	State Average	Quality Size CPH Ranking	
Top-Level								
Largemouth Bass	42	37.6	57.9	Below	22.8	29.4	Below	Above
Chain Pickerel	28	9.9	20.6	Below	6.9	6.3	Above	Above
Mid-Level								
Yellow Perch	321	218.9	102.1	Above	68.4	48.2	Above	Below
Bluegill	169	149.6	343.3	Below	12.9	142.3	Below	Below
Pumpkinseed	83	68.4	59.3	Above	7.9	23.5	Below	Below
Green Sunfish	17	14.9	No State Ave.	NV ¹	1.0	No State Ave.	NV	NV
Bluegill x Pumpkinseed Sunfish	3	3.0	No State Ave.	NV	TF ²	No State Ave.	NV	NV

¹NV = No value is calculated because not enough public lakes contain this species in sufficient abundances to create a statewide average. ²TF = Too few individuals were caught to calculate a meaningful estimate.

Summary

The fish community at City Lake contains a typical assemblage of warmwater fish species for Connecticut lakes/ponds. Lakes are dynamic systems and fish populations can fluctuate in abundance from year-to-year due to habitat and/or climate conditions. Because our single night sample is a “snap shot” in time, it may not provide a complete picture of the fish population size structure. It is not unusual for fish to experience strong year-classes when conditions are favorable and the reverse when conditions are unfavorable. With that said, it would appear that City Lake has a very abundant population of Yellow Perch. Additionally, the Largemouth Bass and Chain Pickerel populations do have an above average index of large fish

in the population relative to State waters open to fishing, which is typical of what we see in most water supply reservoirs that are closed to fishing.

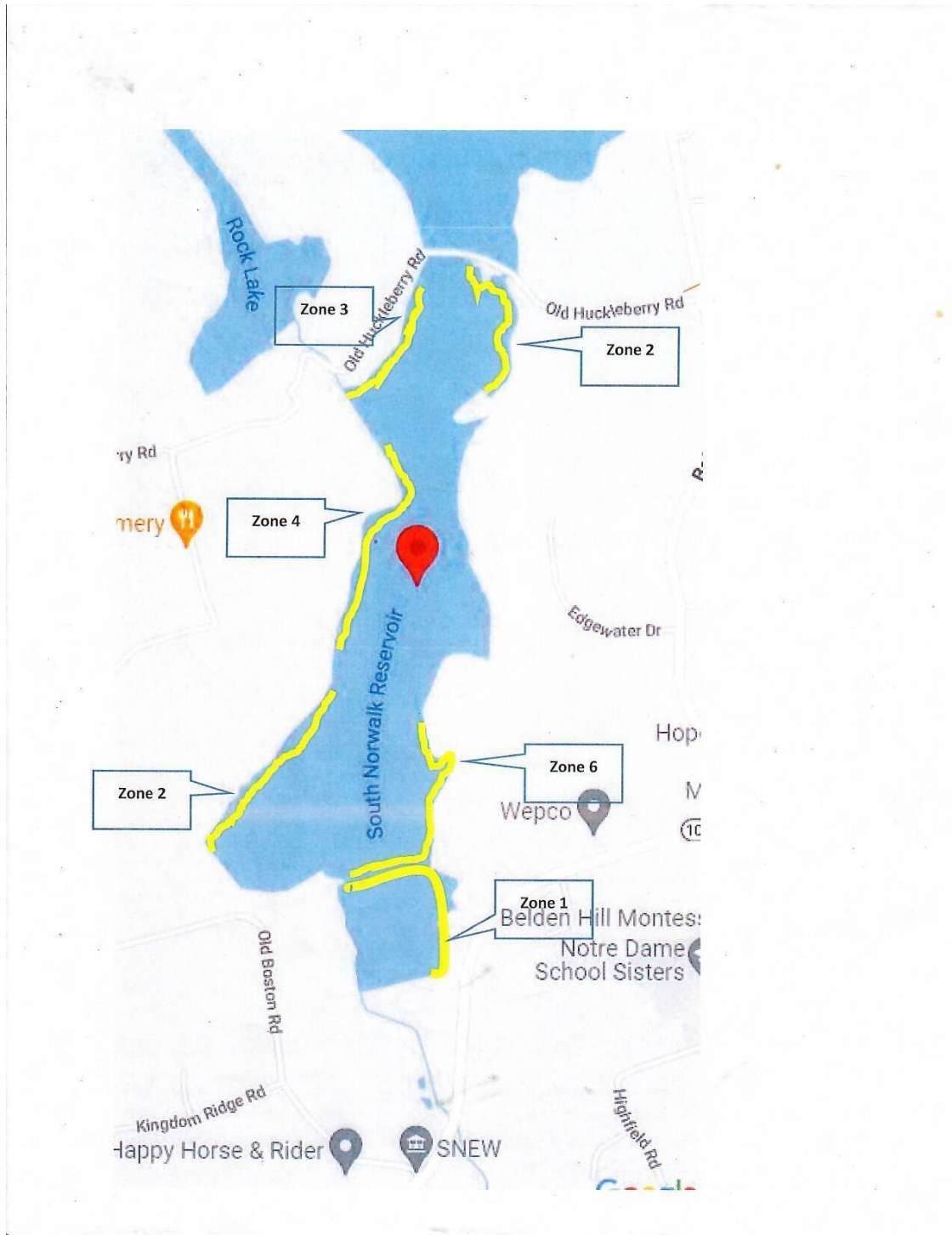
Unfortunately, no age and growth work has been carried out yet on the fish scale samples that were collected from a number of Largemouth Bass, Chain Pickerel, Bluegill and Yellow Perch captured during this sample to compare growth rates to the State averages. These scales are currently being processed and there is no timeframe yet as to when aging work will begin.

If you have any questions please feel free to contact Chris McDowell (phone: 860.707.2767; email: christopher.mcdowell@ct.gov) or Andrew Bade (phone: 860.424.3673; email: andrew.bade@ct.gov).

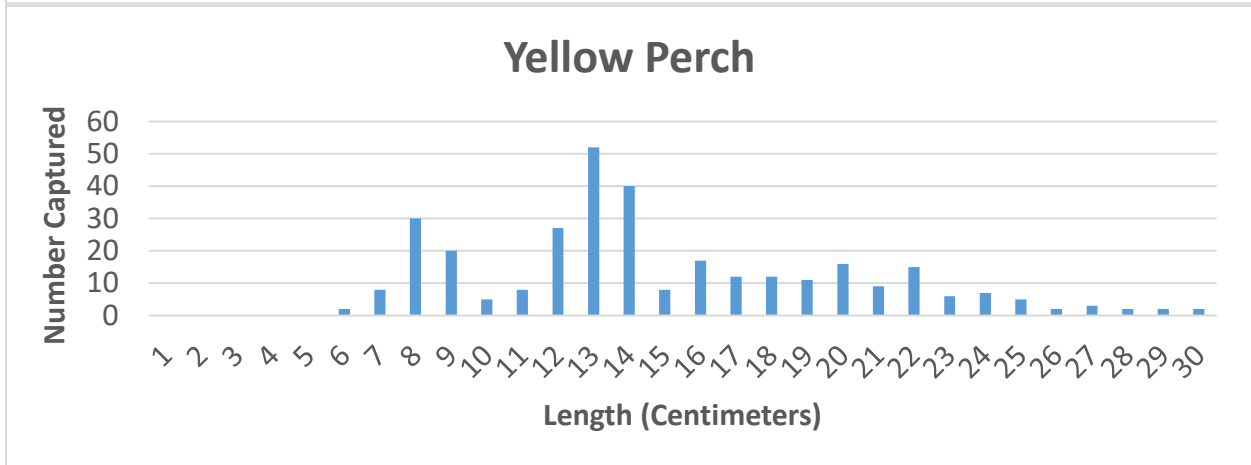
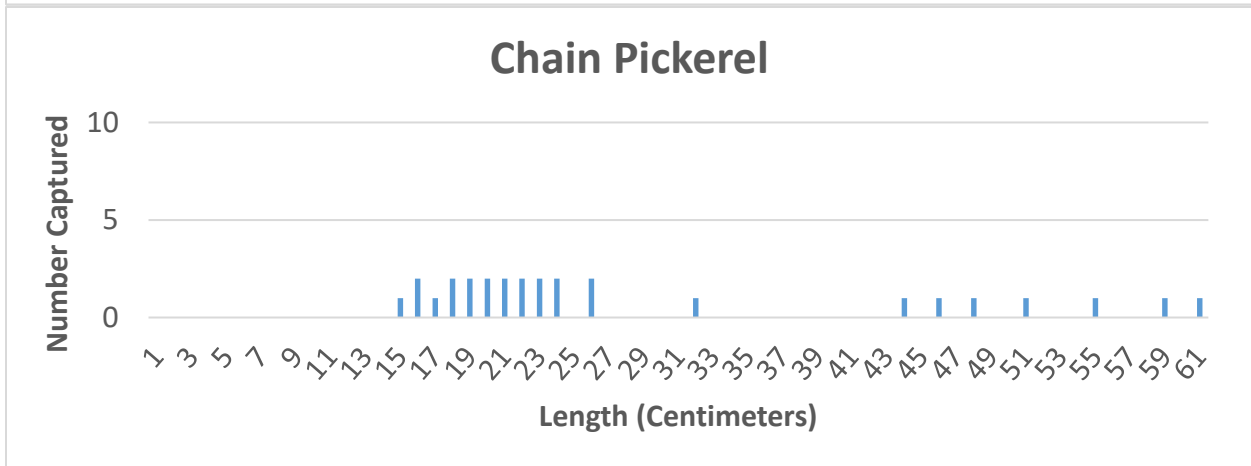
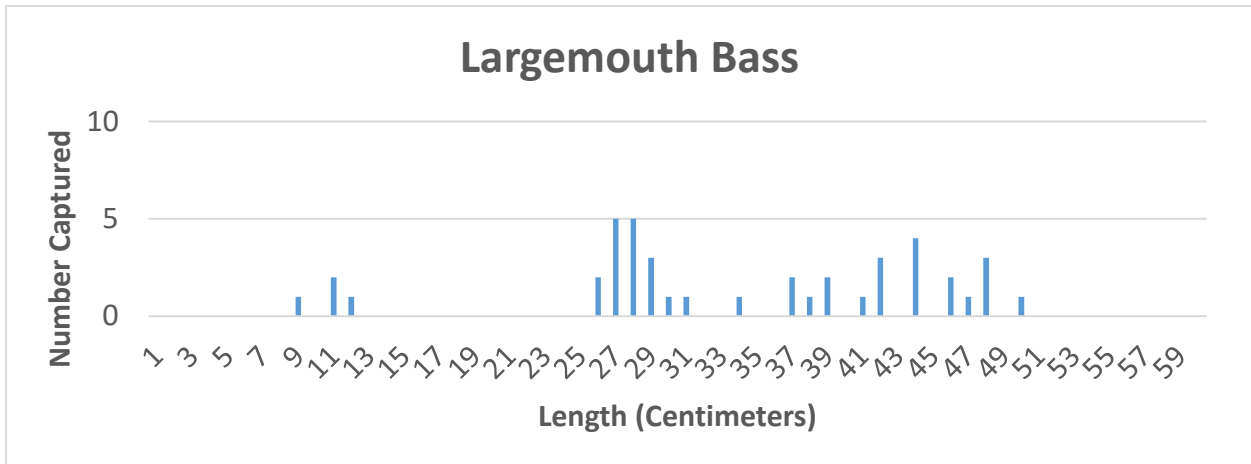
Appendix A. Stock-size and quality-size cutoffs for various Connecticut fish species.

Species	Metric (cm)		English (inches)	
	Stock Size	Quality Size	Stock Size	Quality Size
Top-Level				
Largemouth Bass	20	30	8	12
Smallmouth Bass	20	30	8	12
Brook Trout	20	33	8	13
Brown Trout	20	33	8	13
Rainbow Trout	20	33	8	13
Chain Pickerel	25	38	10	15
Mid-Level				
Black Crappie	13	20	5	8
White Perch	13	20	5	8
Yellow Perch	13	20	5	8
Brown Bullhead	15	23	6	9
White Catfish	20	30	8	12
Bluegill	8	15	3	6
Pumpkinseed	8	15	3	6
Green Sunfish	8	15	3	6
Redbreast Sunfish	8	15	3	6
Rock Bass	8	15	3	6
Low-Level	-	-	-	-
Golden Shiner				
American Eel	-	-	-	-

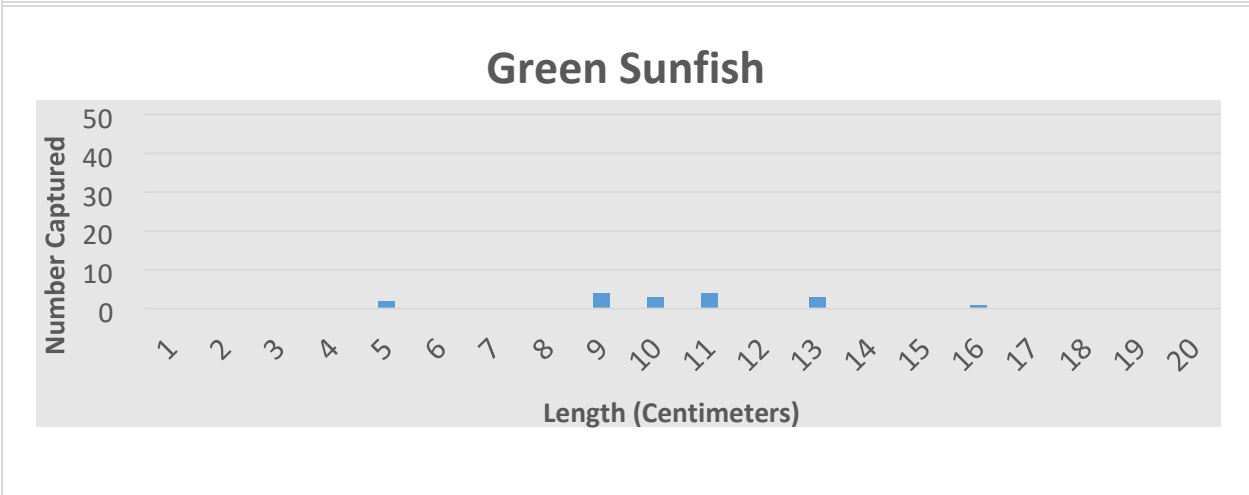
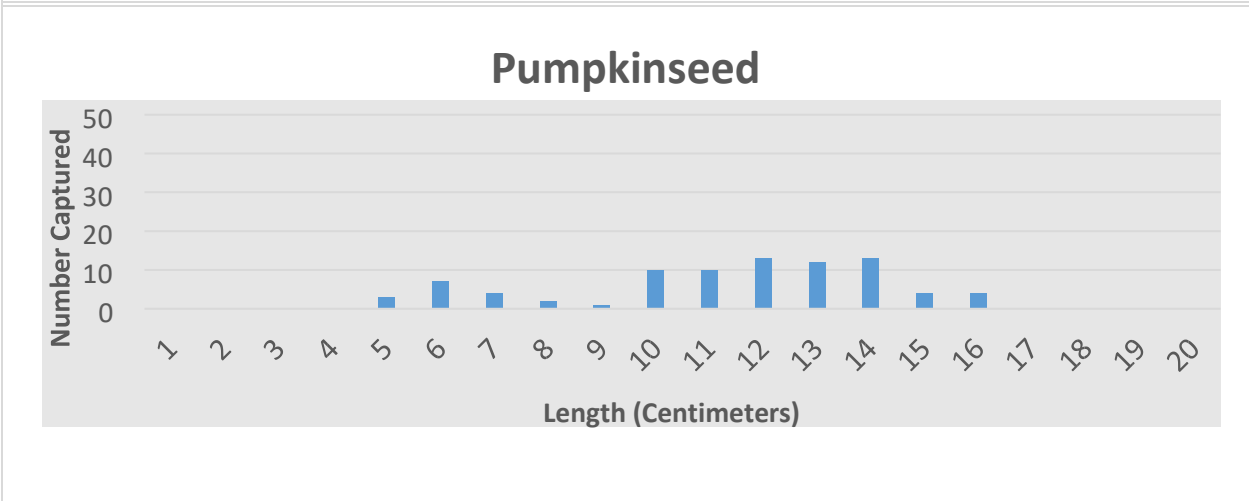
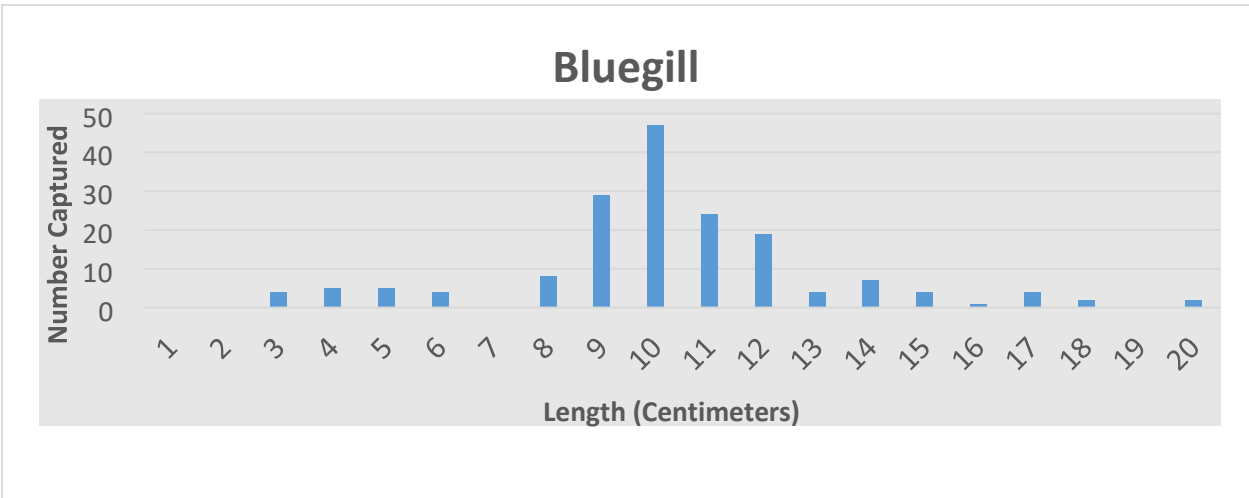
Appendix B. Locations sampled by the Connecticut Department of Energy and Environmental Protection Fisheries Division using nighttime boat electrofishing in City Lake (aka South Norwalk Reservoir), Wilton, Connecticut on May 2, 2022.



Appendix C. Length-frequency graphs for the six species sampled by the Connecticut Department of Energy and Environmental Protection Fisheries Division using nighttime boat electrofishing in City Lake (aka South Norwalk Reservoir), Wilton, Connecticut on May 2, 2022.



Appendix C. (continued).





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



Federal Aid in Sport Fish Restoration F-57-R-41
Annual Performance Report – F22AF01153
4/1/2022 to 3/31/2023

Grant Title: Inland Fisheries Research and Management
Study 2: Warmwater Fisheries Management
Job 2: Lake and Large River Angler Surveys

Report Prepared by: Spencer Mallette
Job Personnel: Spencer Mallette, Job Leader
Lillian Glynos, Primary Staff
Christopher McDowell, Primary Staff
Andrew Bade, Program Coordinator

Overview: Angler surveys are an indispensable component of any sportfish management program. These surveys provide vital information on angler use (effort, catch and harvest) and angler feedback concerning current management practices. Standardized survey methods ensure comparability of data across locations and years. Angler survey staff work in consultation with staff from various management projects to prioritize potential surveys and ensure that data needs are met in a cost-effective manner. This project will provide and maintain a centralized archive for all Connecticut lake and large river angler survey data.

The increasing access to social media and computerized angler statistics (e.g., Connecticut's angler license database) affords the opportunity to solicit large numbers of constituents for the purpose of acquiring statewide angler attitude and use patterns. The biases of these survey mediums must be accounted for when interpreting the results to guide management.

The objectives of the lake and large river angler survey job are:

1. Schedule, coordinate and conduct quantitative angler surveys on lake and large river fisheries on an as-needed and/or rotational basis as resources permit.
2. Develop and implement standardized survey methodologies.
3. Maintain and archive angler survey database(s) and provide support to management projects.
4. Evaluate the potential for collecting angler information using alternative computer-based survey methods.

Key Findings

Objective 1: Schedule, coordinate and conduct quantitative angler surveys on lake and large river fisheries on an as-needed and/or rotational basis as resources permit.

- The Fisheries Division started a roving, boat-based creel survey on Pachaug Pond, Quinebaug Lake, and Wyassup Lake on March 1st, 2023. The purpose of this creel is to assess angler usage, effort, catch, and opinions on management strategies for each of the waterbodies.
 - Pachaug Pond (Griswold) is a Northern Pike Management Lake. The regulations for northern pike are year-round fishing with a daily creel limit of 2 and a 26-inch minimum length limit. Pachaug Pond is also an important bass tournament lake and hosts tournaments on a regular basis throughout the open water season.
 - Quinebaug Lake (Killingly), also known as Wauregan Reservoir is both a Bass Management Lake and a Channel Catfish Management Lake. Bass are regulated by a daily creel limit of 2 and a 16-inch minimum length limit. For Channel Catfish, there is a daily creel limit of 6 with no minimum length limit. This lake was also stocked with 400 adult Rainbow Trout on January 13, 2023 and 300 adult Rainbow Trout and 510 Brown Trout on March 2, 2023. Smallmouth Bass have apparently become extirpated in Quinebaug Lake.
 - Wyassup Lake (North Stonington) is a Bass Management Lake. Bass are regulated by with a daily creel limit of 2 and a 16-inch minimum length limit. Smallmouth Bass have apparently become extirpated in Wyassup Lake.
- Creel surveys are generally performed four times a week, including each weekend day and two randomly selected weekdays. All state-recognized holidays were also scheduled to be sampled with holidays treated as a separate stratum. Within those strata, start times and the order in which lakes are surveyed is randomly selected. The creel is scheduled to run until October 31, 2023, and will be reassessed at that time for continuation into the winter ice-fishing season if weather permits.
- Surveys start at the top of the hour and run for an hour each. Creel agents first count the number of anglers by type (e.g., shore or boat angler) and collect sample metadata (Appendix A).
- Agents then interview all anglers (or a random sample of as many anglers as time allows). The anglers are asked a suite of questions about their effort, catch, and opinions relevant to the waterbody being surveyed. See Appendix B for data sheets showing what data are collected. If an angler refused an interview, the agent would fill out as much of the interview as they could and record that the angler “refused interview”.
- Results will be available in the next project segment.

Objective 2: Develop and implement standardized survey methodologies.

- Generally, we are continuing to implement the standard lake and large river survey methodologies used by the Fisheries Division for decades. This ensures comparability of data through time.

- However, tablets with ArcGIS Survey123 forms have replaced paper data collection for creel surveys. This change has allowed us to eliminate time spent on data entry, passively collect spatial information (i.e., locations of interviews), and improve data quality through thoughtful form design (e.g., certain fields are required to submit).

Objective 3: Maintain and archive angler survey database(s) and provide support to management projects.

- A seasonal employee, Sarah Praisner, began reformatting and labeling historic lake and large river creel survey data files to facilitate the development of a single database. Work is ongoing.

Objective 4: Evaluate the potential for collecting angler information using alternative computer-based survey methods.

- FishBrain, a social media app for fishing where anglers can log their catches, started sharing all catches reported in Connecticut with the Fisheries Division quarterly on January 3rd, 2022.
 - While we are deeply appreciative of this collaboration, several data limitations are apparent. These include incorrectly identified fish, inaccurate catch locations, and a non-random group of anglers logging their catches.
 - Despite these limitations, additional efforts should be made to use this information as appropriate, especially in waters that we are unable to sample or where reporting patterns may indicate range expansions or contractions before our sampling detects them.
- Public ArcGIS Survey123 angler logs were also used to assess Lake Trout and Smallmouth Bass fisheries during the 2022-2023 performance period. Unfortunately, due to low angler participation, these data are of limited value.
 - Only two Lake Trout angler logs and 29 Smallmouth Bass angler logs were received, and several of the Smallmouth Bass reports were from non-targeted waterbodies or lacked critical information.
 - Lack of incentives and limited continued engagement with anglers likely play a role in low participation.

Moving Forward

- Complete the creel surveys at Quinebaug Lake, Wyassup Lake, and Pachaug Pond.
 - If Smallmouth Bass are transplanted into Quinebaug Lake and/or Wyassup Lake in the future, revisit these waters to evaluate fishery impacts.
- Assess possible long-term creel survey schedule that rotates among management types annually.
- Develop and implement a multi-year creel survey of Community Fishing Waters to better understand the angler desires and behaviors of the local communities.

- Research engagement strategies for electronic angler logs to increase participation (e.g., incentives, regular outreach, data sharing).
- Create a relational database for all Connecticut angler surveys.

Appendix A

Creel Survey Hourly Count Form

LAKE: _____

CREEL START TIME:

DATE: _____

Time Count Began: _____

Agent's Name: _____

Time Count Ended: _____

STRATA CODE (Circle one): (WD) Weekday (WE) Weekend (H) Holiday

WEATHER (Circle one in each category):

Precipitation: Clear P. Cloudy Overcast Light Rain Moderate Rain

Heavy Rain Lightning Storm Snow Fog

Wind: Calm Breezy Windy

Air Temp: _____ Water Temp: _____

COUNT OF ACTIVE ANGLERS

(triangle = 1 trolling boat; circle = 1 stationary boat; hash marks within shape = # of anglers in the boat)

BOAT	SHORE

TOTAL NUMBER OF: Fishing Boats: _____ Boat Anglers: _____ Shore Anglers: _____

IS THERE A TOURNAMENT ON THE LAKE TODAY? Yes No #Boats _____ #Anglers _____

COMMENTS:

Appendix B

Pachaug Pond

ID No. _____

Creel Survey Interview Form

**USE THIS FORM FOR PACHAUG PIER AS WELL, BUT DO NOT ASK SUPPLEMENTAL QUESTIONS*

DATE: _____ AGENT: _____ SAMPLE TIME: _____ # OF ANGLERS: _____

Fishing start time: _____ Current time: _____ What are you fishing for?: _____

Fishing from: Boat Shore
 Technique used: Derby/Tourney Trolling Downrigger Casting Bait Fly Rod
 Bait used: Lure Flies Worms Minnows Other bait _____

“How would you rate your success today?”
 _____ “1 Terrible 2 Poor 3 Average 4 Good 5 Excellent 6 Can’t tell yet”

“Would you mind if I measured your fish?”

<u>SPECIES</u>	<u>TOTAL LENGTH (truncate to lower cm)</u>	<u># Not Measured</u>
_____ *	_____	**
_____ *	_____	**
_____ *	_____	**

“Did you release any caught fish?”

<u>SPECIES</u>	<u>Numbers and lengths</u>	<u>SPECIES</u>	<u>Numbers and lengths</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Town/State From: _____ “How many times a year do you fish this lake, on average?” _____

“Have you been interviewed on this lake before?” Yes No (If yes, do not continue with questions)

1. “Have you ever caught a Northern Pike in this lake?” Yes No
2. “Are you aware Northern Pike are stocked in this lake?” Yes No
3. “Are you aware of the current regulations regarding Northern Pike in Connecticut waterbodies?”
Yes No

If no, then state “The Connecticut regulations for Northern Pike state that the fish must be a minimum of 26” in length with a daily creel limit of 2 fish”

4. “What are your opinions of the Northern Pike program in this lake?”
 “2) In Favor 1) Highly in favor 4) Opposed 5) Highly opposed 3) No Opinion”
5. “How likely are you to keep Northern Pike that you catch in this lake?”
 “2) Most of the time (>50%) 1) Always 4) Rarely (<10%) 3) Occasionally (0-50%) 5) Never”
- 5b. (If rarely or never) Why wouldn’t you keep Northern Pike you catch in this lake?”

Reliability of interview: Good Uncertain Poor Refused (if poor/uncertain) Why? _____

ADDITIONAL COMMENTS:

Quinebaug Lake/Wauregan Reservoir

ID No. _____

Creel Survey Interview Form

DATE: _____ AGENT: _____ SAMPLE TIME: _____ # OF ANGLERS: _____

Fishing start time: _____ Current time: _____ What are you fishing for?: _____

Fishing from: Boat Shore

Technique used: Derby/Tourney Trolling Downrigger Casting Bait Fly Rod

Bait used: Lure Flies Worms Minnows Other bait _____

“How would you rate your success today?”

_____ “1 Terrible 2 Poor 3 Average 4 Good 5 Excellent 6 Can’t tell yet”

“Would you mind if I measured your fish?”

<u>SPECIES</u>	<u>TOTAL LENGTH (truncate to lower cm)</u>	<u># Not Measured</u>
_____ *	_____	** _____
_____ *	_____	** _____
_____ *	_____	** _____

“Did you release any caught fish?”

<u>SPECIES</u>	<u>Numbers and lengths</u>	<u>SPECIES</u>	<u>Numbers and lengths</u>
_____	_____	** _____	_____
_____	_____	** _____	_____
_____	_____	** _____	_____

Town/State From: _____ “How many times a year do you fish this lake, on average?” _____

“Have you been interviewed on this lake before?” Yes No (If yes, do not continue with questions)

- “Are you aware Channel Catfish are stocked in this lake?” Yes No
- “Have you ever caught a Channel Catfish in this lake?” Yes No
- “Are you aware of the current regulations regarding CC in Connecticut waterbodies?” Yes No
If no, then state “The Connecticut regulations for Channel Catfish state that there is no minimum length with a daily creel limit of 6 fish, with the exception of community fishing waters”
- “What are your opinions of the Channel Catfish program in this lake?”
“2) In Favor 1) Highly in favor 4) Opposed 5) Highly opposed 3) No Opinion”
- “How likely are you to keep Channel Catfish that you catch in this lake?”
“2) Most of the time (>50%) 1) Always 4) Rarely (<10%) 3) Occasionally (0-50%) 5) Never”
- 5b. (If rarely or never) Why wouldn’t you keep Channel Catfish you catch in this lake?”
- “Are you aware that this lake is a Bass Management Lake with special regulations?” Yes No
If no, then state “The regulations for this lake state that LMB and SMB must be a minimum of 16” in length with a daily creel limit of 2 fish total.”
- “Have you ever caught a Smallmouth Bass in this lake?” Yes No
(If yes) “When was the last time you caught a Smallmouth Bass?” _____
- “According to our data, SMB appear to no longer be present in this lake. How would you feel if fish were transplanted to this lake to attempt to restart the fishery?”
“2) In Favor 1) Highly in favor 4) Opposed 5) Highly opposed 3) No Opinion”
- 8b. “Why would you be (previous answer) to this proposal?” _____

Reliability of interview: Good Uncertain Poor Refused (if poor/uncertain) Why? _____

ADDITIONAL COMMENTS:

Wyassup Lake

ID No. _____

Creel Survey Interview Form

DATE: _____ AGENT: _____ SAMPLE TIME: _____ # OF ANGLERS: _____

Fishing start time: _____ Current time: _____ What are you fishing for?: _____

Fishing from: Boat Shore
Technique used: Derby/Tourney Trolling Downrigger Casting Bait Fly Rod
Bait used: Lure Flies Worms Minnows Other bait _____

“How would you rate your success today?”
“1 Terrible 2 Poor 3 Average 4 Good 5 Excellent 6 Can’t tell yet”

“Would you mind if I measured your fish?”

<u>SPECIES</u>	<u>TOTAL LENGTH (truncate to lower cm)</u>	<u># Not Measured</u>
_____*	_____	**
_____*	_____	**
_____*	_____	**

“Did you release any caught fish?”

<u>SPECIES</u>	<u>Numbers and lengths</u>	<u>SPECIES</u>	<u>Numbers and lengths</u>
_____	_____	**	_____
_____	_____	**	_____
_____	_____	**	_____

Town/State From: _____

“How many times a year do you fish this lake, on average?” _____

“Have you been interviewed on this lake before?” Yes No (If yes, do not continue with questions)

1. “Are you aware that this lake is a Bass Management Lake with special regulations?” Yes No
If no, then state “The regulations for this lake state that LMB and SMB must be a minimum of 16”
in length with a daily creel limit of 2 fish total. ”

2. “Have you ever caught a Smallmouth Bass in this lake?” Yes No
(If yes) “When was the last time you caught a Smallmouth Bass?” _____

3. “According to our data, SMB appear to no longer be present in this lake. How would you feel if fish were transplanted to this lake to attempt to restart the fishery?”

“2) In Favor 1) Highly in favor 4) Opposed 5) Highly opposed 3) No Opinion”

3a. “Why would you be (previous answer) to this proposal?” _____

Reliability of interview: Good Uncertain Poor Refused (if poor/uncertain) Why? _____

ADDITIONAL COMMENTS:



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



Federal Aid in Sport Fish Restoration F-57-R-41
Annual Performance Report – F22AF01153
4/1/2022 to 3/31/2023

Grant Title: Inland Fisheries Research and Management
Study 2: Warmwater Fisheries Management
Job 3: Bass Research and Management

Report Prepared by: Andrew Bade and Spencer Mallette
Job Personnel: Andrew Bade, Co-Job Leader/Program Coordinator
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Christopher McDowell, Primary Staff
Lillian Glynos, Primary Staff
Mike Beauchene, Program Coordinator



Overview: Largemouth and Smallmouth Bass combined (henceforth “bass”) are Connecticut’s most popular freshwater gamefish with 2.1 million fishing days spent per year targeting bass (USFWS 2013). In addition, competitive tournament fishing for bass increased in Connecticut from approximately 124 tournaments in 1986 to 762 in 2022. Currently, the Fisheries Division has special bass fishing regulations on 29 lakes (Figure 1) and a section of the Housatonic River. However, Connecticut is at a crossroads with respect to bass management. Traditional management tools like minimum lengths, slot lengths, and creel limits are generally only effective when regulated harvest is occurring (Hessenauer et al. 2018). The bass regulations implemented in 2002 assumed that the regulated harvest levels documented during the preceding 20 years would continue. However, a shift in angler behavior towards catch-and-release (current regulated harvest levels for bass is <5%) has limited their effectiveness. Increased catch-and-release fishing for bass has also led to a reduction in catch rates due to repeated catch events creating learned avoidance behaviors (Hessenauer et al. 2016). Accordingly, the Fisheries Division developed a new [Bass Action Plan](#), which takes into account changes in angler behaviors and desires, advances in the scientific literature, and extensive public feedback. The final version of the plan was released in September 2022, and significant progress was made during the 2022-2023 grant period to implement various elements of the plan. This includes improvements to our data management practices, a return to intensive creel surveys, and a renewed focus on Smallmouth Bass.

Smallmouth Bass are in decline in several Connecticut lakes and ponds, particularly in the eastern half of the state. Several populations have apparently become extirpated based on electrofishing survey data and angler reports (See Figure 2 for extirpated populations and Figure 3 for reduced populations). Investigating the extent and causes of the decline, as well as developing strategies to stop or reverse the trend, has become an important focus area for bass management in Connecticut. Given their diverging population trends, and the fact that Smallmouth and Largemouth bass differ with respect to preferred habitat, preferred forage, growth rate, adult size, catchability, and fecundity, more species-specific management approaches may be required in the future.

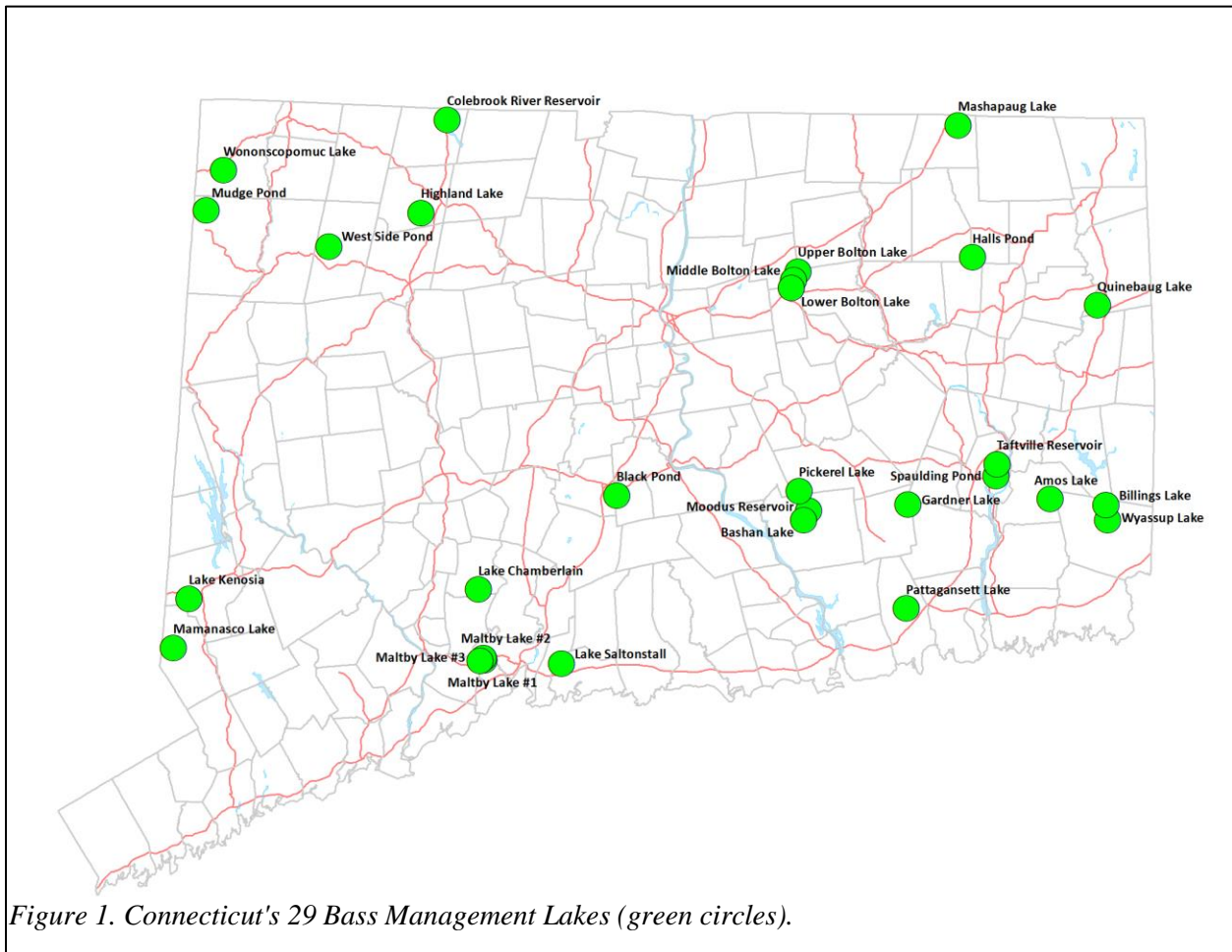


Figure 1. Connecticut's 29 Bass Management Lakes (green circles).

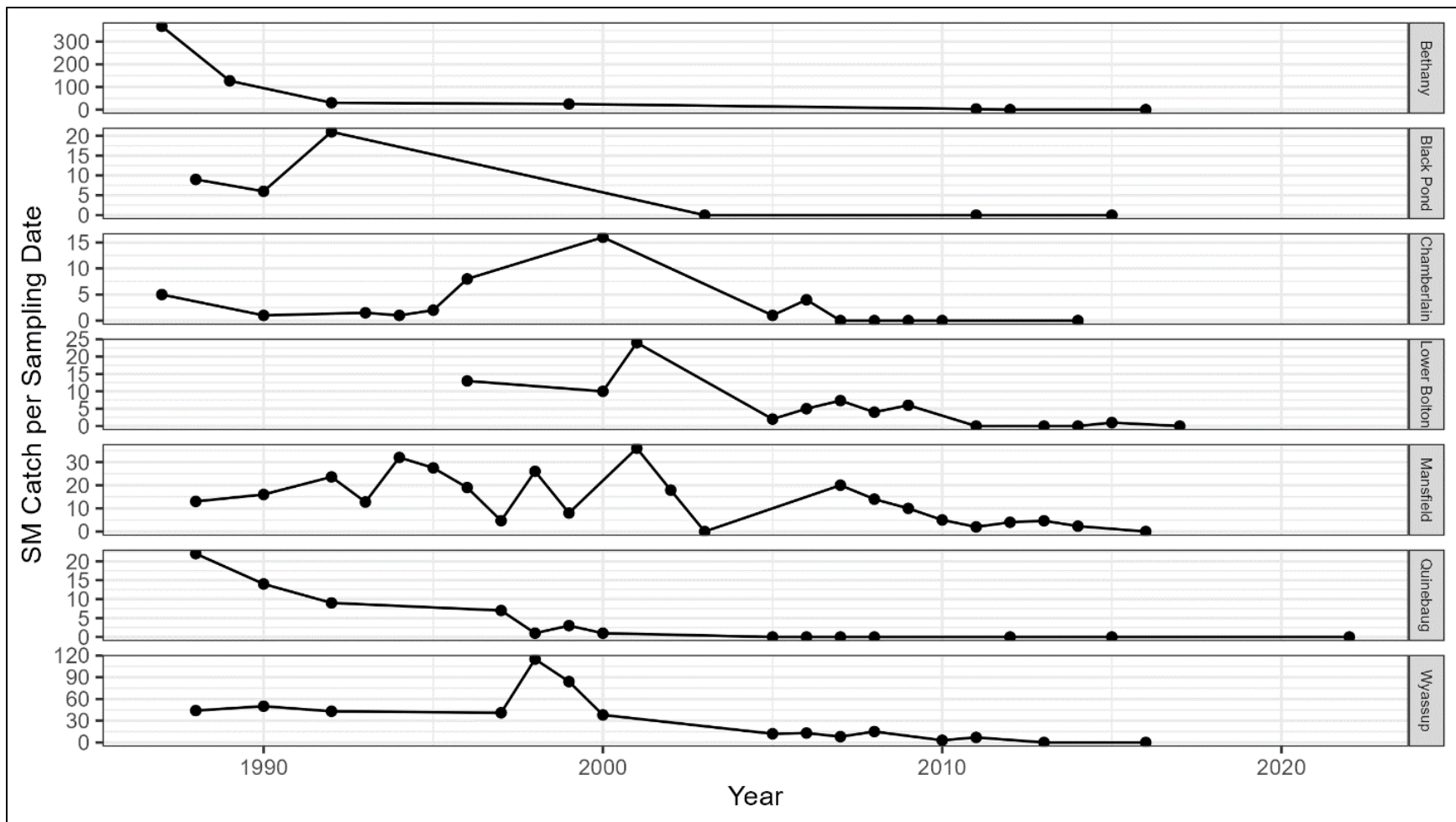


Figure 2. The apparent extirpation of Smallmouth Bass in Bethany Lake, Black Pond, Chamberlain Lake, Lower Bolton Lake, Mansfield Hollow Reservoir, Quinebaug Lake, and Wyassup Lake can be seen in electrofishing survey data as catches per sample have declined to zero. Note that Y-axes vary by lake to enhance visualization.

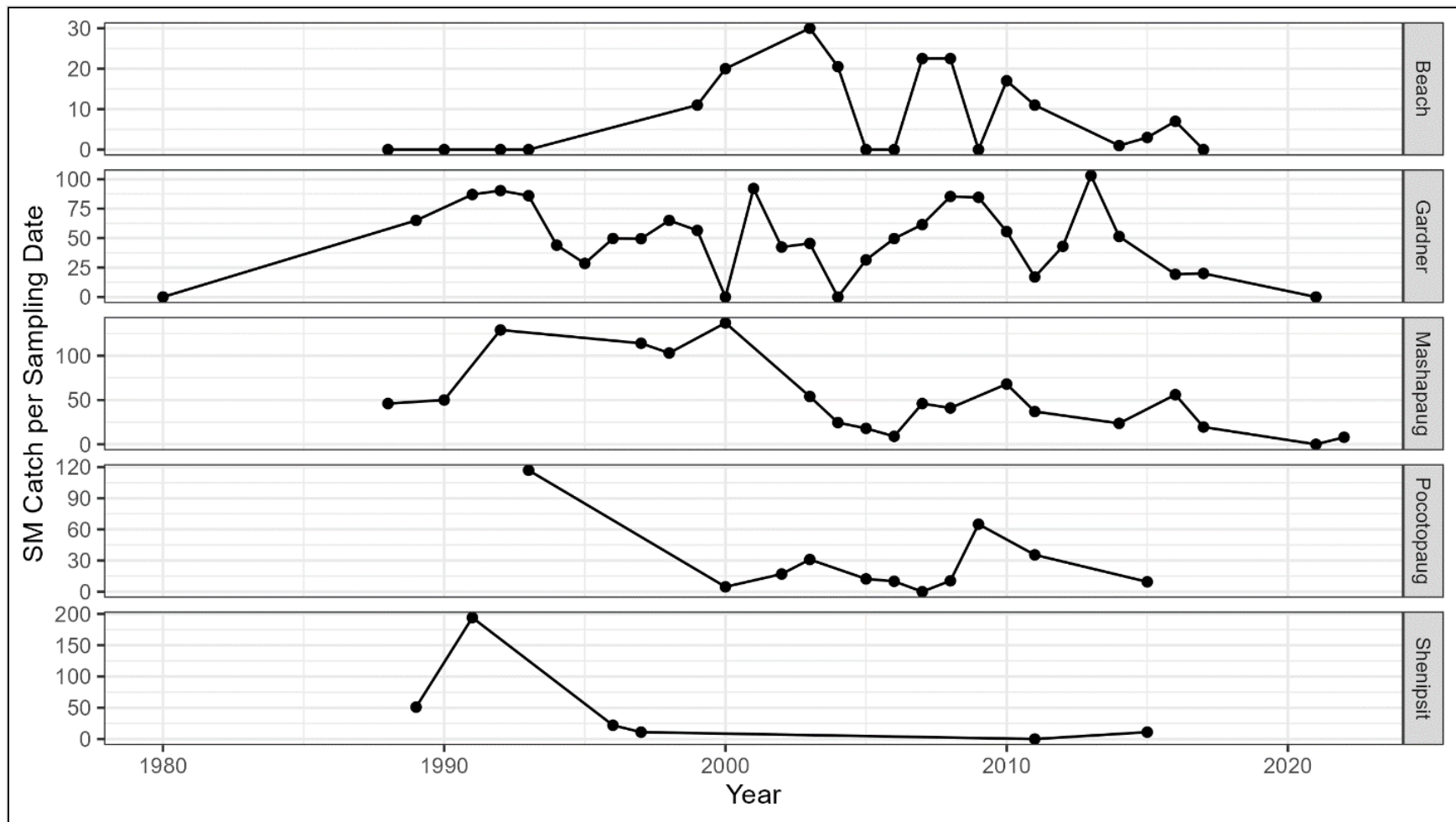


Figure 3. The reduction in Smallmouth Bass abundance in Beach Pond, Gardner Lake, Mashapaug Lake, Lake Pocotopaug, and Shenipsit Lake can be seen in electrofishing survey data as catches per sample have declined. Note that Y-axes vary by lake to enhance visualization.

The objectives for the bass management job are:

1. Continue to monitor Bass Management Lakes (BMLs) and other important bass fisheries via electrofishing on a rotational basis.
2. Monitor tournaments for bass catch rates and size structure in selected lakes.
3. Conduct angler surveys on important bass fisheries as resources permit.
4. Monitor changes in bass angler habits, attitudes and impacts on fisheries.
5. Investigate effects of catch-and-release mortality on bass populations.
6. Determine the need for modifications of traditional statewide and BML regulations.
7. Explore the possibilities of improving angling quality and bass population genetic structure through continued experiments involving stocking reservoir bass into public lakes.

Key Findings

Objective 1: Continue to monitor BMLs and other important bass fisheries via electrofishing on a rotational basis.

- The Fisheries Division sampled several BMLs and other important bass fisheries such as Bantam Lake, Candlewood Lake, Lake Zoar, and Beach Pond (Table 1).

Table 1. Shown are all BMLs and other important bass fisheries sampled during the 2022-2023 grant segment, along with waterbody management type and sample date(s).

Lake	Management Type	Sample Date(s)
Mashapaug Lake	BML/Walleye Management Lake (WML)	4/26/2022 and 10/11/2022
Lake Kenosia	BML/CML	5/16/2022
Moodus Reservoir	BML	5/17/2022 and 11/1/2022
Black Pond	BML/CML	5/18/2022 and 11/8/2022
Quinebaug Lake	BML/CML	5/31/2022
Mudge Pond	BML	6/2/2022 and 11/3/2022
Bantam Lake	Northern Pike Management Lake (PML)/Important Bass Fishery	5/12/2022 and 11/10/2022
Candlewood Lake	Important Bass Fishery	Section 1 on 6/8/2022 Section 3 on 6/7/2022 and 10/25/2022 Section 4 on 6/8/2022
Lake Zoar	Important Bass Fishery	6/6/2022 and 11/14/2022

Beach Pond	WML/Kokanee Management Lake/Important Bass Fishery	3/21/2023, 3/23/2023, 3/27/2023, 3/29/2023, and 3/30/2023
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Objective 2: Monitor tournaments for bass catch rates and size structures in selected lakes.

- While no in-person tournament monitoring was done, our EzFile tournament reporting system was used to monitor tournament results to better understand tournament participation, catch rates, and size structure. Tournament directors are required to submit information about catch and participation after each tournament.
 - Even though reporting is required, less than 25% of post-tournament reports were submitted during the 2022 tournament season. Estimates for total effort, catch, etc. were extrapolated from this subset.
- 755 bass tournaments took place across 46 waterbodies. These tournaments hosted an estimated 16,712 anglers with an average tournament size of 22 anglers. The total angling effort was estimated at 126,494 angler hours, with an average tournament length of approximately 7.5 hours.
- 15 waterbodies held 76% of all tournaments (Table 2). These waterbodies were responsible for an estimated 106,382 total angling hours, or 84% of tournament angling pressure.
 - Candlewood Lake, Connecticut’s largest lake, hosted 156 tournaments (20.6% of the total) from groups representing five different states.
 - Amos Lake, a small (112.4 acre) natural lake in southeast Connecticut, had the highest fishing pressure per acre, with over 27 tournament angling hours per acre.
- Tournaments typically have a 5-fish bag limit, but the average reported bag size was 1.21 per angler, with an average fish weight of 2.16 pounds.
 - Based on the estimated average bag size, approximately 22,430 bass were entered into fishing tournaments, weighing in at an estimated 48,614 pounds. These numbers do not reflect the total number of fish caught by anglers during tournaments as bass that are below 12 inches, or otherwise do not enhance the angler’s bag, are released prior to weigh in.
 - Candlewood Lake had the second highest reported bag size, at 1.78 fish per angler and was the only waterbody that averaged over 3 pounds per fish (3.01), whereas Moodus Reservoir had the smallest average size for black bass at just over 1 pound per fish (1.17).
- Edwards et al. (2004) estimated a 2.8% tournament mortality rate for bass in Mansfield Hollow Reservoir and Gardner Lake. This is below what is typically reported (e.g., 4-10% immediate mortality rates in the following: Kwak and Henry 2004; Driscoll et al. 2007, Sylvia and Weber 2022). Assuming an average bag size of 1.21 fish, the estimated total immediate tournament mortality has a likely range of 628 to 2,243 bass.

Table 2: Estimated number of bass weighed in at bass tournaments at the 15 most popular bass tournament waters in Connecticut from April 1 to March 31, 2023. Total bass caught was calculated by extrapolating average catch/hour to non-reporting tournaments, while estimated weight was calculated using total bass caught multiplied by average bass weight. The CT mortality estimate is from Edwards, et al. (2004). The estimated mortality rates of 4-10% are based off tournament mortality reports from other states. Lakes with an asterisk are Bass Management Lakes.

Lake	# of Tournys	Anglers/ Tourny	Angling Hours	Acres	Angling Hours/Acre	Bag Size	Total Bass Caught	Average Weight (lbs)	Total Weight (lbs)	CT Mortality Estimate (2.8%)	Mortality Range (4-10%)
All	755	22.1	126,494	-	-	1.21	22,430	2.16	48,449	628	897 - 2,243
Amos Lake*	23	17.2	3,044	112.4	27.1	1.00	434	2.31	1,003	12	17 - 43
Aspinook Pond	24	16.8	2755	308.8	8.9	1.03	383	1.49	571	11	15 - 38
Bantam Lake	26	17.5	3,528	955.4	3.7	1.58	766	1.58	1,210	21	30 - 76
Beach Pond	11	17.2	1,454	348.5	4.2	1.51	275	1.70	468	8	11 - 27
Candlewood Lake	158	31.8	41,081	5,085.6	8.1	1.78	9,204	3.01	27,704	258	368 - 920
Connecticut River	64	28.3	13,182	N/A	N/A	0.88	1,829	2.01	3,676	51	73 - 182
Gardner Lake*	39	22.8	5,931	527.3	11.2	1.31	1,177	1.54	1,813	33	47 - 117
Highland Lake*	29	16.5	3,744	448.2	8.4	1.36	665	2.29	1,523	19	26 - 66
Lake Lillionah	56	21.3	9,419	1,594.8	5.9	1.84	2,300	2.27	5,221	64	92 - 230
Lake Zoar	34	20.4	5,594	919.8	6.1	1.31	1,012	1.84	1,862	28	40 - 101
Mansfield Hollow Reservoir*	48	25.7	8,273	429.5	19.3	0.87	1,198	2.04	2,444	34	47 - 119
Moodus Reservoir*	12	11.3	976	440.7	2.2	1.59	237	1.17	277	7	9 - 23
Pachaug Pond	17	21.4	2,646	817.0	3.2	1.12	394	2.09	823	11	15 - 39
Pattagansett Lake*	13	13.0	1,518	125.7	12.1	1.67	354	1.76	623	10	14 - 35
Quaddick Reservoir	22	19.1	3,237	202.8	16.0	1.07	436	1.86	811	12	17 - 43

Objective 3: Conduct angler surveys on important bass fisheries as resources permit.

- The Fisheries Division began a roving creel survey on March 1st, 2023, on three important bass angling waterbodies in eastern Connecticut (Quinebaug Lake, Wyassup Lake, and Pachaug Pond). For further information on the methodology and locations of these creels, refer to Objective 1 of the Lake and Large River Angler Surveys job. This survey is expected to run until October 31, 2023.
- Quinebaug Lake and Wyassup Lake are both locations where Smallmouth Bass have apparently become extirpated. These surveys will help us better understand if Smallmouth Bass are truly extirpated and determine angler attitudes about potential future reintroductions. Results from this survey will be available in the next Annual Performance Report.

Objective 4: Monitor changes in bass angler habits, attitudes and impacts on fisheries.

- Extensive public engagement was used to help develop the Draft Bass Action Plan. During a public comment period for the draft plan, constituents were further engaged through an electronic survey, webinars, and in-person stakeholder meetings. Our [Bass Action Plan webpage](#) includes the draft plan, the final plan, a summary of changes, and answers to frequently asked questions. Additionally, detailed survey results can be found in the appendix of the Bass Action Plan itself.
 - These efforts highlighted the continued popularity of catch-and-release fishing.
 - 71% of survey respondents favored stricter harvest regulations for bass.
 - 62% favored stricter regulations during the bass spawning season.
 - 89% favored supplemental stocking of bass, including 88% support for a State hatchery-based program.
 - Asked to list the top threats to bass fishing in Connecticut, non-tournament anglers identified fishing pressure as the number one threat. Tournament anglers identified aquatic vegetation treatments (e.g., herbicides) as the primary threat.
- The ongoing creel survey on Quinebaug Lake, Wyassup Lake, and Pachaug Pond will also provide information on bass angler habits, attitudes, and fishery impacts. Results will be presented in the next segment report.

Objective 5: Investigate effects of catch-and-release mortality on bass populations.

- Catch and release mortality estimates from the literature applied to recent tournament reporting data suggest that total catch-and-release mortality from tournament sources may be quite low, with fewer than one mortality per tournament on average.
 - However, mortality is underestimated as mortality from bass which are caught but not weighed in is not considered. More intensive tournament monitoring to fill this data gap could improve estimates.
- The ongoing creel survey will also provide insight into the number of bass catch events and voluntary release rate, which can be used to estimate total catch-and-release mortality

using mortality estimates from the literature. Results will be reported in the next project segment.

Objective 6: Determine the need for modifications of traditional statewide and BML regulations.

- The Fisheries Division published the Bass Action Plan, which is the culmination of extensive, iterative public feedback, literature review, consultations with biologists from other states, and reviewing decades of fish community and angler data in Connecticut.
 - The plan includes several suggested regulatory changes including experimental reduced bag limits and/or allowable bass tournament durations during the summer months on BMLs, implementing a protected slot as a statewide regulation, assessing the feasibility of closed areas and/or bait restrictions during the spawning season, extending the Bull’s Bridge Bass Management Area upstream to Massachusetts, and adding a minimum length limit and reduced bag for riverine bass. Public feedback and continued evidence of the ineffectiveness of current regulations point to the need for new strategies, but implementation of alternatives remains in the early stages.

Objective 7: Explore the possibilities of improving angling quality and bass population genetic structure through continued experiments involving stocking reservoir bass into public lakes.

- The angler surveys at Quinebaug Lake and Wyassup Lake are in part to assess angler interest in reintroductions of Smallmouth Bass. Wild fish pathology testing with the USFWS Lamar Fish Health Center was also scheduled during the performance period to better understand the potential risks associated with transplanting bass from reservoirs. Results from both of those efforts will be available in the next segment report.
- Further, the Fisheries Division evaluated options to raise reservoir-origin bass in our hatcheries. A cost-effective plan to raise ~30,000 bass to fryling size that did not impact trout production was developed that may represent a path forward to sustainably stock reservoir-origin bass.

Moving Forward

- Return to in-person tournament monitoring at important bass tournament lakes to fill data gaps related to tournament mortality and efficiently estimate bass population sizes and size structures.
- Develop strategy to improve tournament reporting rates.
- Coordinate with the Habitat Conservation and Enhancement program to include lake and pond habitat assessment and enhancement as part of a broader bass management strategy.
 - Develop methodology for evaluating Mossback habitat structures installed by Connecticut Bass Nation members in Lake Lillinonah, Lake Housatonic, and Lake Zoar in 2017 to assess usage by bass and other resident fish species.

- Evaluate the impact of Grass Carp on Candlewood Lake’s bass fishery through continued monitoring.
- Continue to pursue additional fishing access at select drinking water reservoirs that are currently closed to fishing.
- Proactively monitor important bass fisheries for targeted pathogens.
- Implement and evaluate a Smallmouth Bass stocking program that uses direct transplants from natural populations and/or frylings raised in the hatcheries to recreate Smallmouth Bass fisheries where they have become extirpated.
- Improve knowledge of riverine bass populations and use data to inform updated regulations for riverine bass.

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



Federal Aid in Sport Fish Restoration F-57-R-41
Annual Performance Report – F22AF01153
4/1/2022 to 3/31/2023

Grant Title: Inland Fisheries Research and Management
Study 2: Warmwater Fisheries Management
Job 4: Northern Pike Management

Report Prepared by: Christopher McDowell
Job Personnel: Christopher McDowell, Job Leader
Spencer Mallette, Primary Staff
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Mike Beauchene, Program Coordinator
Andrew Bade, Program Coordinator



Overview: Northern Pike, Connecticut’s largest freshwater sportfish, was introduced to Connecticut in the 1970s to create an exciting fishing opportunity and take advantage of abundant forage fish populations. Northern Pike management adds to the diversity and quality of Connecticut’s freshwater fishing opportunities. None of the Northern Pike Management Lakes (PMLs) have enough natural reproduction to support a directed fishery. They are supplemented or completely supported by annual stockings of three to six-inch Northern Pike “fingerlings” that are raised in small, managed marshes located in Haddam and Mansfield, Connecticut, or purchased from a commercial vendor in Minnesota. Maintaining existing fisheries through marsh management and fingerling stocking, along with development of additional Northern Pike fisheries, where appropriate, will ensure angler access to a unique and popular sport fishery. Currently, the Fisheries Division stocks fingerlings into four PMLs: Bantam Lake (Morris/Litchfield), Mansfield Hollow Reservoir (Mansfield), Pachaug Pond (Griswold) and Winchester Lake (Winchester) (Figure 1). Lake Lillinonah (Brookfield/Bridgewater/Newtown/New Milford/Roxbury/Southbury), which is not a PML and is typically not stocked by the Fisheries Division, receives annual stockings of yearling Northern Pike and Tiger Muskie from the Lake Lillinonah Authority (LLA) through permits issued by the CT DEEP Fisheries Division. The Fisheries Division also stocks Northern Pike fingerlings into the Haddam area of the Connecticut River to supplement its self-sustaining population.

The objectives for the Northern Pike management job are:

1. Continue to produce fingerling Northern Pike from managed spawning marshes and stock into selected lakes.

2. Monitor Northern Pike populations where they have become established as resources permit.
3. Perform population estimates and angler surveys in PMLs on a rotational basis, as resources permit.
4. Evaluate potential sources of additional fingerling Northern Pike to augment current in-state production.
5. Evaluate the most cost-effective method or combination of methods of procuring or producing fingerling Northern Pike to maintain our PMLs.
6. Assess the need for creation of additional Northern Pike fisheries and determine which new lakes have the most potential for supporting Northern Pike.

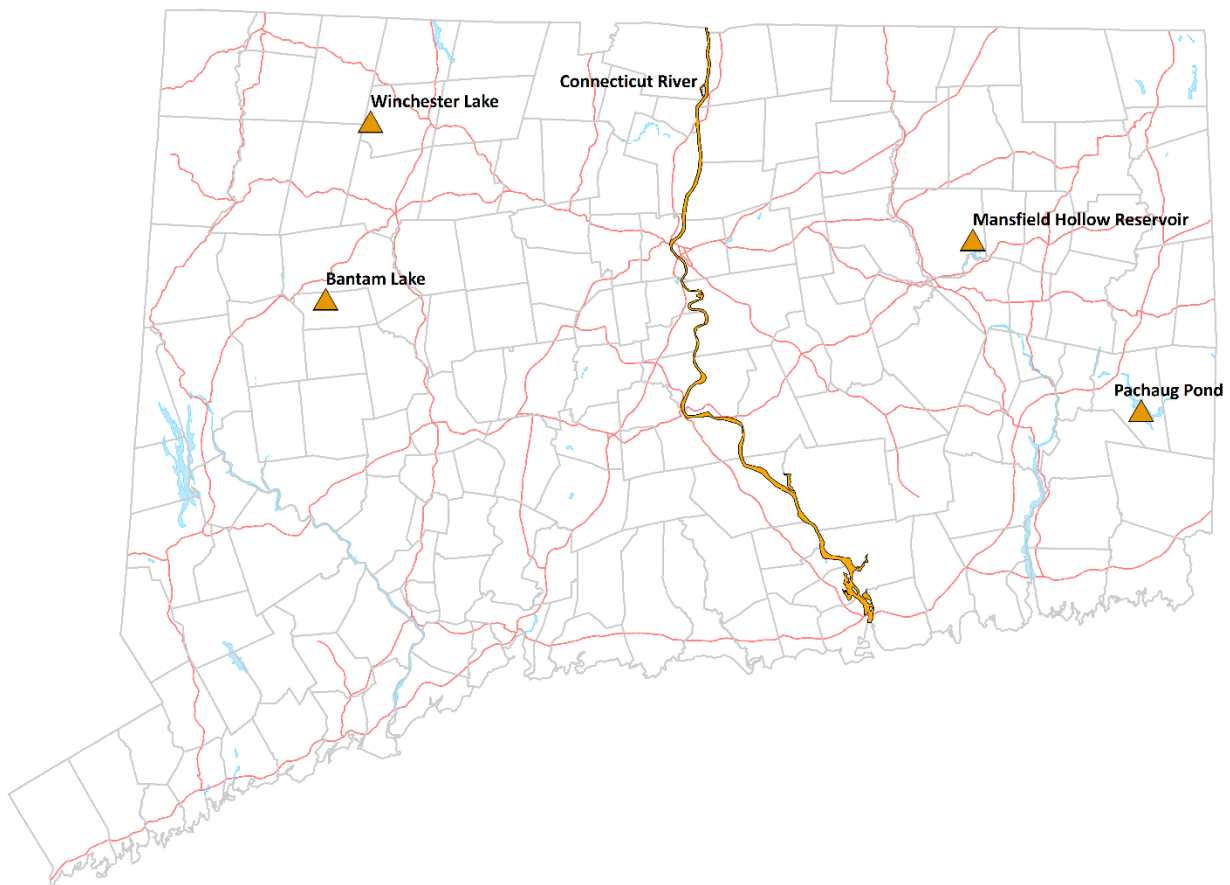


Figure 1. Connecticut's four Northern Pike Lakes (orange triangles). Also highlighted in orange is the Connecticut River, which has a self-sustaining Northern Pike that has been supplemented by Northern Pike raised in the Haddam marsh. Winchester Lake and the Connecticut River were not stocked in 2022.

Key Findings

Objective 1: Continue to produce fingerling Northern Pike from managed spawning marshes and stock into selected lakes.

- The Fisheries Division stocked at total of 11,736 Northern Pike fingerlings in 2022. The Mansfield Marsh produced 10,182 Northern Pike fingerlings (Figure 2) that averaged 5.3 inches (range 3.5-8.0 inches). From Minnesota, the FD purchased 1,554 smaller Northern Pike fingerlings (average length 3 inches, range 2.6-3.6 inches). The FD did not meet the annual stocking goal of 12,864 fingerlings. The fingerlings were stocked into three waterbodies (Table 1): Bantam Lake, Mansfield Hollow Reservoir, and Pachaug Pond.

Table 1. Number of Northern Pike fingerlings stocked into Connecticut’s Pike Management Lakes and the lower Connecticut River in 2022.

Lake	Number Stocked	% of Target Number
Bantam Lake*	1,554	82.0%
Lower Connecticut River	0	0%
Upper Connecticut River	0	0%
Mansfield Hollow Reservoir**	5,545	241.1%
Pachaug Pond**	4,661	110.8%
Winchester Lake	0	0%

**Stocked with Minnesota fingerlings in 2022.
**Mansfield Hollow Reservoir and Pachaug Pond were stocked with fish produced from the Mansfield Hollow spawning marsh. These fingerlings were derived from both fry provided free of charge from the Hackettstown, New Jersey fish hatchery and pre-spawn Northern Pike broodstock from Bantam Lake.*

- The Upper and Lower marshes located at Haddam Meadows State Park have not been operated since 2019 due to water control infrastructure and access issues. These challenges are being addressed but may take several years to be fully resolved.
- Northern Pike fingerling production from the Mansfield Hollow Marsh was the fourth highest production since the marsh’s inception. The marsh was stocked with 24 (17 males and seven females) pre-spawn Northern Pike.
- On 6/20/2022, the Fisheries Division received 1,554 Northern Pike fingerlings (average length 3.0 inches, range 2.6-3.6 inches) from West Central Bait & Fisheries Co. Inc., MN. (Figure 3). All fish were stocked into Bantam Lake.
 - 17,818 Northern Pike “frylings” (i.e., fish ranging in size between 2-3 inches with no fish being smaller than 2 inches) were ordered. However, cannibalism and transportation stress in the days leading up to stocking led to 91% mortality. This is the third consecutive year that Bantam Lake has been stocked exclusively with Minnesota pike fingerlings.

Objective 2: Monitor Northern Pike populations where they have become established as resources permit.

- No action taken towards this objective in 2022-2023.

Objective 3: Perform population estimates and angler surveys in Pike Management Lakes on a rotational basis as resources permit.

- Bantam Lake was sampled using trap nets to estimate the number of catchable size Northern Pike. This sampling was specifically to assess if the Minnesota-purchased Northern Pike fingerlings stocked since 2019 were successful in creating multiple year classes of catchable size fish. Five trap nets were deployed across multiple dates beginning March 16, 2022. All nets were set by March 21, 2022. Nets were removed across multiple dates, with all nets being taken out of Bantam Lake on 4/12/2022. Nets were set in historically sampled locations where pre-spawn Northern Pike were assumed to be traveling to access spawning habitat. A total of 121 trap net days of sampling was performed. Trap net days are calculated by adding together the number of days each net was “working” in the water. Nets were deployed and removed across multiple dates resulting in different “working” times for each net.
- Table 2 shows the results of the 2022 Northern Pike population assessment and the next most recent population assessment from 2007. The estimated population size in 2022 is lower than in 2007, but the difference was not statistically significant. This difference may be driven by environmental factors that made it challenging to effectively sample Northern Pike in 2022 and/or by two years of poor supplemental stocking. Improved survival of Minnesota fingerlings, continued in-lake spawning, and supplemental stocking from our Mansfield Northern Pike marsh when possible, will hopefully increase the number of catchable size Northern Pike in Bantam Lake moving forward.

Table 2. The 2022 Northern Pike relative abundance estimate compared to the 2007 population estimate. In 2022, only trap nets were used and in 2007 both trap net and night electrofishing sampling was performed at Bantam Lake, Litchfield/Morris.

Relative Estimate Data by Standard Size Class		
Equal to or greater than stock size (≥ 14 IN)	2007	2022
<i>N</i>	1,306	598
<i>95% CI</i>	746-2,527	334-1,218
<i>#/Acre (Range)</i>	1.4 (0.79-2.7)	0.6 (0.4-1.3)

- Beginning in February 2023, five trap nets were set in various areas of Pachaug Pond to assess the relative abundance of the Northern Pike population. The nets were pulled on April 3, 2023. Twenty-four pre-spawn broodstock (eight females and 16 males) were retained and brought to the Mansfield Marsh to spawn. Data has been entered into the Microsoft Access relational database. Error checking and analysis will occur during the next project segment (2023-24) and results will be presented in the next segment report.

- A boat-based roving angler survey started on March 1, 2023, at Pachaug Pond. This angler survey is being conducted to assess angler effort, catch, harvest, and opinions regarding Northern Pike in the lake. The survey is expected to run until October 31, 2023. Results will be provided in the next segment report.

Objective 4: Evaluate potential sources of additional fingerling Northern Pike to augment current in-state production.

- No action taken towards this objective in 2022-2023.

Objective 5: Evaluate the most cost-effective method or combination of methods of procuring or producing fingerling Northern Pike to maintain our PMLs.

- Precise cost-benefit analyses are challenging in this context for several reasons.
 - The Fisheries Division received 1,554 Northern Pike fryling (average length 3.0 inches, range 2.6-3.6 inches) on 6/20/2022 from West Central Bait & Fisheries Co. Inc., MN. Given that the fish were received in relatively poor condition, future monitoring will be required to estimate the number of recruits from this stocking event and thus estimate cost-effectiveness.
 - Managed marsh cost-per-recruit was not estimated in 2022, but is historically extremely variable, driven by highly variable production.
- As the different Northern Pike sources have uncorrelated probabilities of success, it is recommended that a diverse portfolio of sources be maintained to maximize the probability of meeting stocking allocation goals in any given year.



Figure 2. Picture of a Connecticut raised Northern Pike fingerling from the Haddam Connecticut managed spawning marsh.



Figure 3. Connecticut Fisheries Division staff receiving the Minnesota Northern Pike fingerlings at Bantam Lake on 6/20/2022. One of the Minnesota fingerlings can be seen in the upper left-hand corner.

Objective 6: Assess the need for creation of additional Northern Pike fisheries and determine which new lakes have the most potential for supporting Northern Pike

- No action taken towards this objective in 2022-23.

Moving Forward

- Continue to pursue necessary infrastructure modifications to the Haddam Marsh water control structures.
 - In 2021, the Fisheries Division met with ConnOSHA to come up with mitigation measures to address the safety issues discovered at both the Haddam marshes.
- Conduct a single-gear relative abundance estimate of Northern Pike at Pachaug Pond, Griswold in March/April 2022.
 - Data will be used to assess the current structure of the Northern Pike population here and compare results against the 2007 multi-gear population estimate.
- Collect broodstock from Pachaug Pond.
 - During the population estimate at Pachaug Pond, we plan to collect 24 pre-spawn Northern Pike adults (8 females and 16 males) to use as broodstock for the Mansfield Hollow Reservoir Northern Pike Spawning Marsh
- Purchase Northern Pike frylings from a private vendor to augment numbers of Northern Pike produced in the Connecticut marshes.



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Federal Aid in Sport Fish Restoration F-57-R-41
Annual Performance Report – F22AF01153
4/1/2022 to 3/31/2023

Grant Title: Inland Fisheries Research and Management
Study 2: Warmwater Fisheries Management
Job 5: Walleye Management

Report Prepared by: Christopher McDowell
Job Personnel: Christopher McDowell, Job Leader
Spencer Mallette, Primary Staff
Lillian Glynos, Primary Staff
Mike Beauchene, Program Coordinator
Andrew Bade, Program Coordinator

Overview: Walleye is one of the most popular gamefish in North America (Scott and Crossman 1973, Eddy and Underhill 1974). They grow to large size, can be caught throughout the year using a variety of techniques, and provide excellent table fare. Walleye are also efficient predators that can utilize abundant forage fish populations. Overall, Walleye management adds to the diversity and quality of Connecticut’s freshwater fishing opportunities. Because natural reproduction of this species in Connecticut lakes appears nonexistent, the Fisheries Division annually stocks fingerlings. Walleye fisheries are maintained by stocking four to seven-inch fingerlings during late October/early November. Starting in 2015, the Connecticut Fisheries Division began stocking “large” fingerlings (6-8-inch) into Gardner and Mashapaug lakes to determine if this larger size-at-stocking would improve recruitment to the fishery. Fingerlings are purchased with Federal Sport Fish Restoration funds from a commercial supplier in Minnesota for the 10 State-owned Walleye Management Lakes (WML) (Figure 1). Two water companies and one municipality purchase their Walleye allotments using their own budgets. Stocking of all waters occurs on the same day from the same vendor as the fish are concurrently shipped.

The objectives for the Walleye Management job are:

1. Maintain quality Walleye fisheries in the WMLs.
2. Evaluate the effects of stocking rates on Walleye growth and abundance.
3. Continue to evaluate the effectiveness of current regulations in maintaining quality Walleye fisheries.
4. Evaluate the performance of larger 7-inch fingerlings relative to 5-inch fingerlings in selected lakes.
5. Identify additional lakes that are likely to support successful Walleye fisheries.

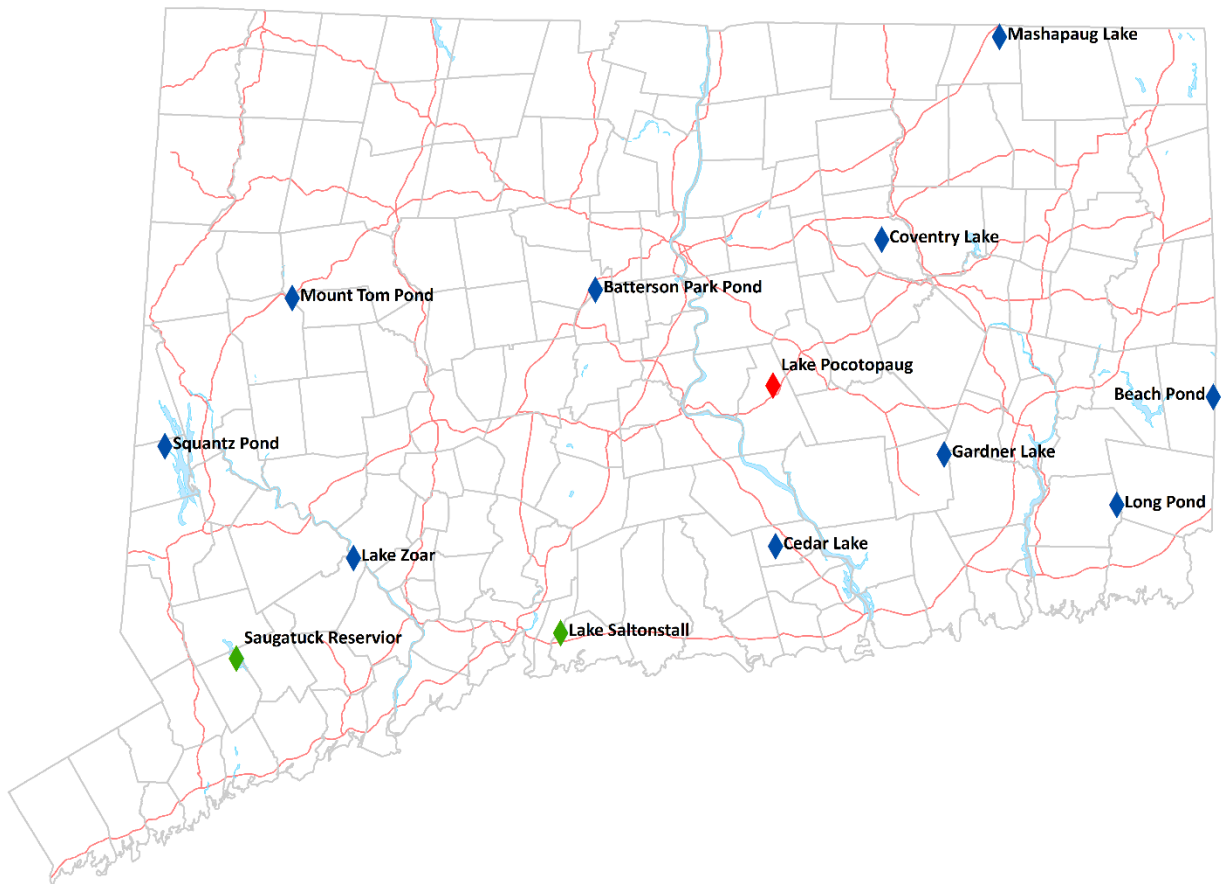


Figure 1. Connecticut waters stocked with Walleye fingerlings on October 24, 2022. Blue diamonds denote State owned Walleye Management Lakes (WMLs). Green diamonds denote the two water company lakes (Lake Saltonstall and Saugatuck Reservoir), and the lone red diamond denotes a private waterbody (Lake Pocotopaug). The Walleye purchased by the water companies and private waterbody are paid for by the water company/municipality. The Walleye for these three waters are shipped on the same truck and stocked on the same day as the Fisheries Division’s delivery.

Key Findings

Objective 1: Maintain quality Walleye fisheries in the WMLs.

- A total of 26,613 (23,243 “small” 4-6 inch and 3,370 “large” 6-8 inch) Walleye fingerlings were stocked into ten State-managed WMLs on October 24, 2022 (Table 1). Transport and handling mortality was slightly higher this year at 4.6% than the three-year average of 3.7 % for the State purchased fish, driven mostly by the high mortality of the Beach Pond allotment (21.5%).
 - Beach Pond mortality was likely driven by a vendor transport tank issue. Hundreds of dead and dying fish were found in the vendor tanks that were

delivered to Beach Pond. The Walleye were further stressed by a relatively long transport time from the vendor truck to Beach Pond.

- The two water companies (the South Central Connecticut Regional Water Authority that oversees Lake Saltonstall [Branford/East Haven] and Aquarion Water Company that oversees Saugatuck Reservoir [Easton/Redding/Weston]) and the Town of East Hampton (which oversees Lake Pocotopaug) purchased 9,318 Walleye fingerlings. These fish were delivered on the same truck and distributed by Fisheries Division staff. This year, the South Central Regional Water Authority opted to stock a mixed load of “small” and “large” Walleye fingerlings into Lake Saltonstall. They requested 1,860 fingerlings (660 “large” and 1,200 “small”), but due to transport and handling mortality, that total was slightly lower at approximately 1,850. Aquarion and the Town of East Hampton opted to stock the “small” fingerlings.
- As in previous years, the Fisheries Division purchased 12.5% of their fingerlings in the “large” category (Photo 5). These larger fingerlings have been stocked into Mashapaug and Gardner lakes for the last seven years as part of an ongoing experiment to see if stocking larger sized Walleye will create more adults. The remaining “small” sized fingerlings were stocked into Batterson Park Pond (New Britain/Farmington), Beach Pond (Voluntown/Exeter, Rhode Island), Cedar Lake (Chester), Coventry Lake (Coventry), Lake Zoar (Monroe/Oxford/Newtown/Southbury), Mount Tom Pond (Morris/Litchfield/Washington), Squantz Pond (New Fairfield/Sherman), and Long Pond (Ledyard/North Stonington).



Figure 2. Examples of “large” and “small” Walleye fingerlings. Left photo is a “large” (7-inch) Walleye fingerling and right photo is a “small” (5-inch) Walleye fingerling.

Table 1. 2021 Walleye stocking locations, numbers stocked and size class. Size class is either “large” for 6-8 inch fish or “small” for 4-6 inch fish.

Waterbody Name	Town	Approximate number stocked	Size Class
Batterson Park Pond	Farmington/New Britain	2,083	Small
Beach Pond	Voluntown/Exeter, RI	2,903	Small
Cedar Lake	Chester	1,032	Small
Coventry Lake	Coventry	1,090	Small
Gardner Lake	Bozrah/Montville/Salem	2,170	Large
Lake Pocotopaug*	East Hampton	1,472	
Lake Saltonstall^	Branford/East Haven	1,850 (1,195 & 655)	Small & Large
Lake Zoar	Monroe/Oxford/Newtown/Southbury	9,590	Small
Long Pond	Ledyard/North Stonington	1,624	Small
Mashapaug Lake	Union	1,200	Large
Mount Tom Pond	Morris/Litchfield/Washington	835	Small
Saugatuck Reservoir^	Easton/Redding/Weston	5,996	Small
Squantz Pond	New Fairfield/Sherman	4,086	Small
<p><i>*Lake Pocotopaug is a private waterbody open to town of East Hampton residents only. The Town of East Hampton purchases Walleye fingerlings using their own budget.</i></p> <p><i>^Lake Saltonstall (owned by the South Central Connecticut Regional Water Authority) and Saugatuck Reservoir (owned by the Aquarion Water Company) purchased Walleye fingerlings using their own budget, but to save shipping costs their order is shipped on the same truck as the CT DEEP Fisheries Division’s order and is distributed to them by Fisheries Division staff.</i></p>			

Objective 2: Evaluate the effects of stocking rates on Walleye growth and abundance;

- From March 20, 2023 to April 28, 2023, a multi-gear Walleye population estimate was performed in Beach Pond (Voluntown). This assessment used five trap nets set in various areas of the lake as well as multiple nights of nighttime boat electrofishing. Data has been entered into the Microsoft Access relational database. Error checking and analysis will occur during the next project segment (2023-24) and results will be presented in the next segment report.
- Multiple nighttime boat electrofishing samples were carried out on Cedar Lake (Chester) and Long Pond (Ledyard/North Stonington) during March and April 2023 to assess relative abundance of the Walleye populations within these lakes. Data has been entered into the Microsoft Access relational database. Error checking and analysis will occur during the next project segment (2023-24) and results will be presented in the next segment report.

Objective 3: Continue to evaluate the effectiveness of current regulations in maintaining quality Walleye fisheries.

- No action taken towards this objective during the 2022-2023 grant period.

Objective 4: Evaluate the performance of larger 7-inch fingerlings relative to 5-inch fingerlings in selected lakes.

- See McDowell et al. 2022 for population estimate work carried out at Mashapaug Lake, Union in 2022 and Gardner Lake, Salem/Bozrah/Montville in 2021.

Objective 5: Identify additional lakes that are likely to support successful Walleye fisheries.

- No action taken towards this objective during 2022-23 grant period.

Moving Forward

- Purchase the same number and sizes of Walleye fingerlings for fall 2023 stocking.

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Federal Aid in Sport Fish Restoration F-57-R-41
Annual Performance Report – F22AF01153
4/1/2022 to 3/31/2023

Grant Title: Inland Fisheries Research and Management
Study 2: Warmwater Fisheries Management
Job 6: Channel Catfish Management

Report Prepared by: Christopher McDowell
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Overview: Channel Catfish is a popular sportfish species across much of the United States. In Connecticut, naturalized populations of Channel Catfish occur within the Connecticut, Housatonic, and Thames rivers. These naturalized populations, especially in the Connecticut River, hold considerable untapped angling potential. Because Channel Catfish stockings can create fishing opportunities in small urban ponds (Stuewe 1999), they represent a promising option to expand fishing opportunities for residents living in densely populated areas (Barry et al. 2011). Recognizing this potential, the Fisheries Division initiated a Channel Catfish stocking program in 2007 to increase Connecticut’s diversity of recreational fishing opportunities. Catfish Management Lakes were stocked under two different strategies. The first is stocking of adult (14-18 inch) Channel Catfish into Community Fishing Waters (CFWs) to support “put-and-take” fisheries that would provide immediate opportunities for anglers to catch and harvest large Channel Catfish. The second strategy involved a “put-and-grow” model where smaller (9-11 inch) yearling Channel Catfish were stocked in several lakes. Because they were less expensive than adults, more locations could be stocked, and there was the expectation that they would survive and grow to desirable (catchable) size within 1-2 years. Since 2007, the Fisheries Division has expanded the number of waterbodies stocked with Channel Catfish to 24. However, beginning in 2019, the Fisheries Division switched to purchasing and stocking only adult Channel Catfish (for an immediate and predictable return to anglers) within the CFWs (Figure 1). Stocking of yearling catfish has been paused as assessment of the number and size of Channel Catfish in these “put-grow-take” waters indicates the fish have more than doubled in size and are of sufficient quantity.

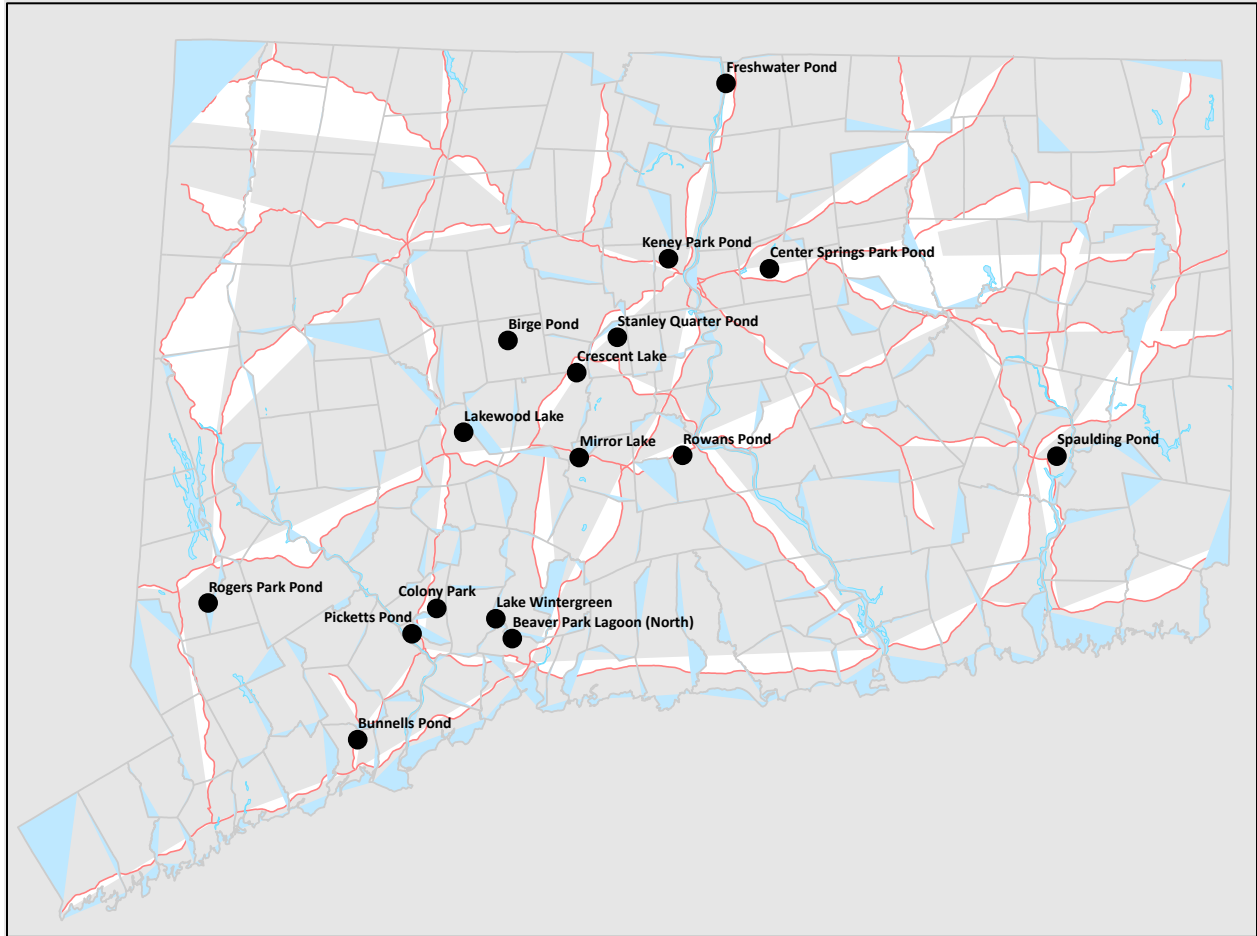


Figure 1. The 16 Community Fishing Waters (CFWs) stocked by the Connecticut Fisheries Division with Channel Catfish in 2022.

The objectives for the Channel Catfish Management job are:

1. Stock Channel Catfish into Channel Catfish Management Lakes (CMLs) to maintain quality fisheries.
2. Collect stock assessment data (abundance, size structure, age structure, growth rates) for Channel Catfish populations in stocked lakes/ponds and established riverine populations as resources permit.
3. Conduct angler surveys to assess angler effort, total catch and harvest, and opinions in CMLs as resources permit.

Key Findings

Objective 1: Stock Channel Catfish into CMLs to maintain quality fisheries.

- The Connecticut Fisheries Division received its annual order of adult-sized (14-18 inches) Channel Catfish on May 5, 2022 (Figure 2) and approximately 9,897 were stocked into the Community Fishing Waters (CFWs).



Figure 2. Distribution of Channel Catfish to waiting Fisheries Division hatchery trucks for transport to CMLs.

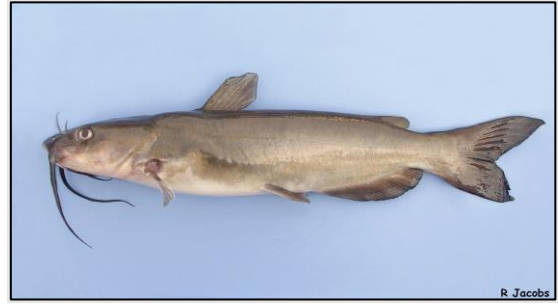


Figure 3. Adult Channel Catfish (14-18 inches)

Table 1. Numbers of adult Channel Catfish stocked in the Community Fishing Waters on 5/5/2022. All waterbodies stocked have a 3 fish per day limit (no minimum size limit) regulation.

<u>Waterbody Name</u>	<u>Town</u>	<u>Approximate number of adults stocked</u>
Beaver Park Lagoon (North)	New Haven	411
Birge Pond	Bristol	408
Bunnells Pond (Beardsley Park Pond)	Bridgeport	985
Center Springs Park Pond	Manchester	396
Colony Park Pond (Abe Stone Park Pond)	Ansonia	412
Crescent Lake	Southington	983
Freshwater Pond	Enfield	404
Keney Park Pond	Hartford	392
Lake Wintergreen	Hamden	1,179
Lakewood Lake	Waterbury	1,388
Mirror Lake (Hubbard Park Pond)	Meriden	408
Picketts Pond	Derby	406
Rogers Park Pond	Danbury	412
Rowans Pond (Butternut Park Pond)	Middletown	411
Spaulding Pond (Mohegan Park Pond)	Norwich	895
Stanley Quarter Pond	New Britain	407

Objective 2: Collect stock assessment data (abundance, size structure, age structure, growth rates) for Channel Catfish populations in stocked lakes/ponds and established riverine populations as resources permit.

- During this grant period, Stillwater Pond, Torrington was sampled using baited hoop nets in order to obtain an estimate of the number of Channel Catfish. This sampling builds upon prior hoop netting efforts initiated to evaluate Channel Catfish populations (McDowell et al. 2020, McDowell et al. 2021, and McDowell et al. 2022).

- Stillwater Pond is a Channel Catfish management lake that was stocked with yearling Channel Catfish (9-11 inch) for 7 years (2012-2018). The assessment confirms that the put and grow strategy at this waterbody (and many other CMLs stocked with yearlings) was successful in creating a Channel Catfish fishery consisting of various catchable size classes (Figure 4). Fish in these lakes have doubled in size from stocking and are available as quality fish for anglers.
- Six tandem hoop net sets were deployed at various depths and in various orientations (i.e., parallel to shore or perpendicular to shore) resulting in 274 tandem net-days of sampling. Tandem net days are calculated by summing the number of days each net was “working” (Table 2). A tandem hoop net set consists of one medium sized hoop net (medium hoop net dimensions: 1-inch square mesh, number of hoops 7, front hoop diameter 30 inches and net total length 11 feet) and one large size hoop net (large hoop net dimensions: 1.5 inch square mesh, number of hoops 7, front hoop diameter 36 and net total length 12 feet).

Table 2. Channel Catfish relative abundance estimates from single-gear sampling using two different sized tandem baited hoop nets deployed at Stillwater Pond, Torrington for 46 and 44 days from October 3 & 5 2022 to November 17, 2022. Total combined tandem net days for this duration was 274. 95% confidence intervals (CI) were calculated using Ricker 1975.

Relative Estimate Data by Standard Size Class	
All Size	
	N 248
	95% CI 182-347
	#/Acre (Range) 2.6 (1.9-3.7)
Stock Size (\geq 8 inches)	
	N 248
	95% CI 182-347
	#/Acre (Range) 2.6 (1.9-3.7)
Quality Size (\geq 12 inches)	
	N 248
	95% CI 182-347
	#/Acre (Range) 2.6 (1.9-3.7)
Preferred Size (\geq 15.7 inches)	
	N 208
	95% CI 152-293
	#/Acre (Range) 2.2 (1.6-3.1)
Memorable Size (\geq 19.7 inches)	
	N 56
	95% CI 33-102
	#/Acre (Range) 0.6 (0.4-1.1)

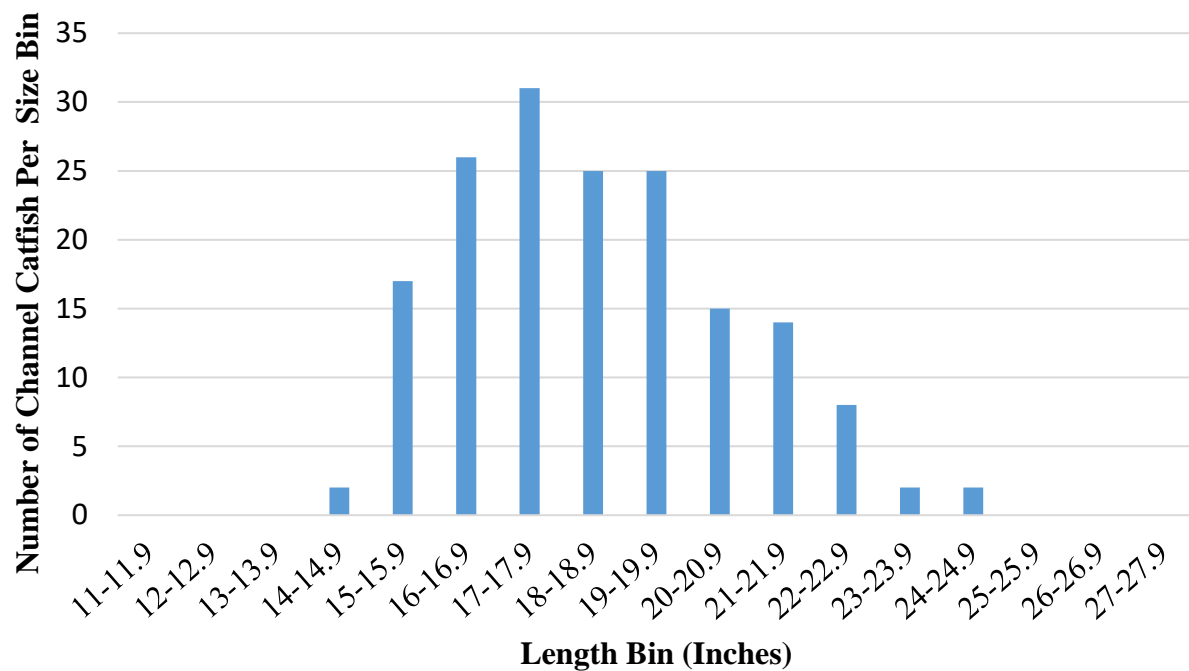


Figure 4. 2022 Channel Catfish single gear tandem-hoop netting relative abundance length frequency results for Stillwater Pond, Torrington, Connecticut. Fish were grouped into one inch length bins.

Objective C - Conduct angler surveys to assess angler effort, total catch and harvest, and opinions in CMLs as resources permit.

- A boat-based roving angler survey started on Quinebaug Lake (a former yearling stocked put-grow-and-take Channel Catfish lake) on March 1st, 2023. This angler survey is being conducted in part to assess angler effort, catch, harvest, and opinions regarding Channel Catfish in the lake. The survey is expected to run until October 31, 2023. Results will be included in the next performance report.

Moving Forward

- Modify stocking efforts and strategies to focus on annual stocking of Community Fishing Waters.
- Discontinue stocking at Stillwater Pond (Torrington) for the foreseeable future based on relative abundance data.
- Perform population estimates on Batterson Park Pond which received stockings of yearling Channel Catfish in the past.

- Collaborate with the Connecticut Aquatic Resources Education Program to develop, implement, and assess methods to encourage and promote fishing in Catfish Management Lakes.
- Add Wharton Pond (Wallingford) to the list of Community Fishing Waters stocked with Channel Catfish in 2023.
- Periodically re-assess Channel Catfish management lake populations to determine need for additional stocking.

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



Federal Aid in Sport Fish Restoration F-57-R-41
Annual Performance Report – F22AF01153
4/1/2022 to 3/31/2023

Grant Title: Inland Fisheries Research and Management
Study 3: Inland Fisheries Coordination and Administration
Job 1: Inland Fisheries Operations

Report Prepared by: Mike Beauchene
Job Personnel: Mike Beauchene, Job Leader/Program Coordinator
Brian Eltz, Primary Staff
Christopher McDowell, Primary Staff
Matthew Devine, Primary Staff
Andrew Bade, Program Coordinator

Overview: Fisheries Division staff must provide services to the angling public to ensure the proper protection and management of Connecticut's fisheries resources. These activities are necessary so that current knowledge and the results of research and management projects can be broadly applied. Included in these activities are public outreach, access development, planning, and technical assistance with the review of permits to avoid any biological issues.

The Fisheries Division is frequently required to administer projects and collect information due to unforeseen circumstances (e.g., investigation of fish kills). In addition, opportunities to collect valuable information often arise. It is important that the Fisheries Division be able to meet these demands and take advantage of such opportunities.

The objectives of the inland fisheries operations job are:

1. Provide general fisheries information to the public.
2. Ensure that data can be collected where needed to evaluate programs and to take advantage of opportunities.
3. Perform minor maintenance to provide adequate physical access to support all fisheries management activities within the grant (e.g., paths, roads, trails, fishing piers, ramps, docks) and allow for fishing access.

Key Findings

Objective 1: Provide general fisheries information to the public.

- Press releases, web page updates, and social media posts were issued to advise the public about important fisheries activities and news.
- Published digital versions of the Fishing Guide ([freshwater](#) and [saltwater](#)).
- Printed and distributed the 2023 Fishing Guide.
- Provided editorial review or authored six fisheries related articles in Connecticut Wildlife Magazine.
- Shared angler posts and questions on the CT Fish and Wildlife Facebook page (currently 51,000+ followers) and on Instagram (currently 5,291 followers).
- Twelve presentations were made to fishing organizations on the benefits of Sport Fish Restoration to Connecticut's fisheries (approximately 350 people).
- Responses to public inquiries for fisheries information were provided upon request.
- Published the [Annual Fish Stocking Report](#).
- Published monthly e-newsletter, *CT Fishin' Tips* using Constant Contact (13,372 subscribers).
- Technical assistance, to avoid biological issues, was provided 1) to anglers participating in 784 fishing tournaments, 2) to individuals making 162 requests to import and 289 requests to liberate fish, 3) to approximately 42 individuals or organizations requesting authorization to collect scientific data on fish, and 4) to retail bait dealers making 166 requests to import bait.
- Maintained a self-service [angler recognition application](#) to enable anglers to submit catch data for trophy fish, state record fish, youth fishing passport – fishing challenge, first fish, and lifetime personal best.
- Maintained a [dashboard](#) to display trophy fish catches submitted to and verified by DEEP staff.
- Mailed certificates to anglers who caught the largest fish of each species, set a new state record, and who achieved the title of “Angler of the Year”.
- Partnered with FishBrain to populate and maintain Connecticut's sportfish regulation data within the APP with CT's fishing regulations. This allows instant access to fishing regulations at the location where the person is fishing.

Objective 2: Ensure that data can be collected where needed to evaluate programs and to take advantage of opportunities.

- Conducted an electronic survey to solicit angler preference and desire as it relates to stocking of Lake Trout.

Objective 3: Perform minor maintenance so to provide adequate physical access to support all fisheries management activities within the grant (e.g., paths, roads, trails, fishing piers, ramps, docks) and allow for fishing access.

- Repairs were made to an access road along the Salmon River. Specifically, the road was re-graded and gravel was added so that anglers and stocking trucks could adequately and safely access a more remote portion of the Salmon River.

Moving Forward

- Continue ongoing efforts to communicate the benefits of the Sport Fish Restoration Program as it relates to improving Connecticut's fisheries, especially through the development of interactive maps and smartphone applications.
- Continue to utilize electronic media as a tool to deliver interesting and educational material to engage constituents, especially through live streaming on Facebook Live. Expand presence on social media.
- Continue to perform minor maintenance at existing access areas as necessary.

Fishing Resources

The Fisheries Division is here for you. We thank you for your support. 100% of your investment in a fishing license and trout and salmon stamp goes to the DEEP Bureau of Natural Resources to support Fish and Wildlife programs (CGS 26-15, 26-15a, 26-15b).

Web content:

[Fishing Guide](#): Our annual publication for all things fishing in CT.

[Current Stocking Report](#): A listing of stocking over the past several weeks.

Interactive maps:

[Saltwater Fishing Map](#): Shows places to fish, party/charter vessels to go fishing on, where to launch a boat, and where to find a bait and tackle shop.

[Trout Stocking Map](#): Shows the number of days since the last stocking.

[CT is Fishy](#): A series of interactive maps that cover general fishing information, fish species, and where to fish.

E- newsletters and reports:

CT Fishin' Tips and the Weekly Fishing report. [Opt-In](#)

Social media:

Facebook: www.facebook.com/ctfishandwildlife

Instagram: <https://www.instagram.com/ctfishandwildlife/?hl=en>

Twitter: <https://twitter.com/CTFishingInfo>

FishBrain: <http://fishbrain.com/>

YouTube: <https://www.youtube.com/channel/UCPKX1p4zQ4c7aN-toHtKKaA>



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