

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



Federal Aid in Sport Fish Restoration F-57-R-41
Annual Performance Report – F22AF01153
4/1/2023 to 3/31/2024

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

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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. These 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). Annual fish population data collection using standardized methods is important to make informed management decisions.

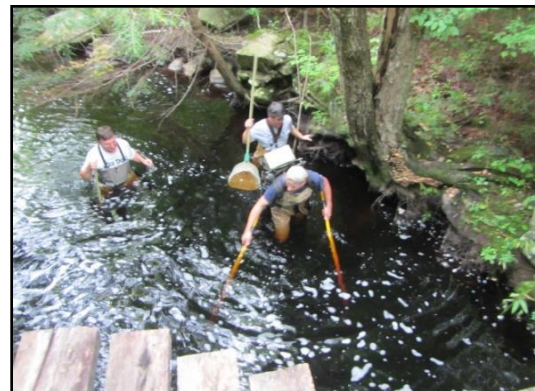


Figure 1. Staff conducting a backpack electrofishing sample.

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 (HCE) 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 167 sites, via electrofishing, during 2023 (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 2023. Note that several locations were sampled for more than one purpose and are binned accordingly. See Appendix in Study 1 Job, 2 for list of streams and locations sampled in 2023.

Sample Purpose	Count
Fry/Fingerling/WTMA	2
Fry/Fingerling/WTMA/Long-term	1
HCE	3
Headwaters	9
Long-Term	4
Old Stream Survey	94
Old Stream Survey/Long-Term	2
Old Stream Survey/WTMA	2
Special Study/WBK Transfer	1
Species Specific	4
Species Specific/Brood	5
TMA	1
TMA/Brood	1
Wild Trout	5
Wild Trout/Long-Term	5
Wild Trout/WBN Removal	2
WTMA	24
WTMA/Long-term	2
Grand Total	167

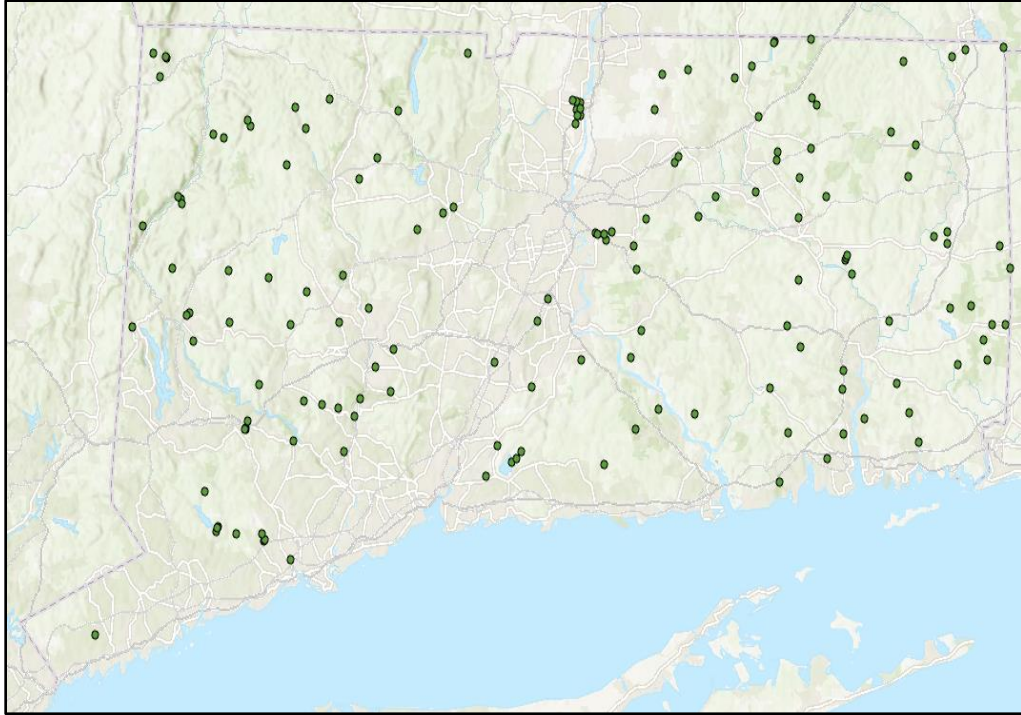


Figure 3. Locations of 167 streams sampled in 2023 in support of this job.

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

- Three sites were sampled in collaboration with the Habitat Conservation and Enhancement program where a water diversion project and culvert replacements were scheduled to be conducted.
 - At a no-named tributary to Purgatory Brook, 155 fish including four wild Brook Trout and three stocked Rainbow Trout were removed and relocated to nearby Branch Brook prior to a temporary dewatering for construction at the new CT DEEP Western District Headquarters.
 - At a no-named tributary to Roaring Brook, 62 fish were removed prior to dewatering and culvert replacements. No wild trout were detected at this site. All fish were placed upstream of the work area.
 - At a no-named tributary to Unionville Brook, sampling was conducted to characterize the fish community prior to a future culvert replacement downstream. No wild trout were detected.
- Three sites were sampled in Deep Brook (one unnamed tributary and two mainstem sites) to evaluate previous in-stream enhancement work and to monitor wild trout populations after a wild Brook Trout transfer took place.
 - Three wild Brown Trout and zero wild Brook Trout were detected in the unnamed tributary where restoration efforts took place, and 152 wild browns (429.4 fish/km) and zero wild brooks were detected in the mainstem site. The three browns collected in the unnamed tributary were low in the system and likely had originated in Deep Brook.

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

- Fish populations were assessed in three long-term reference streams where all-species data is collected; Fulling Mill Brook (Naugatuck), Jordan Brook (Waterford), and Rocky Brook (Thompson), and three long-term reference streams where trout-only sampling occurs (presence-absence data is collected for all other species); Merrick Brook (two sites in Scotland), Trading Cove Brook (Montville), and Salmon Brook (Glastonbury). Salmon Brook is a Wild Trout Management Area (WTMA) Class 2 (see Study 1, Job 2 for detailed description of WTMA). In addition, two (2) sites were sampled as Old Stream Survey sites in 2023, Fulling Mill Brook and Jordan Brook for this Job (Study 1, Job 1). Highlights include:
 - Strong densities of wild Brown Trout (646/km) with fewer wild Brook Trout (73/km) were detected at Fulling Mill Brook.
 - A modest increase in Brown Trout was observed at Salmon Brook where experimental Brown Trout fry stocking was carried out in December of 2021 and 2022. Numbers of wild Brown Trout increased from 18/km in 2019 to 84/km (combined fry stocked Brown Trout and wild Brook Trout) in 2023. The increase can be directly related to fry stocking efforts.
 - 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.
 - Strong wild Brook Trout densities were detected at Rocky Brook (691/km).
 - Moderate densities of an allopatric population of wild Brook Trout (i.e., physically isolated from Brown Trout) were detected at Jordan Brook (193/km). Densities of wild Brook Trout have fluctuated considerably since first sampling this stream in 1993 (Figure 4) with some years of strong young-of-the-year production (1993 & 2022).

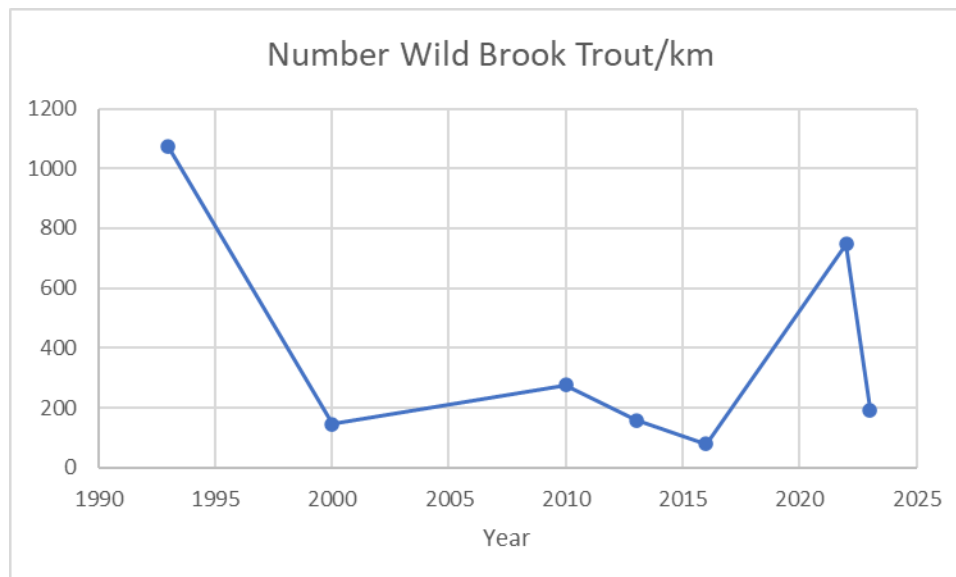


Figure 4. Wild Brook Trout at Jordan Brook since 1993. Young-of-the-year were present in high levels in 1993 and 2022.

- At Merrick Brook, a sympatric population of wild Brook Trout and Brown Trout was reduced in 2023 when compared to historic levels (Figure 5).

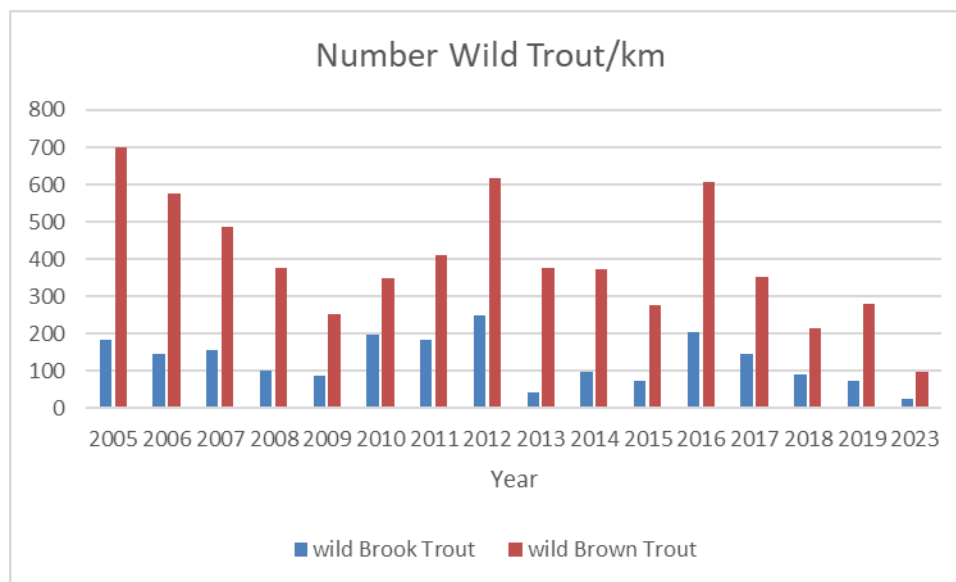


Figure 5. Wild Brook Trout and Brown Trout densities at two Merrick Brook sampling locations combined since 2005.

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

- Eleven thermographs (Figure 6) that were deployed at long-term sites in 2022 were recovered by project staff during 2023 and replaced with new loggers. All recovered temperature data will be uploaded to the SHEDS website (<http://ecosheds.org/>) for long term data storage and public access.
 - In addition, mean July temperatures, mean summertime temperatures (July-August), and the daily maximum temperature will be calculated to determine the extent of coldwater habitat present in logger locations and adjacent stream reaches.
- Survey123 was used to collect information on thermograph placement. Use of the application improved data collection, data entry, and data storage capabilities.

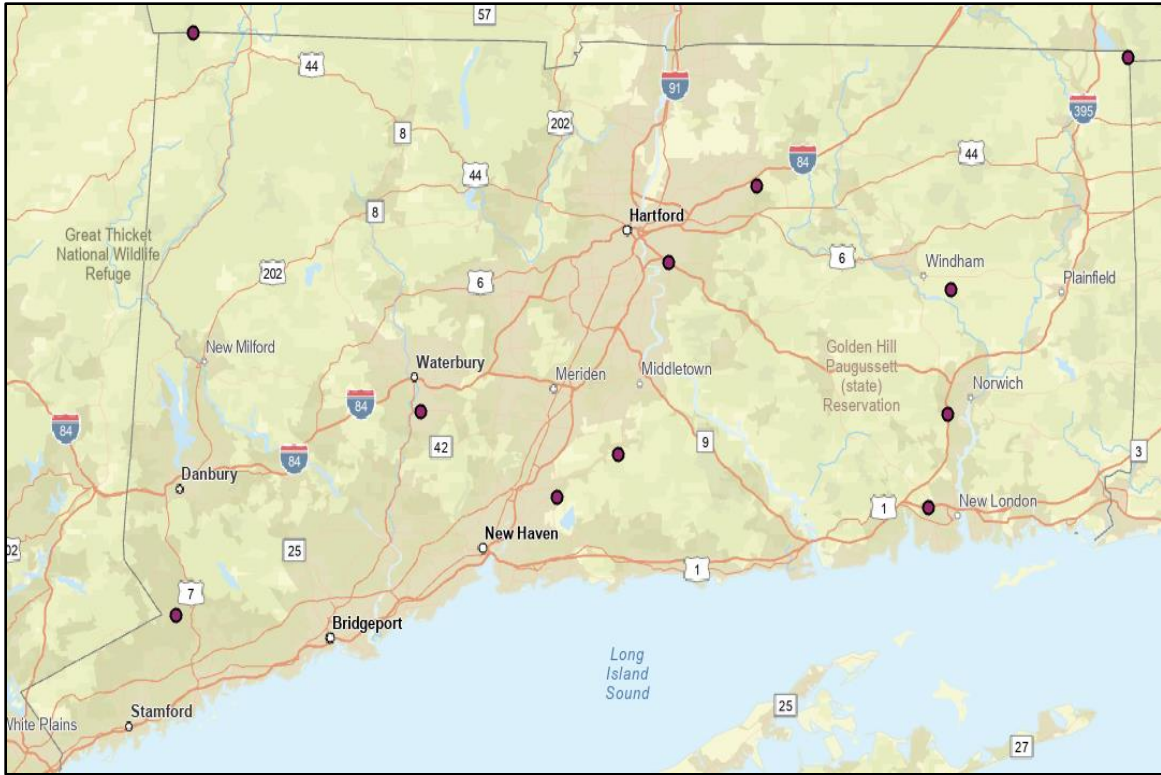


Figure 6. Locations of the 11 thermographs deployed by project staff in 2022-2023.

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.
- In 2023, 12 Fisheries staff completed online culvert survey training through the North Atlantic Aquatic Connectivity Collaborative (NAACC). Staff are slated to complete the required field training and shadowing to become lead observers in 2024 and will be conducting surveys and guiding volunteer groups utilizing a new culvert survey priority list. Staff prioritized culverts by creating a list of those that lie within the States Coldwater Stream Habitat Map ([CT Cold Water Streams](#)) and it will be used to guide future survey efforts within the state. In addition, staff also created a priority list of culverts that have already been surveyed using the NAACC culvert survey protocol (and scored as significant or severe barriers to fish passage) within the Coldwater Stream Habitat Map. This priority culvert replacement list will guide future restoration efforts to improve connectivity to coldwater habitat.

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.

- A total of 89 sites from the original Stream Survey (1988-1995) were randomly selected and sampled during 2023.
 - Excessive rainfall during summer of 2023 resulted in sustained high stream flows that made sampling larger tributaries with a barge electrofishing unit unsafe. As such, most sites sampled were smaller order streams where only a single backpack electrofisher was needed.
 - Wild Brook Trout were sampled in 52 of the 89 samples. The highest density observed was in a No-Name-Tributary to Hall Meadow Brook (1,156 fish/km) located in Norfolk.
 - When compared to the original Stream Survey sample period, a significant decrease in Brook Trout densities (fish/km) was observed in sites resampled in 2023 (paired T-test, $p = <0.001$). Mean densities of 424 fish/km were reduced to 178 fish/km in 2023.
 - Of the 70 sites where wild Brook Trout were documented during the initial Old Stream Survey samples, 18 of them resulted in zero Brook Trout in 2023. Interestingly, six (6) sites in 2023 documented wild Brook Trout that were not detected at 1988-1995 sites.
 - Wild Brown Trout were sampled in 21 of the 89 samples. The highest density observed was in Cricker Brook (1,286 fish/km) located in Easton.
 - No significant changes in Brown Trout density were observed in the 2023 resample (paired T-test, $p = 0.479$). Mean overall densities were 166 fish/km in 2023 and 122 fish/km during the original Stream Survey sample.
 - Of the 26 sites where wild Brown Trout were observed during the original sample, 12 resulted in zero individuals captured. Like Brook Trout, the 2023 resample resulted in seven streams with documented Brown Trout populations that were not detected at 1988-1995 sites.
 - Slimy Sculpin was observed in two sites in 2023, with densities of 19 and 88 fish/km, respectively.
 - The most sampled species was Blacknose Dace, which was observed in 64 of the 89 samples.
 - Redbreast Sunfish, a native sunfish, was present in seven streams. The highest densities of 161.4 fish/km occurred in the Middle River, Stafford.
 - American Eel was present in 29 sites during 2023 sampling and had a mean density of 108 fish/km. No significant changes in overall densities were observed from the initial surveys (paired T-test, $p = 0.458$).

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

- The Mianus River Trout Management Area (TMA) was sampled during the summer of 2023.
 - One stocked adult and one wild Brown Trout were observed. Plans for habitat improvements have been developed for this TMA and subsequent sampling will take place after the work is completed.
- Flows were too high to conduct trout population sampling in the West Branch Farmington River TMA; therefore, only Brown Trout brood were collected for the Survivor Brown Trout program (see Study 1, Job 6).
 - Brood collection occurred on October 20th, which was six weeks later than typical.

- In total, 71 Brown Trout brood were collected.

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.
 - Data was provided to Trout Unlimited, Eastern Brook Trout Joint Ventures, Universities, and DEEPs Water Protection and Land Reuse Division.
- An agreement with the University of Connecticut to employ a post-doctoral or doctoral researcher has been initiated with a start date in 2024. This candidate will compile all historical and contemporary data collected by the inland fisheries management programs and populate cloud-based relational databases to optimize data accessibility.

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.
- Finish the remaining randomly chosen historic Stream Survey (1988-1995) sites selected in 2023.
- Assess wild trout reproduction in formerly Brown Trout fry stocked rivers and streams.
- Finalize priority culvert surveying and replacement lists and make public.
- Monitor stream temperatures in systems to identify thermal loading.
- Work to develop use of drones to aid in water temperature and stream barrier mapping.
- Determine feasibility of using ESRI products to record stream fish sampling data collected in the field.
- Work with the UConn researcher to combine recent and historical stream monitoring data (among other data types) into user-friendly data products for staff and the public.



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Report Prepared by: Brian Eltz
Job Personnel: Brian Eltz, Job Leader
Andrew Ransom, Primary Staff
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A wild Brook Trout caught while stream electrofishing.

Overview: Wild [Brook Trout](#) and [Brown Trout](#) populations are important sustainable resources that 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.

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). A subset of these waterbodies are classified into one of three types 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 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 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.

- Electrofishing sampling (single pass) occurred in 11 sentinel wild trout stream reaches (typically referred to as Long-term sites) during 2023 (Appendix 1). Some highlights include:

- Little River Redding had a strong wild Brook Trout population (403/km) with few wild Brown Trout detected (12/km). This stream was formerly stocked downstream of the sampling location (~ 2.2 km downstream of this sample site to the confluence with the Saugatuck Reservoir) with Brown Trout fry in hopes they would become naturalized, grow to large size, and emigrate into the Saugatuck Reservoir. Stocking has ceased temporarily but should be discontinued altogether as to prevent any impact to the Brook Trout population upstream.
- No wild Brook Trout were detected at the uppermost Beacon Hill Brook (outside of the WTMA 3) sampling reach while wild Brown Trout were detected at a rate of 277/km. Historic sampling densities from 2001-2005 had wild Brook and Brown trout densities that ranged from 120-266/km and 287-1120/km, respectively. From 2015-2019 Brook and Brown trout densities ranged from 40-207/km and 233-420/k, respectively. Overall, wild trout numbers are reduced in this stream reach from what historic levels show.
- Delphi Brook exhibited a strong sympatric population of wild Brook (628/km) and Brown trout (347/km).
- Belden Brook also displayed a strong sympatric population of wild Brook (373/km) and Brown trout (307/km).
- Twenty-three WTMA Class 1 stream sections were sampled in 2023.
 - This was the first time since 2019 that WTMA 1 reference sites were sampled due to COVID-19, staff retirements, and higher priority tasks (historic wild Brook Trout resamples in 2018/2019 and 2022). Typically, WTMA 1 sites were sampled annually prior to 2023.
 - The wild Brook Trout population in Hawley's Brook has been impacted by beaver activity within the Trout Brook Valley Preserve. No Brook Trout have been detected at the lowermost sampling location (sample # 35040; adjacent to the parking lot) since 2018. As well, no Brook Trout were detected in West Branch Hawley's Brook in 2023 (sample # 35041), and the confluence with the East Branch Hawley's Brook has been inundated by lentic waters from beaver activity. Fisheries staff will work with DEEP wildlife staff to determine possible mitigation strategies going forward.
 - Despite a loss in connectivity from beaver activity, wild Brook Trout densities were high (400/km) above the fishway, but lower below (133/km). There is only a short section (~ 125 m) of lotic habitat available to trout above the confluence with the West Branch and below the fishway.
 - No wild Brook Trout (0/km) were detected in the Tankerhoosen River upstream of Reservoir Road (sample # 35128), and very few (16/km) were detected in the reach upstream of the pond (sample # 35127) within Belding Wildlife Management Area. The lowermost sample location downstream of the pond was not sampled in 2023. Brown Trout numbers were strong at both locations (980/km above Reservoir Road and 886/km above the pond). Overall, Brook Trout numbers have declined since 1989 while Brown Trout numbers remained more stable (Figure1). In 2023, Brown Trout numbers were at or above historic levels.

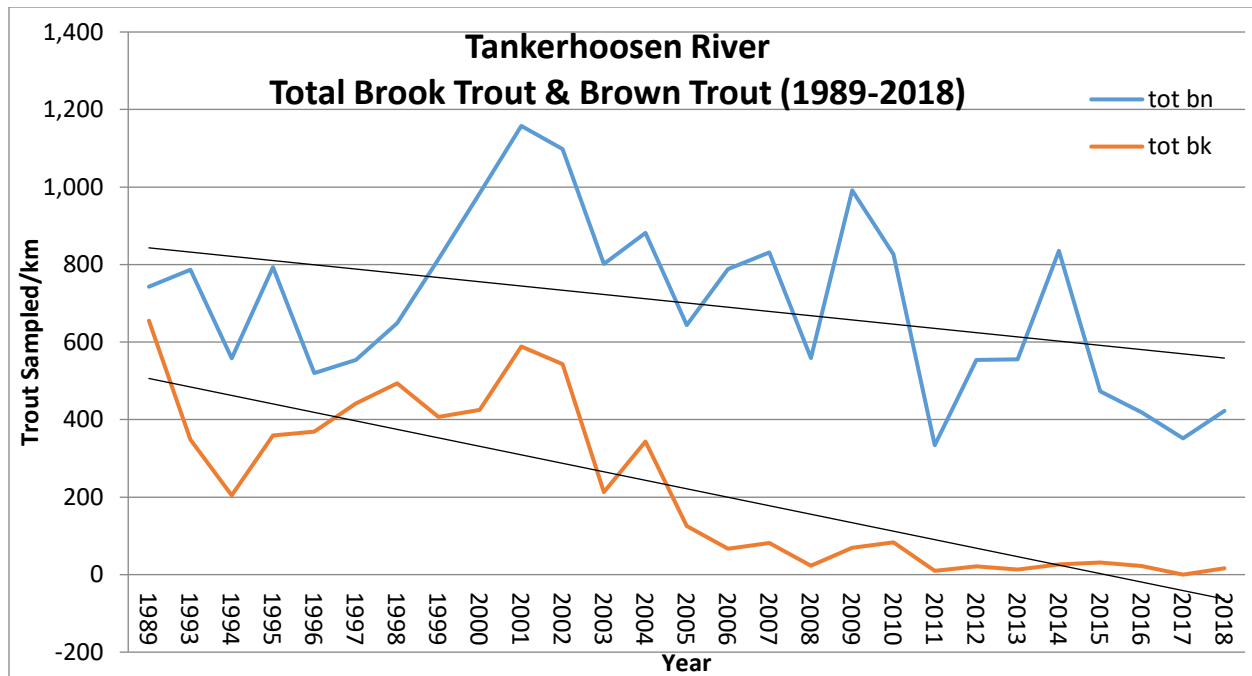


Figure 1. Total number of wild Brook Trout and Brown Trout sampled across three (3) sample sites from 1989-2018. Data from 2023 was not included because only two of the three sample locations were surveyed.

- Wild Brown Trout (685/km) continue to dominate in the lower Mill River (sample # 35083) when compared to Brook Trout (15/km). In contrast, wild Brook Trout fared better (592/km) than Brown Trout (217/km) in the uppermost sampling reach (sample # 35086). From 2016-2019, the average numbers of Brown (964/km) and Brook trout (120/km) in the lower section of the Mill were like what was observed in 2023. Overall numbers were reduced from historical highs, especially Brook Trout. In the upper Mill River over the same period, numbers of Brook (732/km) and Brown trout (270/km) were like what was found in 2023.
- No wild Brook Trout were detected in Deep Brook in 2023 (0/km) while Brown Trout numbers were strong (593/km at sample # 35055 and 377/km at sample # 35056). Brook Trout densities have never been high in this WTMA but averaged 121/km between 2000-2004, where Brown Trout averaged 332/km over the same period. By 2015-2019 Brook and Brown trout averaged 28/km and 157/km, respectively. In 2016, Brook Trout were transplanted to a no-named tributary within the TMA (sample # 35057), and brook numbers between 2015-2019 are inflated due to this effort.
- Wild trout numbers (both Brook and Brown) were extremely low in Macedonia Brook during 2023; only 24/km and 30/km combined trout for each sample location was observed. However, this system can rebound from poor years of recruitment. Total wild trout observed between 2008-2009 averaged 67 total trout/km but rebounded to 421 total trout/km in 2010 and maintained an average of 190/km during 2015-2019.

- Moving forward, historic WTMA 1 sites may be sampled on a rotational basis as opposed to annually. This will allow for increased manpower allocation to monitoring and restoration efforts for wild Brook Trout (transfers from donor populations), and possible wild Brown Trout removals where sympatric Brook and Brown trout populations occur.

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.

- 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 sampling data is older than 10 years. Additionally, patches were given higher priority if they were near patches where wild Brook Trout were previously sampled.

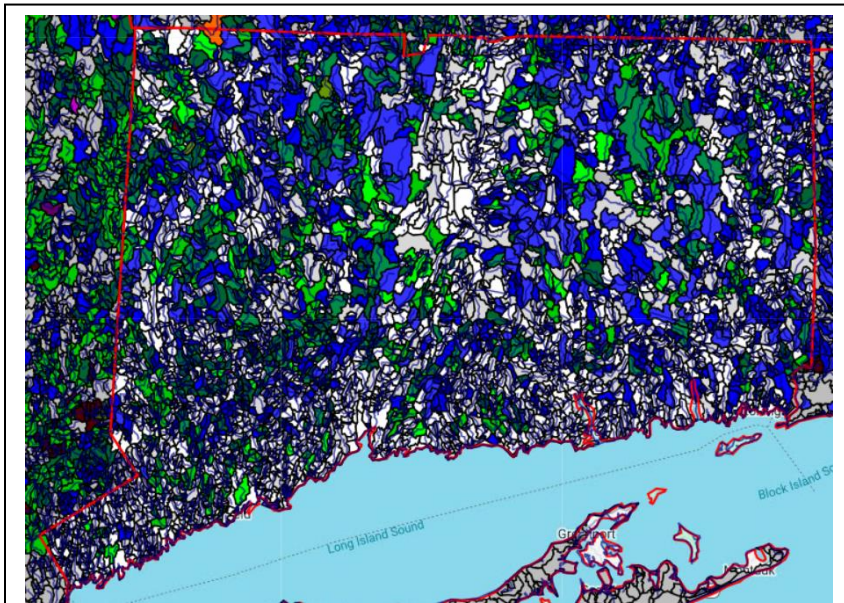


Figure 2. Eastern Brook Trout Joint Venture catchment layer showing where wild trout have been sampled or are predicted to be found. The blue catchments indicate wild Brook Trout populations, the dark green catchments indicate a mix of wild Brook and Brown trout populations, and the bright green catchments indicate wild Brown Trout populations. The gray catchments indicate where no wild trout have been sampled or are predicted to not be found, and the white catchments indicate where no sampling has occurred. The orange catchment indicates where only stocked browns have been documented (this catchment extends down into CT from MA). Additional stream data is evaluated annually for inclusion.

- Data were uploaded to update the EBTJV map.
 - Nine new headwater stream locations were sampled in 2023 (Appendix 1). A total of three new wild Brook Trout populations were documented, and no wild Brown Trout were detected at new locations. Additionally, no new Slimy Sculpin (a coldwater indicator species) populations were documented.
 - Most headwater sites were sampled as possible wild Brook Trout donor sites for future transfers.
 - One site, Waterworks Brook in Windsor Locks, may be utilized as a donor wild Brook Trout source for a no-named Tributary to the CT River in Windsor during 2024.

Objective 3: Systematically re-sample former Statewide Stream Survey sample sites that supported viable wild trout populations.

- No targeted, systematic resample of wild trout populations was conducted in 2023, but an all species resample (some sites included Brook and Brown trout) was conducted to determine if there were changes in fish communities since the original Stream Survey project (1988-1995).
 - A total of 89 sites were resampled.
 - Of 70 sites where Brook Trout were documented during the Old Stream Survey project, 18 of them resulted in zero Brook Trout in 2023 (a 26% loss in occurrence). But six sites sampled in 2023 documented Brook Trout where they went undetected during the original Stream Survey project; these sites were not included in the loss in occurrence calculation.
 - The loss in wild Brook Trout occurrence is similar to what was observed in resamples conducted in 2018-2019 (36%) and 2022 (28%).
 - In addition to a loss in occurrence, a significant decrease in Brook Trout densities (fish/km) was observed in sites resampled in 2023 (paired T-test, $\alpha = <0.001$). Mean densities of 424 fish/km were reduced to 177.5 fish/km in 2023.
 - The decrease in Brook Trout densities in 2023 is similar to what was observed during resamples conducted in 2018-2019 (391 fish/km vs. 138 fish/km) and 2022 (429 fish/km vs. 273 fish/km) when compared to original Stream Survey project sites.
 - Of 26 sites where Brown Trout were documented during the Old Stream Survey project, 12 resulted in zero individuals captured in 2023. Similar to Brook Trout, in 2023 Brown Trout were documented in seven streams where they went undetected during the original Stream Survey.
 - Unlike Brook Trout, no significant changes in Brown Trout density were observed (paired T-test, $p = 0.479$). Mean overall densities were 165.8 fish/km in the 2023 resample and 121.5 fish/km during the original sample.
 - For more details on the statewide resample see Inland Fisheries Research and Management Study 1 Job 1.

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

- Wild Brook Trout were transferred upstream of an impassable culvert on Turkey Hill Brook at Interstate Lane in Waterbury.
 - Previous electrofishing sampling efforts in Turkey Hill Brook on June 16, 2021, and August 14, 2023, indicated that Brook Trout were not present above Interstate Lane but were present below (216/km) and in a no-named tributary (only sampled in 2021; one (1) individual) that joins the brook below the road crossing.
 - On October 2, 2023, twenty-two pre-spawn Brook Trout adults (10 female and 12 male) were collected from downstream of Interstate Lane and stocked upstream of the road crossing to establish a self-sustaining population.
 - Pre-spawn adults were stocked at a rate of 50/km.

- Females ranged in size from 17-25 cm and males from 16-25 cm.
 - A redd survey was conducted in Turkey Hill Brook above and below Interstate Lane, and in the no-named tributary on November 13th, but none were observed.
 - It is likely that subsequent high flow events after stocking may have left redds undetectable (a few suspected redds were noted above and below the road crossing) or may have pushed transferred fish downstream to their source stream reach.
 - Follow-up monitoring (electrofishing) will take place in 2024 to determine if the transfer was successful.
- A sympatric population of wild Brook and Brown Trout was noted in Kent Falls Brook on August 13, 2020, above the falls, which are impassable to fish, and where only Brook Trout were previously documented.
 - To improve conditions for Brook Trout survival, two stream segments above the falls (Dugan Road and Carter Road) were sampled with electrofishing gear on June 12, 2023.
 - At Dugan Road (just above the falls) densities of Brook Trout (76/km) were lower than Brown Trout (222/km). Size of Brook and Brown trout was 6-18 cm and 5-30 cm, respectively.
 - At Cater Road (~ 1 km upstream from Dugan Road) densities of Brook Trout (337/km) were higher than Brown Trout (65/km). Size of Brook and Brown trout was 5-26 cm and 11-25 cm, respectively.
 - In all, 43 Brown Trout were collected between the two sampling locations and transferred to suitable habitat below the falls in the Trout Park.
 - A more widespread removal was planned for late-summer 2023, but high flows prevented such efforts. A follow-up removal will take place in 2024 and population monitoring will take place in subsequent years to determine if the Brook Trout population responds favorably to Brown Trout removals.
 - Further sites for possible Brown Trout removals from sympatric populations with Brook Trout will be investigated in 2024.



Image of Kent Falls. Brown Trout were removed upstream of the falls.

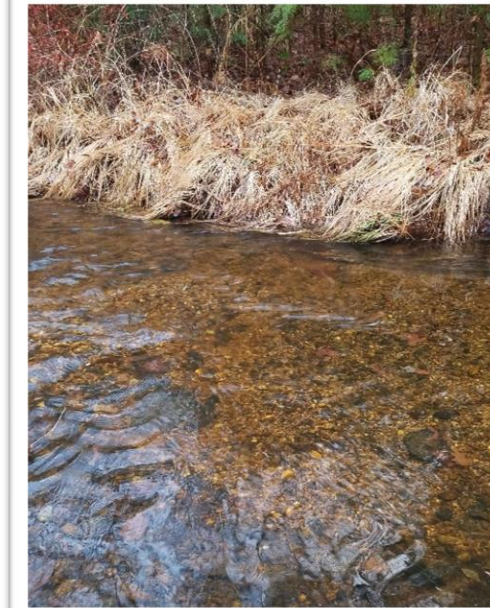
- Water temperature data were collected with Onset Hobo Pro v2 data loggers at four stream locations in 2023 where wild Brook Trout have either become extirpated (three sites) or were thought to have existed prior to development.
 - At Deep River (Colchester), where wild Brook Trout were previously known to exist, logger data showed that mean July temperatures (22 C), mean summertime temperatures (July-August; 23 C), and the daily maximum temperature (27 C) are too warm for Brook Trout restoration efforts.
 - At New City Brook (Stafford), where wild Brook Trout were previously known to exist, logger data showed that mean July temperatures (24 C), mean summertime temperatures (July-August; 25 C), and the daily maximum temperature (28 C) are too warm for Brook Trout restoration efforts.
 - At a no-named tributary to Cobble Brook (Kent), where wild Brook Trout were previously known to exist, logger data showed that mean July temperatures (19 C), mean summertime temperatures (July-August; 20 C), and the daily maximum temperature (22 C) are suitable for Brook Trout restoration efforts. A local donor population has yet to be determined and will be investigated in 2024.
 - At a no-named tributary to the Connecticut River (Windsor), where wild Brook Trout are thought to have persisted prior to development, logger data showed that mean July temperatures (16 C), mean summertime temperatures (July-August; 17 C), and the daily maximum temperature (23 C) are suitable for Brook Trout restoration efforts. A local source population has been determined (Waterworks Brook; Windsor Locks) and restoration efforts will be investigated in 2024 after water temperature data are collected from another location upstream of where the logger was deployed in 2023.
- Electrofishing sampling in 2023 at a no-named tributary to Globe Holl Brook found that a previous Brook Trout transfer conducted in 2016 was successful. Multiple year-classes were documented, and overall densities were strong (273/km).

Other important work done under the auspices of the Wild Trout Job in 2023-2024.

- Updates to the Eastern Brook Trout Joint Ventures (EBTJV) catchments and patch data ([Brook Trout Integrated Spatial Data](#)) were provided by Connecticut fisheries staff in late 2023 through early 2024 after an EBTJV Catchment Updater was developed. Nearly 2,000 stream electrofishing sites were uploaded, as CT has not updated the map since 2012. Public facing updates may not be visible until sometime later in 2024. Recent updates will enable staff to determine changes in wild trout populations at the catchment level over time. Accordingly, staff may modify current sampling practices to aid in determining changes at the catchment level rather than individual stream reaches. This change in sampling may give us greater insight as to how wild trout populations fluctuate over time. As well, this work helps support Objectives 2 and 3 by identifying areas where headwater samples are lacking, and former sampling locations need resampling (more than 10 years since last sampled).
- Redd surveys were conducted collaboratively with Trout Unlimited (TU) members (Farmington Valley TU Chapter, Eastern Region Staff, National Staff) and volunteers in November of 2023. On November 17th, TU members, volunteers, and DEEP Fisheries

staff participated in surveys in tributaries to the Farmington River known to have sustainable populations of wild trout. An electronic form developed by TU staff in ESRI Survey123 was utilized to capture data on specific redd locations. Data recorded included survey stream reach start and stop location (georeferenced), redd location (georeferenced), redd images, and general comments. Fisheries staff also utilized the form to log redd data collected from other wild trout streams around the state into mid-December. Fisheries staff will work with TU to garner interest and support from volunteers and conduct training with the intent of doing a statewide survey in the fall 2024 over an extended period (September-December). Redd survey data will be used to map spawning habitat, index the abundance of sexually mature trout, and help raise awareness and interest in wild trout within the State. Redd data will also be used to support Objectives 1 and 2 by providing insight into population status of sentinel wild trout streams and previously unsampled headwater sites.

- Approximately 20,000 Brown Trout fry were stocked in Salmon Brook, Glastonbury.



Images of redds captured at Delphi Brook in December of 2023. More than one redd was present in image right. This is referred to as a community nest.

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 catchment 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 develop a statewide redd survey program in collaboration with Trout Unlimited.
- 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.
- Identify locations where sympatric populations of Brook and Brown trout populations occur and determine if Brown Trout removals are feasible and if they would improve conditions for Brook Trout. Consider adding this as a new objective to future Wild Trout Job reports.

References

Eltz, B. 2020. A Summary of the Initial Screening for the Presence of Brook Trout Gill Lice (*Salmincola edwardsii*) in Connecticut. Accessed at [Brook-Trout-Gill-Lice-Sampling-Findings_Final.pdf \(ct.gov\)](#)

Appendices

Appendix 1. All locations sampled in 2023 by the Inland Fisheries Division coldwater staff with stream electrofishing equipment (single pass) and number of wild brook and brown trout present. HCE are sites sampled in collaboration with the Habitat Conservation & Enhancement group. Headwaters are locations sampled to document new wild Brook Trout populations. The Long-term sites serve as both sentinel wild trout sites and coldwater sites (coldwater habitat/coldwater spp. present). Old Stream Survey sites were randomly chosen for resampling to determine if stream fish communities have changed since the original samples from 1988-1994. All Fry/Fingerling sites were sampled to determine if Brown Trout numbers improved after experimental stockings. The Farmington River TMA was sampled to collect Brood (broodstock) for the Survivor Brown Trout program. The Mianus River TMA was sampled pre-habitat improvement work. Wild trout sites were sampled to determine the status of wild trout populations. Special Study sites were sampled to collect wild Brook Trout to transfer to another stream section for restoration efforts. WTMA (Class 1, 2, or 3) sites were sampled as sentinel sites to monitor population trends. Species Specific/Brood sites were sampled to collect broodstock for the Survivor Brown Trout program. NNT stands for no-named tributary.

Sample Num.	Waterbody	ylat	xlong	Sample Purpose	Sample Length (m)	Avg. Sample Width (m)	Num. WBK	Num WBN
35001	Purgatory Brook (NNT to)	41.6528	-73.0957	HCE	211	N/A	4	0
35002	Roaring Brook (NNT to)	41.7602	-72.8798	HCE	109	4.8	0	0
35003	Unionville Brook (NNT to)	41.7519	-72.8990	HCE	97.2	3.4	0	0
35004	Abbey Brook	41.9703	-72.4708	Old Stream Survey	115	3.9	9	0
35005	Gulf Stream	41.9792	-72.4201	Long-term	95	2.4	37	0
35006	Aggard Brook aka [Delphi Brook (NNT to)]	42.0235	-72.2507	Old Stream Survey	50	2.6	8	0
35007	Delphi Brook	42.0211	-72.2517	Long-term	121	3.6	76	42
35008	May Brook	42.0269	-72.1789	Old Stream Survey	105.9	6	42	0
35009	Mason Brook	41.8350	-72.2464	Old Stream Survey	57	2.6	5	1
35010	Squaw Hollow Brook	41.8534	-72.1793	Old Stream Survey	48	3.1	2	0

35011	Eldridge Brook	41.8481	-72.2455	Old Stream Survey	51	3.8	5	0
35012	Susquetonscut Brook	41.6439	-72.2042	Old Stream Survey	100	4.7	0	0
35013	Waldo Brook	41.6547	-72.0986	Old Stream Survey	90	2.6	10	1
35014	Sawmill Brook	41.7439	-72.2029	Old Stream Survey	102.6	6	28	0
35015	Fenton River (NNT to)	41.8070	-72.2019	Old Stream Survey	50	3.7	12	0
35016	Willimantic River (NNT to)	41.7844	-72.2882	Old Stream Survey	51.1	2.4	0	0
35017	Willimantic River (NNT to)	41.7847	-72.2873	Headwaters	58.2	2.5	0	0
35018	Burnap Brook	41.7445	-72.3992	Old Stream Survey	140	5.4	21	0
35019	Hemlock Brook	41.7769	-72.3658	Old Stream Survey	51.7	2.4	0	0
35020	Roaring Brook	41.9047	-72.2825	Old Stream Survey/WTMA 3	83	13.2	14	17*
35021	Hemlock Brook	41.7769	-72.3658	Old Stream Survey	4.3	6.2	0	0
35022	Mt. Hope River, East Branch	41.9231	-72.1683	Old Stream Survey	50	2.7	3	0
35023	Kent Falls Brook	41.7726	-73.4132	Wild Trout	144.2	9.5	11	32
35024	Kent Falls Brook	41.7664	-73.4107	Wild Trout	169	6.5	57	11
35025	Mount Hope River	41.9330	-72.1776	Old Stream Survey	125	1.2	46	12
35026	Cemetery Brook	41.8797	-72.0222	Old Stream Survey	64.7	2.4	43	2
35027	Horse Brook	41.7025	-71.9131	Old Stream Survey	128	2.3	0	0
35028	Angell Brook	41.7211	-71.9125	Old Stream Survey	49.6	1.1	1	0
35029	Belden Brook	42.0056	-72.8508	Wild Trout/Long-term	150	4.1	56	46
35030	Freeman Hill Brook	41.7254	-72.9500	WTMA 1	100	2.9	142	9
35031	East Branch Leadmine Brook	41.8056	-73.0639	Old Stream Survey	53.3	2.9	0	0
35032	Bakersville Brook	41.8385	-73.0278	Old Stream Survey	106.6	4.2	8	67
35033	Muddy Gutter Brook	41.5642	-72.5119	Old Stream Survey	41	2.4	21	0
35034	Axelson Brook	41.5206	-72.5322	Old Stream Survey	66	1.55	0	0

35035	Hungerford Brook	41.4320	-72.4067	Old Stream Survey	157	3.9	7	0
35036	Frazer Brook	41.4731	-72.2606	Old Stream Survey	46	1.5	4	0
35037	Gardner Brook	41.5389	-72.2000	Old Stream Survey	143	4.3	0	0
35038	Gillette Brook	41.5714	-72.2256	Old Stream Survey	59	2.8	3	0
35039	Gillette Brook	41.5723	-72.2261	Headwaters	53	8	5	0
35040	Hawleys Brook	41.2458	-73.3433	WTMA 1	102.7	4.8	0	0
35041	Hawleys Brook, West Branch	41.2508	-73.3425	WTMA 1	128.9	4.2	0	0
35042	Hawleys Brook, East Branch	41.2519	-73.3410	WTMA 1	80	1.6	32	0
35043	Hawleys Brook, East Branch	41.2510	-73.3415	WTMA 1	105	2.3	14	0
35044	Cricker Brook	41.2414	-73.3047	Old Stream Survey	51.3	2.8	0	66
35045	Island Brook	41.2008	-73.1975	Old Stream Survey	35	3.2	0	0
35046	Cold Springs Brook	41.6144	-72.6950	Old Stream Survey	142	2	1	3
35047	Falls Brook	41.5797	-72.7144	Old Stream Survey	84.7	3.4	0	0
35048	Sumner Brook	41.5183	-72.6297	Old Stream Survey	97.8	2.2	0	0
35049	Asmun Brook	41.4747	-72.7258	Old Stream Survey	62	3	36	17
35050	Meetinghouse Brook	41.5135	-72.7999	Old Stream Survey	115	0.6	1	0
35051	Hancock Brook	41.5989	-73.0450	Old Stream Survey	163.8	5.77	0	0
35052	Wattles Brook	41.5783	-73.1028	Old Stream Survey	57.3	2.9	0	0
35053	Nonnewaug (NNT to)	41.6258	-73.1664	Old Stream Survey	57.2	2.3	0	1
35054	Wood Creek	41.6486	-73.2411	Old Stream Survey	55.2	1.1	0	0
35055	Deep Brook	41.4096	-73.2855	WTMA 1	86	5.6	0	51
35056	Deep Brook	41.4082	-73.2867	WTMA 1	268	5.2	0	101
35057	Deep Brook, NNT to (aka Meeker Brook)	41.4070	-73.2882	WTMA 1	150	2.9	0	3
35058	Jeremy Brook	41.4528	-73.1717	Old Stream Survey	100	1.9	0	0
35059	Pootatuck River	41.4200	-73.2822	WTMA 1	742	10.7	1	122

35060	Transylvania Brook	41.4781	-73.2606	Old Stream Survey	142	2.6	0	0
35061	Kent Falls Brook	41.7769	-73.4192	Old Stream Survey	154.1	3.86	3	16
35062	Stonehouse Brook (NNT to)	41.7774	-72.1496	Old Stream Survey	40	1	7	0
35063	Sugar Brook	41.7144	-71.9381	Old Stream Survey	43.1	3.3	19	0
35064	Carson Brook	41.6636	-71.7897	Old Stream Survey	40	0.9	0	0
35065	Crooked Brook	41.6978	-71.8097	Old Stream Survey	32	1	0	0
35066	Dark Hollow Brook	41.6611	-72.5203	Old Stream Survey	59.6	2.4	21	0
35067	Burton Brook	41.9667	-73.4539	Old Stream Survey	116.6	2	11	40
35068	Heffers Brook	41.8697	-73.3286	Old Stream Survey	50.1	2.5	37	0
35069	Ivy Mountain Brook	41.8270	-73.2050	Old Stream Survey	104	7.2	0	0
35070	Little River (Redding)	41.3090	-73.3658	Wild Trout/Long-term	248	6.4	100	3
35071	Halfway River	41.3886	-73.1936	Wild Trout/Long-term	100.4	6.7	0	47
35072	Little River (Oxford)	41.4469	-73.1362	WTMA 3	148	4.1	83	1
35073	Bee Brook	41.6601	-73.3199	Old Stream Survey	103	6.1	4	0
35074	Cross Brook	41.5925	-73.3969	Old Stream Survey	50.1	3.8	0	17
35075	Great Brook	41.5881	-73.4019	Old Stream Survey	115.7	3.5	0	6
35076	Denman Brook	41.6631	-73.4300	Old Stream Survey	76.4	4.3	0	0
35077	Beach Pond (NNT to)	41.5735	-71.7986	Old Stream Survey	51.5	2.2	0	0
35078	Bliven Brook	41.5733	-71.8244	Old Stream Survey	60	1.8	11	0
35079	Denison Brook	41.5486	-71.8422	Old Stream Survey	93	3.8	45	0
35080	Koistenen Brook	41.5172	-71.8347	Old Stream Survey	57.1	1.3	8	0
35081	Ashwillet Brook	41.5111	-71.8914	Old Stream Survey	44	1.8	0	0
35082	Lowden Brook	41.6028	-71.8656	Old Stream Survey	110.8	6.8	36	0
35083	Mill River	41.2303	-73.2508	WTMA 1	332.8	5.2	5	228
35084	Mill River	41.2319	-73.2485	WTMA 1	41.4	4.8	0	49
35085	Mill River	41.2412	-73.2540	WTMA 1	118.6	7.8	40	48
35086	Mill River	41.2412	-73.2537	WTMA 1	359.7	7.6	213	78

35087	Pine Swamp Brook (NNT to)	41.4245	-72.0758	Old Stream Survey	55.4	1.3	0	0
35088	Kinneytown Brook	41.3714	-73.0933	Old Stream Survey	51.5	4.1	15	0
35089	Hemp Swamp Brook	41.4279	-73.0734	Old Stream Survey	63.9	4.7	3	0
35090	Beacon Hill Brook	41.4670	-73.0020	Wild Trout/Long-term	155	4.1	0	43
35091	Fulling Mill Brook	41.5056	-73.0315	Old Stream Survey/Long-term	178	4.3	13	115
35092	Wachocastinook Brook	41.9967	-73.4417	Old Stream Survey/WTMA 1	177.8	7.6	4	53
35093	Wachocastinook Brook	41.9983	-73.4436	WTMA 1	103.4	5.1	16	30
35094	Wachocastinook Brook	42.0048	-73.4677	WTMA 1	130	3.66	0	0
35095	Bradford Brook	41.8889	-73.2767	Old Stream Survey	103	1.9	23	0
35096	Hall Meadow Brook (NNT to)	41.9189	-73.1881	Old Stream Survey	102.9	4.6	119	0
35097	Rugg Brook	41.9328	-73.1214	Old Stream Survey	72.8	4.3	0	0
35098	Greenwood Brook	41.5694	-73.5072	Old Stream Survey	107	2.6	1	0
35099	Town Farm Brook	41.5477	-73.3889	Old Stream Survey	110	3.2	12	8
35100	Moosehorn Brook	41.5781	-73.3175	Old Stream Survey	100	4	55	0
35101	East Meadow Brook	41.5739	-73.1975	Old Stream Survey	77	4.3	0	0
35102	Farm River	41.3818	-72.7941	Wild Trout/Long-term	125	8.2	1	60
35103	Roses Brook	41.3560	-72.7656	Headwaters	105.1	3.1	0	0
35104	Roses Brook	41.3614	-72.7554	Headwaters	49.6	3	0	0
35105	Roses Brook	41.3714	-72.7463	Headwaters	156	3.7	31	0
35106	Farm River	41.3331	-72.8153	WTMA 3	204	5	1	68
35107	Trading Cove Brook	41.5012	-72.1161	Long-term	153	4.9	43	33
35108	Stony Brook	41.4716	-72.1182	WTMA 3	150	7.8	7	16
35109	Hubbard Brook	41.7082	-72.5803	Species Specific	103	3.4	85	0
35110	Kettle Brook	41.9266	-72.6315	Species Specific	295.3	3.3	0	13

35111	Kettle Brook	41.9287	-72.6393	Species Specific	105.1	2.7	0	52
35112	Kettle Brook	41.9292	-72.6467	Species Specific	100.7	3.16	0	2
35113	Waterworks Brook	41.9066	-72.6316	Headwaters	53	1.86	58	0
35114	Dibble Hollow Brook	41.9147	-72.6377	Headwaters	51.7	1.1	0	0
35115	Dibble Hollow Brook	41.9169	-72.6301	Headwaters	103.3	1.1	0	0
35116	Waterworks Brook	41.9067	-72.6361	Wild Trout	59	1.4	19	0
35117	CT River (NNT to)	41.8937	-72.6399	Headwaters	80.2	2.2	0	0
35118	Haleys Brook	41.3867	-71.9681	Old Stream Survey	125	5.86	13	0
35119	Lee Brook (NNT to)	41.4342	-71.9864	Old Stream Survey	45	2.3	0	0
35120	Rose Brook	41.4797	-72.0119	Old Stream Survey	53.2	2	0	0
35121	Hunts Brook	41.4001	-72.1153	Old Stream Survey	152.3	7.3	0	0
35122	Latimer Brook	41.4022	-72.2238	Old Stream Survey	148.5	6.6	0	0
35123	Jordan Brook	41.3605	-72.1474	Old Stream Survey/Long-term	134.5	3.8	26	0
35124	Bride Brook	41.3233	-72.2419	Old Stream Survey	51.7	2.5	0	0
35125	Hall Meadow Brook	41.8861	-73.1689	Old Stream Survey	135.5	8.6	2	0
35126	Hollenbeck River	41.8992	-73.2819	Old Stream Survey	157.6	6.7	5	0
35127	Tankerhoosen River	41.8317	-72.4467	WTMA 1	303.5	4.5	5	269
35128	Tankerhoosen River	41.8405	-72.4395	WTMA 1	226.5	4.9	0	222
35129	Globe Hollow Brook (NNT to)	41.7418	-72.5015	Wild Trout	205	1.4	56	0
35130	Salmon Brook	41.7191	-72.6020	Fry/Fingerling/WTMA 2/Long-term	226.2	4.56	0	19*
35131	Salmon Brook	41.7180	-72.5974	Fry/Fingerling/WTMA 2	164.5	4.1	0	8*
35132	Salmon Brook	41.7167	-72.5851	Fry/Fingerling/WTMA 2	153.9	4.3	0	6*
35133	Salmon Brook	41.7213	-72.5702	Wild Trout	95	3.6	0	0
35134	Roaring Brook	41.6981	-72.5257	WTMA 3	140	4.3	9	0
35136	Spruce Brook	41.4562	-73.0626	Old Stream Survey	101.7	3.8	2	4

35137	Towantic Brook	41.4408	-73.1044	Old Stream Survey	101.7	3.3	34	0
35138	Turkey Hill Brook	41.5344	-72.9959	Wild Trout	134.1	4.4	29	0
35139	Turkey Hill Brook	41.5342	-72.9959	Wild Trout	202.1	2.7	0	0
35140	English Neighborhood Brook	41.9920	-71.9984	Old Stream Survey	65.1	4.16	0	0
35141	Backwater Brook (NNT to)	41.9988	-71.9030	Old Stream Survey	28	1.8	0	0
35142	Backwater Brook (NNT to)	41.9988	-71.9030	Old Stream Survey	80	1.9	0	0
35143	Long Branch Brook	42.0107	-71.8777	Old Stream Survey	61.7	6.6	0	0
35144	Long Branch Brook	42.0107	-71.8777	Old Stream Survey	52	3.93	0	0
35145	Rocky Brook	42.0134	-71.8020	Long-term	98.4	2.9	68	0
35146	Roaring Brook	41.4397	-72.4778	Old Stream Survey	56.2	4.1	0	0
35147	Pattaconk Brook	41.4078	-72.5219	Old Stream Survey	53.8	3.3	0	0
35148	Chatfield Hollow Brook	41.3508	-72.5847	Old Stream Survey	143.7	6.6	0	0
35149	Macedonia Brook	41.7298	-73.4884	WTMA 1	251	7.1	0	6
35150	Macedonia Brook	41.7298	-73.4884	WTMA 1	331.6	5.7	1	9
35151	Merrick Brook	41.6771	-72.1121	WTMA 1/Long-term	287	7.5	5	13
35152	Merrick Brook	41.6792	-72.1100	WTMA 1/Long-term	268.7	8.3	10	41
35153	Beaver Brook	41.6842	-72.1092	WTMA 1	183.7	2.9	1	8
35154	Sap Tree Run	41.8600	-71.9733	Old Stream Survey	57.6	3.7	45	0
35155	Sandy Brook	41.8089	-71.9897	Old Stream Survey	54	3.6	8	0
35156	Crooked Brook	41.5999	-71.9067	Old Stream Survey	65	3.2	0	0
35157	Blissville Brook	41.5789	-72.0267	Old Stream Survey	102	3.8	0	0
35158	Mianus River	41.0806	-73.5812	TMA	120	10.7	0	1
35159	Broad Brook	41.9154	-72.4846	Old Stream Survey	72	4.9	72	67
35160	Middle River	41.9659	-72.3278	Old Stream Survey	130.1	8.8	0	0
35161	Furnace Brook	41.9841	-72.2947	Old Stream Survey	122.3	7.8	0	0
35162	Tankerhoosen River	41.8405	-72.4395	Species Specific/Brood	490	N/A	0	34

35163	Turkey Hill Brook	41.5344	-72.9959	Special Study/WBK Transfer	408	N/A	22	0
35164	Mill Brook	41.8762	-73.3496	Species Specific/Brood	N/A	N/A	0	2
35165	Kent Falls Brook	41.7769	-73.4192	Species Specific/Brood	N/A	N/A	0	0
35166	Fulling Mill Brook	41.5056	-73.0315	Species Specific/Brood	N/A	N/A	0	16
35167	Beacon Hill Brook	41.4670	-73.0020	Species Specific/Brood	N/A	N/A	0	3
35168	Farmington River	41.9127	-72.9879	TMA/Brood	N/A	N/A	0	0

*Indicates where Brown Trout fry have been stocked; therefore, all Brown Trout cannot be classified as being wild.



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
4/1/2023 to 3/31/2024

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

Report Prepared by: Brian Eltz & Matt Devine
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Overview: Connecticut’s stream fisheries see continuous changes in angler participation, expectations, and attitudes towards these fisheries. Trout stocking has also adapted to ongoing changes in hatchery production. New statutes, regulations, stocking policies, and varying levels of law enforcement have affected 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 manage 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 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 period of interest (i.e., Opening Day weekend) – as



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

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

- No action taken towards this objective in 2023.

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

- An intensive stream angler creel survey was designed and performed at four trout stocked rivers/streams (Skungamaug River (Tolland, Coventry, Andover), Blackledge River (Bolton, Marlborough, Hebron, Colchester), Dickenson Creek (Marlborough, Colchester), Jeremy River (Hebron, Colchester) and one pond (Gay City Pond, Hebron) in the eastern part of the state during the spring trout fishing season in 2023. The creel survey (Appendix 1) 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. In total, 74 creel days were conducted (50 weekdays and 24 weekend days).
 - 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).
 - 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 stratum.
 - 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.
 - Although contiguous, the Blackledge River (Bolton, Marlborough, Hebron, Colchester) 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.
 - The first creel was on 3/5/2023 and the last on 6/15/2023.
 - 32% (n=18) of creels were conducted during the catch and release season (3/1/2023 – 4/7/2023) and 68% were conducted during the harvest season (4/8/2023 – 6/15/2023).
 - Across all waterbodies, stocking sites, and strata, 3,116 angler counts were recorded (including zeros) and 198 interviews conducted.
 - More interviews were conducted on weekdays (110) than weekends (88).
 - Interview times were normally distributed while angler start times were right skewed, with most of the anglers that were interviewed (57%) beginning their fishing trip before 12:00pm (Figure 1).

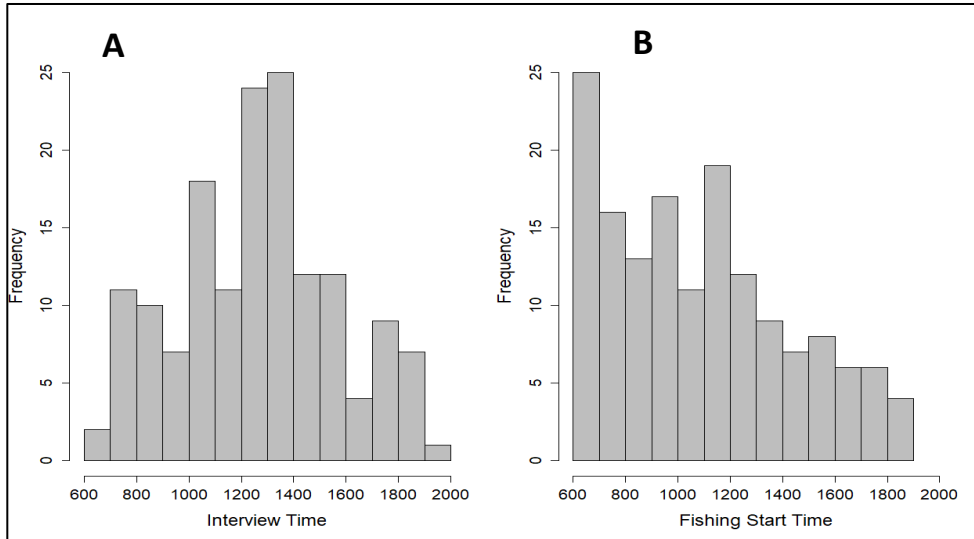


Figure 1. Frequency histograms of a) time of day interviews were conducted and b) time of day anglers started their fishing trip. $N = 198$.

- Of the 268 total anglers counted across all waterbodies, 70 (26%) fished in March, 125 (47%) in April, and 52 (19%) in May. Only 21 anglers (8%) were counted fishing after June 1st (Figure 2). It is worth noting that only eight creel days were conducted in June compared to 13, 19, and 18 in March, April, and May, respectively.
- Given the decline in fishing effort observed in May and June, re-evaluating the timeline of late-season trout stocking across the state is worthwhile. The initiation of spring trout stocking season is largely driven by environmental conditions, angler access, and angler desires. Evidence to support a predetermined annual end date to spring trout stocking should be investigated.
- Combined with deteriorating environmental conditions that many waterbodies experience such as warming water temperatures and decreased flows in late May and June, a decline in angling effort for stocked trout may be resulting in an underutilization of hatchery trout, and thus a poor use of hatchery resources.

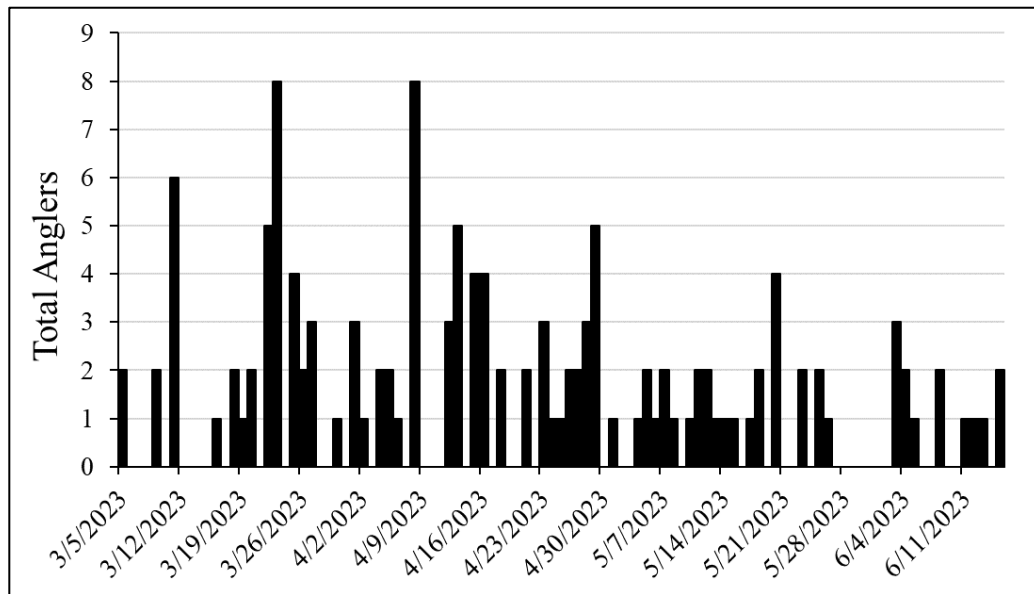


Figure 2. Angler counts by date. Data are aggregate of all waterbodies. $N = 268$

- Anglers reported catching 592 total trout during the survey: 203 (34%) Brook Trout, 129 (22%) Brown Trout, 250 (42%) Rainbow Trout, and 10 (2%) Tiger Trout (Figure 3).
 - While these catches represent what was stocked to some extent, some discrepancies exist. For example, of the 13,259 trout stocked in 2023 into the surveyed waterbodies, 24% were Brook Trout, 42% were Brown Trout, 30% were Rainbow Trout, and 5% were Tiger Trout.
 - Future surveys that ask anglers which species they prefer to target, coupled with catch data from creel surveys, can help inform hatchery production targets and help meet other fisheries management goals (e.g., increase production of Rainbow Trout because they a) appear to be caught more frequently than other species even when stocked in lower densities, b) are less problematic to rear in the hatcheries, and c) minimize impacts on wild trout resources relative to Brook and Brown Trout).

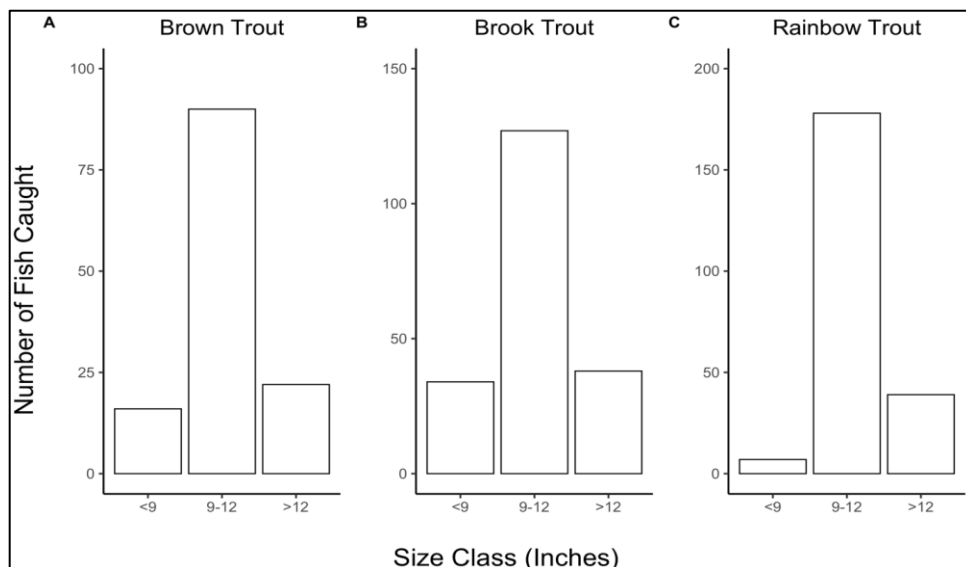


Figure 3. Total number of trout caught by species and size class that were reported by anglers.

- Of the 198 anglers interviewed 106 (53%) had caught 0 trout at the time of the interview.
- Of the total trout caught only 48 (8%) were harvested (all during the legal harvest season). 17 (35%) were Brook Trout, 5 (10%) Brown Trout, 21 (44%), Rainbow Trout, and 5 (10%) Tiger Trout.
 - Although poaching during the catch and release season remains a major concern of many anglers, these data suggest that it is not occurring in the surveyed waterbodies.
- Various bait/lure types were used by anglers including bait (29%), lures (37%), fly (13%), or a combination of types (21%). Bait included earthworms, mealworms, minnows, crayfish, and powerbait.
 - The percentage of trout caught varied by bait/lure type with bait, lures, fly, or a combination making up 25%, 34%, 14%, and 27% of the total catch, respectively.
 - These data suggest that Connecticut anglers use a wide range of bait types and methods, and any future restrictions to tackle and/or bait types should be carefully considered to minimize alienating a user group and potentially not retaining a subset of anglers in the state.
- Interviewed anglers had been fishing between 0.08 – 8.9 hours (median = 0.88, sd = 1.52).
- A zero-inflated negative binomial regression model showed there was a positive relationship between the total number of trout caught and total minutes fished ($p <$

0.05, $R^2 = 0.53$) (Figure 4) and this relationship was not significantly different by waterbody (Figure 5).

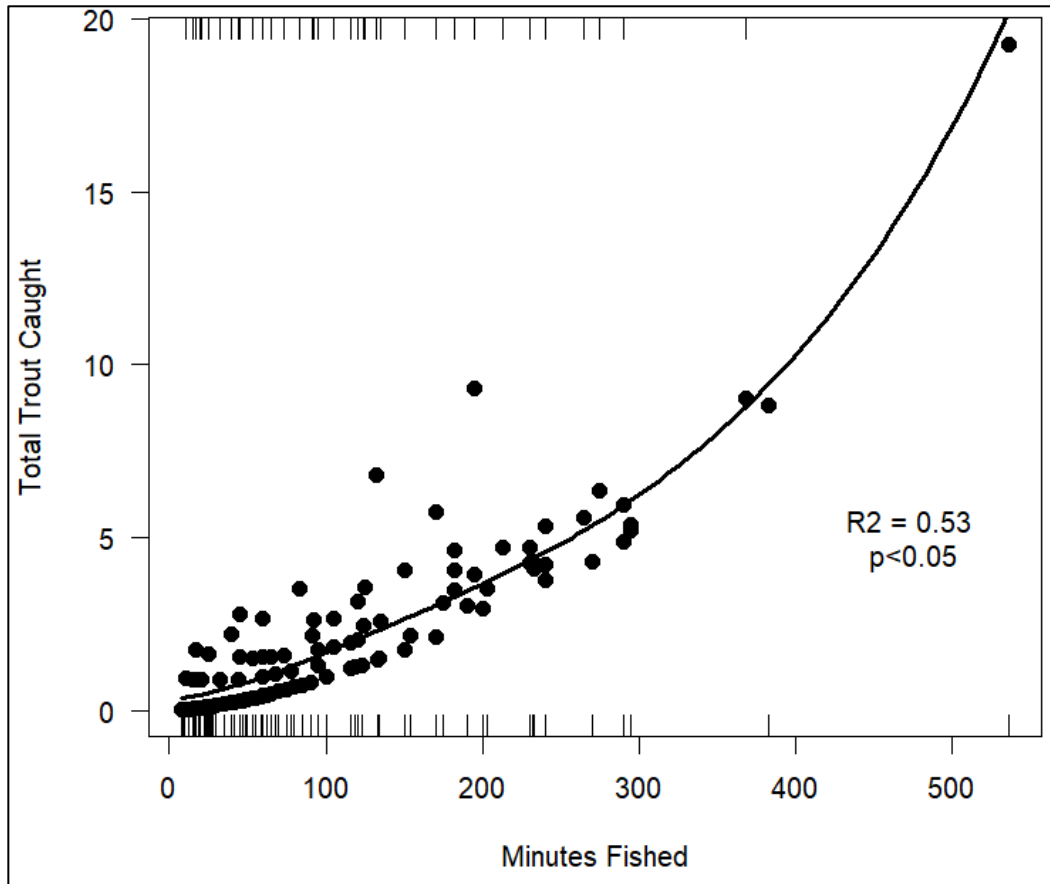


Figure 4. The relationship between the total number of trout reported to be caught by interviewed anglers and the total minutes fished by each angler. Data were fit using a zero-inflated negative binomial regression model. Points represent individual anglers ($n = 159$), tick marks identify where each point falls on the x-axis, and black line represents model fit. Observations of anglers reported to be fishing less than five minutes were omitted ($n=8$) as were outliers where anglers reported catching more than 25 trout ($n=3$).

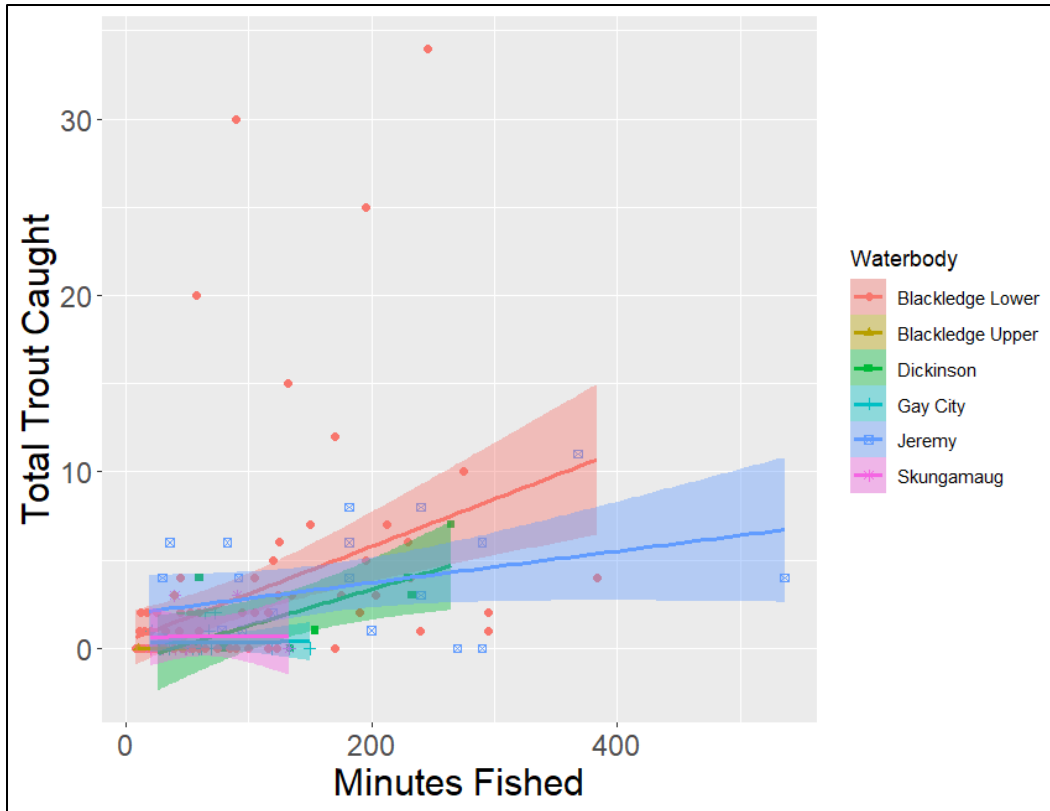


Figure 5. The relationship between the total number of trout reported to be caught by interviewed anglers and the total minutes fished by each angler, conditioned on waterbody. Data were fit using a linear regression model and points represent individual anglers, lines represent model fit, and shading represents 95% confidence intervals.

- Data expansions showed that angling effort throughout the spring was highest in the lower Blackledge River and lowest in Dickenson Creek (Appendix 1).
- More angling effort was observed during the late spring strata compared to the early spring strata in all waterbodies except for Dickenson Creek (Appendix 1), and the number of anglers counted were highest in the days immediately after a stocking event at most waterbodies (Figure 6).

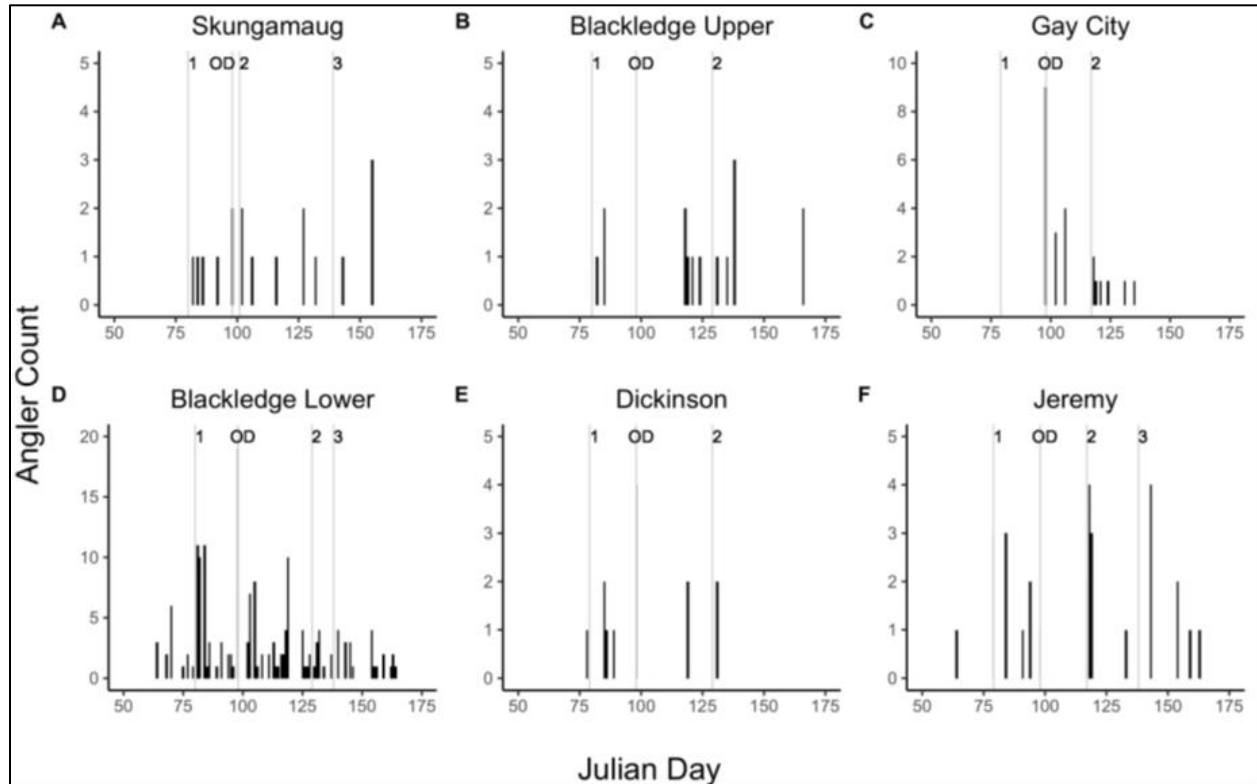


Figure 6. Angler counts by waterbody and Julian date (black bars). Numbers 1-3 in panels denote the 1st, 2nd, and 3rd time each waterbody was stocked with trout and are represented by gray vertical lines. Opening day (OD) of harvest (4/8/2023) is also noted and represented by gray vertical lines.

- Catch-per-unit-effort (CPUE; trout caught/hr) expansions showed the highest catch rates (early and late season in aggregate) were at Dickenson Creek (16.20 trout/hour) and the lowest were recorded at the upper Blackledge River (0.00 trout/hour) (Appendix 2).
- CPUE was significantly different between management seasons ($p < .05$; two-sample *t*-test), but not between bait type nor weekday/weekend strata.
- Most anglers provided fishing license numbers when asked (Appendix 3).
- 80% of anglers interviewed across all waterbodies and strata combined had purchased a Trout and Salmon stamp, and the probability of anglers buying a stamp ranged from 50% (upper Blackledge River) to 93% (upper Blackledge River) (Appendix 4).
- Most anglers (74%) were aware of the recently established catch and release season (all waterbodies and strata combined) (Appendix 5). Although additional messaging about trout fishing regulations may be warranted as new means of media develop to reach various angler groups, these data suggest the Fisheries Division's efforts to publicize a major change to the trout fishing season had a positive outcome.

- 54% were either in favor or highly in favor, 17% were either opposed or highly opposed, and 29% had no opinion (Appendix 6).
 - Common responses as to why anglers were in favor of the catch and release season included: they already practice catch and release, they support conservation measures, they don't eat fish, or it spreads anglers out and reduces crowds. Common responses as to why anglers were opposed included: concern about high poaching rates and post-release mortality, and a preference to return to a traditional opening day.
 - When asked how often they keep their catch during the harvest season, anglers responded they were more likely to release than harvest their catch across all waterbodies, and voluntary release rates derived from observed catch and harvest data from interviews suggests the percentage of anglers that always harvested their catch was relatively low (<15% for all waterbodies) (Appendix 7).
 - The likelihood of keeping their catch also varied by bait type with anglers using bait most likely to keep their catch and anglers fly-fishing least likely to harvest their catch.
 - Common responses from anglers releasing their catch included: they already practice catch and release, they don't eat fish, or they lack fish processing skills. Anglers likely to keep their catch reported the following reasons: they eat everything they catch, post-release mortality concerns, they enjoy eating wild trout.
 - 80% of anglers across all waterbodies and temporal strata were either highly in favor or in favor of a statewide 9" minimum length on all trout (Appendix 8).
 - Common responses from anglers highly in favor or in favor of a statewide 9" minimum length on all trout included: they support wild trout conservation, they don't keep trout, believe a 9" is too small to keep, would like to let trout grow bigger. Interestingly, 15% of anglers would like to see a higher minimum length, with the majority (83%) already in favor of a 9" minimum length limit.
- An intensive angler survey was designed and started on the West Branch Farmington River Trout Management Area (TMA) and Farmington River TMA from the Goodwin Dam (Barkhamsted) down to the RT 177 bridge (Unionville) in January 2024. The survey will run the entire calendar year and provide estimates of catch by species (harvest and release), angling effort (hours), and opinion data regarding a possible expansion of the year-round catch-and-release regulations in the West Branch Farmington River TMA. A total of 22.4 miles of river will be surveyed and provide managers with useful data regarding current and future management decisions in the TMA.

- A stratified roving creel design was employed (Malvestuto et al. 1978) starting January 1st and will run through December 31st of 2024.
 - The TMA was sectioned into five (5) zones to replicate survey methods in 2012 (Hagstrom et al. 2012).
 - Temporal strata include: 1) **Day Type**; weekday early/weekday late/weekday evening and weekend/holiday, and 2) **Season**; winter (January 1st-February 29th), early spring (March 1st-April 12th), Opening Day of harvest (April 13th), spring (April 14th-June 15th), summer (June 16th-September 2nd), fall (September 3rd-October 31st), and late fall (November 1st-December 31st). The target was to capture 5% of the time in each stratum.
 - Survey days, start times, start zone, and start direction were selected using Microsoft Excel's random number generator function.
 - Results will be included in the following performance report.
- Building on the 2023 spring angler survey, an intensive stream angler creel survey was designed and started at four trout stocked rivers/streams (Lower Scantic River (East Windsor, South Windsor), Farmington River (Simsbury, Tariffville), East Branch Salmon Brook (Granby, East Granby), West Branch Salmon Brook (Hartland, Granby)) during the spring trout fishing season in 2024. Like the 2023 survey, the survey is intended to provide empirical estimates about recreational trout fishing.
 - A stratified roving creel design was employed (Malvestuto et al. 1978) starting March 1st and running through June 15th, 2024.
 - Defined strata included: 1) weekday/weekend and 2) early spring (3/1/2024 – 4/12/2024), opening day for harvest (4/13/2024), and spring (4/14/2024 – 6/15/2024). The target was to capture 5% of the time in each stratum.
 - 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 stratum.
 - Each waterbody was stocked once in early spring and twice in late spring and stocking events were spaced roughly two weeks apart for all waterbodies.
 - The Scantic River (Somers, Enfield, Windsor) is stocked as two discrete sections (upper and lower), though only the lower section was surveyed to accommodate staff time limitations and daylight hours.
 - 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.

- No work towards this objective in 2023.

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 and trip information regarding Lake Trout after they were stocked in March 2023 (see Coldwater Job 4: Distribution of Hatchery Salmonids).

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

- Evaluate stream angler survey results and make modifications to trout stocking allocations and trout stocking locations as needed including:
 - Discontinue the pre-season stocking and reduce the number of fish stocked in the Upper Blackledge River during the harvest season.
 - Increase the number of trout stocked in the Lower Blackledge River (possibly re-allocating the fish reduced from the Upper Blackledge).
 - Stock Gay City Park Pond as close to the opening day of harvest season as possible.
 - Discontinue stocking Dickensen Creek after April 31st.
- Continue to evaluate alternatives or modifications to traditional survey methodologies to gain efficiencies.
- Utilize ESRI Survey123 application software and mobile devices to record angler survey data collected in the field.
- Develop SOP and long-term strategies for utilizing trail cameras to collect angler usage information.
- Research options for more sophisticated trail cameras to improve image capture and data retrieval.
- Support a post-doc over a 2-year period to standardize and collate stream angler survey data into a relational database.

References

- Hagstrom, N., B. Eltz, E. Machowski, and M. Humphreys. 2012. Cold Water Management: Farmington River Management. Federal Aid to Sport Fish Restoration. F-57-R-31, Study 1 Job 5. Progress Report. Connecticut Department of Environmental Protection.
- 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 1. Creel interview form used during the 2023 stream angler survey.

Water body: _____		Date: _____		Count Time: _____		Agent: _____																				
Bait used: L) Lures W) Worms M) Minnows F) Fly O) Other		Catch		Harvest																						
Stocking Site <small>(enter # from map)</small>	Time started fishing	Time interviewed	<u>BN</u>		<u>BK</u>		<u>RW</u>		<u>UNK Trt</u>		<u>Other</u>	<u>BN</u>		<u>BK</u>		<u>RW</u>		<u>UNK Trt</u>		<u>Other</u>	Total Trt Caught	Total Trt Harvested	Trt/ATS Stamp? Yes or No	Town From	Consv ID Number	
			<9" 9-12" >12"	<9" 9-12" >12"	<9" 9-12" >12"	<9" 9-12" >12"	<9" 9-12" >12"	<9" 9-12" >12"	<9" 9-12" >12"	<9" 9-12" >12"	<9" 9-12" >12"	<9" 9-12" >12"	<9" 9-12" >12"	<9" 9-12" >12"	<9" 9-12" >12"	<9" 9-12" >12"	<9" 9-12" >12"	<9" 9-12" >12"	<9" 9-12" >12"							

A) What are you fishing for? _____
If responded w/ trout is preference wild or stocked ? Don't care? Unknown?

B) Have you previously been interviewed on this river section since January 1st? **Yes** or **No** (circle one)
If angler was not interviewed before continue:

C) Are you aware of the new C&R period for trout from March 1st through 6am of the 2nds Saturday in April (OD)?
Yes or No (circle one)

D) What is your opinion of the C&R season?
2) In favor 1) Highly in favor 4) Opposed 5) Highly opposed 3) No opinion
Why?

E) How often are you likley to keep "target" during the harvest period in this river?
2) Most of the time (>50%) 1) Always 4) Rarely (<10%) 3) Occasionally (<50%) 5) Never
Why?

F) What is your opinion of a proposed statewide minimum length of 9" on all trout (stocked or wild)?
2) In favor 1) Highly in favor 4) Opposed 5) Highly opposed 3) No opinion
Why?

Comments

Appendix 2. Estimated spring angler effort and catch at six (6) waterbodies surveyed in 2023.

Season	Effort (hrs)	SE	df	RSE	Trout Catch	SE	df	RSE	Catch/ Effort
Gay City Park Pond									
<i>Early spring</i>	0	-	-	-	0	-	-	-	0.00
<i>Late spring</i>	280	107.0	41	38.2%	420	0.22	6	51.8%	1.50
Total	280				420				1.50
Blackledge River Upper									
<i>Early spring</i>	56	39.0	15	70.0%	0	-	-	-	0.00
<i>Late spring</i>	249	88.9	37	35.6%	0	-	-	-	0.00
Total	305				0				0.00
Blackledge River Lower									
<i>Early spring</i>	1,619	392.8	22	24.3%	5,063	1,067.2	30	21.10%	3.13
<i>Late spring</i>	2,933	452.5	42	15.4%	839	161.6	60	19.3%	0.29
Total	4,552				5,902				1.30
Jeremy River									
<i>Early spring</i>	195	90.7	22	46.4%	486	272.2	5	56.0%	2.49
<i>Late spring</i>	361	136.1	46	37.7%	4,069	823.7	13	20.2%	11.27
Total	556				4,555				8.19
Dickenson Creek									
<i>Early spring</i>	95	45.4	19	47.9%	1,176	1,172.5	1	99.7%	12.38
<i>Late spring</i>	78	54.1	42	69.1%	1,627	744.9	1	45.7%	20.86
Total	173				2,803				16.20
Skungamaug River									
<i>Early spring</i>	78	36.7	22	46.9%	0	-	-	-	-
<i>Late spring</i>	214	81	32	37.8%	1,102	634.8	3	57.6%	5.15
Total	292				1,102				3.77

Appendix 3. Angler response to providing conservation ID number during the stream angler survey.

	Blackledge River Lower		Blackledge River Upper		Dickenson Creek		Jeremy River		Skungamaug River		Gay City Pond	
	n	%	n	%	n	%	n	%	n	%	n	%
All Anglers	99	77%	1	50%	11	73%	15	58%	9	56%	16	76%
Yes	99	77%	1	50%	11	73%	15	58%	9	56%	16	76%
No	29	23%	1	50%	4	27%	11	42%	7	44%	5	24%

Appendix 4. Angler response to purchasing a Trout & Salmon stamp during the stream angler survey.

	Blackledge River Lower		Blackledge River Upper		Dickenson Creek		Jeremy River		Skungamaug River		Gay City Pond	
	n	%	n	%	n	%	n	%	n	%	n	%
All Anglers	114	93%	1	50%	13	87%	24	92%	12	80%	13	76%
Yes	114	93%	1	50%	13	87%	24	92%	12	80%	13	76%
No	9	7%	1	50%	2	13%	3	8%	3	20%	4	24%

Appendix 5. Responses from anglers when asked if they were aware of the statewide catch and release season for trout that extends from March 1st to 6:00am on the 2nd Saturday in April. These opinion questions were only asked the first time they were interviewed at a river/pond during the entire survey.

	Blackledge River Lower		Blackledge River Upper		Dickenson Creek		Jeremy River		Skungamaug River		Gay City Pond	
	n	%	n	%	n	%	n	%	n	%	n	%
All Anglers												
Yes	107	87%	1	50%	12	80%	22	85%	13	87%	13	76%
No	16	13%	1	50%	3	20%	4	15%	2	13%	4	24%

Appendix 6. Responses from anglers when asked their opinion of the statewide Catch and Release season for trout. These opinion questions were only asked the first time they were interviewed at a river/pond during the entire survey.

	Blackledge River Lower		Blackledge River Upper		Dickenson Creek		Jeremy River		Skungamaug River		Gay City Pond	
	n	%	n	%	n	%	n	%	n	%	n	%
All Anglers												
Highly in Favor	24	20%	0	0%	1	7%	3	12%	2	13%	1	6%
In Favor	62	50%	2	100%	7	47%	15	58%	7	47%	5	29%
No Opinion	20	16%	0	0%	4	27%	2	8%	3	20%	4	24%
Opposed	13	11%	0	0%	2	13%	5	19%	3	20%	3	18%
Highly Opposed	4	3%	0	0%	1	7%	1	4%	0	0%	4	24%

Appendix 7. Responses from anglers when asked how often they keep their catch during the harvest season, which extends from 6:00am on the 2nd Saturday in April to the last day in February. Note, these opinion questions were only asked the first time an angler was interviewed at a river/pond during the entire survey and were asked both during the catch and release season and harvest season.

	Blackledge River Lower		Blackledge River Upper		Dickenson Creek		Jeremy River		Skungamaug River		Gay City Pond	
	n	%	n	%	n	%	n	%	n	%	n	%
All Anglers	n	%	n	%	n	%	n	%	n	%	n	%
Always	11	9%	0	0%	1	7%	3	12%	1	7%	2	12%
Most of the Time	26	21%	0	0%	2	13%	2	8%	1	7%	1	6%
Occasionally	19	15%	0	0%	2	13%	4	15%	2	13%	5	29%
Rarely	34	28%	0	0%	8	53%	8	31%	6	40%	3	18%
Never	33	26%	2	100%	2	13%	9	35%	5	33%	6	35%

Appendix 8. Responses from anglers when asked their opinion of a proposed statewide 9” minimum length on all trout. These

opinion questions were only asked the first time they were

	Blackledge River Lower		Blackledge River Upper		Dickenson Creek		Jeremy River		Skungamaug River		Gay City Pond	
	n	%	n	%	n	%	n	%	n	%	n	%
Highly in Favor	19	15%	2	100%	2	13%	2	8%	1	7%	3	18%
In Favor	72	59%	0	1%	12	80%	18	69%	13	87%	10	59%
No Opinion	13	11%	0	0%	1	7%	4	15%	0	0%	3	18%
Opposed	15	12%	0	0%	0	0%	2	8%	1	7%	1	6%
Highly Opposed	4	3%	0	0%	0	0%	0	0%	0	0%	0	0%

interviewed at a river/pond during the entire survey.



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
4/1/2023 to 3/31/2024

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

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. The Trumbull Connecticut Scott Group helps stock trout in the Pequonnock River.

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 of harvest for trout (4/8/2023, in-season, and late-season schedules. Fish allotments were sorted by hatchery, management type, and watershed, and 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, 101 lakes/ponds and 151 distinct riverine sections were stocked with catchable-size (> 6 inches) salmonids in 2023.
 - One waterbody (Hunts Brook) was dropped from the stocking program due to low angler usage and poor public access.
 - One waterbody (Whiting River) was dropped from the stocking program because of poor public access and the presence of strong naturally reproducing populations of wild Brook Trout and Brown Trout.

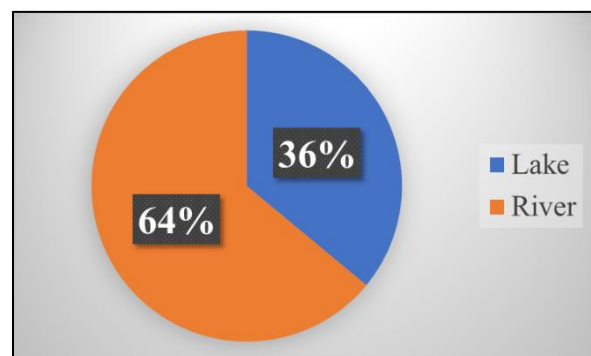


Figure 2. Percent of total catchable-size trout (> 6 inches) stocked in 2023 by habitat type.

- One waterbody (Stanley Quarter Park Pond) was temporarily dropped from the stocking program due to extensive dredging and dewatering related to a habitat restoration project.
- One waterbody (Hockanum River) was added back to the stocking program although the chemical polyfluoroalkyl substances (PFAS) has been detected in fish tissue. While fish tissue collection and analysis is ongoing, the Fisheries Division decided to only stock trout in the Trout Management Area section of the river which is catch and release only for trout.
- One waterbody (Lake McDonough) was added back to the stocking program because reduced boat launching fees restored reasonable public access.
- Approximately 582,466 catchable-size trout, 1,474 catchable-size Atlantic Salmon, 334,738 Atlantic Salmon fry, and 192,000 Kokanee Salmon fry were stocked in 2023 (see the [Annual Fish Stocking Report](#) for location specifics).
- Of the total number of catchable-size trout stocked, 36% were released into lakes and ponds and 64% were released into rivers and streams (Figure 2). Size composition for catchable-size trout was 4% yearlings (6-9 inches), 77% adults (9-12 inches), 18% large-size trout (>12 inches), and <1% retired broodstock (> 16 inches). Species composition was approximately 40% Brown trout, 41.0% Rainbow trout, 16% Brook trout, and 3% tiger trout.
- To take advantage of mild winter conditions in 2023, and in anticipation of Opening Day of Harvest (OD) slated for April 8th, 2023, DEEP began stocking [Trout Management Areas](#) on February 15th and [Trout Management Lakes](#) on January 13th.
- Of the total allotment of catchable-size trout distributed, 50% were stocked prior to OD, approximately 40% were stocked from OD to May 22nd, and 10% were stocked July through December.
- During fall 2023 (October – December), 1,474 [broodstock Atlantic Salmon](#) raised at the [Kensington State Fish Hatchery](#) (Berlin) were stocked into the following waterbodies: Naugatuck River (594 fish), Shetucket River from the Scotland Dam to Occum Dam (630 fish), Mount Tom Pond (125 fish), and Crystal Lake (125 fish).
- Just under 18,000 standard adult Tiger Trout (9-12 inches) were stocked with 7,460 stocked into lakes and ponds (42%) and 10,435 stocked into rivers and streams (58%).
- The Seeforellen strain Brown Trout stocking program continued in 2023.
 - Over 4,000 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.
 - 378 broodstock Seeforellen strain Brown Trout were stocked into 10 lakes (Mashapaug Lake, Crystal Lake, Squantz Pond, Black Pond (Woodstock), Long

Pond, Beach Pond, Cedar Lake, West Hill Pond, Highland Lake and East Twin Lake).

- These fish were 2-3 years in age, and many were greater than 20 inches in length.
- Also of note was the spring (2023) stockings of 2,000 >14 inches retired broodstock Brook Trout (avg. weight of 3-5 lbs.). Mohawk Pond received 300 and Black Pond received 300 fish in the spring, and each waterbody received 700 >14 inches Brook Trout in the fall.
- Finally, no Brown Trout fry were stocked within Class 2 and Class 3 [Wild Trout Management Areas](#) (waters are listed in the [Annual Fish Stocking Report](#)) as the Fisheries Division has implemented a moratorium on Brown Trout fry stocking to evaluate the success of establishing naturalized populations and developing a fishery.

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 2023. 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, and Kokanee and Atlantic Salmon) throughout the State.
- Design of a relational database continues. Currently all data are stored within Microsoft Excel, with separate worksheets for each year.
- An historical trout and salmon stocking database has been designed and is currently being updated. These data are sorted by waterbody, year, species, and fish size and will facilitate data visualization, summary reports, and review of how allocations have changed over time.

Objective 4: Continue to update electronic stocking maps.

- Public stocking maps (n = 11) were updated as needed and made available [online](#) including an interactive stocking map.
- In the interactive stocking map, modifications to color schemes for stream segments were made, locations no longer being stocked were removed, and both text and signage were updated on waterbody popups to reflect current regulations.
- Stocking maps for hatchery staff are being revised and converted to Google Maps to improve navigation to stocking locations and optimize fish distribution operations.
- 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.

- 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

May 8, 2024

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. Results are included in Coldwater Job 3.

- Building on the 2023 spring angler survey, an intensive stream angler creel survey was designed and started at four (4) trout stocked rivers/streams (Lower Scantic River (East Windsor, South Windsor), Farmington River (Simsbury, Tariffville), East Branch Salmon Brook (Granby, East Granby), West Branch Salmon Brook (Hartland, Granby)) during the spring trout fishing season in 2024. Similar to the 2023 survey, the survey is intended to provide empirical estimates about recreational trout fishing.
 - A stratified roving creel design was employed (Malvestuto et al. 1978) starting March 1st and will run through June 15th, 2024.
 - Defined strata included: 1) weekday/weekend and 2) early spring (3/1/2024 – 4/12/2024), opening day for harvest (4/13/2024), and spring (4/14/2024 – 6/15/2024). 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.
 - Each waterbody was stocked once in early spring and twice in late spring and stocking events were spaced roughly two weeks apart for all waterbodies.
 - The Scantic River (Somers, Enfield, Windsor) is stocked as two discrete sections (upper and lower), though only the lower section was surveyed to accommodate staff time limitations and daylight hours.
 - Results will be included in the next performance report.
- A voluntary Survey123 was designed to capture angling effort for Lake Trout provide by the USFWS and stocked into five (5) waterbodies on 3/28/2023 and 3/29/2023. The public survey was advertised on the DEEP website, Facebook, CT Fishin’ Tips newsletter, and email.
 - In total 440 Lake Trout averaging 10 pounds and 30 inches were stocked: Crystal Lake (90), Coventry Lake (155), Tyler Lake (50), Squantz Pond (105), and Bigelow Pond (40).
 - 19 anglers submitted an entry between 3/30/2023 and 5/21/2023 and fishing effort was highest at Coventry Lake (8 anglers) and Squantz Pond (6 anglers).
 - The average fishing trip was 3.78 hours. A total of 16 Lake Trout were caught and two were harvested.
 - The Fisheries Division will continue to seek unique stocking opportunities like this to diversify fishing across the state.

- An online statewide trout stocking survey was developed and distributed to better understand changing angler behaviors and desires around trout fishing. Specifically, anglers were asked about their awareness and opinion of the catch and release season, preferences for Tiger Trout, opinions on the timing and frequency of stocking, in what season and in which management type do they most fish, and bait types used.
 - The survey was sent via email to all license holders as well as posted on Facebook, the DEEP website, and CT Fishin' Tips.
 - 3,635 survey responses were recorded and 40% included written comments in their response.
 - 75% of respondents were aware of the catch and release season (3/1/2023 – 4/8/2023) but only 48% fished during that period.
 - 41% of respondents like to catch Tiger Trout, while 38% responded they have never caught one. 43% of anglers would like to see the Fisheries Division stock more Tiger Trout.
 - When asked what type of trout they preferred to fish for, 6% said recently stocked trout, 12% prefer holdover trout, 24% prefer wild trout, and 58% had no preference.
 - As expected, many anglers responded that they prefer to fish in Trout Management Areas. However, a surprising result was that many respondents spend most or all of their time fishing in rivers/streams with no special regulations (5 trout/day, no minimum length limit).

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

- Annual stocking densities for all lakes/ponds and rivers/streams were determined in 2020. 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.
- In summer 2023, fisheries staff began conducting a comprehensive statewide trout stocking site assessment to evaluate the suitability of current stocking locations. The most recent site assessment was done in 2014.
 - A rank and score model is being used to assess 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.
 - A Survey123 form was developed to facilitate data collection in the field and to date 884 individual stocking locations have been assessed (Figure 2).
 - Once complete, fisheries staff will review and, coupled with results from angler surveys and fish sampling data, modify stocking locations and allotments as needed.

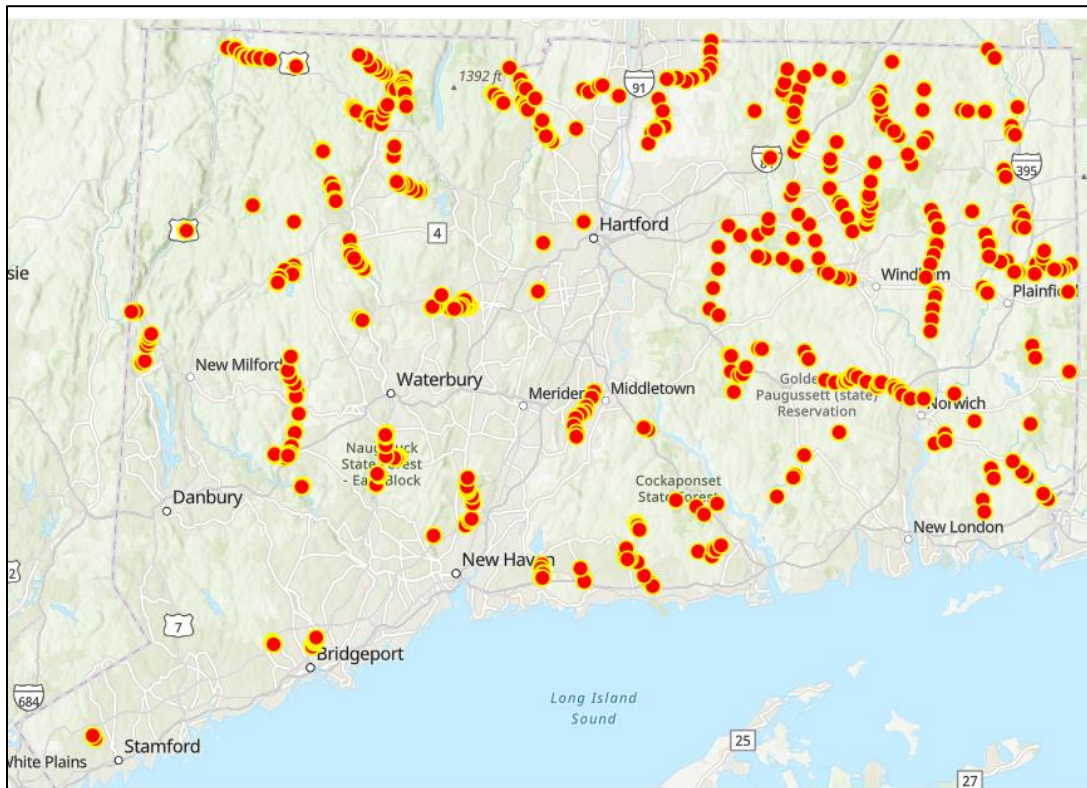


Figure 3. Individual stocking locations assessed as part of the ongoing statewide stocking site assessment using Survey123.

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 occurred on the 2nd Saturday in April. But in 2021, stocked waterbodies were advertised starting on March 5th. In 2022 and 2023, 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.

- Progress made towards the themes and goals in [Connecticut's Salmonid Action Plan](#) (Beauchene and Eltz 2021) is being evaluated and additional needs and gaps in information are being identified and work plans adjusted accordingly. Staff will begin to revise the current plan and draft the next action plan, scheduled for 2026.

- An updated trout stocking operations directive has been drafted and is currently being finalized by fisheries staff. The last trout stocking directive was completed in 1978.

Moving Forward

- Implement actions identified within the [Statewide Salmonid Action plan](#) (Beauchene and Eltz 2021) and evaluate progress and additional needs for the upcoming Statewide Salmonid Action plan.
- Research current property ownership and public access of stocking sites where there is 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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- USFWS. 2013. 2011 national survey of fishing, hunting, and wildlife-associated recreation- Connecticut. U.S. Department of the Interior, U.S. Fish and Wildlife Service, and U.S. Department of Commerce, U.S. Bureau of the Census. Washington, D.C. 172 pp.



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
4/1/2023 to 3/31/2024

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

Report Prepared by: Brian Eltz and Andrew Ransom
Job Personnel: Brian Eltz, Co-Job Leader
Andrew Ransom, Co-Job Leader
Matthew Devine, Primary Staff
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

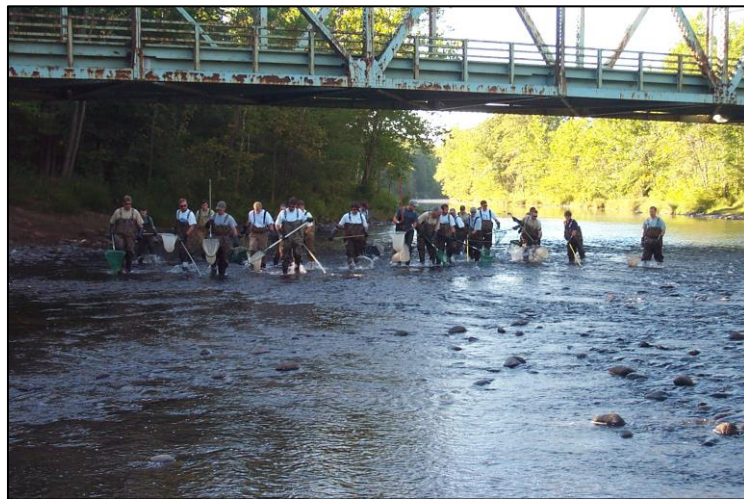


Figure 1. Sampling the West Branch Farmington River Trout Management Area to determine population estimates and collect broodstock.

Connecticut. Since the inception of the TMA, the proportion of wild Brown Trout in fall population samples has increased (from 2% to 45%) and now also comprise a substantial component 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 supports 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 better understand 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, East Twin Lake, and Beach Pond by stocking approximately 50,000 fry per year in each lake, stocking any surplus fry in Lake Wononscopomuc.
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 as well.



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 extended duration 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 period as fish ripen in the hatchery environment.
- In 2023, 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 2023.

Date	Waterbody	Yearlings	Adults	Large Adults (>12")
4/10/2023	Farmington River (West Br. TMA)	0	0	1,000
4/19/2023	Housatonic River, Upper TMA	3,000	0	0
4/17/2023	Housatonic River, Bull's Bridge TMA	3,000	0	0
10/4/2023	Hockanum River TMA	3,000	0	0
5/8/2023	Farmington River (West Br. TMA)	1,571	0	0
10/3/2023	Pequabuck River, RTS 229-177	3,000	0	0
10/16/2023	Housatonic River, Upper TMA	0	0	2,000
10/17/2023	Housatonic River, Upper TMA	0	0	2,000
Total		13,571	0	5,000

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

- Single pass electrofishing sampling was used to collect 71 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 October 20th. The brood collection was delayed six weeks due to several significant high flow events and sampling was carried out under higher-than-normal flow conditions (~150 cfs). Typical samples are conducted when flows are reduced to 80-100 cfs. These high flows resulted in reduced sample efficiency, and few Brown Trout were captured compared to normal collection years. Due to reduced numbers of captured trout, Fish Management and Hatchery personnel were not able to screen fish for brood selection using normal protocol, and most fish over 12 inches were retained for spawning. 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 (e.g., spawning coloration, kype development).
- The selected fish were transported to the Burlington State Fish Hatchery in a hatchery truck with aerated, insulated tanks. At the hatchery, broodstock were isolated from other hatchery populations for fish disease/health measures.
 - Hatchery staff spawned 30 pairs (consisted of 30 females and 17 males; several males were used more than once) and collected 46,598 green eggs from these fish. Overall egg eye-up was determined to be 63%, which is lower than in previous years (by ~20%). All fish were spawned between October 25th and November 22nd. The reduced eye-up was likely due to less stringent brood selection.
 - These crosses will produce enough fish to meet all the Survivor production needs for 2025 spring yearlings (8,000), 2025 fall adults (4,000), 2025 fall large adults (500), and 2026 spring large age-2 adults (1,100).
 - All collected brood are returned to the river after spawning is completed.
- Additional Brown Trout brood were collected from other sources where wild fish are known to persist [Mill Brook (Cornwall), Kent Falls Brook (Kent), Fulling Mill Brook (Naugatuck), Beacon Hill Brook (Naugatuck), and Tankerhoosen River (Vernon)] in late September and early October in case the Farmington River could not be sampled.
 - A total of 41 pre-spawned adults were captured and brought back to the Burlington State Fish Hatchery in an aerated tank on Fish Management trucks. At the hatchery, the broodstock were isolated from other hatchery populations for fish disease/health measures.

- Hatchery staff spawned 11 pairs (consisted of 11 females and 11 males) and collected 6,678 green eggs from these fish. Overall egg eye-up was determined to be 65%. All fish were spawned between October 27th and November 22nd. Resultant fry were isolated for an extended period of time to assess survival and growth rates before mixing with Survivor fry for continued growth.
- All collected brood were returned to their source waterbodies after spawning was 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.

- Frequent precipitation and resulting high flow events during summer of 2023 hindered the ability of PhD candidate Chris Sullivan of UConn to tag holdover Brown Trout in the Housatonic River TMA (Cornwall). However, Chris was able to deploy underwater camera traps and temperature loggers to survey trout occupying thermal refuge areas.
 - A manuscript detailing trout thermal refuge usage and behavior at thermal refuges in the Housatonic River was published (Sullivan and Vokoun 2023).
 - Remaining acoustic tags are planned for deployment in summer of 2024.
- A year-long intensive creel survey also began on the Farmington River on January 1, 2024. Please see Study 1, Job 3: Stream Angler Surveys for more information.

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 2023.

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 Wononscopomuc.

- [Developed and implemented Kokanee work plan](#) in 2021.
- Kokanee fry were stocked by boat into: East Twin Lake, Salisbury (50,000), West Hill Pond, New Hartford/Barkhamsted (50,000), Beach Pond, Voluntown, CT/Exeter, RI (50,000), and surplus fry into Lake Wononscopomuc, Salisbury (40,000).

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 (8th consecutive year of stocking) to re-establish the Kokanee Salmon 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.
 - Four trap nets were set to assess the adult spawning population of Kokanee from 10/16 to 11/3. Zero adult Kokanee were collected.
 - Angler reports from summer of 2023 and spring of 2024 indicate large Kokanee (18") are being caught recreationally. Kokanee size is inversely related to abundance (i.e. smaller population results in larger fish), and the large size reported suggests that the present population is low in density.



Figure 4. Retired Fisheries Division Biologist Edward Machowski holding a nice male Kokanee in full spawning color from East Twin Lake (Salisbury).

Objective 9: Continue the collection of Kokanee broodstock.

- At West Hill Pond, trap netting for the collection of broodstock salmon was completed during October 2023. Nets were fished from October 10th through October 13th and a total of 1,079 adult salmon (487 females; 592 males) were captured and transported to the Burlington Fish Hatchery. Of these fish, 864 were spawned (432 male/female pairs), producing 282,439 green eggs equating to 642 eggs/female. The percent eye-up of the eggs at Burlington Hatchery was high at 87.6% (like previous years) resulting in 247,506 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 2024.

- No broodstock netting was needed at East Twin 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 114 broodstock salmon from West Hill Pond (53 males and 61 females) was measured while being spawned at the Burlington Fish Hatchery. The average size of both sexes combined was 335 mm (males = 343 mm; females = 328 mm). The overall size of the Kokanee collected for spawning in 2023 was larger in size to those found in 2022 (307 mm).
- At West Hill Pond, three nets were only fished for a total of three days (i.e., 72 hrs.) because the number of brood needed for spawning at the hatchery was met after the second day. One net was removed after the second day, and Kokanee were released back to the lake from the remaining two nets before being removed on the third day. It typically requires at least three days to meet the 225 male/female breeding pairs; therefore, Kokanee densities in the lake appear to be remain high.

Moving Forward

- Grow out Survivor Brown Trout for stocking in fall 2024 and spring 2025.
- Evaluate the condition of the wild trout population in the Farmington River year-round TMA after sampling in fall of 2024. 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 Farmington River through angler surveys, 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 and purse seining.
- 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.

May 8, 2024

- Monitor the populations within each of the stocked lakes, especially Beach Pond. A secondary assessment in Beach Pond should occur in the fall of 2024 to assess the developing fishery.
- Determine the best method for assessing the survival of June-stocked Kokanee

References

fingerlings in West Hill Pond.

- Develop plan for reintroducing new genes into the Kokanee population as needed.
- Monitor zooplankton communities in Kokanee lakes and determine if current stocking timings are appropriate given available food source.

Sullivan, C.J. and Vokoun, J.C., 2023. Disentangling effects of habitat on salmonid abundance in thermal refuges while accounting for imperfect detection. *Ecosphere*, 14(12), p.e4727.



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
4/1/2023 to 3/31/2024

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

Report Prepared by: Andrew Ransom & Brian Eltz
Job Personnel: Andrew Ransom, Co-Job Leader
Brian Eltz, Co-Job Leader
Matthew Devine, Primary Staff
Andrew Bade, Program Coordinator

Overview: Though most of Connecticut’s lakes and ponds are considered warmwater, several locations in Connecticut support coldwater lake fisheries for 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.

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 (e.g., 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



Figure 5. Photo of night boat electrofishing.

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 and Rainbow Smelt; Eltz and Machowski 2016). 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.

- The relative population size of Alewives was assessed at Lake Wononscopomuc (8/21/23-8/23/23) and East Twin Lake (8/23/23-8/25/23) using vertical gillnets. Five nets were set each sample date and retrieved the following day. The average Alewife catch per night was similar in each lake (77.5 and 70, respectively), and both have increased from the last sample event in 2014 (Figures 1 and 2). In East Twin specifically, the population was assumed to be extirpated in the early 2010's, but they appear to have had a strong

Lake Wononscopomuc

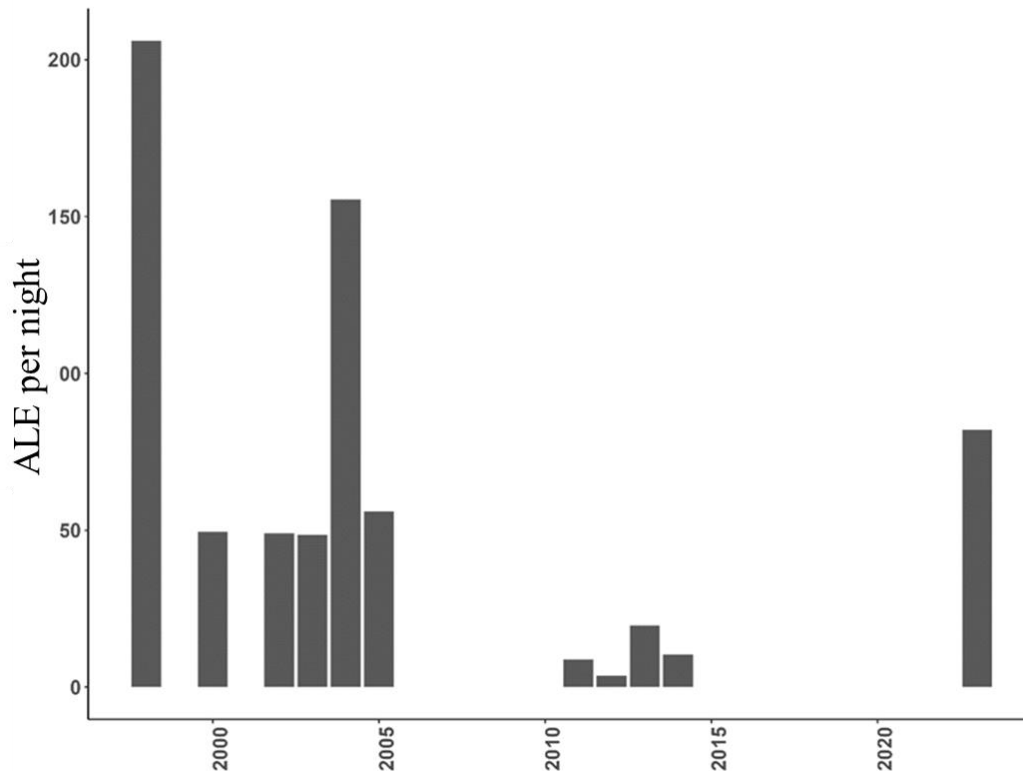


Figure 1. Relative population size (number of fish/night) of Alewives in Lake Wononscopomuc during each sample year using vertical gillnets. Prior to 2023, the most recent sample conducted was in 2014.

resurgence in recent years. It is currently unknown if this was a natural recovery from a few remaining individuals or the result of another illegal introduction into the system.

- Relative abundance nighttime electrofishing sampling was conducted at Highland Lake on 10/17/2023 and 11/14/2023 to assess the trout population. During both sample events, fewer than twelve trout were captured. The summer of 2023 was cool with major rain events (>2”) occurring frequently, and that may explain the lack of fish in typical sample zones. The standard sampling zones are focused around coldwater refugia near tributary mouths, and during typical summer conditions fish move to these nearshore areas after the cold and oxygen rich water in the lake is depleted. Occasionally, as in 2023, conditions remained suitable within the lake proper, and fish were able to remain at depth and were unavailable for sampling with electrofishing. Water temperature and dissolved oxygen profiles collected by Northeast Aquatic Research for the Highland Lake

East Twin Lake

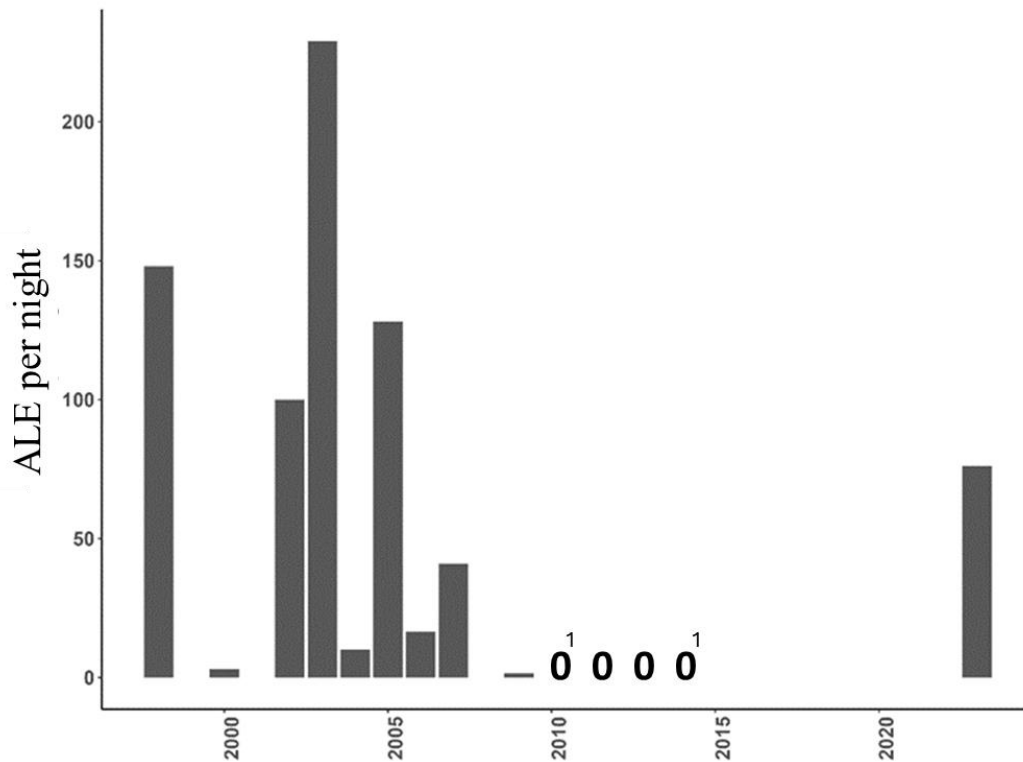


Figure 2. Relative population size (number of fish/night) of Alewives in East Twin Lake during each sample year using vertical gillnets. Zero Alewives were captured from 2010 – 2014, and in 2010 and 2014 nets were only set for a single night. Prior to 2023, the most recent sample conducted was in 2014.

watershed Association indicate that a 2-4 meter layer of water in Middle and South bays were suitable for trout survival throughout the season (Kilson and Knoecklein 2024).

- An experimental electrofishing sample was conducted at the Saugatuck Reservoir on 10/24/23 to assess recent stockings of Seeforellen Brown Trout. This was the first time a trout specific sample has been conducted in this waterbody, and zero trout were captured. Future efforts will be required to determine how to effectively assess this population.
- In Beach Pond, trap netting was used to assess the spawning kokanee salmon population using the Schnabel mark-recapture method (Everhart et al. 1975, Ricker 1975) from 10/16/23 until 11/3/23. Four nets were set on October 16th; one net was pulled on 10/23 and 10/25, and the final two nets were pulled on 11/3. Zero kokanee were captured during sampling, suggesting survival of that particular year class was minimal. However, several anglers have reported catches up to 18 inches in length.

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).

- A temperature and dissolved oxygen profile was conducted in Colebrook River Lake (Colebrook) on August 15th, 2023. Results indicated that most of the cold water (<20C) from the reservoir had been flushed from the system due to a large number of rain events and the need for discharging water downstream to ensure sufficient flood storage capacity. Oxygen content within the reservoir was still sufficient, with all readings being above 4.5mg/L. This action was conducted to assess the amount of cold water available to supply the Farmington River, a popular tailwater fishery immediately downstream of the lake.

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 support holdover Brown Trout. It may take up to two years for this change in regulations to take place.
- A protected thermal refuge area in Highland Lake has been proposed for the mouth of Taylor Brook. When summer conditions are stressful for trout in Highland Lake, large numbers of fish congregate in this area and rely on the cold oxygenated water entering the lake to survive until the fall.

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 hatchery system to rear the Seeforellen strain of Brown Trout for stocking in 2023/2024. 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.
 - For locations stocked with Seeforellen in 2023 and 2024, see Table 2.

Table 2. Numbers, sizes, and lakes stocked with Seeforellen-strain Brown Trout in the 2023/2024 reporting period.

Lake	Month of Stocking	Seeforellen-strain Brown Trout Stocked		
		> 6 inches	> 12 inches	> 16 inches
Black Pond, Meriden	Dec./Jan./Feb.	0	0	40
Beach Pond	Nov./Feb.	0	450	35
Cedar Lake	Feb.	0	0	30
Crystal Lake	Nov./Jan.	0	450	40
East Twin Lake	May/Nov./Jan.	5,500	950	38
Highland Lake	Nov./Jan.	0	1,000	40
Lake Wononskopomuc	May	3,642	0	0
Long Pond	Nov./Feb.	0	450	35
Mashapaug Lake	Feb.	0	0	40
Saugatuck Reservoir	May	1,500	0	0
Squantz Pond	Nov./Feb.	0	300	40
West Hill Pond	Nov.	0	450	40
Total		10,642	4,050	378

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

- No work was performed during the 2023-24 working period towards this objective.

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

- No work was performed during the 2023-24 working period towards this objective.

Moving Forward

- Continue to monitor the abundance and size distribution of Alewives in important coldwater lakes via vertical gill nets and purse seine. Continue to evaluate the effects of Alewife competition with kokanee in East Twin Lake by monitoring growth of kokanee.
- Continue to monitor temperature and dissolved oxygen during late summer in key coldwater lakes and adjust Brown Trout stocking numbers as needed.
- Continue to assess newly initiated stockings of March season Trout Management Lakes with angler surveys or trail cameras including Brook Trout Management 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.

References

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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
4/1/2023 to 3/31/2024

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
Spencer Mallette, Primary Staff
Lillian Glynos, Primary Staff
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 climate change), that can 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.

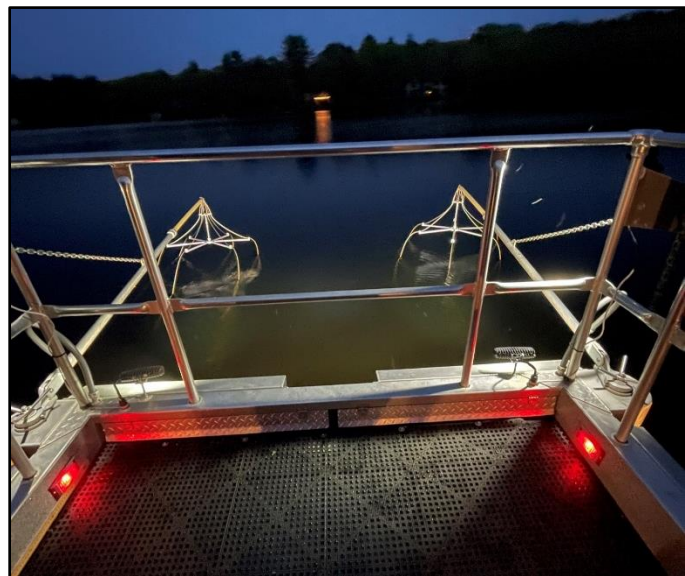


Figure 1. Nighttime boat electrofishing to obtain various fish species data is a core function of the warmwater fisheries program.

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.

- Thirty-eight “all fish species” and one “trout only” nighttime boat electrofishing samples were performed between May 1 and June 20, 2023, and again between October 2 and November 8, 2023 (Table 1) following standard sampling protocols.
 - “All fish species” refers specifically to 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 and relative abundance estimates at Cedar Lake and Long Pond. The results for these specific species samplings are reported separately in their respective annual reports).
 - Twenty-one waterbodies were sampled as part of an ongoing statewide lacustrine (i.e. “lake dwelling”) Smallmouth Bass assessment. At these waterbodies all fish species were sampled and up to 30 Largemouth Bass, 30 Smallmouth Bass (when possible) and either 30 Bluegill or Pumpkinseed were retained and sent to the United States Department of the Interior Fish and Wildlife Service Lamar Fish Health Center in Lamar, PA for fish pathology testing. This testing was done as part of an ongoing study to assess Connecticut’s lacustrine Smallmouth Bass populations. The pathology testing was done according to the protocols of the United States Fish and Wildlife Service, Wild Fish Health Survey Protocols, which included: bacteriology, kidney tissues inoculated on BHIA slants with bio-chems run on bacterial growth and PCR confirmation; virology, cell culture of kidney/spleen/swim bladder samples homogenized, diluted and incubated for two weeks on CHSE, EPC, FHM, and BF-2 cell lines with PCR confirmation on any noted CPE) to look for Largemouth Bass virus and other fish pathogens.

May 8, 2024

- Two waterbodies that are not open to the public (Columbia Lake and Lake Garda) and one town park pond (Hurds Pond) were sampled. Appendix A contains detailed reports of the results for each of these waterbodies that were provided to the respective lake associations and town authorities.
 - Of note, sampling at Columbia Lake (which had been sampled once before by the FD in 2004) revealed declines in certain fish species.

Table 1. List of waterbodies sampled for the lake and pond program between May 1 and June 20, 2023, and again between October 2 and November 8, 2023.

<u>Waterbody Name</u>	<u>Town</u>	<u>Lake Designation</u>
Andover Lake	Andover	All species
Bargh (aka Mianus) Reservoir	Stamford	Fish pathology/All species
Barkhamsted Reservoir	Barkhamsted	Fish pathology/All species
Black Pond	Woodstock	Fish pathology/All species
Candlewood Lake	Brookfield/New Fairfield/Danbury	All species
Colebrook River Lake	Colebrook/Massachusetts	Fish pathology/All species
Columbia Lake	Columbia	All species
Easton Reservoir	Easton	Fish pathology/All species
Gardner Lake	Salem/Montville/Bozrah	Fish pathology/All species
Highland Lake	Winchester	Trout only
Hopeville Pond	Griswold	All species
Hurds Pond	Somers	All species
Lake Bethany	Bethany	Fish pathology/All species
Lake Chamberlain	Bethany	Fish pathology/All species
Lake Garda	Burlington/Farmington	All species
Lake Hayward	East Haddam	All species
Laurel Reservoir	Stamford	Fish pathology/All species
Lake Wononscopomuc	Salisbury	All species
Long Pond	Ledyard/North Stonington	All species
Mansfield Hollow Lake	Mansfield	Fish pathology/All species
Mashapaug Lake	Union	Fish pathology/All species
Middle Bolton Lake	Vernon	Fish pathology/All species
Moodus Reservoir [upper]	East Haddam	Fish pathology
Moodus Reservoir [lower]	East Haddam	All species
Mount Tom Pond	Washington/Morris/Litchfield	All species
Nepaug Reservoir	New Hartford	Fish pathology/All species
Norwich Pond	Lyme	All species
Pachaug Pond	Griswold	All species
Pickerel Lake	Colchester/East Haddam	All species
Pocotopaug Lake	East Hampton	Fish pathology/All species
Quinebaug Lake	Killingly	Fish pathology/All species
Saugatuck Reservoir	Easton/Redding/Weston	Trout only
Shenipsit Lake	Ellington/Tolland/Vernon	Fish pathology/All species
Trap Falls Reservoir	Shelton	Fish pathology/All species
Uncas Pond	Lyme	All species
Wangum Lake	Canaan	Fish pathology/All species
Wassel Reservoir	Berlin	Fish pathology/All species
Woodbridge Lake	Goshen	All species
Wyassup Lake	North Stonington	Fish pathology/All species

- In conjunction with population and relative abundance work carried out for the Northern Pike and Walleye jobs in 2023, FD staff performed, for the first time in Connecticut, a mark-recapture population estimate for Chain Pickerel (a native top predatory fish in Connecticut) during the spring of 2023 in Pachaug Pond (Griswold), Cedar Lake (Chester), Long Pond (North Stonington) and Beach Pond (Voluntown/Rhode Island) (Table 2). Both trap nets and nighttime boat electrofishing were used at Pachaug Pond and Beach Pond and nighttime boat electrofishing only was used at Cedar Lake and Long Pond.
 - Results (Table 1 and Figure 2) indicate robust Chain Pickerel populations, especially in Long Pond. However, the results for all four lakes should be interpreted with caution as few recaptures were obtained.

Table 2. Summary of Chain Pickerel abundance by size class for four Connecticut lakes (Pachaug Pond [Griswold], Cedar Lake [Chester], Long Pond [North Stonington] and Beach Pond [Voluntown/Rhode Island]) using mark-recapture. Trap nets and nighttime boat electrofishing were used at Pachaug Pond and Beach Pond, while nighttime boat electrofishing only was used at Cedar Lake and Long Pond March 8, 2023, and May 4, 2023.

Method of Capture = <u>Size Class</u>	<u>Lake</u>			
	<u>TN^a & EX^b & E0^c</u> <u>Beach Pond</u>	<u>E0</u> <u>Cedar Lake</u>	<u>E0</u> <u>Long Pond</u>	<u>TN</u> <u>Pachaug Pond</u>
All Size				
Number of Chain Pickerel captured in size class	215	113	224	73
Number of Chain Pickerel recaptured in size class	30	12	9	3
Mortalities	1	0	0	2
Estimated population size (N)	635	399	2,152	742
95% CI	445-942	227-771	1,133-4,843	253-3,712
Number per acre (Range)	1.7 (1.2-2.5)	5.8 (3.3-11.1)	19.7 (10.4-44.4)	0.9 (0.3-4.4)
Stock Size ≥9.8 Inches				
Number of Chain Pickerel captured in size class	187	84	180	73
Number of Chain Pickerel recaptured in size class	29	11	8	3
Mortalities	1	0	0	2
Estimated population size (N)	493	240	1,554	742
95% CI	344-737	134-490	787-3,657	253-3,712
Number per acre (Range)	1.3 (0.9-2.0)	3.5 (1.9-7.1)	14.3 (7.2-33.5)	0.9 (0.3-4)
Quality Size ≥14.9 Inches				
Number of Chain Pickerel captured in size class	109	53	93	66
Number of Chain Pickerel recaptured in size class	21	9	6	3
Mortalities	0	0	0	1
Estimated population size (N)	232	116	548	598
95% CI	152-374	61-260	251-1,495	204-2,992
Number per acre (Range)	0.6 (0.4-1.0)	1.7 (0.9-3.8)	5.0 (2.3-13.7)	0.7 (0.2-3.6)

Preferred Size ≥ 17.7 Inches				
Number of Chain Pickerel captured in size class	39	27	34	46
Number of Chain Pickerel recaptured in size class	12	6	4	3
Mortalities	0	0	0	1
Estimated population size (N)	50	44	106	282
95% CI	29-97	20-119	42-424	96-1,410
Number per acre (Range)	0.1 (0.1-0.3)	0.6 (0.3-1.7)	1 (0.4-3.9)	0.3 (0.1-1.7)
Memorable Size ≥ 20.9 Inches				
Number of Chain Pickerel captured in size class	8	4	9	9
Number of Chain Pickerel recaptured in size class	4	0	1	1
Mortalities	0	0	0	1
Estimated population size (N)	6	UC ^d	29	29
95% CI	2-22	UC	5-290	5-290
Number per acre (Range)	0.01 (0.01-0.1)	UC	0.3 (0.05-2.7)	0.03 (0.01-0.3)
^a TN = trap net. ^b EX = Walleye only nighttime boat electrofishing. ^c E0 = All species nighttime boat electrofishing. ^d UC = Unable to calculate due to no recaptures.				

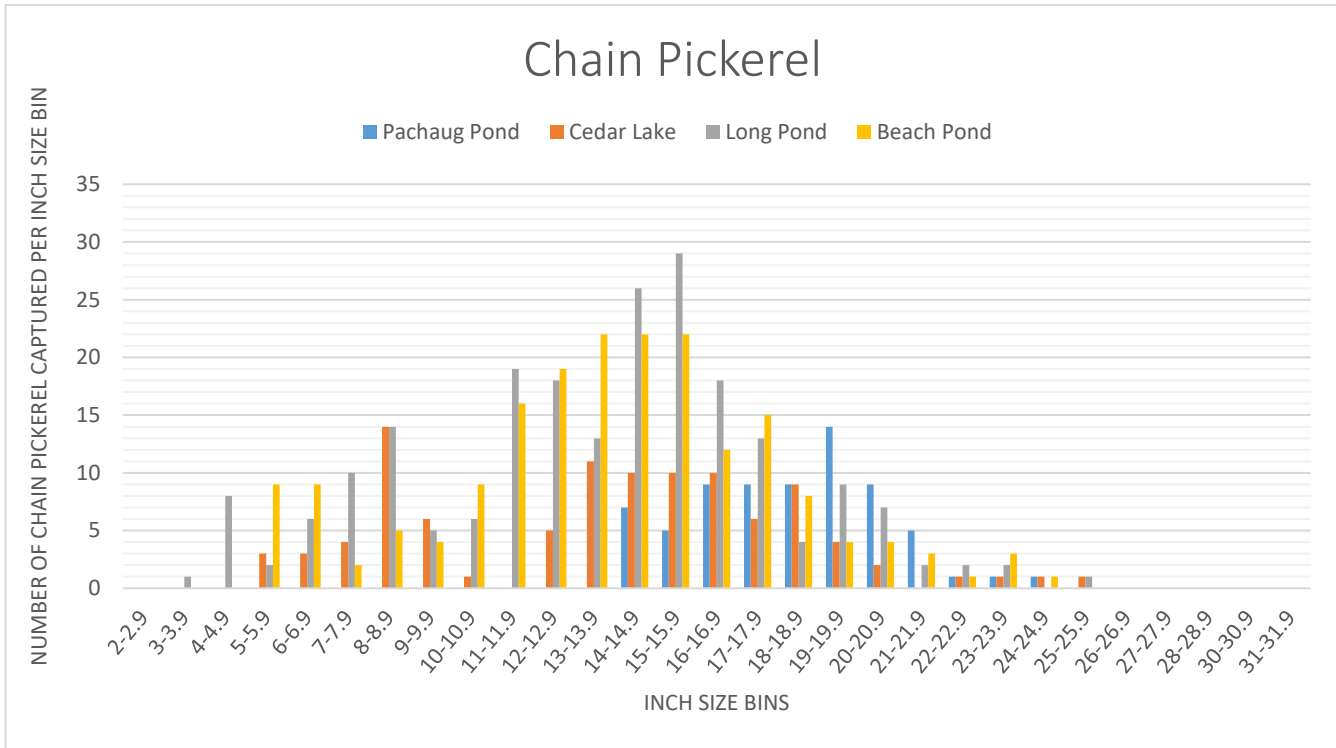


Figure 2. Length-frequency graph for Chain Pickerel captured between March 8, 2023, and May 4, 2023, for four Connecticut lakes (Pachaug Pond (Griswold), Cedar Lake (Chester), Long Pond (North Stonington) and Beach Pond (Voluntown/Rhode Island)) determined using mark-recapture. Trap nets and nighttime boat electrofishing were used at Pachaug Pond and Beach Pond, while nighttime boat electrofishing only was used at Cedar Lake and Long Pond.

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 2023 lake and pond sampling. Most of these samples (excluding *Esocid* [i.e., Northern Pike and Chain Pickerel] scales) have been processed and are ready for ageing, which will be carried out as time allows.
- Moving forward, the number of locations where we collect fish scales for age and growth work will be limited to waterbodies where there is a specific project need and enough fish are likely to be captured to develop reasonably precise age length keys. Instead of the historic three scales per centimeter class that have been taken, the number of scales samples taken per centimeter class will increase to five and will be collected on the species the specific project is studying. This new process has been instituted due to the lack of staff time to process large volumes of scales in a timely manner, in-house analysis suggesting that our current approach does not produce adequately precise age/growth information to guide management, and contemporary American Fisheries Society age and growth methods guidance recommending a minimum of five scales per centimeter to inform management.

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. We will resume work on this once a post-doctoral project begins in summer of 2024.
- During the winter of 2023-24 two seasonal resource assistants (Danielle Shubat and Ryan Adams) created a poster for the winter meeting of the Southern New England Chapter of the American Fisheries Society titled “Population Dynamics and Competitive Interactions of Stocked Channel Catfish in a Connecticut Lake”. This poster can be found in Appendix B.

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

- Four previously unsampled waterbodies were sampled during 2023: Hurds Pond (Somers), Lake Garda (Burlington/Farmington), Moodus Reservoir [lower basin] (East Haddam) and Wassel Reservoir (Berlin). See Appendix A for special reports written up regarding the fish populations for Hurds Park Pond and Lake Garda.

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

- All 2023 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, and Northern Pike relative abundance 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 one night 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 the sampling plan that includes supporting special management projects, rotationally sampling waters without special management, and sampling new waters as time allows.

- Begin utilizing in spring of 2024 the newly purchased electrofishing raft to sample smaller waterbodies and Community Fishing Waters that our traditional electrofishing boats cannot access.
- 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. The onboarding of a post-doctoral fellow in the summer of 2024 to develop a more complete and user-friendly database will be a major step forward in this effort.
- Increase focus on evaluating the impacts of introduced gamefish on resident fish species. (Data management improvements should facilitate this work.)
- Begin the process of researching and purchasing a new electrofishing boat.
- 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.

May 8, 2024

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

May 8, 2024

Mary A. Roickle
Lake Management Advisory Commission Member
Columbia Lake
Columbia, CT 06237

Dear Ms. Roickle:

Thank you for inviting us to sample the fish population in Columbia Lake on November 2, 2023. Please find attached a brief summary report of our 2023 results along with the results from the last sample we performed on the lake on May 27, 2004.

Sincerely;

Christopher P. McDowell

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

Attachment: Summary Report for the November 2, 2023 and the May 27, 2004 Fisheries Samples of Columbia Lake, Columbia, CT by the Connecticut Department of Energy and Environmental Protection Fisheries Division

**Summary Report for the November 2, 2023 and the May 27, 2004
Fisheries Samples of Columbia Lake, Columbia, CT by the Connecticut
Department of Energy and Environmental Protection Fisheries Division**

Background

- Columbia Lake is in the town of Columbia, Connecticut, in Tolland County. It is a 277-acre artificial impoundment. It has a maximum depth of approximately 26 feet, with an average depth of approximately 17 feet. The lake has an unnamed stream that enters the lake on the south end of the lake. There is a dam on the north end of the lake that drains into Columbia Lake Brook.
- A request to sample Columbia Lake was made by Mary A. Roickle (member of the Lake Management Advisory Commission for Columbia Lake) due to reports from concerned residents who live and fish on the lake that there has been “a decrease in some of [the lake’s] fish species such as pumpkin seeds, perch and pickerel”.
- The Connecticut Department of Energy and Environmental Protection (CT DEEP) Fisheries Division (FD) is continually trying to obtain an adequate “picture” of Connecticut’s freshwater fisheries resources and therefore samples a variety of freshwater lakes and ponds, which can include public waters, private water supply reservoirs and private lakes. Gathering data from different waterbodies allows us to assess the State’s freshwater resources and make comparisons of fish population size, and fish age and growth based on varying usage types. For example, public waters see far more angling pressure than private lakes and closed-to-fishing water supply reservoirs. Therefore, the fish populations can be markedly different in terms of size and age structure between these different types of waterbodies.
- The FD has sampled Columbia Lake once before on May 27, 2004.

Key Concepts

- The FD 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 immediately netted, counted and measured, then released back into the lake (electrofishing is mostly non-lethal).

- Throughout this document, fish 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.
- 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 stock and quality size length values of popular Connecticut fish species.
- Proportional Size Distribution (PSD) is an index of size structure that describes the percentage of all stock-size or larger fish that are of quality size or greater. PSD is considered an index of the percentage of “big” fish within a population. For several low-level fish species there is no stock-size designation, but there is a quality-size designation. PSD values are still calculated for these species, but, in this case, the PSD is a percentage of all the sizes of fish captured that are of quality-size or greater.
- Hyperlinks attached to each fish species name under the ‘Key Findings’ section have been provided. These hyperlinks will lead the reader to the online version of the ‘Freshwater Fishes of Connecticut’ book where more in-depth information can be reviewed regarding each fish species.

Key Findings

- Five FD employees arrived at Columbia Lake on November 2, 2023, around 5:30pm. A resident from Columbia Lake joined us on the sample. Sampling began at 6:17pm and was completed at 9:11pm. Six zones were sampled around the lake, taking between 22-27 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 a little less than one hour.
- Sampling conditions were considered ‘good’ by the team leader.
- Water clarity, as determined by Secchi disk, was 2 meters (i.e., ~6.7 feet). Water temperature was 12.6 °C (i.e., ~54.7 °F).
- During the 2023 sample, 13 different fish species were captured, whereas 12 were captured in 2004 (Appendix B). Additionally, three types of hybrid sunfish were captured in 2023: Bluegill x Pumpkinseed, Bluegill x Green Sunfish and Bluegill x Redbreast Sunfish. In 2004, only one type of hybrid sunfish was captured: Bluegill x Redbreast Sunfish.
- Appendix C contains a set of length-frequency graphs showing the size structure of each species captured during sampling. When a species was caught in 2004 and 2023 those lengths appear on the same graph with the years differentiated by different color bars.
- **Top-Level Fish Species (See Appendix B and C)**
 - [Largemouth Bass](#), a highly sought after sport fish within Connecticut and nationally, was present in below average abundance for both stock- and quality-size fish relative to the state average from public lakes open to fishing in both samples. However, the 2004 PSD was comparable to the state average. The number of stock- and quality-size Largemouth Bass was surprisingly low during the 2023 sample, with only one individual being captured of stock-size or greater. Because of the lack of Largemouth Bass captured of stock- and quality-size, a meaningful PSD could not be calculated for 2023.
 - [Smallmouth Bass](#) populations, which are declining in eastern Connecticut, may be declining in Columbia Lake as well. It is possible that the time of year that the 2023 sample was conducted was less conducive to capturing Smallmouth Bass so

interpretation of the results from 2023 should be done with caution. In 2004, stock-size CPH, quality-size CPH and PSD values were all above average relative to the state average for public lakes open to fishing. In 2023, however, both stock- and quality-size CPH were below average relative to the state average for public lakes open to fishing. Because there were so few individuals captured in 2023 in the stock- and quality-size categories, a meaningful PSD value could not be calculated.

- [Chain Pickerel](#), a native predatory sport fish in Connecticut, was not present in the 2004 sample but was captured during the 2023 sample, and was above average abundance for stock-size fish relative to the state average for public lakes open to fishing. No individuals were captured in the quality-size category, so no PSD could be calculated.
- **Mid-Level Species (Appendix B and C)**
 - [Black Crappie](#), also called “calico bass”, occur within all drainages in Connecticut. Black Crappie have highly variable year-to-year abundance and reproduction. It is not surprising that in 2004 no Black Crappie were sampled and in 2023 some were, but not enough stock- and quality-size individuals were captured to create a PSD value. Those individuals that were captured in the stock- and quality-size ranges in 2023 were both below average CPH relative to the state average for public lakes open to fishing.
 - [Yellow Perch](#) is found in almost all lakes, ponds and larger streams in Connecticut. It tends to be a schooling species and is one of Connecticut’s most popular panfish. Aside from the 2004 stock-size ranking, which was average, all other rankings for 2004 and 2023 were below average abundance relative to the state average for public lakes open to fishing.
 - [White Perch](#) is a schooling fish species that frequents open water and can be found in both estuarine, tidal and freshwater environments. White Perch are prolific spawners when conditions are right. Landlocked populations have the potential to become overabundant and stunted if there are no predators to keep

their populations in check. It does not appear that overabundance is an issue with the White Perch in Columbia Lake as very few individuals were captured during both samples. As such, no meaningful calculations could be performed.

- [Brown Bullhead](#) is Connecticut's most widely distributed and only native catfish species. It can be difficult to sample with nighttime boat electrofishing unless in high abundance. Only three were captured in 2004 and none were captured in 2023 so no calculations could be carried out to determine CPH and PSD rankings.
- [White Catfish](#) are established in all major drainages in Connecticut. There are several lakes and ponds in Connecticut that have self-sustaining populations, many of which became established in the 1960s through various stockings from well-meaning anglers. However, there are still too few lakes and ponds in Connecticut that contain White Catfish to create statewide averages for stock- and quality-size or PSD. During the FD's sampling of Columbia Lake in 2004 a substantial number of White Catfish was captured, whereas in 2023 very few were captured possibly due to the time of year the sample was conducted.
- [Channel Catfish](#) is the state's largest catfish species and is a very popular sport and food fish throughout the country. Though they prefer rivers and larger streams, they can also be found in lakes and ponds, but are not typically able to successfully reproduce in smaller lakes. Too few individuals were captured during both the 2004 and 2023 samples to perform any meaningful calculations.
- [Bluegill](#) is found in almost every waterbody in Connecticut and tends to be extremely prolific, which can result in stunted growth of their populations and depressed numbers of other coexisting sunfish species. Compared to the state average for public lakes open to fishing, stock- and quality-size CPH in 2004 and 2023 were below average. PSD values for 2004 were considered average and in 2023 were below average.
- [Pumpkinseed](#) is one of Connecticut's native freshwater fish species. When co-occurring with Bluegill they tend to be less abundant. In 2004, both stock- and quality-size CPH were above average abundance relative to the state average for

public lakes open to fishing, and the PSD was considered average. However, in 2023, all three rankings were below average.

- [Redbreast Sunfish](#) are typically common in rivers and large streams but usually uncommon to rare in lakes. They are native to Atlantic coastal areas from New Brunswick to central Florida, but in Connecticut, they have a patchy distribution across all the major watersheds. Very few individuals of this species were captured during both sampling events, which makes interpretation of these data difficult. The general trend however appears that both stock- and quality-size CPH for both years is below average relative to the state average for public lakes open to fishing. PSD appears to be above the state average for public lakes open to fishing.
- [Hybrid sunfish](#) are captured regularly in our samples, but in very low numbers. Typically, hybridization results when there are fewer spawning age individuals of one species compared to another. There are no stock-size, quality-size or PSD comparisons that are made for these individuals because numbers captured are so low in Connecticut lakes that a statewide average cannot be made.
- **Low-Level Species (Appendix B and C)**
 - Three different “low-level” fish species were captured in Columbia Lake during 2023: Banded Killifish, Golden Shiner and White Sucker. Whereas only two were captured in 2004: Banded Killifish and White Sucker.
 - [Banded Killifish](#) have a patchy distribution within all the major watersheds in Connecticut and is the state’s only freshwater killifish species. There is no statewide average for this species. Catch rates were similar between the two samples.
 - [Golden Shiner](#) can be found in almost all lakes, ponds, and larger streams in Connecticut. This species is our most common lake and pond minnow species and tends to be the preferred prey species (when in high abundance) for predatory sport fish. There is not a statewide stock-size designation for this species, so all sizes captured are used to calculate a

stock-size value. There is, however, a quality-size designation (Appendix A). No Golden Shiner were captured in 2004 and very few were captured in 2023. Therefore, no analyses were performed.

- [White Sucker](#) is found in all but the smallest Connecticut streams and in most lakes that have significant tributary streams suitable for spawning. Considered the most abundant native fish of its size in Connecticut, it makes up much of the fish biomass in many streams. For this reason, it is arguably Connecticut's most important fish species. There is not a statewide stock-size designation for this species, so all sizes captured are used to calculate a stock-size value. There is, however, a quality-size designation (Appendix A). Between the 2004 and 2023 samples, White Sucker numbers increased, as did their ranking for stock- and quality-size CPH between the years; increasing from average to above average abundance relative to the state average for stock- and quality-size White Sucker captured from public lakes open to fishing. The PSD values, however, remained the same between the two samples and are considered 'average' when compared to the state average PSD for White Sucker found in public lakes open to fishing.

Summary

The fish community in Columbia Lake contains a diverse assemblage of warmwater fish species typical of Connecticut lakes and ponds. Lakes and ponds are dynamic systems and fish populations can fluctuate in abundance from year-to-year due to habitat and/or climatic conditions. Because our single night sample is a "snapshot" 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. This is why we try to sample locations multiple times over multiple years to get a better handle on the status of fish populations. With that said, there are some interesting findings at Columbia Lake between the 2004 and 2023 samples. Regarding the Largemouth Bass, we are

very interested as to why the size structure of the Largemouth Bass population shifted to smaller individuals compared to the 2004 sample. Seeing the lake was impounded in 1865, it would make sense that the lake is heading towards a eutrophic state (eutrophication is a general term describing a process in which nutrients accumulate in a body of water, resulting in an increased growth of microorganisms and vegetation. This is a natural process and can also be accelerated by humans). As this process occurs, it is typically more favorable for Largemouth Bass that prefer warmer, more vegetated bodies of water so we would expect Largemouth Bass numbers to increase.

It appears that Smallmouth Bass may be declining in Columbia Lake similar to other eastern Connecticut Smallmouth Bass populations. Smallmouth Bass prefer cool, clear lakes with rocky or boulder strewn bottoms. In small closed systems like Columbia Lake, they may be outcompeted by Largemouth Bass. However, seeing that the Largemouth Bass population appears small, it is possible that other factors are driving their apparent decline.

For Chain Pickerel, the fact that none were sampled in 2004, but some were sampled in 2023 could be related to the time of year that the samples were conducted or perhaps they were introduced into the lake by some means during the nearly 20-year span between samples and this is why they have not established a quality-size class yet.

All mid-level fish species sampled in 2023 have below average abundance when compared to the state average for public lakes open to fishing. Additionally, since the 2004 sample, all mid-level fish species sampled that were average or above have now dropped to below average compared to the state average from public lakes open to fishing. The reasons for this are unknown, and there could be a number of factors working in concert to create this situation, which could include the timing of the 2023 sample and changes in the lake environment and surrounding watershed.

Of note regarding low-level fish species, the White Sucker has increased in stock- and quality-size abundance relative to the state average from public lakes open to fishing. This could be from conditions within the lake (e.g., increases in preferred forage, and decreases in top-level predatory fish species) or in the feeder stream found on the southern end of the lake (e.g. better spawning habitat) becoming more conducive for this species to thrive.

The apparent changes among fish populations in Columbia Lake may also be driven by the timing of the 2023 sample (i.e., fall) as compared to the 2004 sample (i.e., spring). In the 2023 sample, the fish may have already begun transitioning to deeper water for the winter period. We would recommend another sample of Columbia Lake towards the end of May in 2025 to more closely align with the 2004 sample date. Additionally, if we are going to sample it again we would like to take scale samples from captured fish to perform age and growth analyses to compare against the 2004 sample to see if changes have occurred relative to the growth of certain fish in the lake, as well as against statewide averages. Additionally, we would like to retain up to 30 bass and 30 sunfish (likely Bluegill) to send out for pathology testing to look for specific pathogens (e.g., Largemouth Bass Virus), that could provide some explanation for the changes we are seeing in the Largemouth and Smallmouth Bass population abundance and size structure.

We would also recommend (if you have not already) that you request an aquatic vegetation survey from the Connecticut Agricultural Experiment Station (CAES) Office of Aquatic Invasives [Data Repository \(ct.gov\)](#) to supplement the fish community data. Knowing the type and extent of aquatic vegetation and littoral zone area in the lake can be helpful in explaining changes in fish community structure. Nearly all the fish found in Columbia Lake require some form of aquatic vegetation for some portion of their life cycle and when changes in the aquatic vegetation occur, it will influence the fish community.

Lastly, you may be interested in the following report regarding Columbia Lake that we found while researching Columbia Lake's history: [Columbia_ColumbiaLake_186.pdf \(ctert.org\)](#).

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: 860.490.0701; email: andrew.bade@ct.gov).

Appendix A. Stock-size and quality-size length 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
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	22	6	9
White Catfish	20	30	8	12
Channel 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
Low-Level				
Golden Shiner	-	15	-	6
White Sucker	-	30	-	12

Appendix B. Number sampled, all-size catch-per-hour (CPH), stock-size CPH, and quality-size CPH and proportional size distribution (PSD) of captured fish species in Columbia Lake, Columbia, CT during the May 27, 2004 and the November 2, 2023 night boat electrofishing samples relative to the State average for public lakes. Entries of “Average” indicate CPH was within ± 10% or PSD was within ± 5 percentage points of the State average.

Species	Number Sampled		All Size CPH		Stock Size CPH					Quality Size CPH					Columbia Lake PSD Relative to State Average	
	2004	2023	2004	2023	Columbia Lake		State Average	Stock Size CPH Ranking		Columbia Lake		State Average	Quality Size CPH Ranking		2004	2023
					2004	2023		2004	2023	2004	2023		2004	2023		
Top-Level																
Largemouth Bass	25	21	22.7	21.0	21.8	1.0	57.9	Below	Below	11.8	1.0	29.4	Below	Below	Average	⁵ NE
Smallmouth Bass	144	25	131.0	25.0	31.8	2.0	26.0	Above	Below	19.1	2.0	10.4	Above	Below	Above	NE
Chain Pickerel	0	36	¹ NS	36.0	NS	45.0	20.6	NS	Above	NS	NS	0.6	NS	NS	NS	NE
Mid-Level																
Black Crappie	0	37	NS	37.0	NS	2.0	21.3	NS	Below	NS	2.0	17.1	NS	Below	NS	NE
Yellow Perch	124	237	112.8	237.1	110.1	62.0	102.1	Average	Below	37.3	30.0	48.2	Below	Below	Below	Below
White Perch	3	4	2.7	4.0	NS	4.0	127.6	NS	³ TF	NS	4.0	48.9	TF	TF	NS	NE
Brown Bullhead	3	0	2.7	NS	2.7	NS	11.7	TF	NS	1.8	NS	10.6	TF	NS	TF	NS
White Catfish	75	13	68.2	13.0	66.4	11.0	² NV	NV	NV	56.4	11.0	NV	NV	NV	NV	NV
Channel Catfish	1	0	0.9	NS	NS	NS	NV	NV	NV	NS	NS	NV	NV	NV	NV	NV
Bluegill	139	343	126.4	343.2	116.4	136.1	343.3	Below	Below	52.8	48.0	142.3	Below	Below	Average	Below
Pumpkinseed	84	51	76.4	51.0	69.1	27.0	59.3	Above	Below	27.3	3.0	23.5	Above	Below	Average	Below
Redbreast Sunfish	14	9	12.7	9.0	12.7	9.0	33.7	Below, but TF	Below, but TF	8.2	8.0	12.7	Below, but TF	Below, but TF	Above, but TF	Above, but TF
Bluegill x Pumpkinseed	0	4	NS	4.0	NS	4.0	NV	NV	NV	NS	4.0	NV	NV	NV	NV	NV
Bluegill x Green Sunfish	0	3	NS	3.0	NS	0.0	NV	NV	NV	NS	NS	NV	NV	NV	NV	NV

Bluegill x Redbreast Sunfish	2	2	1.8	2.0	1.8	2.0	NV	NV	NV	1.8	2.0	NV	NV	NV	NV	NV
Low- Level																
⁴ Banded Killifish	12	11	10.9	11.0	10.9	11.0	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV
⁴ Golden Shiner	0	14	NS	14.0	NS	14.0	20.9	NS	Below, but TF	NS	NS	6.7	NS	NS	NS	NE
⁴ White Sucker	33	77	30.0	77.0	30.0	77.0	31.2	Average	Above	26.4	65.0	25.8	Average	Above	Average	Average

¹NS = Either none of this species was sampled or none in the specified size class was sampled. Refer to 'Number Sampled' column to see if a species was sampled.

²NV = No value is calculated because not enough public lakes contain this species in sufficient abundances to create a statewide average.

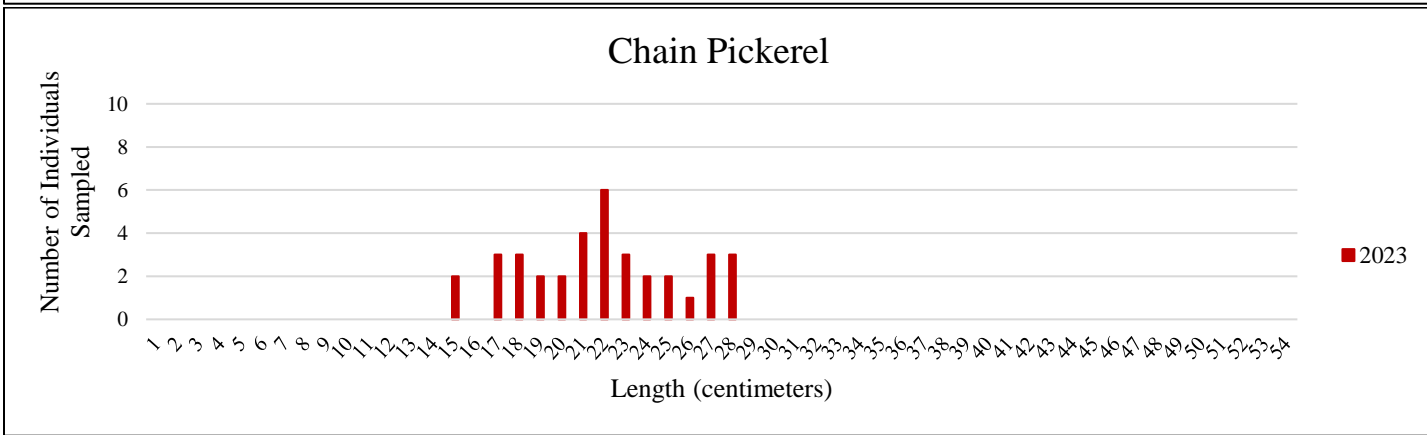
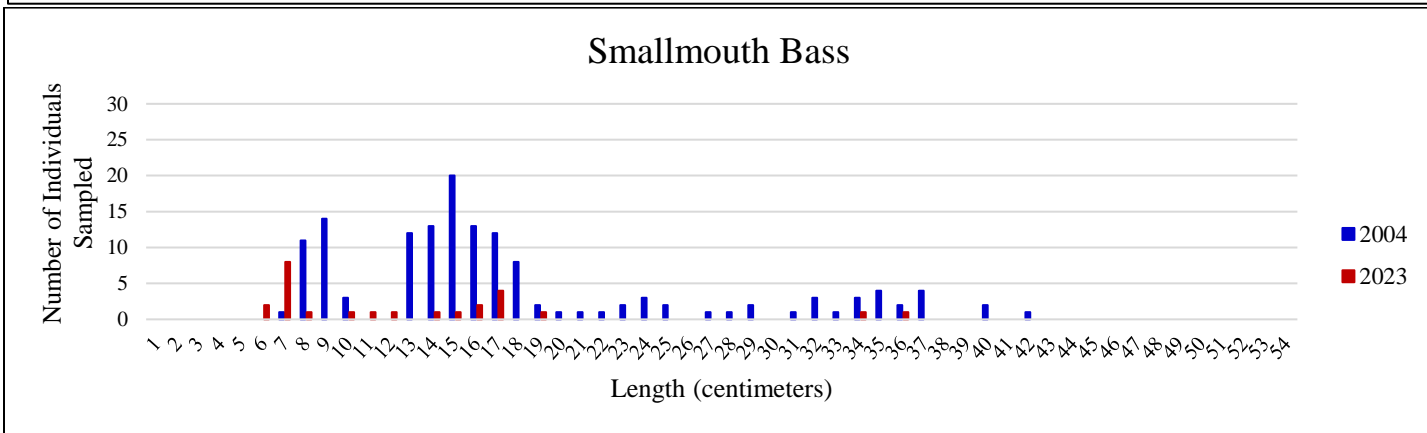
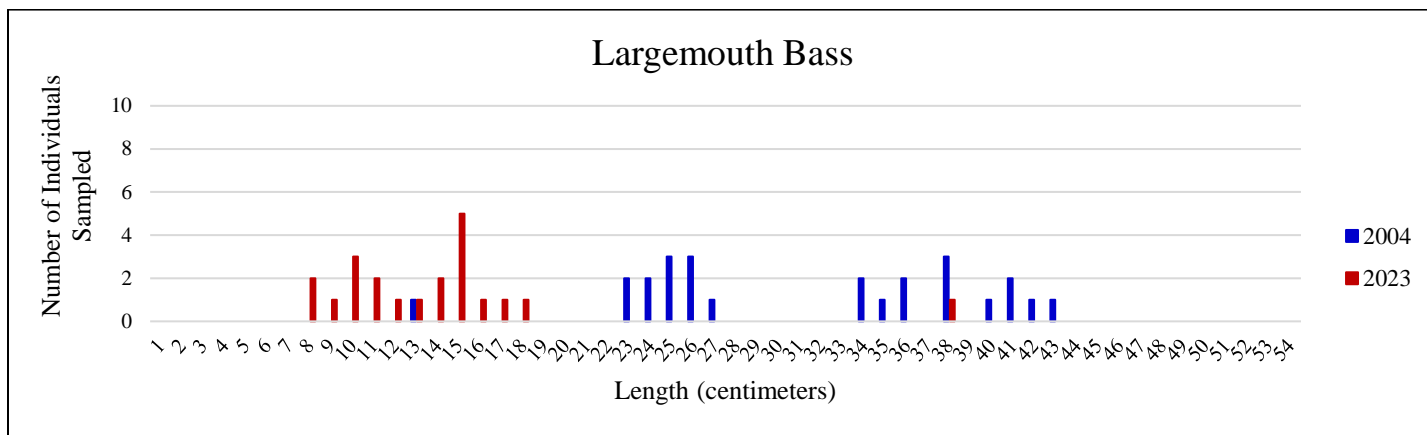
³TF = Too few individuals were caught to determine a meaningful ranking.

⁴For several low-level fish species there is no specific stock-size designation. Instead, a value for the stock-size column is derived from all the size classes sampled. There are however specific quality-size values. PSD values are calculated for these species, but, in this case, the PSD value is a percentage of the all-size fish captured that are of quality-size or greater.

⁵NE = Not enough stock-size and or quality-size individuals were captured to perform the PSD calculation.

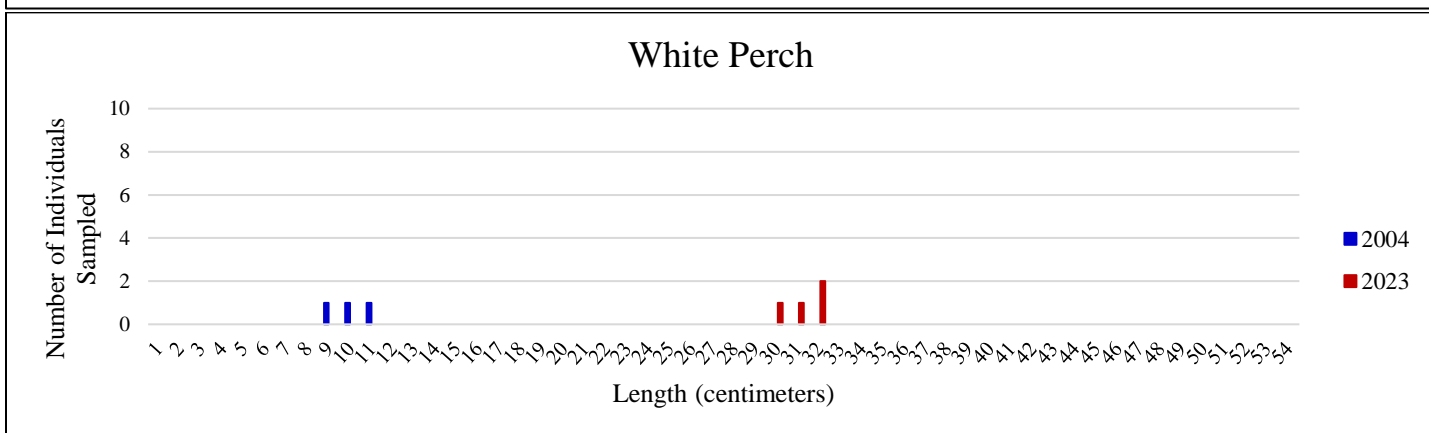
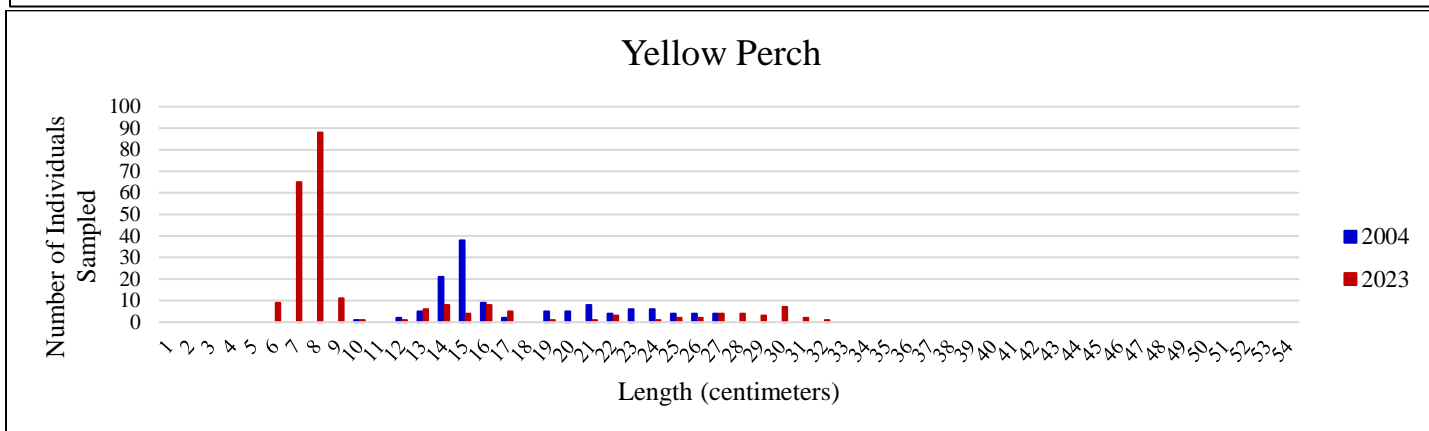
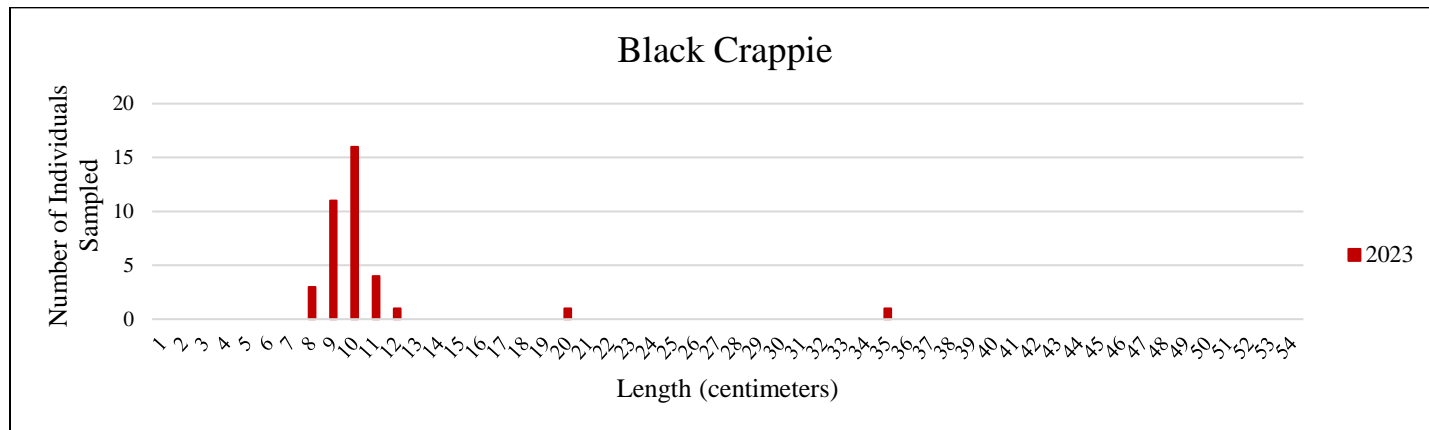
Appendix C. Length-frequency graphs for fish species sampled by the Connecticut Department of Energy and Environmental Protection Fisheries Division using nighttime boat electrofishing in Columbia Lake, Columbia, Connecticut on May 27, 2004, and November 2, 2023. (*Note – the values for the x-axis [i.e. “Length (centimeters)”] are the same for all graphs. The scaling value for the y-axis [i.e. “Number of Individuals Sampled”] could be different for each graph due to the number of individuals caught being widely different for certain species.)

Top-Level Fish Species



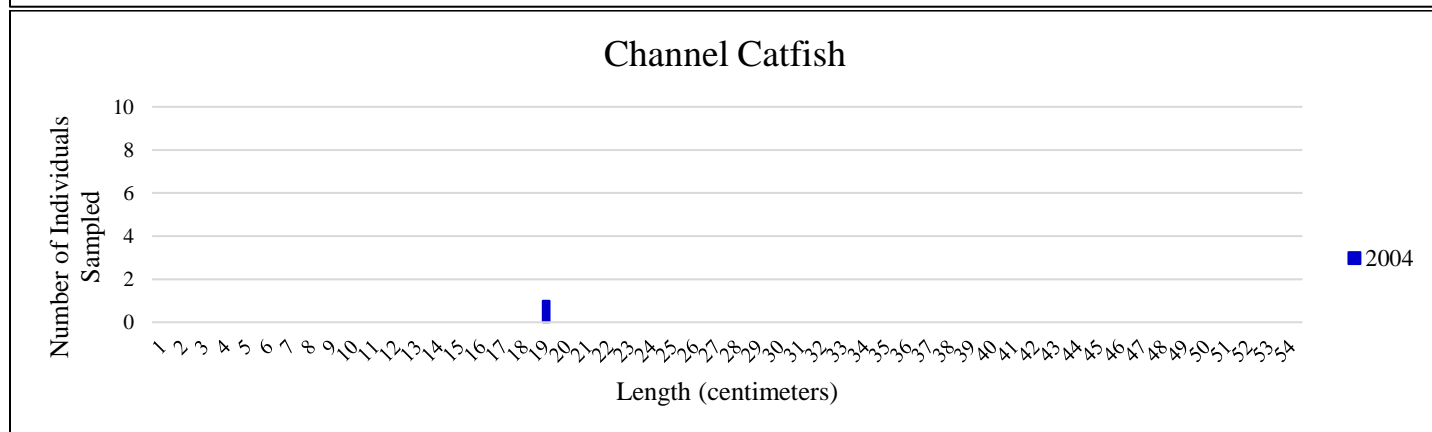
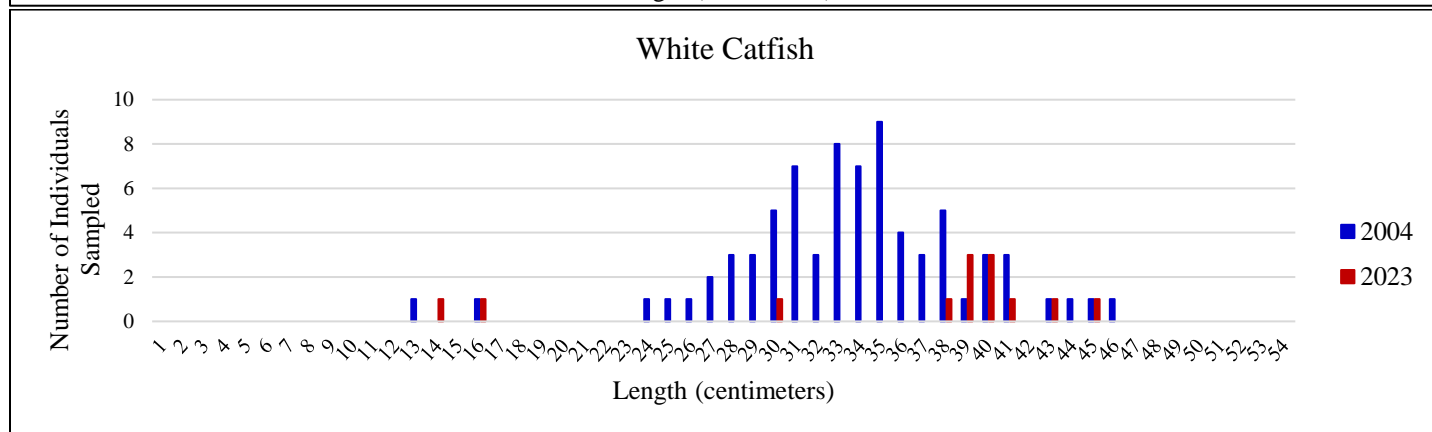
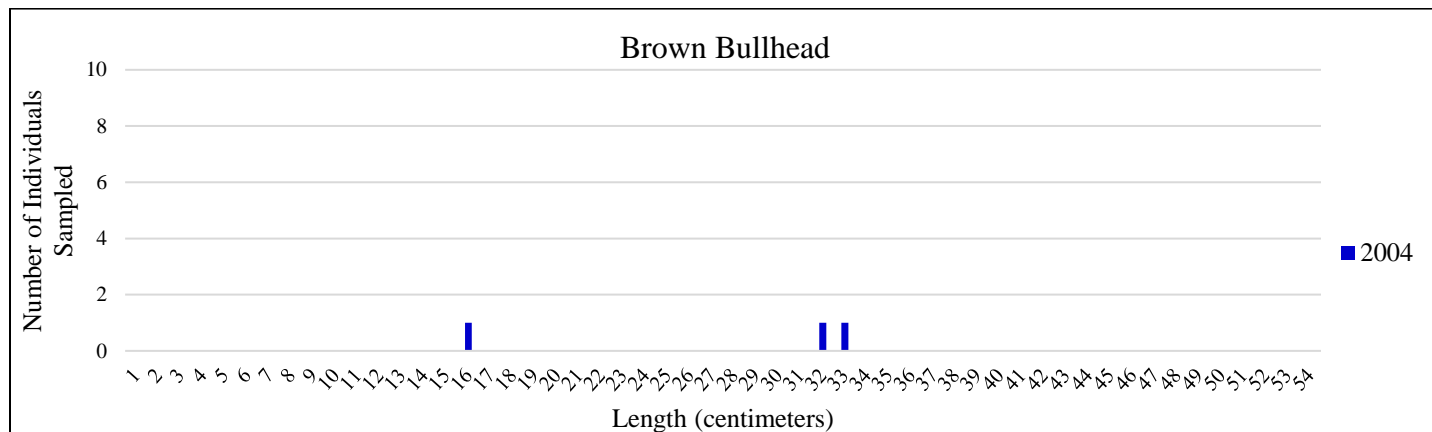
Appendix C. (continued).

Mid-Level Species



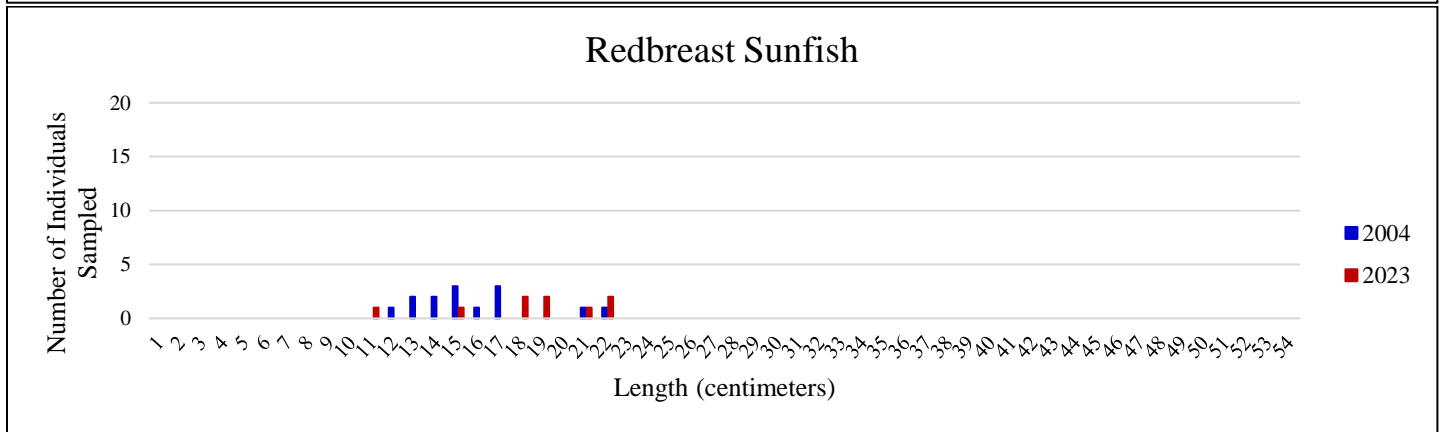
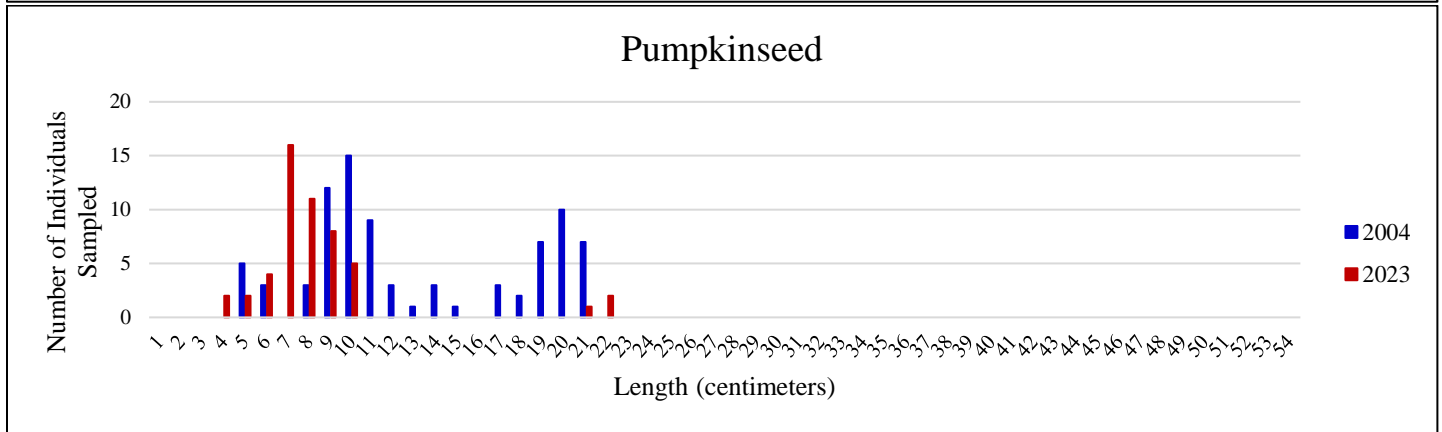
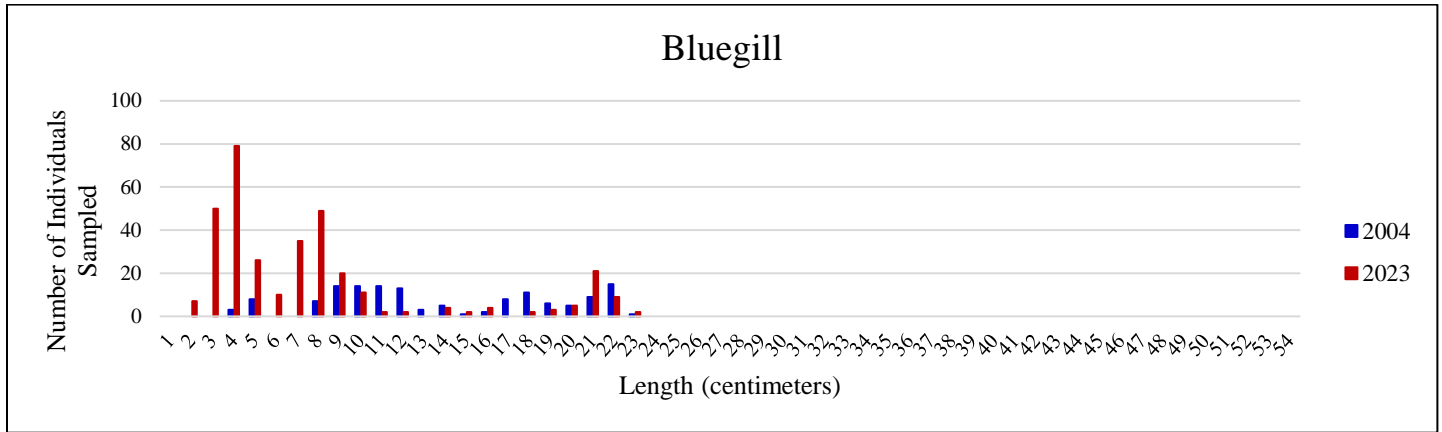
Appendix C. (continued).

Mid-Level Species (continued)



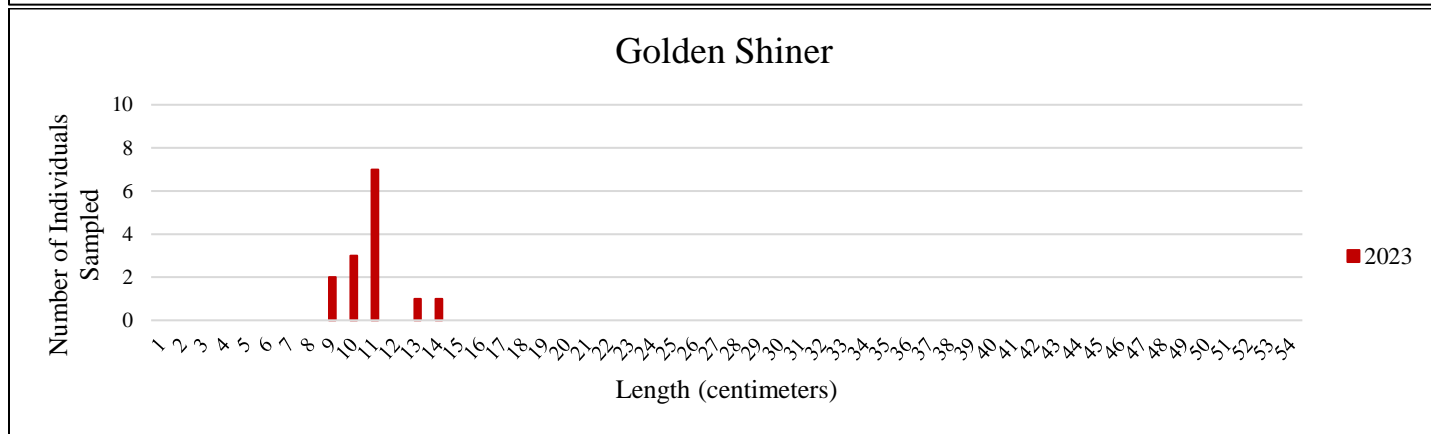
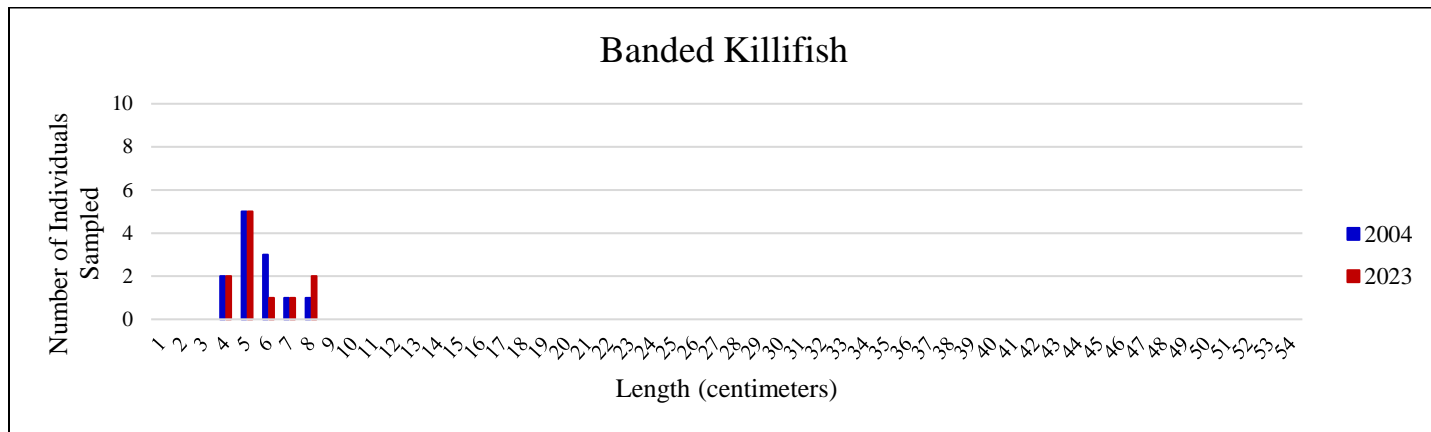
Appendix C. (continued).

Mid-Level Species (continued)



Appendix C. (continued).

Low-Level Species





Spencer M. Mallette
Fisheries Biologist 1
Connecticut Department of Energy and Environmental Protection
Bureau of Natural Resources
Fisheries Division
Western District Headquarters
230 Plymouth Road
Harwinton, CT 06791

December 11, 2023

Lee Gezelman
Lake Garda Improvement Association
P.O. Box 222
Unionville, CT 06085

Dear Mr. Gezelman,

Thanks to you and the Lake Garda Improvement Association for requesting that we sample the fish community in Lake Garda, which we did on October 11, 2023. Please find attached with this letter a summary report of our findings.

Sincerely,

Spencer M. Mallette

Spencer M. Mallette
860-424-3138
spencer.mallette@ct.gov

Attachment: Summary Report for the October 11, 2023, Fisheries Sample of Lake Garda, Burlington/Farmington, CT by the Connecticut Department of Energy and Environmental Protection Fisheries Division

Summary Report for the October 11, 2023, Fisheries Sample of Lake Garda, Burlington/Farmington, CT by the Connecticut Department of Energy and Environmental Protection Fisheries Division

Background

- Lake Garda straddles the Burlington and Farmington town lines in the Farmington River Valley region of Connecticut. Owned and operated by the Lake Garda Improvement Association (LGIA), this 42.6-acre waterbody was created by the impoundment of Rose Brook in the 1920's. According to a 2012 sedimentation analysis done by Macchi Engineers, LLC, Lake Garda is an average of just over 5 feet in water depth, with a maximum depth of 14.5 feet. The lake does not have public fishing access, as only members of the community are permitted to fish there.
- A request to sample Lake Garda was made by the LGIA on January 27, 2023, to learn more about the fish population in the impoundment and to detect the presence of illegally introduced Grass Carp. Furthermore, the Pond and Lake Connection (PLC) is managing the waterbody for the LGIA and was also interested in assessing the impact of Common Carp in the pond, as PLC believes these fish are the primary driver for the lake's turbidity issues.
- On October 11, 2023, Lake Garda was sampled for the first time ever by the Connecticut Department of Energy and Environmental Protection (CT DEEP) Fisheries Division. To get an adequate depiction of the State of Connecticut's freshwater fisheries resources, the CT DEEP Fisheries Division samples a variety of freshwater lakes and ponds, which can include public waters, private water supply reservoirs and private lakes, such as Lake Garda. Gathering data from all these different waterbodies allows CT DEEP 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 or private lakes and therefore the fish populations can be markedly different in terms of size and age structure).
- Furthermore, the CT DEEP Diadromous Fish Restoration Program has expressed interest in Lake Garda and one staff-member attended the night electrofishing sample. This group is currently developing "The Plan to Restore Diadromous Fishes to the Farmington River Watershed", a plan to identify the potential habitat for five highly migratory native fish species, including Alewife and American Eel. Lake Garda, and nearby Monce Pond, will be included in the plan as potential adult spawning and juvenile rearing habitat for sea-run Alewife as well as habitat for adult American Eel. Lake Garda has the potential to sustain an annual Alewife run of up to 9,000 adults during their spring spawning migrations. The plan is a guide that will aid CT DEEP and others when prioritizing fisheries work within the Farmington River Watershed.

Key Concepts

- The Fisheries Division samples lake fish populations using boat electrofishing following standardized sampling protocols. The electrofishing boat is deployed at night in nearshore areas of a waterbody. The boat is propelled at slow speeds (usually 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, identified, and measured, then released back into the waterbody (electrofishing is a mostly non-lethal method of fish collection).
- 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 and other matter.
- A species’ relative abundance is expressed as catch-per-hour (CPH) of active electrofishing time. CPH provides a standardized index of abundance that facilitates comparison of species densities between lakes or over time within a lake.
- For most species, the CPH is calculated for two size classes: fish that are “stock size” or larger and those that are “quality size” or larger. “Stock size” is defined as the smallest size fish of a given species most commonly caught by anglers. “Quality size” fish are defined as the size of a given species at which most anglers consider the fish desirable to catch. See Appendix A for stock and quality size range classifications of popular Connecticut fish species.
- Proportional size distribution (PSD) is an index of size structure within a waterbody that describes the percentage of stock-size fish that are also quality-size or greater (i.e. total number of quality-size fish or greater caught by the total number of stock-size fish or greater caught for a given species). This can be thought of as the proportion of “big fish” within a population. For some “low-level” species there is no stock-size designation, but there is a quality-size designation. PSD values for these species are still calculated, but in this case, the PSD value is a proportion of all size ranges of fish captured that are of quality-size or greater (i.e. total number of quality-size or greater fish caught by the total number of fish of all sizes caught for a given species).

Key Findings

- On October 11, 2023, five CT DEEP Fisheries Division employees arrived at Lake Garda around 6:00pm, began the sample at 6:44pm, and completed the sample at 10:14pm. Six zones were completed around the lake

(Appendix B), nearly encompassing the entire shoreline apart from a couple hundred meter stretch just north of the boat launch. Each zone took between 22-34 minutes to sample, with total “on-time” being exactly 1.00 hours (“on-time” is the time when the boat is actively putting electricity into the water to stun and capture fish).

- Overall sample conditions were reported as good by the team leader, even though water visibility was considered poor. The effectiveness of the netters was still good even in the poor visibility conditions.
- During the sample, 11 different fish species were caught and identified (Table 1). Additionally, a total of 25 Musk Turtles and 3 Painted Turtles were observed.
- Largemouth Bass was the only top-level species present in Lake Garda. Largemouth Bass is one of the most sought-after sport fish in Connecticut and nationally. Overall, total catch-per-hour (CPH) of both stock and quality-size fish is well below the statewide average (Table 1). However, PSD was above average, which indicates that the likelihood of catching a “big” Largemouth Bass is more likely than your average state waterbody (Table 1).
- Six “mid-level” species were present in Lake Garda (Black Crappie, White Perch, Yellow Perch, Brown Bullhead, Bluegill, and Pumpkinseed; Table 1; Appendix C).
 - Black Crappie, colloquially referred to as “Calico Bass”, occurs within all major drainages in Connecticut. At Lake Garda, they are below statewide average for stock and quality-size CPH, though above average for PSD. However, because of the low number of stock or quality-size fish caught (Appendix C), no definitive statements can be made. The large number of sub-stock size fish caught could

Table 1. Stock size catch-per-hour (CPH), quality size CPH and proportional size distribution (PSD) of caught fish species in Lake Garda during the October 11, 2023 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.

Species	Number Sampled	Stock Size CPH			Quality Size CPH			Lake Garda PSD Relative to State Average
		Lake Garda	State Average	Stock Size CPH Ranking	Lake Garda	State Average	Quality Size CPH Ranking	
Top-Level								
Largemouth Bass	25	14.0	57.9	Below	9.0	29.4	Below	Above
Mid-Level								
Black Crappie	25	1.0	21.3	Below	1.0	17.1	Below	Above
White Perch	958	182.0	127.6	Above	170.0	48.9	Above	Above
Yellow Perch	334	184.0	102.1	Above	98.0	48.2	Above	Average
Brown Bullhead	2	2.0	11.7	Below	2.0	10.6	Below	Above
Bluegill	186	118.0	343.3	Below	37.0	142.3	Below	Below
Pumpkinseed	79	33.0	59.3	Below	9.0	23.5	Below	Below
Low-Level								
Golden Shiner	8	8.0	20.9	Below	0.0	6.7	Below	Below
American Eel	1	1.0	24.3	Below	0.0	6.4	Below	Below
Grass Carp	2	NV ¹	NV	NV	NV	NV	NV	NV
Common Carp	2	NV	NV	NV	NV	NV	NV	NV

NV¹ = No value is calculated because not enough public lakes contain this species in sufficient abundances to create a statewide average.

be an indication of a strong year-class, as Black Crappie are erratic spawners that are known to go through extreme boom-or-bust reproductive years.

- Both Yellow and White Perch had well above average CPH values for both stock and quality-size fish (Table 1). White Perch was by far the most abundant species caught in this sample, including hundreds of individuals below stock-size (Appendix C). This indicates that White Perch are likely benefiting from the lack of large predatory fish species in the lake that would typically keep their population in check. White Perch are prolific spawners, and often eat eggs of other species, especially Yellow Perch.

White Perch also had an above average PSD, indicating that there are a greater proportion of “big” individuals than the state average (Table 1). In comparison, Yellow Perch, another prolific spawning species, has an average PSD. This species could likely be suffering from competition with White Perch (Appendix C); however, population numbers are still strong enough for above average densities. This is a species the LGIA should keep an eye on moving forward if water clarity remains murky, as decreased clarity could reduce predation pressures on juvenile White Perch.

- Brown Bullhead is Connecticut’s only native catfish species and is widely distributed around the state. Even though PSD was above average for this species, no definitive statements can be made about it as relatively few individuals (two) were caught. They are a difficult species to sample with nighttime boat electrofishing unless in high abundances.
- Two sunfish species were present in Lake Garda: Bluegill and Pumpkinseed. Both species had below average values in both CPH categories and PSD (Table 1).
- Four “low-level” species were caught during the sample (Golden Shiner, American Eel, Grass Carp, Common Carp; Table 1).
 - Golden Shiner is the most common lake and pond minnow species in Connecticut, found in almost all lakes, ponds and larger streams. They tend to be the preferred prey species for predatory species when in high abundance. However, Golden Shiner stock and quality-size CPH and PSD were below average (Table 1; Appendix C).
 - American Eel are a catadromous species, which means spawning takes place out at sea, and the young return and grow to maturity in freshwater habitats. Access to freshwater habitats is critical for this species, and the American Eel found in Lake Garda had to swim up the Connecticut River into the Farmington River, before ascending Unionville Brook to reach the waterbody. Densities of American Eel are difficult to determine via nighttime boat electrofishing, therefore a definitive statement about this species cannot be made without further sampling.

- Two different carp species were caught by CT DEEP Fisheries Division in Lake Garda: Common Carp and Grass Carp. Two of each species were caught; a 71cm and 81cm Common Carp, and a 119cm and 121cm Grass Carp.

Both species are difficult to capture during nighttime boat electrofishing as they are sensitive to the electrical current put out by the boat and will leave an area before the boat gets close enough to stun them. However, there is no statewide CPH or PSD available for either species as they are not present in enough waterbodies to get a statewide average (Table 1). Other sampling methods would be better suited to get a relative abundance of these species in Lake Garda.

Summary

Nighttime boat electrofishing only represents a singular “snapshot” in time, so our sample may not provide a complete picture of the fish community in Lake Garda. More samples over a short period of time would help create a more thorough picture of the fish community. However, the fish community at Lake Garda contains a typical assemblage of warmwater fish species for Connecticut lakes and ponds, with a few exceptions. First, the high abundance of White Perch, often considered a nuisance species, could prove detrimental to the health of the other fish species populations with the lack of large numbers of predatory fish (i.e., only Largemouth Bass in Lake Garda). It is not unusual for fish to experience strong year-classes when conditions are favorable and the reverse when conditions are unfavorable, which could be the case with both perch species. Even with the low density of big Largemouth Bass, the above average index of large fish in Lake Garda is typical of what is seen in most waterbodies that have closed or limited fishing access.

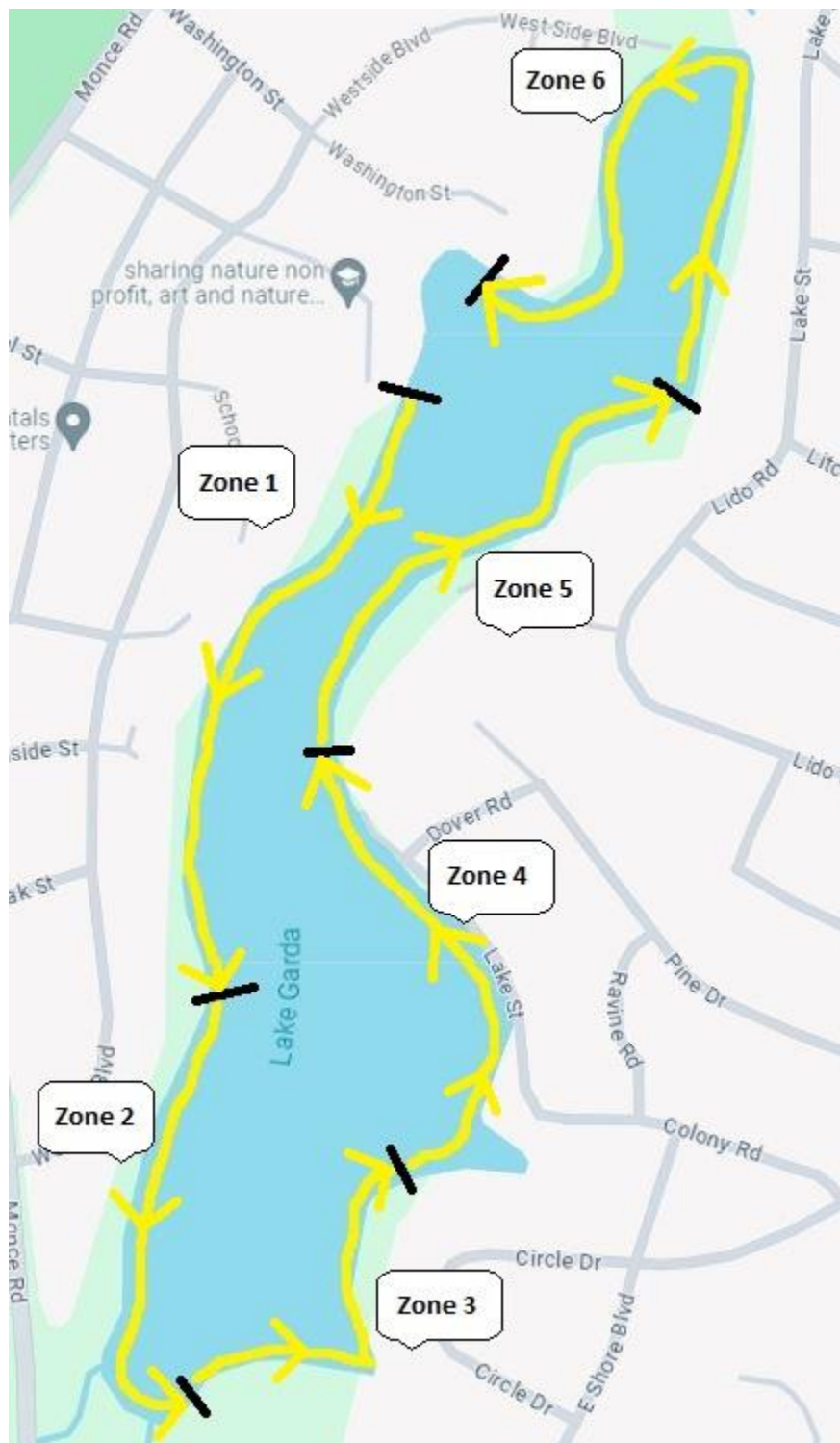
Second, regarding either carp species being at nuisance densities, no definitive statement can be made to support this. With so few carp being captured, a sufficient picture of the populations of these two species cannot be drawn. To further help support this idea, other methods of capture would be better suited for getting an estimate. One such method would be to trap these fish using deployment of nets in habitat they would frequent and marking fish to get a population estimate. Another, more time-consuming method, would be angling for these fish and again marking them for recapture rates. If immediate removal of Common Carp is desired, the state-wide regulation of 5 fish per person, per day, would be applicable. Bowfishing, if authorized at Lake Garda, would allow for up to 12 Common Carp per angler, per day, to be harvested. For removal of Grass Carp, a state-issued scientific collectors permit would need to be requested and approved through the CT DEEP. Otherwise, any Grass Carp caught must be released alive.

If you have questions please feel free to contact Spencer Mallette (phone: 860-424-3138; email: spencer.mallette@ct.gov) or 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. Size cutoffs for various Connecticut fish species

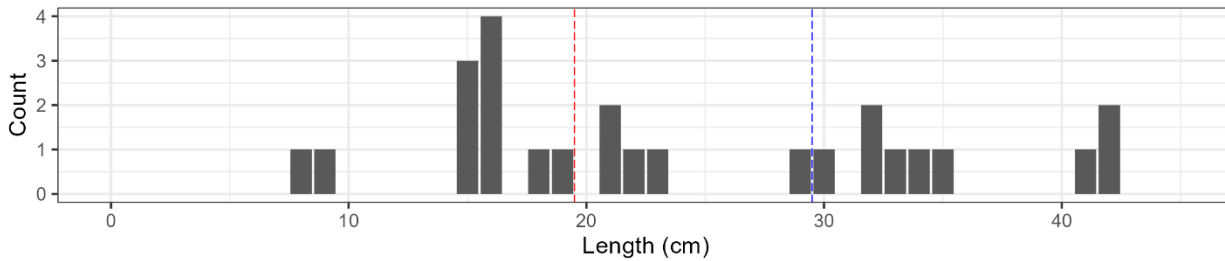
Species	Metric (cm)		English (inches)	
	Stock	Quality	Stock	Quality
Top -Level				
Largemouth Bass	20	30	8	12
Smallmouth Bass	20	30	8	12
Northern Pike	35	60	14	24
Chain Pickerel	25	38.1	10	15
Channel Catfish	20	30.5	8	12
Walleye	25	38.1	10	15
Brook Trout	20	33	8	13
Brown Trout	20	33	8	13
Rainbow Trout	20	33	8	13
Mid-Level				
Black Crappie	13	20.3	5	8
White Perch	13	20.3	5	8
Yellow Perch	13	20.3	5	8
Brown Bullhead	15	22.9	6	9
White Catfish	20	30.5	8	12
Rock Bass	8	15.2	3	6
Bluegill	8	15.2	3	6
Pumpkinseed	8	15.2	3	6
Green Sunfish	8	15.2	3	6
Redbreast Sunfish	8	15.2	3	6
Low-Level				
Golden Shiner	-	15	-	6
White Sucker	-	30	-	12
American Eel	-	38	-	15
Alewife	-	14	-	5.5

Appendix B. Locations sampled by the Connecticut Department of Energy and Environmental Protection using nighttime boat electrofishing in Lake Garda, Burlington/Farmington, Connecticut on October 11, 2023. Arrows indicate direction of movement.

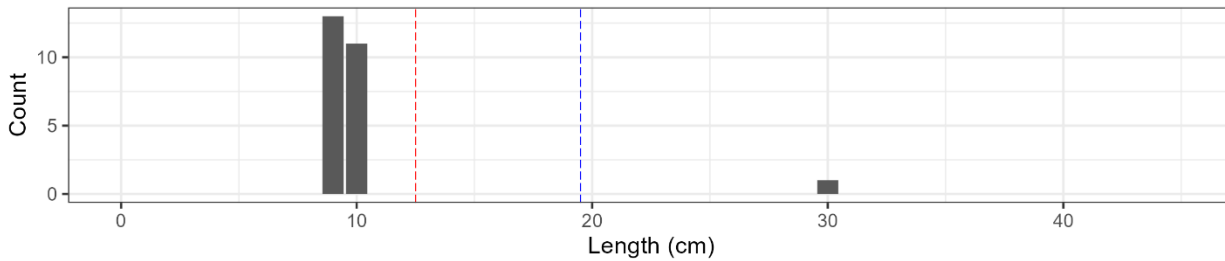


Appendix C. Length-frequency graphs of the seven most abundant species caught on October 11, 2023, using nighttime boat electrofishing in Lake Garda, Burlington/Farmington, Connecticut. Length values before the red line represent fish caught below species-specific stock-size values. Length values between the red and blue lines represent fish caught of species-specific stock-size. Length values after the blue line represent species-specific quality-size and above fish caught. No Golden Shiner were caught that were above the reported quality-size length. Four species (Brown Bullhead, American Eel, Common Carp, Grass Carp) were caught in low abundances, so no figure was created.

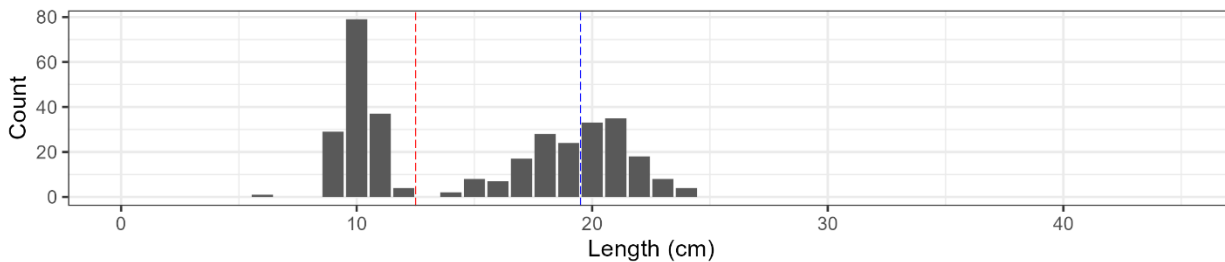
Largemouth Bass



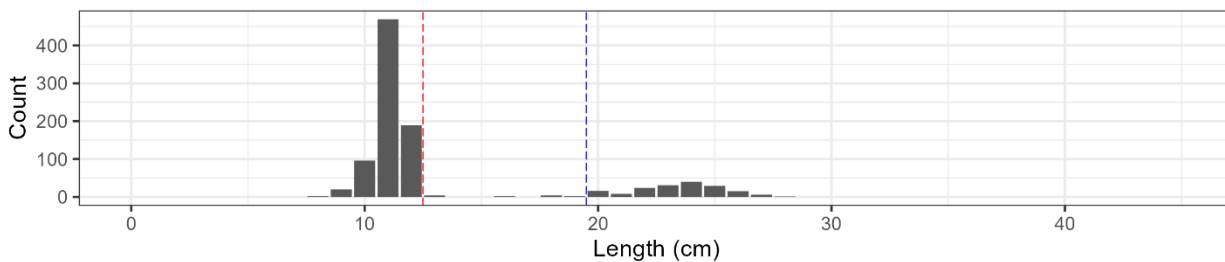
Black Crappie



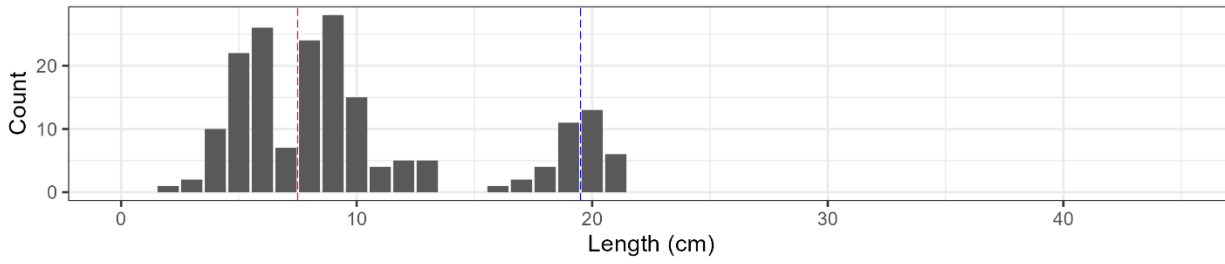
Yellow Perch



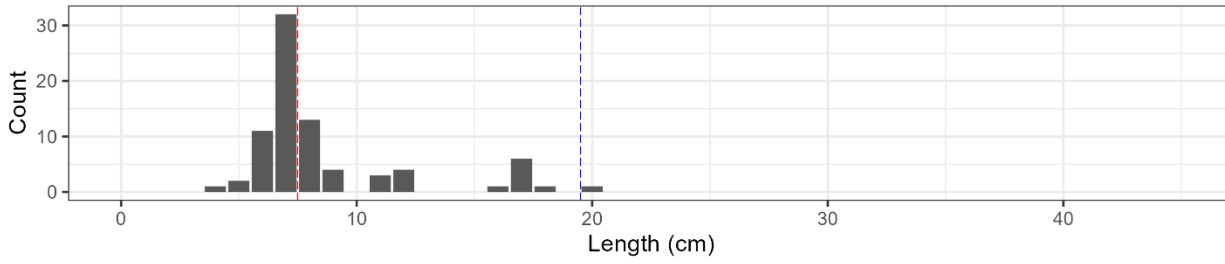
White Perch



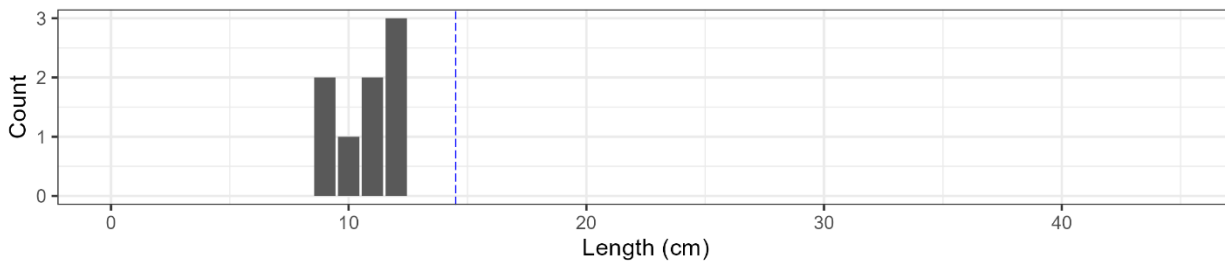
Bluegill



Pumpkinseed



Golden Shiner



Spencer M. Mallette
Fisheries Biologist 1
Connecticut Department of Energy and Environmental Protection
Bureau of Natural Resources
Fisheries Division
Western District Headquarters
230 Plymouth Road
Harwinton, CT 06791

December 15, 2023

Ann Moses
Town of Somers, Open Space and Trails Committee
600 Main Street
Somers, CT 06071

Dear Ms. Moses,

Thanks to you and the Town of Somers Open Space and Trails Committee for requesting that we sample the fish community in Hurds Pond, which we did on May 18, 2023. Please find attached with this letter a summary report of our findings.

Sincerely,

Spencer M. Mallette

Spencer M. Mallette
860-424-3138
spencer.mallette@ct.gov

Attachment: Summary Report for the May 18, 2023, Fisheries Sample of Hurds Pond, Somers, CT by the Connecticut Department of Energy and Environmental Protection Fisheries Division

**Summary Report for the May 18, 2023, Fisheries Sample of Hurds Pond by the Connecticut
Department of Energy and Environmental Protection Fisheries Division**

Background

- Hurds Pond is in Somers, Connecticut, inside Somers Town Park. Currently owned and maintained by the Town of Somers, Open Space and Trails Committee (SOSTC), the waterbody was first created around 1862 by impounding Gillettes Brook. The lake is approximately 20-acres in area and has a maximum water depth of nearly 12 feet. The lake has access for public fishing, but currently receives no management or stocking from either the town, the CT DEEP Fisheries Division, or any other entity.
- A request to sample Hurds Pond was made by the SOSTC in Summer 2022 to learn more about the fish population in the lake. Initial interest was expressed in turning Hurds Pond into a potential trout fishing destination with stocking provided by the fish raised at State Fish Hatcheries. Furthermore, at the time the Fisheries Division was conducting angler counts at Hurds Pond to gather some preliminary data on fishing pressure.
- On May 18, 2023, Hurds Pond was sampled for the first time by the Connecticut Department of Energy and Environmental Protection (CT DEEP) Fisheries Division. To get an adequate depiction of the State of Connecticut's freshwater fisheries resources, the 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 different waterbodies allows CT DEEP to assess the State's freshwater resources and make comparisons of fish population size, age, and growth based on varying usage type (i.e., public waters see far more angling pressure than water supply reservoirs closed to fishing or private lakes and therefore the fish populations can be markedly different in terms of size and age structure).

Key Concepts

- The Fisheries Division samples lake fish populations using boat electrofishing following standardized sampling protocols. The electrofishing boat is deployed at night in nearshore areas of a waterbody. The boat is propelled at slow speeds (usually less than one mile per hour) and Direct 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, identified, and measured, then released back into the waterbody (electrofishing is a mostly non-lethal method of fish collection).

- 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 and other matter.
- A species relative abundance is expressed as catch-per-hour (CPH) of active electrofishing time. CPH provides a standardized index of abundance that facilitates comparison of species densities between lakes or over time within a lake.
- For most species, the CPH is calculated for two size classes: fish that are “stock size” or larger and those that are “quality size” or larger. “Stock size” is defined as the smallest size fish of a given species most commonly caught by anglers. “Quality size” fish are defined as the size of a given species at which most anglers consider the fish desirable to catch. See Appendix A for stock and quality size range classifications of popular Connecticut fish species.
- Proportional size distribution (PSD) is an index of size structure within a waterbody that describes the percentage of stock-size fish that are also quality-size or greater (i.e. total number of quality-size fish or greater caught by the total number of stock-size fish or greater caught for a given species). This can be thought of as the proportion of “big fish” within a population. For some “low-level” species there is no stock-size designation, but there is a quality-size designation. PSD values for these species are still calculated, but in this case, the PSD value is a proportion of all size ranges of fish captured that are of quality-size or greater (i.e. total number of quality-size or greater fish caught by the total number of fish of all sizes caught for a given species).

Key Findings

- On May 18, 2023, three CT DEEP Fisheries Division employees arrived at Hurds Pond around 7:45pm, began the sample at 8:40pm, and completed the sample at 10:43pm. Alongside Fisheries Division staff were six volunteers, five of which were with the SOSTC. These volunteers were rotated on and off the boat between zones, with new volunteers being picked up at the launch at the beginning of each zone, then motoring back to starting position.
- Three zones were completed around the lake (Appendix B), which encompassed the entirety of the shoreline. Each zone took between 25-29 minutes, with total “on-time” being 0.402 hours

(“on-time” is the time when the boat is actively putting electricity into the water to stun and capture fish).

- Zone 1 was not a complete 600 second “on-time” zone as the on-board generator had mechanical issues. After a ~40-minute delay, the impeller was replaced, and sampling resumed. Zone 1 was considered completed after the delay, and Zone 2 resumed where Zone 1 ended. Zone 1 total “on-time” was 248 seconds. Both other zones were a complete 600 seconds of “on-time”.
- Overall sample efficiency was considered “Fair” by the team leader, even though weather conditions were considered good. Inexperienced netters likely resulted in lower catch than expected, especially of the smallest size classes.
- Overall, 6 different fish species were caught and identified (Table 1). Additionally, 2 Painted

Table 1. Stock size catch-per-hour (CPH), quality size CPH and proportional size distribution (PSD) of fish species sampled in Hurds Pond during the May 18, 2023 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.

Species	Number Sampled	Stock Size CPH			Quality Size CPH			Hurds Pond PSD Relative to State Average
		Hurds Pond	State Average	Stock Size CPH Ranking	Hurds Pond	State Average	Quality Size CPH Ranking	PSD Ranking
Top-Level								
Largemouth Bass	30	69.6	57.9	Above	44.8	29.4	Above	Above
Chain Pickerel	17	27.3	20.6	Above	9.9	6.3	Above	Average
Mid-Level								
Yellow Perch	72	94.5	102.1	Average	34.8	48.2	Below	Below
Brown Bullhead	1	2.5	11.7	Below	2.5	10.6	Below	Above
Pumpkinseed	31	47.2	59.3	Below	19.9	23.5	Below	Average
Low-Level								
Golden Shiner	24	59.7	20.9	Above	22.4	6.7	Above	Below

Turtles were observed, but not netted, during the sample.

- Largemouth Bass, a non-native fish first introduced into Connecticut waters in the 1800’s, is now likely the most widely distributed fish species in the State and is present in nearly all lakes and ponds. A “top-level” predatory species, this is one of the most sought-after sport fish in Connecticut and nationally. Both stock and quality-size CPH were above the State average, indicating a higher-than-expected abundance of Largemouth Bass in this small waterbody (Table 1). Furthermore, Hurds Pond had an above average PSD relative to the State Average, indicating a greater proportion of “big” fish in the population (Appendix C). This is good news for anglers looking to catch a quality-size or larger Largemouth Bass.
- Chain Pickerel, the largest native “top-level” fish in Connecticut, were present in above average abundance for both stock and quality-size fish relative to the State average (Table 1). Prior to the introduction of bass, this species was the top predator in most of Connecticut’s lakes and ponds.

However, the PSD appears to be average, indicating “big” Chain Pickerel are in proportion to the statewide average (Appendix C).

- Three “mid-level” species were present in Hurds Pond (Yellow Perch, Brown Bullhead, Pumpkinseed; Table 1; Appendix C).
 - Yellow Perch, found in nearly all Connecticut lakes, ponds and large low-gradient streams, are a schooling fish species and one of the State’s most popular panfishes. At Hurds Pond, they match the statewide average for stock-size fish but were below average for quality-size fish (Table 1). Yellow Perch PSD was below the statewide average. A possible reason for below average PSD is that with more fish of smaller size classes, there is more competition for forage, which limits growth (Appendix C).
 - Brown Bullhead is Connecticut’s only native catfish species and is widely distributed around the state. Even though densities of both stock and quality-size fish were below average, with an above average PSD, no definitive statement can be made as relatively few individuals were caught (Table 1, Appendix C). They are a difficult species to sample with nighttime boat electrofishing unless in high abundance.
 - Pumpkinseed is one of three native Connecticut sunfish species. In Hurds Pond, stock and quality-size Pumpkinseed were generally below the statewide average. The PSD was average, indicating an expected size class distribution, but with less than expected abundance of fish.
- Golden Shiner was the only “low-level” species caught during the Hurds Pond sample. Found in almost all lakes, ponds and larger low gradient streams in Connecticut, Golden Shiner is our most common lake and pond minnow and are a preferred prey species for predatory gamefish, such as Largemouth Bass and Chain Pickerel. There is no statewide stock-size designation for this species, but there is a quality-size designation (Appendix A). When data are analyzed for the stock-size category, all sizes of fish caught are used. Both stock and quality-size catch-per-hour at Hurds Pond are above the State averages. However, the PSD is low relative to the State average. This indicates that there are not as many quality-size individuals as would be expected in Hurds Pond, indicating a possible top-down pressure on larger individuals from increased predation.

Summary

The fish community at Hurds Pond contains only native species, with the exception of Largemouth Bass. However, nighttime boat electrofishing only represents a singular “snapshot” in time,

so our sample may not provide a complete picture of the fish community in Hurds Pond. More samples over a short period of time would help create a more thorough picture of the fish community.

Regarding initiating stocking Hurds Pond with hatchery-raised trout, at this time it would be best to retain the current management practices. Stocking trout could result in multiple different outcomes. One potential outcome is the stocked trout, a cold-water fish, would die quickly in the relatively shallow, warm pond or be eaten by the other predatory species (i.e. Largemouth Bass) present in the waterbody. Thus, shortening the amount of time available for anglers to participate in this fishery before the stock is depleted. This outcome is the most likely. Another possible outcome could be that the introduction of another top predator species would put pressure on the “mid” and “low-level” species and create competition with other “top-level” predators. First, “mid” and “low-level” species abundances would likely decrease, with a change in size structure towards smaller fish. Second, the added competition with other predators (i.e., Largemouth Bass, Chain Pickerel) would create an overlap of food partitioning in an already small waterbody, leading to a decrease in size structure of these species, resulting in fewer “big” fish.

Additional information about recreational fishing behaviors and practices at Hurds Pond would be important in determining the future of trout stocking on this waterbody. Performing an angler survey to estimate current fishing pressure throughout the year (during both open-water and ice-fishing periods) and gauging public interest in initiating a stocking program would help gather important information. It should be noted that adding trout would increase the number of anglers utilizing the waterbody, putting pressure on all species, not just those targeted, and increase general use of the property (i.e., foot trails, shoreline buffer, parking availability, etc). If the aim of the SOSTC is to increase use of Hurds Pond and associated property, stocking trout would likely achieve this goal. However, if the SOSTC desires to maintain native species diversity and protect the health of the lake, encouraging fishing for the species already present would achieve this goal.

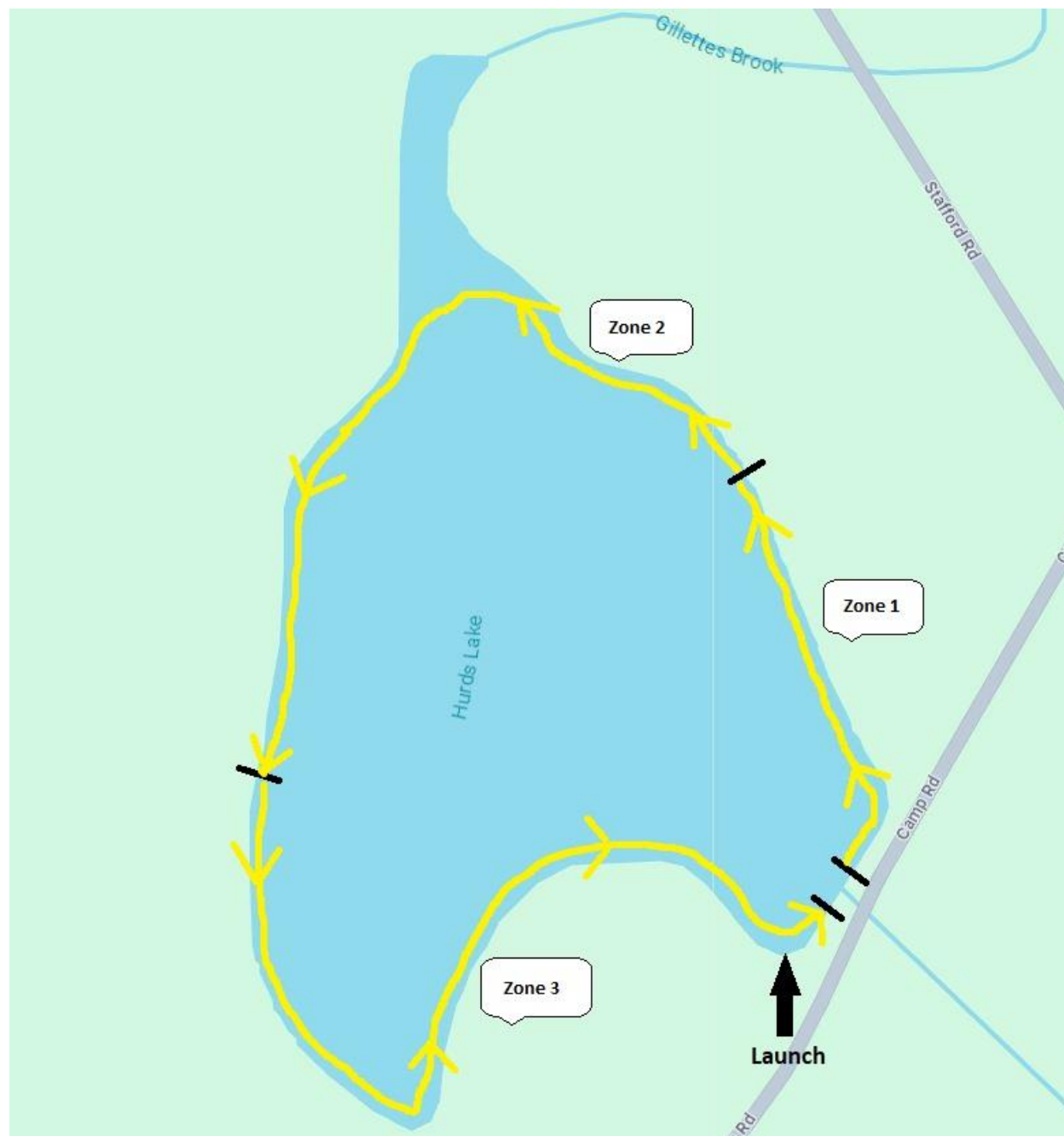
At this time, the CT DEEP will not allocate hatchery raised trout to Hurds Pond. If the SOSTC desires to move forward with a plan to stock trout, they will need to go through a commercial supplier. To do this, the SOSTC will need to file for a fish liberation permit with CT DEEP Fisheries Division. If the supplier is located outside of the state, a fish importation permit will also need to be submitted and approved to CT DEEP Fisheries Division before stocking proceeds.

If you have any questions, please feel free to contact Spencer Mallette (phone: 860-424-3138; email: Spencer.Mallette@ct.gov), Chris McDowell (phone: 860-707-2767; email: Christopher.McDowell@ct.gov), or Andrew Bade (phone: 860-424-3673; email: Andrew.Bade@ct.gov).

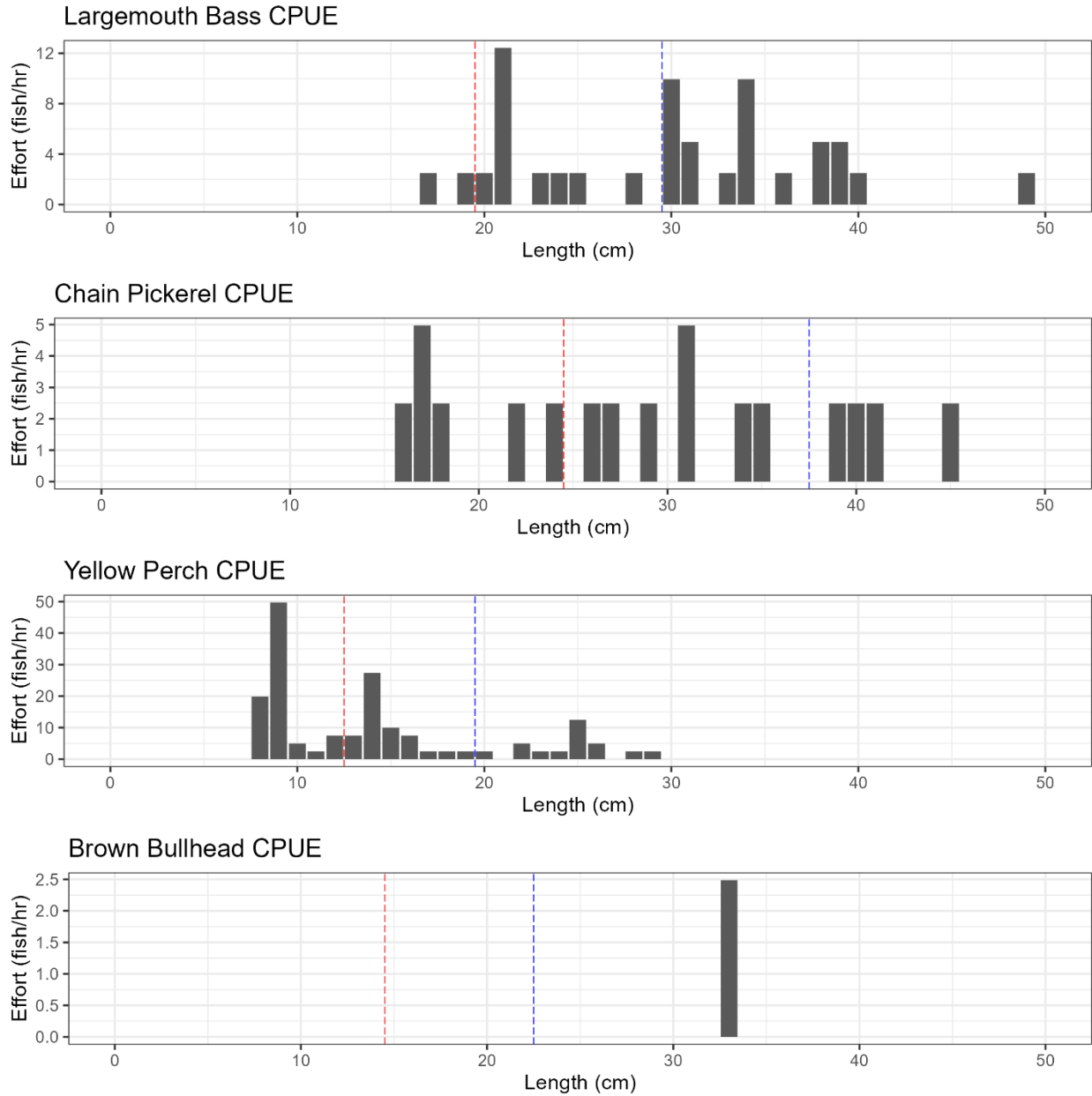
Appendix A. Stock and quality size cutoffs for various Connecticut fish species

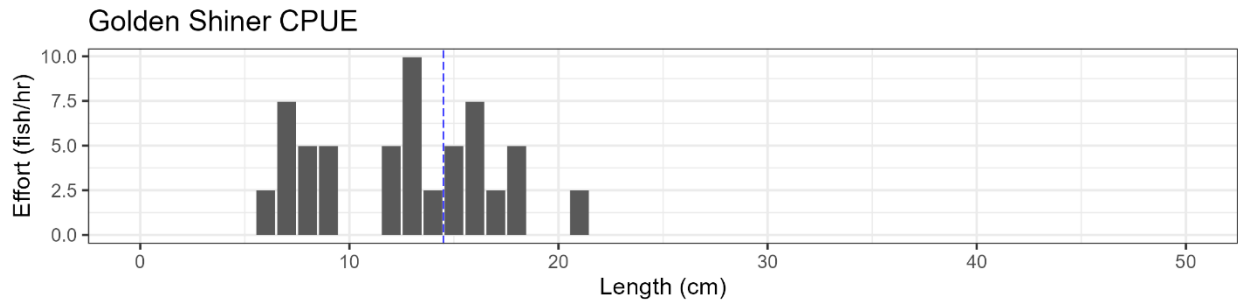
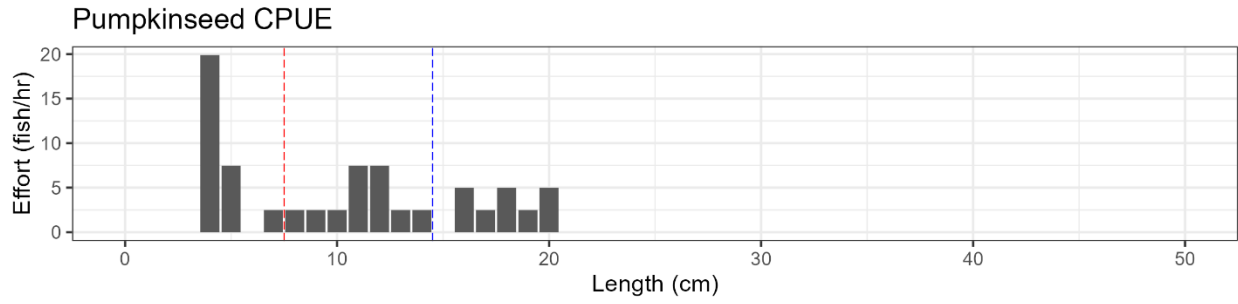
Species	Metric (cm)		English (inches)	
	Stock	Quality	Stock	Quality
Top -Level				
Largemouth Bass	20	30	8	12
Smallmouth Bass	20	30	8	12
Northern Pike	35	60	14	24
Chain Pickerel	25	38.1	10	15
Walleye	25	38.1	10	15
Brook Trout	20	33	8	13
Brown Trout	20	33	8	13
Rainbow Trout	20	33	8	13
Mid-Level				
Black Crappie	13	20.3	5	8
White Perch	13	20.3	5	8
Yellow Perch	13	20.3	5	8
Brown Bullhead	15	22.9	6	9
White Catfish	20	30.5	8	12
Rock Bass	8	15.2	3	6
Bluegill	8	15.2	3	6
Pumpkinseed	8	15.2	3	6
Green Sunfish	8	15.2	3	6
Redbreast Sunfish	8	15.2	3	6
Low-Level				
Golden Shiner	-	15	-	6
White Sucker	-	30	-	12
American Eel	-	38	-	15
Alewife	-	14	-	5.5

Appendix B. Locations sampled by the Connecticut Department of Energy and Environmental Protection using nighttime boat electrofishing in Hurds Pond, Somers, Connecticut on May 18, 2023.



Appendix C. Catch-per-unit-effort figures of the six species caught on May 18, 2023, using nighttime boat electrofishing in Hurds Pond, Somers, Connecticut. Values represented in these figures are estimates of catch rates per hour of on-time via nighttime boat electrofishing. Total on-time for this sample was 0.402 hours. Length values before the red line represent expected catch below species-specific stock-size. Length values between the red and blue lines represent expected catch of species-specific stock-size. Length values after the blue line represent species-specific quality-size and above expected catch.







Ryan Adams

Population Dynamics and Competitive Interactions of Stocked Channel Catfish in a Connecticut Lake

Danielle Shubat



- Purpose:**
- Evaluate Channel Catfish (*Ictalurus punctatus*) Management Lakes using Quinebaug Lake (Wauragan Reservoir) as a case study (Figure 1).
 - Assess angler participation and knowledge of catfish fisheries in Connecticut.



Figure 2. (a) An adult Channel Catfish (*Ictalurus punctatus*) and (b) Tandem hoop nets used in Channel Catfish mark-recapture abundance estimates.

- Methods:**
- 2000-2023: All species spring nighttime boat electrofishing surveys.
 - 2020: Targeted Channel Catfish (Figure 2a) abundance estimate using mark-recapture (Schnabel) and tandem hoop nets (Figure 2b).
 - 2023: Angler surveys using stratified random roving design.

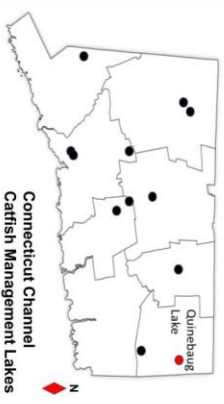


Figure 1. Connecticut Channel Catfish Management Lake locations including Quinebaug Lake (red dot).

Table 1. Capture events of Channel Catfish by size class, estimated abundances using Schnabel mark-recapture, and the percentage of individuals that fall into each size class (Schnabel Estimate = 694, 95% CI: 540-892)

Size Class (cm)	Captures	Recaptures	Estimated Abundance	% of Population
Stock (< 20)	470	139	694	100
Quality (> 30.5 cm)	469	139	685	98.7
Preferred (> 40 cm)	404	125	653	94.1
Memorable (> 50 cm)	85	30	228	32.9

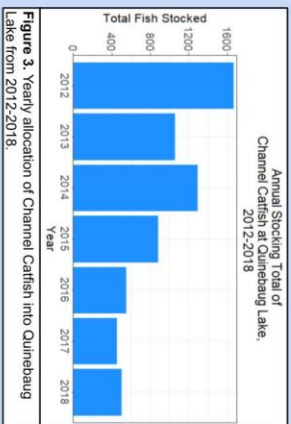


Figure 3. Yearly allocation of Channel Catfish into Quinebaug Lake from 2012-2018.

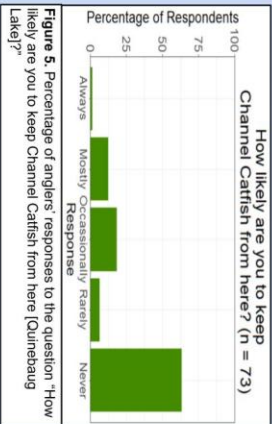


Figure 5. Percentage of anglers' responses to the question "How likely are you to keep Channel Catfish from here (Quinebaug Lake)?"

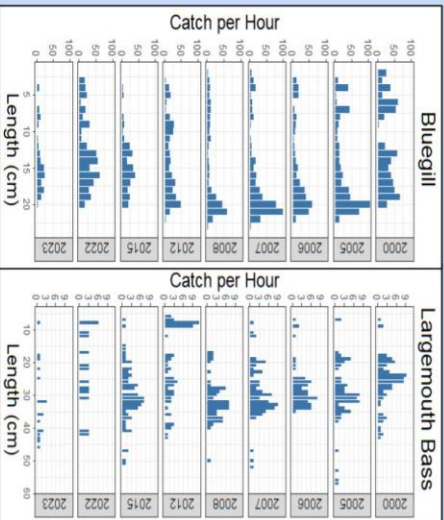


Figure 4. Length-frequencies of Bluegill, Largemouth Bass, and Channel Catfish adjusted with CPUE (number of fish caught per hour of electrofishing) from 2000-2023.

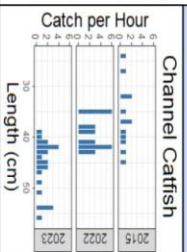


Figure 6. A regulation sign for Channel Catfish

- Results:**
- A robust Channel Catfish population is present in Quinebaug Lake, despite stocking ceasing in 2018 (Figure 3; Table 1).
 - Shift in predator and prey fish composition of lake (Figure 4).
 - Angler participation in the fishery is underutilized with little harvest (Figure 5).
 - Channel Catfish may be inducing declines in both the abundance and growth of other fish species.

- Future Directions:**
- Increase angler awareness of the Channel Catfish program and current regulations (Figure 6).
 - Investigate other Connecticut Channel Catfish Management Lakes to determine if statewide trends exist.
 - Monitor the effects of changing environmental conditions, such as habitat and water quality, at Catfish Management Lakes.

Acknowledgements:

We would like to thank the fisheries biologists and seasonal employees at the CT DEEP who assisted in data collection, and also for their guidance and help in completing this project.



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
4/1/2023 to 3/31/2024

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 and Andrew Ransom
Job Personnel: Spencer Mallette, Job Leader
Andrew Ransom, Primary Staff
Christopher McDowell, Primary Staff
Andrew Bade, Program Coordinator

Overview: Angler surveys are an indispensable component of any sportfish management program, providing vital information on angler use (effort, catch and harvest) and angler feedback on current management practices. Standardized survey methods ensure comparability of data across locations and years. Angler survey staff work in consultation with staff from other fish 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 unique responses when evaluating statewide angler attitude and use patterns. The biases of these survey media 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 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.

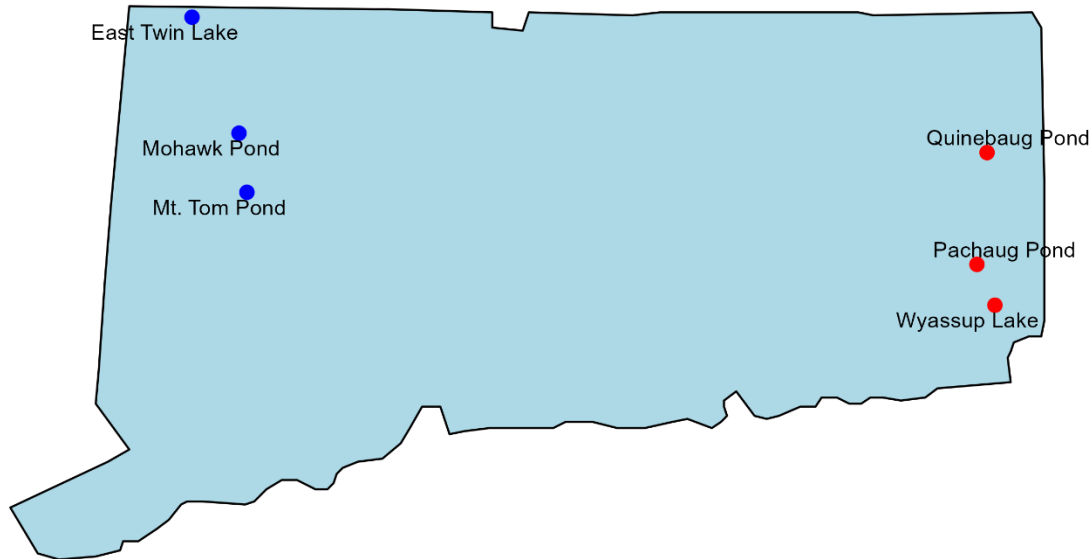


Figure 6: Waterbodies where angler surveys were conducted during the open water (red circles, 3/1/2023 – 10/31/2023) and ice (blue circles, 1/18/2024 – 2/24/2024) fishing seasons.

- The Fisheries Division performed a stratified, roving, boat-based creel survey design (Malvestuto et al. 1978) on Pachaug Pond, Quinebaug Lake, and Wyassup Lake (Figure 1) from March 1, 2023, to October 31, 2023. The purpose of this creel was 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. Current regulations for Northern Pike are a daily creel limit of 2 and a 26-inch minimum length limit year-round. Pachaug Pond is also an important bass fishery in eastern Connecticut, holding over 40 bass tournaments annually. The selection of Pachaug Pond for this survey was to pair fishing effort with a Northern Pike population estimate during the spring of 2023 (McDowell et al. 2024). Pachaug Pond has been surveyed a total of 4 times during the open water season, being last surveyed in 2017 (McDowell et al. 2018).
 - 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, whereas there is a daily creel limit of 6 Channel catfish with no minimum length limit. Selection of Quinebaug Pond for this survey was two-fold: first to assess angler interest in reestablishing Smallmouth Bass to this waterbody as they are reportedly

extirpated, and second to investigate angler awareness and interest in the Channel Catfish management program. Quinebaug Pond has been surveyed once during the open water season, in 2012 (Davis et al. 2013).

- Wyassup Lake (North Stonington) is a Bass Management Lake. Bass here are regulated by a daily creel limit of 2 and a 16-inch minimum length limit. Like Quinebaug Pond, Wyassup Lake was selected to assess angler interest in reestablishing a Smallmouth Bass population to a waterbody where the species is reportedly extirpated. Wyassup Lake has not previously had an angler survey.
- Creel surveys were performed on average four times per week, including both weekend days and two randomly selected weekdays, creating two unique strata. All state-recognized holidays were surveyed and are included in the weekend stratum. Within each stratum, start time and lake survey order was randomly selected for each day with equal probability for all start times and lake orders.
 - Furthermore, the survey was broken into four unique seasonal periods, corresponding to time of year and available daylight hours. Seasonal periods were as follows, with calendar dates and daily possible survey hours in parenthesis: early Spring (03/01 – 04/15; 0600 – 1800); late Spring (04/16 – 06/15; 0600 – 1900); Summer (06/16 – 09/15; 0600 – 2000); early Fall (09/16 – 10/31; 0600 – 1800).
- Surveys started at the top of the selected hour and lasted one hour in duration. Creel agents were to make an initial loop of the lake to first count the number of anglers by type (i.e., fishing by boat or from shore) and collect waterbody variables. After the initial count of anglers, agents were to interview all anglers if possible. If all anglers could not be interviewed, creel agents were to interview every other angler or group of anglers. Both angler count data and angler interview data were collected using separate ArcGIS Survey123 forms for ease of entry and to eliminate the need for paper forms. See Mallette et al. (2023) to view questionnaires.
 - All three waterbodies were surveyed on each selected day. After survey completion of the first or second lake, the creel agent was able to start the next lake at the nearest top of the hour if possible. However, no more than two hours between survey start times was to pass.
 - Anglers were asked a suite of questions about their effort, catch, and opinions relevant to that specific waterbody. If an angler had previously been surveyed on a particular waterbody, only trip and catch information was reported. If an angler refused an interview, the agent would fill out as much of the interview as they could and record that angler as a “refused interview.”
- All surveys quantify overall angler effort (expressed as angler-hours) and total catch (number of fish caught by anglers) using Malvestuto et al. (1974). Achievement of a relative standard error (RSE) of $\leq 20\%$ was estimated for an acceptable level based on previous estimates done by CT Fisheries Division staff (Barry et al. 2011). Surveys also quantify directed effort (percentage and/or number of angler-hours spent in pursuit of a particular species or group of species) and catch rate (number of targeted species caught per angler-hour). Angler opinions of current and prospective Fisheries Division management programs were also quantified from first-time survey responses.

- Fisheries Division staff also conducted an ice creel from January 18, 2024, to February 24, 2024, on Mohawk Pond in Goshen, Mount Tom Pond in Litchfield/Morris/Washington and East Twin Lake in Salisbury (Figure 1). Creel methods were again standardized following historical CT Fisheries Division protocols and Malvestuto et al. (1978), where both weekend days and two weekdays were randomly selected for surveys. Start times for each survey were also randomly selected, and surveys were conducted for an hour at each lake.
 - This creel was conducted to assess angler effort, opinion about current stocking practices, and harvest rates of stocked trout and salmon in each lake. East Twin Lake supports a population of large Seeforellen Brown Trout, Mohawk Pond is exclusively stocked with Brook Trout, and Mount Tom is stocked with surplus Atlantic Salmon broodstock each fall.
 - Statewide ice conditions were poor or nonexistent for much of the 2023/2024 winter season. However, safe ice did form on some smaller waterbodies. Anglers were observed fishing Mohawk Pond on 16 of the 20 days where creels were conducted and on Mount Tom Pond on 9 days. Safe ice cover never occurred on East Twin; however, one angler was observed in shallow areas near the shoreline on two occasions. As such, no creel data from East Twin Lake were included in this report.

Pachaug Pond Results:

- A total of 120 counts were performed at Pachaug Pond during the open-water fishing season (59 weekday, 61 weekend/holiday). 399 anglers were observed actively fishing, with 157 of those anglers being interviewed by a Fisheries Division creel agent (39% of total anglers observed). There were 117 full interviews conducted (those anglers interviewed for the first time) with the remaining 40 interviews being repeat anglers, where only catch and trip information was recorded. Six anglers were approached that refused an interview, stating they did not want to be bothered while fishing.

Table 1: Estimated angling effort (angler-hours) for each seasonal strata at Pachaug Pond during the open-water fishing season (March 1, 2023 – October 31, 2023). Effort/Acre is the estimated fishing pressure per acre of waterbody (angler-hours/acre).

Season	Acres	Effort (angler - hrs)	Effort /Acre	SE	df	RSE	% of Total Effort
<i>Early Spring</i>	817	799	0.98	219	14	27%	10%
<i>Late Spring</i>	817	2010	2.46	367	15	18%	26%
<i>Summer</i>	817	4306	5.27	824	23	19%	56%
<i>Early Fall</i>	817	616	0.75	227	10	37%	8%
Total	817	7732	9.46	1637	-	-	100%

- Total angler effort was estimated at 7,732 angler-hours (AH) for the entire open water fishing season (March 1 – October 31; Table 1). Approximately 56% of angler effort

occurred in the summer season (4,306 AH). Late spring (April 16 – June 15) angling accounted for an additional 26% (2010 AH) of open water effort, while early spring (March 1 – April 15) and early fall (September 16 – October 31) accounted for 799 and 616 AH, respectively. Boat-based angling accounted for 89% of all observed fishing effort and was the predominant angling type in all seasons (Appendix A). There was no reported harvest of any species during this survey period.

- There were an expected 48 bass-directed tournaments held at Pachaug Pond during this survey period, for an estimated total effort of 9,595 angler-hours (Mallette et al. 2024). Not all tournaments reach permitted attendance levels, and tournament effort is estimated from the listed number of expected anglers at each tournament. Also, some tournament organizers may have cancelled without notifying the Fisheries Division. However, this suggests that bass tournaments are a primary

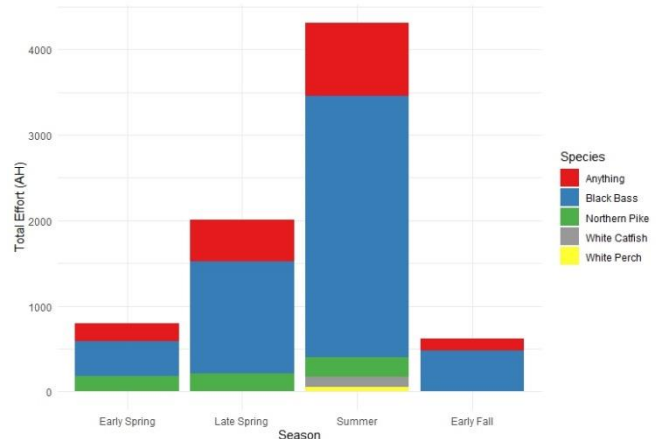


Figure 7: Total fishing effort (angler-hrs) by season at Pachaug Pond during the open-water fishing season (March 1 - October 31, 2023). Seasonal values are broken down into directed angling effort by targeted species by angler.

driver of angling effort on the lake and that the angling effort estimated herein may be an underestimate. As most tournaments take place on weekend days from 7am – 2pm, it is possible that tournaments were missed during survey periods or tournament anglers were in locations that survey agents could have missed.

- During the 2017 open water season (McDowell et al. 2018), angler effort was an estimated 9,556 AH for the period from April 8 to October 31, 2017. The 2017 period roughly coincides (7 days longer) with the 2023 creel periods of late Spring to early Fall sampling periods (April 15 to October 31, 2023), where a total effort of 6,933 AH was estimated. This represents a 27% decrease in total estimated angling effort (AH) at Pachaug Pond within the past six years. Further surveys or questionnaires would be required to understand why this decrease in angling effort is taking place.
- Two-thirds (68.1%; Appendix B) of all angling activity was directed at black bass (Largemouth and/or Smallmouth Bass), with much of this effort occurring during the summer season (Figure 2). Anglers caught an estimated 4,114 black bass (Appendix C), with a mean catch rate for all anglers of 0.40 bass/AH (0.17 bass/AH for legal size [≥ 12 inches] bass). Anglers specifically targeting black bass had an average catch rate of 0.43 bass/AH (0.19 bass/AH for legal size [≥ 12 inches] bass).
- Anglers fishing for “anything” accounted for 21.8% of the effort and were the second most abundant angling group (Appendix B). The mean catch rate for all anglers fishing

for “anything” was 0.81 fish/AH (all species combined), with the most success coming in the late spring season. Anglers fishing for anything were also more likely to catch Largemouth Bass than any other fish.

- Northern Pike was the third most targeted, accounting for 7.9% of total effort during the open water season (676 AH; Appendix B). During the 2017 open water period, effort was reported as 2.0% for Northern Pike. Part of this could be explained by the increased duration of the open water survey period during the 2023 season, allowing anglers who historically may have been missed to be counted and interviewed. Further reasoning could be a decrease in available “safe ice” days at Pachaug Pond, resulting in fewer opportunities to ice fish for Northern Pike (79.4% of effort during the 2017-2018 ice season; McDowell et al. 2018) and requiring anglers to alter the methods in which they target this fish to be more open water, boat-based strategies.

- An estimated 427 Northern Pike were caught during this period (Appendix C), with 147 of legal size (≥ 26 inches). The early spring season saw the highest percentage of targeted fishing effort (22%), while no other season exceeded 10%. No anglers were reportedly targeting Northern Pike in the early fall season (Figure 2).

- McDowell et al. (2024) performed a population estimate of Northern Pike at Pachaug Pond during the beginning of this survey (2/21 – 4/3/2023). There are an estimated 400 catchable size Northern Pike in the lake (136-2,000 95% CI), suggesting that released fish may experience multiple catch events.

- 117 anglers answered questions related to management practices of Northern Pike in Pachaug Pond (Appendix D). Over half (54%) of interviewed anglers had previously caught a Northern Pike, but only 42% of interviewees were aware of the current regulations. 62% of people were aware that Northern Pike were stocked into the lake, representing a chance for the Fisheries Division to better advertise both the opportunities and regulations of Northern Pike at Pachaug Pond.

- Overall, anglers were generally in favor (both “highly in favor” and “in favor”) of the Northern Pike management program (44%; Figure 3; Appendix D). Anglers that were opposed (29% of total interviews; both “opposed” and “highly opposed”) were often targeting bass (97% of those anglers opposed). The opposed

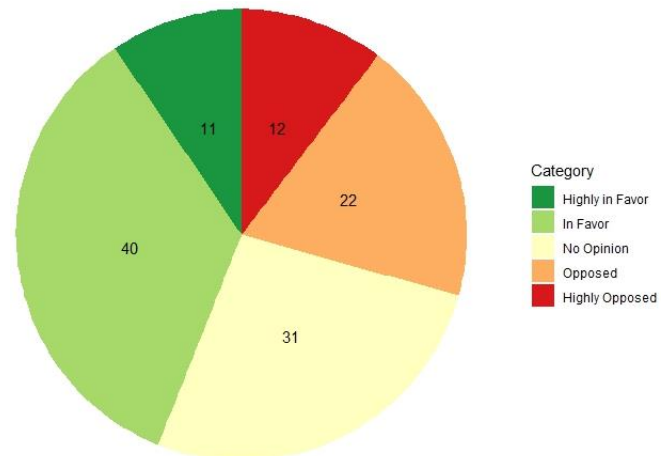


Figure 3: Angler opinions collected during the open-water fishing season (March 1 - October 31, 2023) at Pachaug Pond. Anglers were posed the question, “What are your opinions of the Northern Pike Program in this lake?” (n = 116)

anglers believed Northern Pike were responsible for the perceived collapse of the bass fishery in Pachaug Pond. Bass anglers opposed to the fishery also frequently commented on the loss of gear as a reason for opposing the program.

- Compared to the 2017 open water survey, the favorability of the Northern Pike program at Pachaug Pond has increased approximately 10% (2017 rate = 34.6%). However, opposition to the program also increased by 5% since 2017 (23.9%). The increase in favorability could be driven by the increase in directed generalist anglers (14.1% in 2017; 21.8% in 2023) who are looking for a variety of species to catch.

Quinebaug Pond Results:

Table 3: Estimated angling effort (angler-hours) for each seasonal strata at Quinebaug Pond during the open-water fishing season (March 1, 2023 – October 31, 2023). Effort/Acre is the estimated fishing pressure per acre of waterbody (angler-hours/acre).

Season	Acres	Effort (angler - hrs)	Effort /Acre	SE	df	RSE	% of Total Effort
<i>Early Spring</i>	71.1	355	5.00	135	11	38%	12%
<i>Late Spring</i>	71.1	754	10.60	130	16	17%	25%
<i>Summer</i>	71.1	1575	22.15	299	28	19%	52%
<i>Early Fall</i>	71.1	331	4.65	109	11	33%	11%
Total	71.1	3014	42.40	673			100%

- A total of 123 counts was performed at Quinebaug Pond during the open-water fishing season (62 weekday, 61 weekend/holiday). 160 anglers were observed actively fishing, with 89 of those anglers being interviewed by a Fisheries Division creel agent (56% of total anglers observed). There were 75 full interviews conducted (those anglers interviewed for the first time) with the remaining 14 interviews being repeat anglers, where only catch and trip information was recorded. Eight anglers were approached that refused an interview, stating they did not want to be bothered while fishing and that they were unhappy with Fisheries Division staff using a boat with an outboard motor attached. Only electric motors are allowed for use on this waterbody by the public.

- Total angler effort was estimated at 3,014 AH for the entire open water fishing season (Table 3). Over half (52%) of all angling effort occurred in the summer season with 1,575 AH. Late spring accounted for an additional 25% (754 AH), while early spring and early fall accounted for 12% (355 AH) and 11% (331 AH), respectively. Boat-based angling accounted for 68% of observed fishing effort and was the predominant fishing type in all but one season (Appendix A). Shore-based angling accounted for 60% of observed fishing effort during early fall. The relatively high proportion of shore-based angling at Quinebaug Lake can be attributed to good shore access from a trail that circles the waterbody with multiple locations cut-out for fishing access.

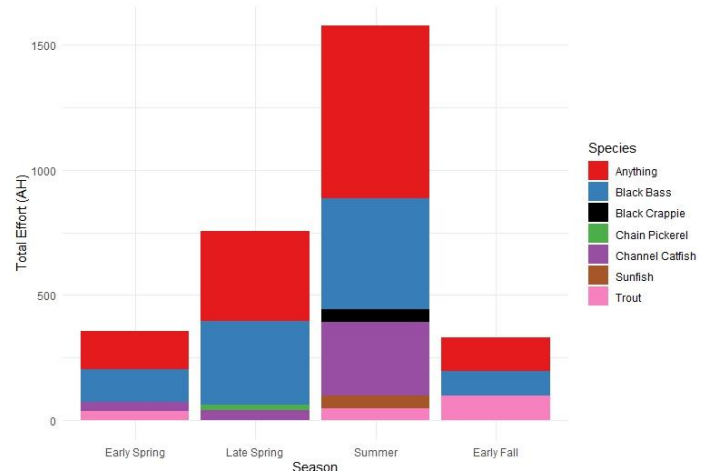


Figure 4: Total fishing effort (angler-hrs) by season at Quinebaug Pond during the open-water fishing season (March 1 - October 31, 2023). Seasonal values are broken down into directed angling effort by targeted species by angler.

- During the 2012 open water season (Davis et al. 2013), angler effort was an estimated 4,293 AH for the period from April 21 to October 31, 2012. The 2012 period roughly coincides (6 days shorter) with the 2023 creel periods of late Spring to early Fall sampling periods (April 15 to October 31, 2023), where a total effort of 2,659 AH was estimated. This represents a 38% decrease in total estimated angling effort (AH) at Quinebaug Pond over the past 11 years. Further surveys would be required to understand why this decrease in angling effort is taking place.
- Anglers fishing for “anything” were the largest group and accounted for 44.0% of the total effort across seasons (Appendix B). The mean catch rate for anglers targeting “anything” was 0.82 fish/AH, with the most success coming in the late spring season (1.04 fish/AH). Anglers fishing for “anything” at Quinebaug Pond were more likely to catch sunfish (i.e. Bluegill, Pumpkinseed, Rock Bass) than any other fish. Overall, sunfish accounted for 57% of the total catch for “anything” anglers.
- Just over one-third (35.4%) of all angling activity was directed at black bass, with late spring seeing the highest percentage of AH directed at black bass (44%; Figure 4). Anglers caught an estimated 403 black bass (Appendix C), with a mean catch rate for all anglers of 0.13 bass/AH. Anglers specifically targeting black bass had an average catch rate of 0.22 fish/AH (0.11 fish/AH for legal size (≥ 16 inches) fish). The late fall season anglers were the most successful, catching black bass at a rate of 0.46 bass/AH.

- The percentage of Black bass directed effort decreased by nearly half (from 64% in 2012) from the previous open water survey (Davis et al. 2013). This decrease in directed effort could be driven by the decrease in catch rate for black bass at Quinebaug Pond. During the 2012 survey, all anglers were catching black bass at a rate of 0.68 bass/AH, an increase of over 500% from 2023. Those anglers that were directly targeting bass also saw a near 400% decrease in catch rate, going from 0.90 bass/AH to 0.22 bass/AH. Further work will need to be done to understand this shift in angler catch rates and to determine if the black bass community at Quinebaug Pond is decreasing.
- 75 anglers answered questions related to fisheries management practices at this lake (Appendix E). There were four questions directly related to black bass management. Less than half (47%) of anglers that were asked questions knew that Quinebaug Pond was a Bass Management Lake with special regulations.
- The remaining questions on black bass management focused on Smallmouth Bass and angler opinions on restarting a fishery at Quinebaug Pond. Of those anglers that were asked if they had previously caught a Smallmouth Bass at Quinebaug Pond (n = 74), thirteen anglers responded positively (18%; Appendix E). Two anglers reported they had caught Smallmouth Bass that day, but with no photo proof or visual identification by creel agents, this could not be confirmed. Furthermore, another five anglers reported having caught a Smallmouth within the past year or more recently. The remaining anglers reported not having caught a Smallmouth Bass in the past two or more years, which is more in-line with Fisheries Division estimates of extirpation somewhere in the mid-to-late 2000's.
- However, Smallmouth Bass could theoretically enter Quinebaug Lake via Quandock Brook. This stream could provide access to the reservoir for Smallmouth Bass during certain times of year, which could explain the occasional angler encounter despite the lack of a persistent Smallmouth population in Quinebaug Pond.
- Anglers were asked their feelings on a possible transplantation of Smallmouth Bass to restart a fishery at Quinebaug Pond. An overwhelming majority of anglers

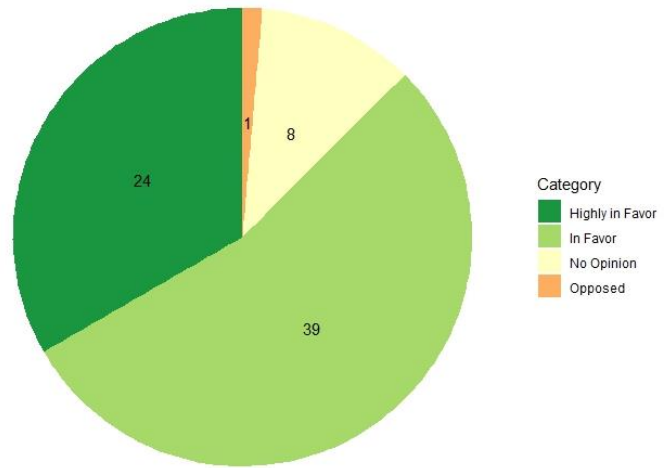


Figure 5: Angler opinions collected during the open-water fishing season (March 1 - October 31, 2023) at Quinebaug Pond. Anglers were posed the question, "According to our data, Smallmouth Bass appear to no longer be present in this lake. How would you feel if fish were transplanted to this lake to attempt to restart the fishery?" (n = 72)

asked this question were either “in favor” or “highly in favor” of this idea (88%; Appendix E). Only one angler was opposed, citing “if it’s not broke, don’t fix it”.

- Channel Catfish, a species introduced by the Fisheries Division in 2012, were the third most fished for species at Quinebaug Pond, accounting for 12.4% of the total effort (375 AH, Appendix B). Directed effort for Channel Catfish was highest in the summer season, representing 19% of the total angling-hours (Figure 4). An estimated 88 catfish were caught during the survey period, representing a catch rate of 0.03 fish/AH for all anglers. Anglers directly targeting Channel Catfish had an average catch rate of 0.18 fish/AH, with the late spring season being the most successful (0.40 fish/AH).

- This project was not optimized to survey anglers targeting Channel Catfish. These anglers often fish from dusk to dawn, when Channel Catfish are perceived to be more active. Due to staffing and safety concerns, these hours were not surveyed. Therefore, this project likely underestimated targeted effort for Channel Catfish.

- Furthermore, Channel Catfish were first stocked at Quinebaug Pond on May

21, 2012 (Hagstrom et al. 2013), a month after the start of the 2012 open water survey. During the remainder of the survey, no Channel Catfish were caught by anglers, and no anglers were specifically targeting Channel Catfish yet.

- Five questions targeting angler awareness and opinions of the Channel Catfish management program at Quinebaug Pond were asked to anglers (Appendix E). Of the anglers who answered these questions, only 40% of anglers were aware these fish were stocked, and only 31% reported ever catching a Channel Catfish in Quinebaug Pond. Even fewer anglers (19%) knew of the current regulations for Channel Catfish, representing a knowledge gap for anglers and an area where the Fisheries Division can better advertise and educate anglers on this program.
- After anglers were informed of the regulations for Channel Catfish at Quinebaug Pond, they were asked their opinions of the program (Figure 6; Appendix E). 73% were “in favor” or “highly in favor” and 3% were “opposed”. Those anglers that were opposed cited a decrease in other fishes in the lake after the stocking of Channel Catfish and believe Channel Catfish make the water less clean. All other interviewees stated they had no opinion on the program.
- In total, creel agents observed or recorded a total of four Channel Catfish being caught during this survey. One fish was harvested and was directly measured by

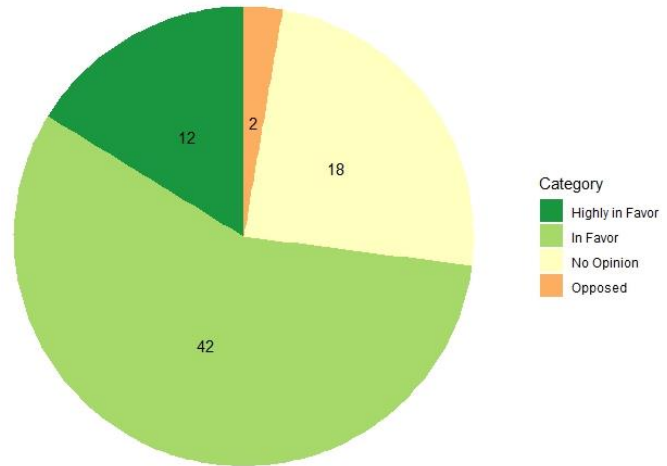


Figure 6: Angler opinions collected during the open-water fishing season (March 1 - October 31, 2023) at Quinebaug Pond. Anglers were posed the question, “What are your opinions of the Channel Catfish program in this lake?” (n = 74).

staff (Appendix C). This 25% harvest rate, though based off low surveyed catch and harvest, falls in line with anglers who were 10% or more likely to keep a Channel Catfish if caught (31% of anglers interviewed). The remaining anglers (69%) were “rarely” or “never” going to keep a Channel Catfish.

- Trout, which are annually stocked in Quinebaug Pond multiple times (2023 stocking dates: 4/11, 5/19, 9/29), were the fourth most targeted fish group with an estimated 188 AH of pressure (Appendix C). Of those anglers directly targeting trout, the average catch rate was 0.16 fish/AH.
 - A total of 2,254 trout of varying species were stocked into Quinebaug Pond during the 2023 stocking season (Devine et al. 2024). With only 188 hours of directed effort towards these fish, that equates to just 0.08 targeted AH/trout stocked, possibly representing a low return-on-investment of fish resources.

Wyassup Lake Results:

- A total of 124 counts were performed at Wyassup Lake during the open-water fishing season (63 weekday, 61 weekend/holiday). 165 anglers were observed actively fishing, with 121 of those anglers being interviewed by a Fisheries Division creel agent (73% of total anglers observed). There were 91 full interviews conducted (those anglers interviewed for the first time) with the remaining 30 interviews being repeat anglers, where only catch and trip information was recorded. Eight anglers were approached that refused an interview, stating they did not want to be bothered while fishing.

Table 4: Estimated angling effort (angler-hours) for each seasonal strata at Wyassup Lake during the open-water fishing season (March 1, 2023 – October 31, 2023). Effort/Acre is the estimated fishing pressure per acre of waterbody (angler-hours/acre).

Season	Acres	Effort (angler - hrs)	Effort /Acre	SE	df	RSE	% of Total Effort
<i>Early Spring</i>	98.9	161	1.62	70	10	43%	5%
<i>Late Spring</i>	98.9	1344	13.59	413	15	31%	40%
<i>Summer</i>	98.9	1262	12.76	301	26	24%	37%
<i>Early Fall</i>	98.9	601	6.08	239	11	40%	18%
Total	98.9	3368	34.05	1023		100%	

- Total angler effort was estimated at 3,368 AH for the open-water fishing season (Table 4). Late spring and summer accounted for nearly equal amounts of the total open-water effort (40% [1344 AH] and 37% [1262 AH], respectively), even though the late spring period was shorter in duration than the summer (61 to 92 survey days, respectively). Early fall represented the third most effort (18%, 601 AH), with little effort overall in early spring (5%, 161 AH). Boat-based angling accounted for 86% of all observed fishing effort (Appendix A), and never represented less than 81% in any given season (summer, 81%).

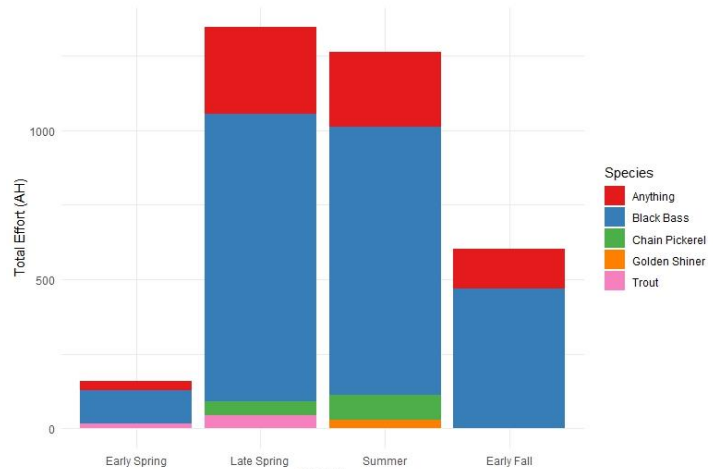


Figure 7: Total fishing effort (angler-hrs) by season at Wyassup Lake during the open-water fishing season (March 1 - October 31, 2023). Seasonal values are broken down into directed angling effort by targeted species by angler.

- The low percentage of shore-based angling at Wyassup can be attributed to only a small portion of land being publicly available for access near the boat ramp, with the remainder of shore-based fishing coming from private homes surrounding the lake.
- Almost three-quarters (72.6%, Appendix B) of all angling activity was directed at black bass, with no less than 70% of effort during any given season (early spring, 70%; Figure 7). Anglers caught an estimated 5,662 black bass (Appendix C), with a mean catch rate for all anglers of 1.02 bass/AH (0.51 bass/AH for legal size ≥ 16 inches] black bass). Anglers specifically targeting black bass had an average catch rate of 1.08 bass/AH (0.54 bass/AH for legal size ≥ 16 inches] black bass). During the summer, black bass anglers were the most successful, with a rate of 1.53 all size bass/AH.

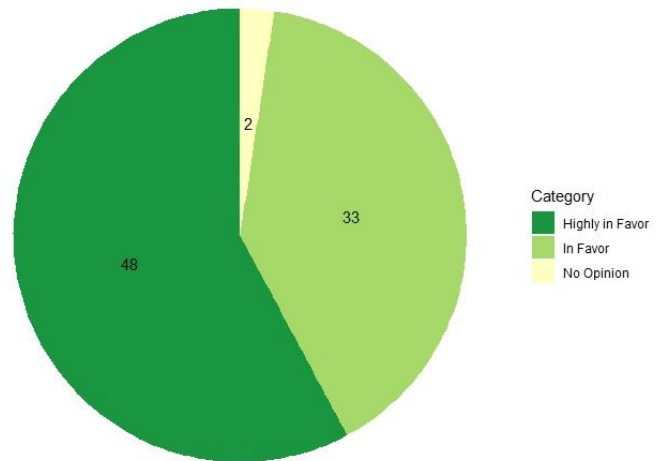


Figure 8: Angler opinions collected during the open-water fishing season (March 1 - October 31, 2023) at Wyassup Lake. Anglers were posed the question, "According to our data, Smallmouth Bass appear to no longer be present in this lake. How would you feel if fish were transplanted to this lake to attempt to restart the fishery?" (n = 83)

- 84 anglers answered questions related to the Bass

Management Lake program and experience catching Smallmouth Bass (Appendix F). There were four questions directly related to black bass management. Of interviewed anglers, 63% knew that Wyassup Lake was a Bass Management Lake that had special creel regulations.

- The remaining questions focused on Smallmouth Bass and angler opinions toward restarting a fishery at Wyassup Lake. Of the anglers interviewed and asked if they had ever caught a Smallmouth Bass there, only 17% responded positively (Appendix F). Those that had previously caught a Smallmouth Bass almost all reported having caught one five or more years ago (93%, n = 13). Only one angler reported having caught one in the past year.
- Anglers were asked their feelings on a possible transplantation of Smallmouth Bass to restart a fishery at Wyassup Lake. No anglers were opposed to this idea, while a majority (98%) were in favor (Figure 8). Of those that responded positively, 58% of respondents were “highly in favor” and 40% were “in favor”. Anglers cited the increase in fishing opportunities for Smallmouth Bass in Eastern Connecticut as one of their most common reasons why they would be in favor, while also enjoying the fight a Smallmouth Bass provides over other species.
- Anglers fishing for “anything” account for 21.0% of the effort and were the second most abundant angling group (Appendix B). The mean catch rate for all anglers fishing for anything was 2.03 fish/AH, with the most success coming during the late spring season (2.22 fish/AH). Anglers fishing for “anything” were more likely to catch Largemouth Bass than any other fish.
- Chain Pickerel were the third most targeted species at Wyassup Lake, representing just 3.8% of all directed effort (129 AH; Appendix B). Even though directed effort for Chain Pickerel was low, estimated catch of this species was the second highest at a total of 3,324 (Appendix C). The average catch rate for all anglers was 0.76 Chain Pickerel per angler-hour (0.32 chain pickerel/AH for legal size ≥ 15 inches] fish), while those directly targeting Chain Pickerel had a catch rate of 0.88 fish/AH (0.65 chain pickerel/AH for legal size ≥ 15 inches] fish). Only 2 Chain Pickerel were observed as being harvested during this survey, representing a 1.7% harvest rate of those reported catches.
- Trout, which are annually stocked in the spring at Wyassup Lake (2023 stocking dates: 3/6, 4/13, 4/28), were the fourth most targeted group, with a total directed effort of just 74 AH (Appendix B). Of those directly targeting trout, there was no reported catch of trout.
 - A total of 1,268 trout of varying species were stocked into Wyassup Lake during the 2023 stocking season (Devine et al. 2024). The 74 hours of directed effort towards trout equates to just 0.05 targeted AH/trout stocked, possibly representing a low return-on-investment of fish resources.

Mohawk Pond Results:

- A total of 93 anglers was observed on Mohawk Pond, with an estimated 930 hours of effort (SE = 203.5). Creels were conducted on 20 unique days, and 43 interviews were completed. Complete (100%) ice cover was present during the entire creel period. Most anglers that were interviewed used tip-ups (80%), and a subset of these also utilized a

jigging style fishing rod concurrently (38%). A smaller percentage of anglers utilized only a single jigging rod (19%).

- Almost half of anglers surveyed reported fishing success was Poor (41%), some reported “average” (27%), “good” (19%), or “can’t tell yet” (8%), and few were “terrible” (3%) or “excellent” (3%). When asked what species the anglers were targeting, a majority were after Trout (56%), some targeted “anything” (36%), and a subset fished only for panfish (8%). Mohawk Pond is a Trout Management Lake (TML) where only Brook Trout are stocked, and of the anglers interviewed for the first time, 36% were not aware of this information. However, 94% of anglers supported the program and only 6% reported “no opinion”. Zero anglers were against the Brook Trout only stockings. At the time interviews were conducted, 31% of anglers had caught at least one Brook Trout. 34% of Brook Trout caught were harvested. Most anglers released the targeted species because they “did not eat trout” or wanted the fish to “go back and grow for next year”.

Mount Tom Pond Results:

- Forty-four anglers were observed on the 9 creel days when Mount Tom Pond had safe ice conditions, with an estimated 360 hours of angler effort (SE = 126.1). Sixteen interviews were conducted. Only 20-30% of the lake, primarily nearshore near the state beach access, held safe ice during the creel. This area also melted and re-froze several times, further reducing ice angler opportunity. All anglers were using tip-ups (100%), and only three also used a jigging rod (7%). Six Atlantic Salmon catches were reported during the angler survey, five of which were harvested.
- Most anglers surveyed reported fishing success was “average” (35%), “poor” (26%), or “terrible” (26%). However, some reported “good” (4%), “can’t tell yet” (4%), or “excellent” (4%). Most anglers targeted trout or Atlantic Salmon (78%), and some targeted “anything” (22%). Of the anglers interviewed for the first time, all (100%) were aware that Atlantic Salmon are stocked into Mount Tom, with all of them being “in favor” (30%) or “highly in favor” (70%). Despite no anglers targeting stocked Walleye, most (90%) were aware of the program and were either “in favor” (20%) or “highly in favor” (40%). Forty percent (40%) of anglers surveyed reported “no opinion” about Walleye. The timing of interviews and design of the creel may not have been conducive for sampling anglers targeting Walleye. Walleye are typically fished for during early morning or evening/nighttime hours, but the lake was typically sampled between the hours of 9 am and 3 pm.

Ongoing Creel Surveys:

- On March 1, 2024, the Fisheries Division initiated a creel survey of the State’s Community Fishing Waters (CFW) to assess angler usage, effort, catch, and opinions on management strategies for each of the 17 waterbodies (Table 5, Figure 9) and Wharton Brook Pond, North Haven. This creel survey is expected to run until October 31, 2024 and be repeated in 2025 and possibly 2026.

- Wharton Brook Pond, North Haven, is included in this survey as it is expected to be designated a CFW in the coming regulations package. It will begin to receive an annual stocking of Channel Catfish while continuing traditional trout stocking.
- The 18 waterbodies have been divided into six groups (henceforth referred to as “loops”)

Loop	Town; County	Community Fishing Water	Alternative Name
1	New Haven; New Haven	Beaver Park Pond	Beaver Park Lagoon
1	Bridgeport; Fairfield	Bunnell's Pond	Beardsley Park Pond
1	Hamden; New Haven	Lake Wintergreen	
2	Bristol; Hartford	Birge Pond	
2	Enfield; Enfield	Freshwater Pond	
2	New Britain; Hartford	Stanley Quarter Park Pond	
3	Southington; Hartford	Crescent Lake	
3	Waterbury; New Haven	Lakewood Lake	Great Brook Reservoir
3	Waterbury; New Haven	Upper Fulton Park Pond	
4	Manchester; Hartford	Center Springs Park Pond	
4	Hartford; Enfield	Keney Park Pond	
4	Norwich; New London	Mohegan Park Pond	Spaulding Pond
5	Meriden; New Haven	Mirror Lake	Hubbard Park Pond
5	Middletown; Middlesex	Rowan's Pond	Butternut Pond
5	North Haven; New Haven	Wharton Brook Park Pond	Allen Brook Pond
6	Ansonia; New Haven	Colony Pond	
6	Derby; New Haven	Pickett's Pond	
6	Danbury; Danbury	Rogers Park Pond	

based on average travel time from each other (Table 5). A stratified, random survey schedule for each loop was created based on two different strata (weekdays and weekend days) and three different sampling periods (morning, mid-day, dusk; loop start times range from 0600 – 0800, 1300 – 1500, and 1500 - 1600 start times; respectively). The starting time for the dusk sampling unit moved depending on sunset time and season.

- An average of one loop will be surveyed each day during this reporting period. Selection of daily loop was done with replacement across all strata and sampling units.
- Daily loops were surveyed in a randomly selected order at a random start time within the selected sampling unit. There is a two-hour gap between the start of one survey and the next. For example, if the randomly selected start time was 0800, then the first lake would be surveyed at that time, the second lake at 1000, and the third at 1200, with one hour allotted for counts and interviews and the other hour for travel to the next destination.
- See Appendix G and Appendix H for survey count form and angler questionnaires, respectively.

Table 5: List and location of Community Fishing Waters being surveyed during the open water (3/1/2024 – 10/31/2024) fishing season.

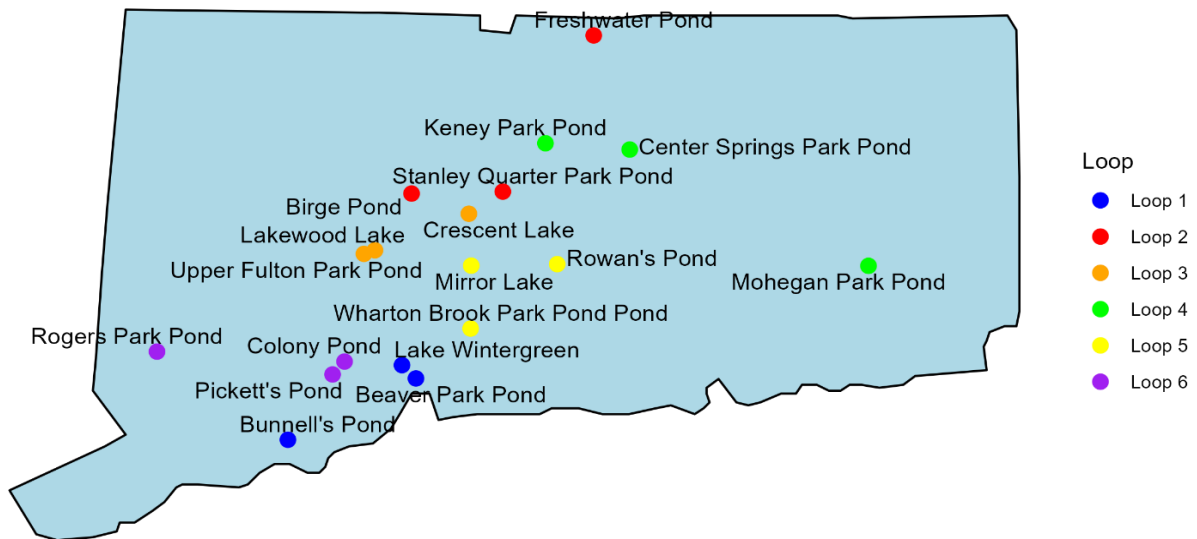


Figure 9: Waterbodies where angler surveys are being conducted during the open water (3/1/2024 – 10/31/2024) fishing season. Colors indicate groupings for each individual survey loop.

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.
- Tablets with ArcGIS Survey123 forms have replaced paper data collection for most 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 objectives.

- A seasonal resource assistant, Sarah Praisner, completed compiling historic lake and large river creel survey data files into a single format. This work will help with the creation of a single database moving forward. A post-doctoral scholar at the University of Connecticut who is starting in August 2024, will collate and modernize data storage practices for our angler survey data, among other data streams, as part of their studies.

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

- Using a publicly accessible Survey123 survey, the Fisheries Division captured angling effort for Lake Trout stocked into five waterbodies across the state (Devine et al. 2024). Using multiple forms of public outreach (i.e. DEEP website, Facebook, CT Fishin’ Tips

Newsletter, and email), this method only received 19 angling reports in return, but was higher than previous efforts using a similar strategy in years past.

- The Fisheries Division receives quarterly catch reports from the social media platform, FishBrain. The Fisheries Division can also send notifications through FishBrain to anglers fishing specific waterbodies if the need arises. This could be used, for example, to give anglers who have fished a waterbody a link to complete a survey concerning management of the waterbody.
 - There are serious data quality issues with the catch reports. Catch coordinates are often missing or incorrect and species identification is unreliable.

Moving Forward

- Continue the creel surveys at the Community Fishing Waters.
 - Examine reported information to help determine the extent of effort needed for the next phase of this creel, and how long it will continue.
 - Begin using preliminary data to optimize stocking practices and highlight areas for improved management.
- Develop long-term creel survey schedule.
- Research engagement strategies for electronic angler logs to increase participation (e.g., incentives, regular outreach, data sharing).
 - Tournament anglers could be a group to test-run this on, as they often pre-fish a waterbody to find locations. This pressure is not included in tournament reporting data and could be useful for managing populations.
 - Partner with the Connecticut Aquatic Resources Education (CARE) to engage in angler logs with individuals who attend classes to track retention of anglers as well as catch efficacy. Could be supplemented with incentives for returning logs.

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Appendix A

Estimated angling effort (angler-hours) for each seasonal strata by angling type (boat v. shoreline) at Pachaug Pond, Quinebaug Pond, and Wyassup Lake during the open-water fishing season (March 1, 2023 – October 31, 2023). NA = no reported shoreline angling effort at Wyassup Lake during the early spring season.

	Season	Total Effort (AH)	Boat Angling Effort				Shoreline Angling Effort					
			Effort (AH)	SE	df	RSE	% of Season Effort	Effort (AH)	SE	df	RSE	% of Season Effort
Pachaug Pond	<i>Early Spring</i>	799	722	204	13	28%	90%	77	51	9	66%	10%
	<i>Late Spring</i>	2010	1606	333	15	21%	80%	404	163	29	40%	20%
	<i>Summer</i>	4306	3979	785	23	20%	92%	327	109	31	33%	8%
	<i>Early Fall</i>	616	599	229	10	38%	97%	16	16	10	97%	3%
	Total	7732	6907	1551			89%	824	339			11%
Quinebaug Pond	<i>Early Spring</i>	355	271	120	16	44%	76%	84	57	9	66%	24%
	<i>Late Spring</i>	754	494	108	17	22%	66%	260	95	15	36%	34%
	<i>Summer</i>	1175	881	167	28	19%	75%	294	183	25	26%	25%
	<i>Early Fall</i>	331	131	58	10	44%	40%	200	87	18	43%	60%
	Total	2614	1777	453			68%	838	422			32%
Wyassup Lake	<i>Early Spring</i>	161	161	70	10	43%	100%	0	NA	NA	NA	0%
	<i>Late Spring</i>	1344	1154	362	15	31%	86%	190	89	20	47%	14%
	<i>Summer</i>	1262	1017	263	36	26%	81%	246	107	25	44%	19%
	<i>Early Fall</i>	601	567	209	11	37%	94%	34	33	10	99%	6%
	Total	3368	2898	904			86%	470	229			14%

Appendix B

Directed effort (angler-hrs) for various species at lakes surveyed during the open water (3/1/2023 – 10/31/23) fishing period. “All bass” directed effort includes all effort targeting Largemouth Bass and/or Black Bass. “All trout” and “All sunfish” directed effort includes all trout species and all sunfish species, respectively. “Anything” directed effort reflects a generalist angler approach towards any species they can catch. “% of Total Effort” may sum to slightly more or less than 100% due to rounding. Shaded cells represent species that were not targeted at specific waterbodies. NT = this fish species was not targeted by anglers at this waterbody.

Species	Pachaug Pond		Quinebaug Pond		Wyassup Lake	
	Effort (hrs)	% of Annual Total	Effort (hrs)	% of Annual Total	Effort (hrs)	% of Annual Total
Anything	1682	21.8%	1327	44.0%	706	21.0%
All Bass	5267	68.1%	1008	33.4%	2444	72.6%
Northern Pike	612	7.9%	NT	NT	NT	NT
Chain Pickerel	NT	NT	21	0.7%	129	3.8%
Channel Catfish	NT	NT	375	12.4%	NT	NT
All Trout	NT	NT	186	6.2%	61	1.8%
Black Crappie	NT	NT	49	1.6%	NT	NT
White Catfish	113	1.5%	NT	NT	NT	NT
All sunfish	NT	NT	49	1.6%	NT	NT
White Perch	57	0.7%	NT	NT	NT	NT
Golden Shiner	NT	NT	NT	NT	28	0.8%
Total	7731	100	3014	100	3368	100

Appendix C

Estimated catch (number of fish) and harvest rate (percent of fish caught that were harvested) at lakes during the open water (3/1/2023 – 10/31/2023) fishing season. Catch of individual sunfish species are not reported because most anglers cannot reliably identify sunfish species. NC = Not captured during this survey.

Species	<u>Pachaug Pond</u>					<u>Quinebaug Pond</u>					<u>Wyassup Lake</u>				
	Catch	SE	df	RSE	Harvest Rate	Catch	SE	df	RSE	Harvest Rate	Catch	SE	df	RSE	Harvest Rate
All bass	4114	875	85	21.3%	0.0%	403	130	62	32.3%	0.0%	5662	1103	63	19.5%	0.0%
Northern Pike	427	199	93	46.7%	0.0%	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Chain Pickerel	412	204	110	49.5%	0.0%	360	130	61	36.2%	0.0%	3324	709	63	21.3%	1.70%
Channel Catfish	NC	NC	NC	NC	NC	88	74	62	84.0%	25%	NC	NC	NC	NC	NC
All trout	NC	NC	NC	NC	NC	99	56	64	56.5%	0.0%	96	92	60	96.0%	0.0%
Black Crappie	644	682	70	59.3%	0.0%	32	12	60	67.9%	0.0%	NC	NC	NC	NC	NC
Yellow Perch	237	114	62	48.2%	0.0%	404	235	104	58.0%	0.0%	281	110	69	39.3%	0.0%
White Perch	582	383	59	65.8%	0.0%	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
All sunfish	566	312	59	55.1%	0.0%	1265	455	114	36.0%	0.0%	1216	492	103	40.4%	0.0%

Appendix D

Responses from anglers when asked about their awareness of and opinions on the Northern Pike Management project at Pachaug Pond, Griswold, Connecticut, during the open water (3/1/2023 – 10/31/2023) fishing season.

Have you ever caught a Northern Pike in this Lake? (n = 117)

Yes	No
54% (63)	46% (54)

Are you aware Northern Pike are stocked in this lake? (n = 116)

Yes	No
62% (72)	38% (44)

Are you aware of the current regulations regarding Northern Pike in Connecticut waterbodies? (n = 115)

Yes	No
42% (48)	58% (67)

What are your opinions of the Northern Pike program in this lake? (n = 116)

Highly in Favor	In Favor	No Opinion	Opposed	Highly Opposed
10% (11)	35% (40)	27% (31)	19% (22)	10% (12)

How likely are you to keep Northern Pike that you catch in this lake? (n = 116)

Always	Most of the time (>50%)	Occasionally (10-50%)	Rarely (<10%)	Never
0% (0)	0% (0)	4% (5)	5% (6)	91% (105)

Appendix E

Responses from anglers when asked about their awareness of and opinions on the Channel Catfish Management project, as well as awareness of the Bass Management Lake project at Quinebaug Pond, Killingly, Connecticut, during the open water (3/1/2023 – 10/31/2023) fishing season. Further responses were centered around re-establishment of Smallmouth Bass populations and angler interest.

Have you ever caught a Channel Catfish in this Lake? (n = 74)

Yes	No
31% (23)	69% (51)

Are you aware Channel Catfish are stocked in this lake? (n = 73)

Yes	No
40% (29)	60% (44)

Are you aware of the current regulations regarding Channel Catfish in Connecticut waterbodies? (n = 74)

Yes	No
19% (14)	81% (60)

What are your opinions of the Channel Catfish program in this lake? (n = 74)

Highly in Favor	In Favor	No Opinion	Opposed	Highly Opposed
16% (12)	57% (42)	24% (18)	3% (2)	0% (0)

How likely are you to keep Channel Catfish that you catch in this lake? (n = 73)

Always	Most of the time (>50%)	Occasionally (10-50%)	Rarely (<10%)	Never
1% (1)	12% (9)	18% (13)	6% (4)	63% (46)

Are you aware that this lake is a Bass Management Lake with special regulations? (n = 72)

Yes	No
47% (34)	53% (38)

Have you ever caught a Smallmouth Bass in this lake? (n = 74)

Yes	No
18% (13)	82% (61)

If yes, when was the last time you caught a Smallmouth Bass in this lake? (n = 13)

Today	Past Month	Past Year	Past 2-4 Years	Past 5+ Years
15% (2)	23% (3)	15% (2)	15% (2)	31% (4)

According to our data, Smallmouth Bass 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? (n = 72)

Highly in Favor	In Favor	No Opinion	Opposed	Highly Opposed
33% (24)	54% (39)	11% (8)	1% (1)	0% (0)

Appendix F

Responses from anglers when asked about their awareness of the Bass Management Lake project at Wyassup Lake, North Stonington, Connecticut, during the open water (3/1/2023 – 10/31/2023) fishing season. Further responses were centered around re-establishment of Smallmouth Bass populations and angler interest.

Are you aware that this lake is a Bass Management Lake with special regulations? (n = 84)

Yes	No
63% (53)	37% (31)

Have you ever caught a Smallmouth Bass in this lake? (n = 84)

Yes	No
17% (14)	83% (70)

If yes, when was the last time you caught a Smallmouth Bass in this lake? (n = 14)

Today	Past Month	Past Year	Past 2-4 Years	Past 5+ Years
0% (0)	0% (0)	7% (1)	0% (0)	93% (13)

According to our data, Smallmouth Bass 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? (n = 83)

Highly in Favor	In Favor	No Opinion	Opposed	Highly Opposed
58% (48)	40% (33)	2% (2)	0% (0)	0% (0)

Appendix G

Community Fishing Water 2024
Creel Survey Hourly Count Form

Waterbody: _____

CREEL START TIME: _____

DATE: _____

Time Count Actually Began: _____

Agent's Name: _____

Time Count Actually 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: _____

Age	Shore	Boat
Under 16		
16 or Older		

IS THERE AN ONGOING EVENT ON THE WATERBODY? Yes No # of Participants____
(circle one if yes): Fishing Class Derby Other

COMMENTS:

Appendix H

Waterbody: _____

ID No. _____

Creel Survey Interview Form

Date: _____ Agent: _____ Sample Time: _____ # of Anglers: ___(if >1, separate with A, B, etc....)
 Time Fishing Started: _____ Time Now: _____ Fishing from: Boat Shore
 Technique used: Casting Fly Rod Bait Trolling Downrigger
 Bait used: Lure Flies Worms Minnows Other bait: _____

“What are you fishing for?”: _____ “Are you part of a fishing event/derby today?” Yes No

“Did you catch any fish today?” Yes No
 If yes “Do you mind if I measure your fish” Yes No
 “Did you release ANY fish?” Yes No

Species Code	Lengths (truncate to lower cm) <i>separate w/ commas. If too many to measure, put extra count in (parentheses)</i>	# Released	Size Range (in)

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

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

“What brings you to fish this lake today?”

“How long did you travel today to get to this lake?”: _____ mins “How did you get to this lake today?” _____
 “Have you been interviewed on this lake this year?” Yes No # of times: _____

----- ONLY CONTINUE IF FIRST TIME INTERVIEWED -----

1. Town/State From _____
2. “How many times in an average year do you fish in this lake?” _____
3. “Are you aware that Channel Catfish have been stocked in this lake?” Yes No
4. “Have you ever caught a Channel Catfish in this lake?” Yes No
5. “What’s your opinion of the Channel Catfish program in this lake?”
 “2) In Favor 1) Highly in favor 4) Opposed 5) Highly opposed 3) No Opinion”
6. “Why are you <previous opinion> to the Channel Catfish program in this lake?”

7. “How often are you likely to keep Channel Catfish that you catch in this lake?”
 “2) Most of the time (>50%) 1) Always 4) Rarely (<10%) 3) Occasionally (10-50%) 5) Never”
8. (If rarely or never) “Why wouldn’t you keep Channel Catfish that you catch in this lake?”

9. “Are you aware that trout have been stocked in this lake?” Yes No
10. “Have you ever caught a trout in this lake?” Yes No
11. “What’s your opinion of the trout stocking program in this lake?”
 “2) In Favor 1) Highly in favor 4) Opposed 5) Highly opposed 3) No Opinion”
12. “Why are you <previous opinion> to the trout stocking program in this lake?”

13. “How often are you likely to keep trout that you catch in this lake?”
 “2) Most of the time (>50%) 1) Always 4) Rarely (<10%) 3) Occasionally (10-50%) 5) Never”
14. (If rarely or never) “Why wouldn’t you keep trout you catch in this lake?”

15. “Are there other types of fish you would be interested in catching at this lake?” _____

16. “What other services could D.E.E.P. provide to anglers to improve fishing experiences?”

I.e. improved shoreline access, more stocking, more outreach, more locations

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

ADDITIONAL COMMENTS:

Waterbody: _____
 (Either Crescent Lake or Lakewood Lake)

ID No. _____

Creel Survey Interview Form

Date: _____ **Agent:** _____ **Sample Time:** _____ **# of Anglers:** ___ (if >1, separate with A,B, etc...)
Time Fishing Started: _____ **Time Now:** _____ **Fishing from:** Boat Shore
Technique used: Casting Fly Rod Bait Trolling Downrigger
Bait used: Lure Flies Worms Minnows Other bait _____

“What are you fishing for?”: _____ **“Are you part of a fishing event/derby today?”** Yes No

“Have you caught any fish today?” Yes No
If yes “Do you mind if I measure your fish” Yes No
“Did you release ANY fish?” Yes No

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

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

“What brings you to fish this lake today?”

Species Code	Lengths (truncate to lower cm) <i>separate w/ commas. If too many to measure, put extra count in (parentheses)</i>	# Released	Size Range (in)

“How long did you travel today to get to this lake?”: _____ mins **“How did you get to this lake today?”** _____
“Have you been interviewed on this lake this year?” Yes No **# of times:** _____

----- **ONLY CONTINUE IF FIRST TIME INTERVIEWED** -----

- Town/State From _____
- “How many times in an average year do you fish in this lake?” _____
- “Are you aware that Channel Catfish have been stocked in this lake?” Yes No
- “Have you ever caught a Channel Catfish in this lake?” Yes No
- “What’s your opinion of the Channel Catfish program in this lake?”
 “2) In Favor 1) Highly in favor 4) Opposed 5) Highly opposed 3) No Opinion”
- “Why are you <previous opinion> to the Channel Catfish program in this lake?”
- “How often are you likely to keep Channel Catfish that you catch in this lake?”
 “2) Most of the time (>50%) 1) Always 4) Rarely (<10%) 3) Occasionally (10-50%) 5) Never”
- (If rarely or never) “Why wouldn’t you keep Channel Catfish that you catch in this lake?”
- “Are there other types of fish you would be interested in catching at this lake?” _____
- “What other services could D.E.E.P. provide to anglers to improve fishing experiences?”
 I.e. improved shoreline access, more stocking, more outreach, more locations

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

ADDITIONAL COMMENTS:

Waterbody: _____
 (Either Upper Fulton Park Pond or Wharton Brook Park Pond)

ID No. _____

Creel Survey Interview Form

Date: _____ **Agent:** _____ **Sample Time:** _____ **# of Anglers:** ___(if >1, separate with A,B, etc...)
Time Fishing Started: _____ **Time Now:** _____ **Fishing from:** Boat Shore
Technique used: Casting Fly Rod Bait Trolling Downrigger
Bait used: Lure Flies Worms Minnows Other bait _____

“What are you fishing for?”: _____ **“Are you part of a fishing event/derby today?”** Yes No

“Have you caught any fish today?” Yes No

If yes **“Do you mind if I measure your fish”** Yes No

“Did you release ANY fish?” Yes No

“How would you rate your fishing success today?”

1 Terrible 2 Poor 3 Average
 4 Good 5 Excellent 6 Can't tell yet

“How would you rate your overall experience today?”

1 Terrible 2 Poor 3 Average
 4 Good 5 Excellent 6 Can't tell yet

“What brings you to fish this lake today?”

Species Code	Lengths (truncate to lower cm) <i>separate w/ commas. If too many to measure, put extra count in (parentheses)</i>	# Released	Size Range (in)

“How long did you travel today to get to this lake?”: _____ mins **“How did you get to this lake today?”** _____

“Have you been interviewed on this lake this year?” Yes No **# of times:** _____

----- **ONLY CONTINUE IF FIRST TIME INTERVIEWED** -----

1. Town/State From _____
2. “How many times in an average year do you fish in this lake?” _____
3. “Are you aware that trout have been stocked in this lake?” Yes No
4. “Have you ever caught a trout in this lake?” Yes No
5. “What’s your opinion of the trout stocking program in this lake?”
 “2) In Favor 1) Highly in favor 4) Opposed 5) Highly opposed 3) No Opinion”
6. “Why are you <previous opinion> to the trout stocking program in this lake?”
7. “How often are you likely to keep trout that you catch in this lake?”
 “2) Most of the time (>50%) 1) Always 4) Rarely (<10%) 3) Occasionally (10-50%) 5) Never”
8. (If rarely or never) Why wouldn’t you keep trout you catch in this lake?”
9. “Are there other types of fish you would be interested in catching at this lake?” _____
10. “What other services could D.E.E.P. provide to anglers to improve fishing experiences?”
 I.e. improved shoreline access, more stocking, more outreach, more locations

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
4/1/2023 to 3/31/2024

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
Spencer Mallette, Co-Job Leader
Christopher McDowell, Primary Staff
Lillian Glynos, Primary Staff

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, which is a 31% increase in bass fishing over the past decade (U.S. Fish and Wildlife Service 2013). In addition, competitive tournament fishing for bass has also doubled in Connecticut from approximately 400 tournaments in 1990 to over 800 tournaments. 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 regular harvest occurs (Hessenauer et al. 2018). The bass regulations implemented in 2002 assumed that the harvest levels documented during the preceding 20 years would continue. However, a shift in angler behavior towards catch-and-release (current 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 and published a new Bass Action Plan in September 2022, with emphasis on the changes in angler behavior and desires, advances in the scientific literature, and extensive public feedback. Significant progress has been made to implement various elements of this plan since release.

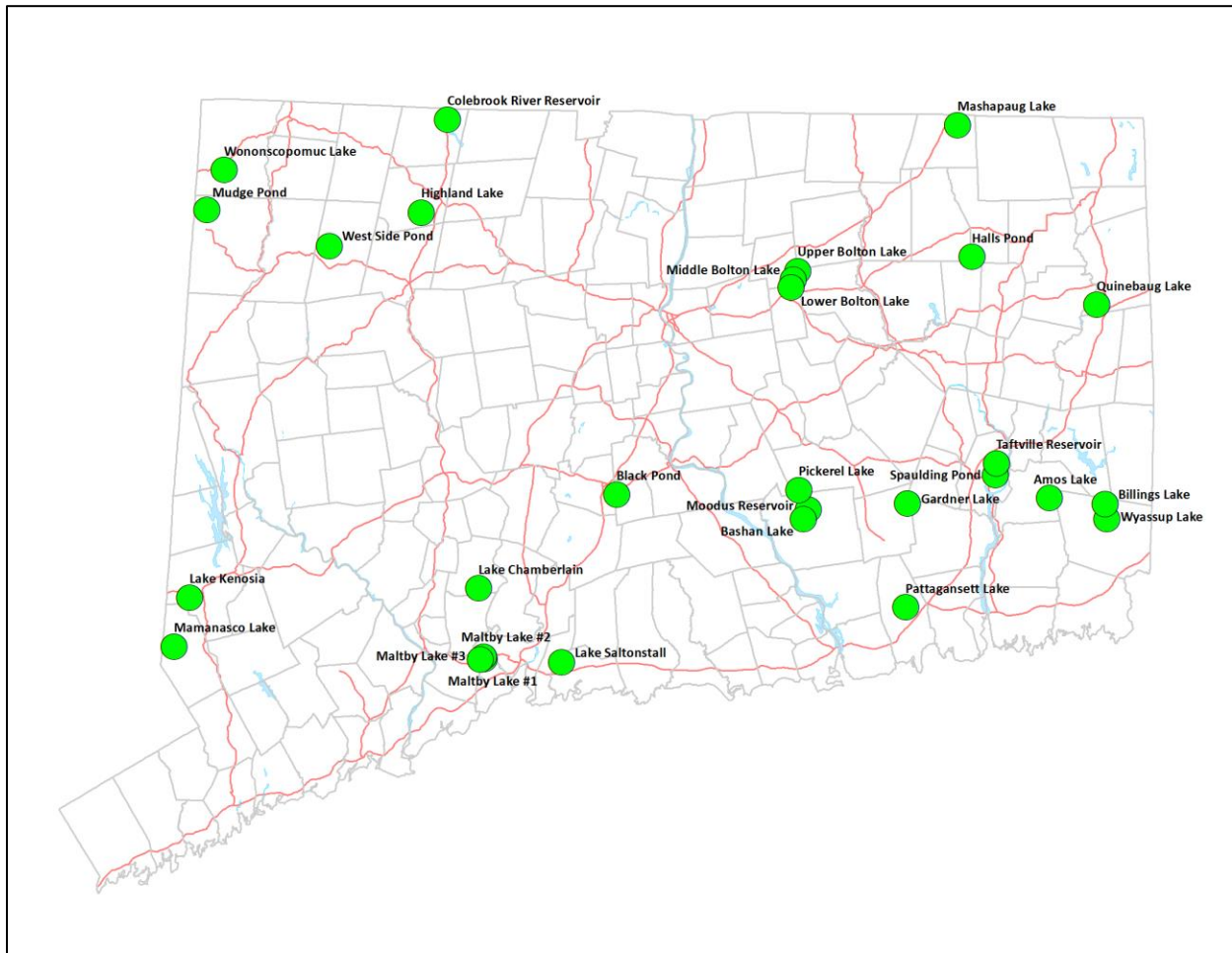


Figure 8. Connecticut's 29 Bass Management Lakes (green circles).

The objectives for the bass management job are:

1. Continue to monitor Bass Management Lakes (BML's) 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 Bass Management Lakes (BML's) and other important bass fisheries via electrofishing on a rotational basis.

The Fisheries Division sampled several BML's and other important bass fisheries such as Pachaug Pond, Candlewood Lake, and Beach Pond (Table 1).

Table 1: All BML's and other important bass fisheries sampled during the 2023-2024 performance period, along with waterbody management type and sample date(s).

Lake	Management Type	Sample Date(s)
Colebrook River Lake	BML and Potential Smallmouth Bass Source	11/7/2023
Lake Hayward	BML	5/11/2023
Middle Bolton Lake	BML	5/22/2023
Moodus Reservoir	BML	10/26/2023 (lower)
Pickerel Lake	BML	10/12/2023
Wyassup Lake	BML	5/9/2023
Quinebaug Pond (Wauregan Reservoir)	BML/Catfish Management Lake (CML)	5/2/2023; 10/4/2023
Mansfield Hollow Lake	BML/Northern Pike Management Lake (PML)	5/16/2023; 3/27/2024
Highland Lake	BML/Trout Management Lake (TML)	3/28/2024
Wononskopomuc Lake	BML/TML/Kokanee Management Lake	6/14/2023
Gardner Lake	BML/ Walleye Management Lake (WML)	10/30/2023
Mashapaug Lake	BML/WML	6/20/2023
Candlewood Lake	Important Bass Fishery	Section 4 on 11/8/2023
Pachaug Pond	PML/Important Bass Fishery	5/17/2023
Beach Pond	WML/Kokanee Management Lake/Important Bass Fishery	4/12/2023; 4/13/2023; 4/17/2023; 4/19/2023; 4/21/2023; 4/26/2023
Wangum Lake	Potential Smallmouth Bass Source	10/17/2023; 3/25/2024
Barkhamsted Reservoir	Potential Smallmouth Bass Source	10/2/2023
Nepaug Reservoir	Potential Smallmouth Bass Source	10/3/2023
Trap Falls Reservoir	Potential Smallmouth Bass Source	10/16/2023
S.J. Bargh Reservoir	Potential Smallmouth Bass Source	10/23/2023
Laurel Reservoir	Potential Smallmouth Bass Source	10/24/2023
Easton Reservoir	Potential Smallmouth Bass Source	11/6/2023

Objective 2: Monitor tournaments for bass catch rates and size structure in selected lakes.

- In-person tournament monitoring began August 19, 2023, at the Connecticut River. The purpose of this monitoring was directed toward informing tournaments anglers at two State boat launches along the Connecticut River (Salmon River and Haddam Meadows) about proper cleaning procedures and the introduction of the invasive aquatic plant, Hydrilla. A total of 10 tournaments were visited during end of tournament weigh-ins.

Weighed-in fish were collected and measured at each tournament, with a total of 282 fish processed.

- 162 Largemouth Bass were collected and measured, with an average length of 377mm. The largest Largemouth Bass recorded was 529 mm, with the smallest being 300mm. Two sublegal (<12”) Largemouth Bass were weighed in.
- 120 Smallmouth Bass were collected and measured, with an average length of 375mm. The largest Smallmouth Bass was 508mm and the smallest was 298mm. Three sublegal (<12”) Smallmouth Bass were weighed in.
- When a tournament group does not have a year-long weight component for prizes, tournament anglers who do not believe they will weigh-in a top bag will fail to report and release their fish prior to weigh-in. This results in an underreporting of the bass caught at tournaments and could alter further attempts for the Fisheries Division to estimate the impact of tournament fishing on bass populations.
- The EzFile tournament reporting system is 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 according to the permit regulations.
 - Even though reporting is required within two weeks after the event, less than 25% of post-tournament reports were submitted through the EzFile system. Another 16% of post-tournament reports were submitted via email or mail and have yet to be incorporated into the system. Estimates for total effort, catch, etc. were extrapolated from the subset of post-tournament reports submitted via EzFile.
- 805 bass tournaments took place across 43 waterbodies. These tournaments hosted an estimated 18,969 anglers with an average tournament size of 23.5 anglers. The total angling effort was estimated at 143,965 angling hours, with an average tournament length of approximately 7.6 hours. All of these values are higher than the 2022-2023 reporting period.
- 18 waterbodies hosted 84% of all tournaments (Table 2). These waterbodies were responsible for an estimated 128,875 angling hours, or 89.5% of total tournament angling pressure.
 - Candlewood Lake, Connecticut’s largest lake and one of its most important bass fisheries, hosted 181 tournaments (22.5% of the total tournaments) from groups representing six different states.
 - Glasgo Pond (84.1 acres), an artificial impoundment of the Pachaug River system, had the highest fishing pressure per acre, with over 23 tournament angling hours per acre. Amos Lake, a small (112.4 acre) natural lake in southeast Connecticut, also had an average of over 23 tournament angling hours. The tournament angling pressure for Amos Lake is down nearly 4 angling hours from the previous reporting period.
- Tournaments typically have a 5-fish bag limit, but the average reported bag size was 1.17 fish per angler, with an average of 2.16 pounds per fish. The average bag size is smaller than the previous reporting period. The average fish size stayed the same year-over-year.

- Based on the estimated average bag size, approximately 23,624 bass were weighed-in at fishing tournaments, weighing an estimated 51,173 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 (referred to as “culling”).
- Candlewood Lake showed a drop in average bag size and average fish weight compared to the 2022-2023 reporting season.
- Edwards et al. (2004) estimated a 2.8% tournament mortality rate for bass caught in Mansfield Hollow Reservoir and Gardner Lake, two highly utilized tournament lakes in Connecticut. This rate is below what has been previously reported across other studies nationally (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 1.17 fish, the estimated total immediate tournament mortality has a likely range of 661 to 2,362 bass.

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

- From March 1st until October 31st, 2023, the Fisheries Division ran a roving open-water creel survey on three important bass angling waterbodies in Eastern Connecticut (Pachaug Pond, Quinebaug Lake, and Wyassup Lake). For further information on the methodology and results of this study, refer to Objective 1 of the Lake and Large River Angler Surveys job. Quinebaug Lake and Wyassup Lake are Bass Management Lakes, as well as locations where Smallmouth Bass have reportedly been extirpated.

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

- Anglers at the three surveyed lakes were targeting bass (either “Black Bass” or “Largemouth Bass”) from 35-72% of the time, varying by waterbody.
 - Pachaug Pond, a waterbody frequented by over 40 bass tournaments a year, had over 67% of anglers fishing specifically for bass.
 - The most notable comment received about bass during the survey is that tournament anglers feel the introduction of Northern Pike into Pachaug Pond has caused a decline in bass populations and overall size of bass. Tournament anglers are also generally not in favor of the Northern Pike management program in this lake as they lose tackle and fish to these larger predators.
 - Quinebaug Pond and Wyassup Lake are both Bass Management Lakes, however, they receive different amounts of bass directed angling pressure (35% and 72% of angling hours, respectively). A plurality (44%) of Quinebaug Pond anglers fished for “anything that bites.” However, anglers at both lakes were overwhelmingly in favor of restoring a Smallmouth Bass fishery (87% and 97%, respectively).

Table 4: Estimated number of bass weighed-in at the 18 most popular bass tournament waterbodies in Connecticut from April 1, 2023 – March 31, 2024. Numbers in parentheses represent EZFile system post-event reports submitted for completed tournaments. Total catch 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 * denote Bass Management Lakes.

Lake	# of Tournaments	Anglers / Tourney	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	805 (196)	23.5	143,965	-	-	1.17	23,624	2.16	51,173	661	945 - 2,362
Amos Lake*	17 (1)	20.2	2,624	112.4	23.3	3.40	1,115	2.23	2,492	31	45 - 112
Aspinook Pond	24 (5)	19.3	3,229	308.8	10.5	0.9	422	1.78	751	12	17 - 42
Bantam Lake	30 (7)	17.3	4,195	955.4	4.4	0.9	500	2.20	1,102	14	20 - 50
Candlewood Lake	181 (42)	29.9	44,471	5,085.6	8.7	1.32	7,142	2.76	19,718	200	286 - 714
Connecticut River	67 (11)	32.6	15,786	N/A	N/A	1.05	2,238	1.96	4,390	63	90 - 224
Coventry Lake* (Wangumbaug Lake)	12 (5)	21.4	1,329	374.4	3.5	1.08	311	2.15	669	9	12 - 31
East Twin Lake	14 (2)	15.9	1,783	565.3	3.2	1.27	284	2.36	669	8	11 - 28
Gardner Lake*	32 (10)	23.7	5,029	527.3	9.5	1.15	964	1.65	1,594	27	39 - 96
Glasgo Pond	18 (6)	14.7	1,937	81.3	23.8	1.07	275	1.76	484	8	11 - 28
Highland Lake*	29 (9)	20.1	4,461	448.2	10.0	1.45	799	2.29	1,828	22	32 - 80
Lake Lillinah	58 (12)	20.5	9,587	1,594.8	6.0	1.6	1,974	2.40	4,421	55	79 - 197
Mansfield Hollow Reservoir*	52 (17)	27.5	9,806	429.5	22.8	0.92	1,405	1.84	2,584	39	56 - 141
Pachaug Pond	48 (13)	27.5	9,595	817.0	11.7	1.18	1,573	2.08	3,279	44	63 - 157
Pattagansett Lake*	12 (2)	14.7	1,492	125.7	11.9	1.3	323	1.85	597	9	13 - 32
Quaddick Reservoir	13 (4)	13.2	1,332	202.8	6.6	1.29	229	1.67	382	6	9 - 23
Rogers Lake	18 (5)	17.7	2,321	275.4	8.4	1.7	508	2.56	1,302	14	20 - 51
Lake Wononskopomuc* (Lakeville Lake)	10 (1)	17.7	1,264	348.1	3.6	1.68	265	2.43	644	7	11 - 27
Lake Zoar	43 (11)	24.5	8,634	919.8	9.4	0.9	1,049	1.80	1,889	29	42 - 105

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.
- During the open-water creel survey during this reporting period, angler harvest was recorded. However, no bass were reported to be harvested for food. The only bass measured during this period were being held by tournament anglers that were willing to allow creel agents to measure their catch. This supports the notion that most bass fishing mortality in Connecticut is likely from catch-and-release mortality.

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, assessing the feasibility of closed areas and/or bait restrictions during the spawning season, 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.
 - Regulations were developed that include extending the Bull's Bridge Bass Management Area in the Housatonic River upstream to the Massachusetts border.

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 were in part to assess angler interest in the reintroduction of Smallmouth Bass. An overwhelming majority (87% and 97%; respectively) at each waterbody were either "In Favor" or "Highly in Favor." These numbers coincide with the 2020 Bass Management Survey published in the Bass Action Plan, that over 89% of people would be in support of a supplemental stocking program. Only one Quinebaug Lake angler reportedly "Opposed" as they believe Largemouth Bass "grow bigger without them".
- Wild fish pathology testing with the USFWS Lamar Fish Health Center was scheduled during both the spring and fall night-time boat electrofishing surveys. Collection of up to 10-30 of one sunfish species (i.e. Bluegill or Pumpkinseed) and both Largemouth and Smallmouth Bass were used to test for a suite of common viral and bacterial diseases.

Spring sampling focused primarily on waterbodies wherein Smallmouth Bass were in decline or extirpated, while fall sampling was focused more on possible source locations for Smallmouth Bass direct transplanting and/or broodstock collection.

- All spring samples came back negative for all certified fish pathogens (Appendix A).
- The fall samples had multiple positive results for different fish pathogens (Appendix B). Largemouth Bass from Nepaug Reservoir tested positive for *Edwardseilla tarda* bacteria, while Largemouth Bass from Trap Falls Reservoir, Gardner Lake, and Easton Reservoir, as well as Smallmouth Bass from Colebrook River Lake, tested positive for Largemouth Bass Virus (LMBV). Gardner Lake has previously tested positive for LMBV. All other fall samples tested negative for certified fish pathogens.
- Further, the Fisheries Division continues to evaluate options to raise reservoir-origin Smallmouth Bass in our hatcheries. Two cost-effective plans to raise ~30,000 bass to fryling size without impacting trout production were developed and may represent a path forward to sustainably stocking reservoir-origin Smallmouth Bass to restore and maintain more Smallmouth Bass fisheries in eastern Connecticut.
- Nine Largemouth Bass were transplanted from Batterson Park Pond to Stanley Quarter Park Pond as part of an effort to recreate the fishery after it was dewatered for dredging.

Moving Forward

- Continue with in-person tournament monitoring at important bass tournament lakes to fill data gaps related to tournament mortality and efficiently estimate population sizes and size structures.
- Develop strategy to improve tournament reporting rates by engaging with tournament directors through email and in-person tournament visits.
- Continue coordination with the Habitat Conservation and Enhancement program to include lake and pond assessment and enhancement as a broader bass management strategy.
 - Use side-scan sonar technology to map and evaluate substrate and habitat types in important bass fisheries.
 - 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.
 - Pursue adding additional habitat structures documented to improve recruitment of Smallmouth Bass (e.g., half-logs and nest boxes).
- 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 in coordination with the USFW Lamar Fish Health Lab.
- Move forward with transplanting Smallmouth Bass from Wangum Lake into Wyassup Lake and enhancing habitat in Wyassup Lake.

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Appendix A



United States Department of the Interior



FISH AND WILDLIFE SERVICE

Lamar Fish Health Center

400 Washington Ave

Lamar, PA 16848

August 21, 2023

Andrew Bade, PhD

Supervising Fisheries Biologist
Vice President, Northeastern Division of the American Fisheries Society
Bureau of Natural Resources Fisheries Division
Connecticut Department of Energy & Environmental Protection
79 Elm Street, Hartford, CT 06106-5127

Dear Andrew;

Wild Fish Health Survey samples from the state of Connecticut:

<u>Case No.</u>	<u>Date Sampled</u>	<u>Site</u>	<u>Species/No. Fish</u>	<u>Viral</u>	<u>Bacti</u>	<u>Results</u>
23-144	5-2-23	Black Pond (Woodstock)	LMB/30	Neg	Neg	
			BLG/30	Neg	Neg.	
23-146	5-3-23	Quinebaug Lake	LMB/12	Neg.	Neg.	
			BLG/30	Neg.	Neg.	
23-150	5-8-23	Chamberlain Lake	LMB/32	Neg.	Neg.	
			BLG/30	Neg.	Neg.	
23-151	5-9-23	Wyassup Lake	LMB/30	Neg.	Neg.	
			BLG/30	Neg.	Neg.	

23-156	5-16-23	Shenipit Lake	LMB/19 + SMB/11 BLG/30	Neg. Neg.	Neg. Neg.
23-158	5-17-23	Mansfield Hollow Reservoir	LMB/30 BLG/30	Neg. Neg.	Neg. Neg.
23-165	5-23-23	Middle Bolton Lake	LMB/30 BLG/30	Neg. Neg.	Neg. Neg.
23-173	5-30-23	Lake Pocotopaug	SMB/30 BLG/17	Neg. Neg.	Neg. Neg.
23-181	6-5-23	Lake Bethany	LMB/23 BLG/30	Neg. Neg.	Neg. Neg.
23-194	6-20-23	Mashapaug Lake	LMB/6 + SMB/9 BLG/30	Neg. Neg.	Neg. Neg.

The Samples were all tested, according to the protocols of the USFWS, Wild Fish Health Survey Protocols (Bacteriology, kidney tissues inoculated on BHIA slants with bio-chems run on bacterial growth and PCR confirmation. Virology, cell culture of kidney/spleen/swim bladder samples homogenized, diluted and incubated for two weeks on CHSE, EPC, FHM, and BF-2 cell lines with PCR confirmation on any noted CPE). As indicated, all samples were negative of certified fish pathogens.

Please Contact us if you have questions or should you need further assistance.

The samples not received from the following: Woodridge Lake, Moodus Reservoir, Beach Pond, Wangum Lake, and Gardner Lake.

Sincerely;

William Quartz
william_quartz@fws.gov
Lamar Fish Health Center
400 Washington Ave
Lamar Pa., 16848
570-726-6611 ext.224

Appendix B



United States Department of the Interior



FISH AND WILDLIFE SERVICE

Lamar Fish Health Center

400 Washington Ave

Lamar, PA 16848

January 12, 2024

Andrew Bade, PhD

Supervising Fisheries Biologist
Vice President, Northeastern Division of the American Fisheries Society
Bureau of Natural Resources Fisheries Division
Connecticut Department of Energy & Environmental Protection
79 Elm Street, Hartford, CT 06106-5127

Dear Andrew;

Wild Fish Health Survey samples from the state of Connecticut:

<u>Case No.</u>	<u>Date Sampled</u>	<u>Site</u>	<u>Species/No. Fish</u>	<u>Viral</u>	<u>Bacti</u>	<u>Results</u>
24-03	10-2-23	Barkhamsted Reservoir	SMB/30 + LMB/30 BLG/30	Neg. Neg.	Neg. Neg.	
24-06	10-3-23	Nepaug Reservoir	LMB/30 SMB/30 + BLG/30	Neg. Neg.	E. tarda Neg.	
24-15	10-10-23	Wassel Reservoir	LMB/30 BLG/30	Neg. Neg.	Neg. Neg.	
24-20	10-17-23	Trip Falls Reservoir	LMB/30 SMB/3 + BLG/30	Positive LMBv Neg.	Neg. Neg.	

24-22	10-17-23	Wangum Lake	SMB/20 PSS/29	Neg. Neg.	Neg. Neg.
24-28	10-24-23	Mianus Reservoir	LMB/30 BLG/30	Neg. Neg.	Neg. Neg.
24-32	10-24-23	Laurel Reservoir	LMB/30 BLG/30	Neg. Neg.	Neg. Neg.
24-37	10-31-23	Gardner Lake	LMB/11 BLG/30	Positive LMBv Neg.	Neg. Neg.
24-43	11-6-23	Easton Reservoir	LMB/30 BLG/30	Positive LMBv Neg.	Neg. Neg.
24-48	11-8-23	Colebrook River Reservoir	LMB/4 + BLG/30 SMB/30	Positive LMBv Neg.	Neg. Neg.

The Samples were all tested, according to the protocols of the USFWS, Wild Fish Health Survey Protocols (Bacteriology, kidney tissues inoculated on BHIA slants with bio-chems run on bacterial growth and PCR confirmation. Virology, cell culture of kidney/spleen/swim bladder samples homogenized, diluted and incubated for two weeks on CHSE, EPC, FHM, and BF-2 cell lines with PCR confirmation on any noted CPE). The Nepaug Reservoir largemouth bass had *Edwardseilla tarda* bacteria, the Trip Falls, Gardner and Easton largemouth bass and the Colebrook River Reservoir smallmouth bass tested for Largemouth Bass virus. As indicated, all other samples were negative of certified fish pathogens.

Please Contact us if you have questions or should you need further assistance.

Sincerely;

William Quartz
william_quartz@fws.gov
Lamar Fish Health Center
400 Washington Ave
Lamar Pa., 16848
570-726-6611 ext.224



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
4/1/2023 to 3/31/2024

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, Co-Job Leader
Spencer Mallette, Co-Job Leader
Andrew Bade, Program Coordinator

Overview: Northern Pike (Figure 1), Connecticut’s largest predatory freshwater sportfish, were 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 2). 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 or tiger muskie purchased by the Lake Lillinonah Authority (LLA) from commercial



Figure 1. A female Northern Pike captured to be used for breeding in a CT DEEP Fisheries Division Northern Pike spawning marsh.

vendors through permits issued by the Fisheries Division. The Fisheries Division, when possible, 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.

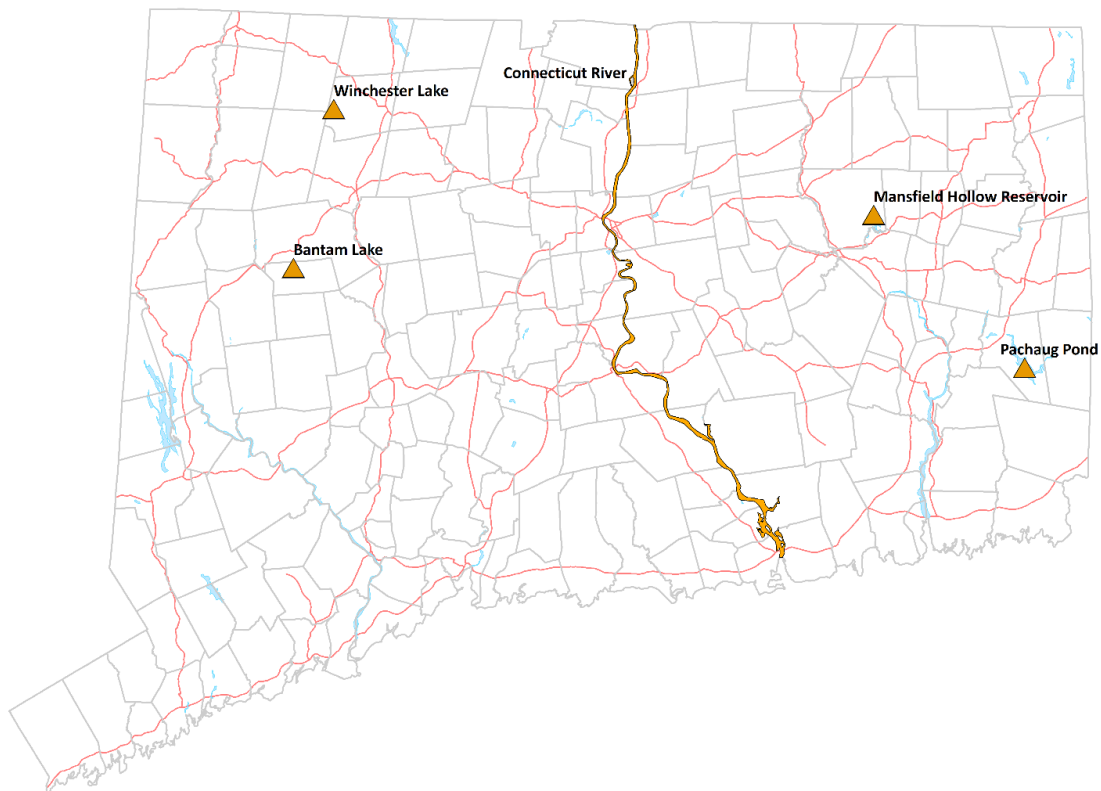


Figure 2. Connecticut's four Northern Pike Management Lakes (orange triangles). Also highlighted in orange is the Connecticut River, which has a self-sustaining Northern Pike population that has been supplemented by CT DEEP Fisheries Division Northern Pike fingerlings raised in the Haddam marsh through 2020. (Stocking of the Connecticut River has been paused due to the Haddam marsh system being shut down for renovations since December of 2020.) All locations, sans the Connecticut River, were stocked with fingerling Northern Pike in 2023.

Key Findings

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

- The Fisheries Division stocked a total of 22,501 Northern Pike fingerlings in 2023 (Table 1). The FD exceeded its annual stocking goal of 12,864 fingerlings by 74.9%.
 - The Mansfield Marsh produced 4,301 Northern Pike fingerlings (Figure 3) that averaged 4.5 inches (range 3.1-5.9 inches).
 - Northern Pike fingerling production from the Mansfield Hollow Marsh was slightly below (11.7%) the 1999-2022 average. The marsh was stocked with 25 (17 males and eight females) pre-spawn Northern Pike from Pachaug Pond.
 - The fingerlings from Mansfield Marsh were stocked into three waterbodies (Table 1): Bantam Lake, Mansfield Hollow Reservoir, and Pachaug Pond.
- On June 26, 2023, the Fisheries Division received 18,200 Northern Pike “frylings” (average length 2.2 inches, range 1.2-3.8 inches) after accounting for transportation related mortality from West Central Bait & Fisheries Co. Inc., MN. (Figure 4). The fish were split evenly and stocked into Bantam Lake and Winchester Lake (Table 1).
- The Upper and Lower marshes located at Haddam Meadows State Park have not been operated since 2020 due to water control infrastructure and access issues. These challenges are being addressed but will take several more years to be resolved.

Table 1. Number of Northern Pike fingerlings stocked into Connecticut’s Pike Management Lakes in 2023. Please note that the upper and lower Connecticut River are not being stocked at this time due to the Haddam spawning marshes being closed for renovation.

<u>Lake</u>	<u>Number Stocked</u>	<u>% of Target Number</u>
Bantam Lake^a	9,100	380.5%
Mansfield Hollow Reservoir^b	1,731	75.3%
Pachaug Pond^b	2,337	55.6%
Winchester Lake^c	9,333	758.8%

^aStocked with Minnesota “frylings” in 2023.

^bMansfield Hollow Reservoir and Pachaug Pond were stocked with fish produced from the Mansfield Hollow spawning marsh. These fingerlings were derived from fry from the Hackettstown, New Jersey fish hatchery and pre-spawn Northern Pike broodstock from Pachaug Pond. The lineage of the Pachaug Pond broodstock could be a mixture of New Jersey, Bantam Lake and/or Connecticut River fish.

^cWinchester Lake was stocked with both Minnesota “frylings” and with fish produced from the Mansfield Hollow spawning marsh. These fingerlings were derived from both fry from the Hackettstown, New Jersey fish hatchery and pre-spawn Northern Pike broodstock from Pachaug Pond. The lineage of the Pachaug Pond broodstock could be a mixture of New Jersey, Bantam Lake and/or Connecticut River fish.



Figure 3. Picture of a Connecticut raised Northern Pike fingerling from one of the FD managed spawning marshes.



Figure 4. Connecticut Fisheries Division staff receiving the Minnesota Northern Pike frylings at Bantam Lake on 6/26/2023. One of the Minnesota frylings can be seen in the upper left-hand corner.

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.

- A single gear (trap nets) mark-recapture population estimate of the number of catchable size Northern Pike was carried out in Pachaug Pond during the spring of 2023. Captured Northern Pike were marked with a fin clip. The population at Pachaug Pond was last estimated in 2007.
 - Five trap nets were deployed from February 21, 2023, to April 3, 2023. Nets were set in historically sampled locations where pre-spawn Northern Pike were assumed to be traveling to access spawning habitat. A total of 210 trap net days of sampling was performed. Trap net days were calculated by adding together the number of days each net was “working” (open, in the water, and actively fishing).
- Table 2 shows the results of the 2023 Northern Pike population assessment as well as past estimates carried out in 2002 and 2007. For 2004, a relative abundance estimate was carried out but no marks were given to fish, which made determining population size for each catchable size class impossible.
 - The estimated population size in 2023 is substantially lower than in 2007 in all size categories and only slightly above for certain sizes classes when compared to

2002. Very few recaptures were present in 2023, which led to wide confidence intervals and therefore these data should be interpreted with caution.

- Three potential hypotheses as to why the 2023 population estimate was low could be:
 - Environmentally driven; the winter of 2022-23 was overly warm, which might have resulted in broodstock pike making their journey to spawning areas prior to our nets being deployed.
 - Fingerling stocking targets have rarely been met since the 2007 sample. Though some level of natural reproduction likely occurs in Pachaug Pond, it is unlikely sufficient to sustain a directed fishery. As such, inconsistent stocking practices result in missing or smaller than desired year classes.
 - An almost year-long drawdown was carried out starting in 2022 and ending in 2023 in which the water level was brought down by four feet then remained between three to four feet below normal summer pool for the repair of the dam. This likely resulted in some number of pike leaving the lake and heading to the next waterbody downstream (i.e., Hopeville Pond). This extended drawdown also likely reduced the availability of suitable habitat during the summer months which could have impacted survival and recruitment. Emigration of adult Northern Pike from Pachaug Pond has been documented in the past when a CT DEEP Parks employee drew the lake down lower (i.e., six feet as opposed to three feet) than was planned.

Table 2. Pachaug Pond (Griswold) Northern Pike mark-recapture population estimate summary table for the four years where netting work was carried out. Captured Northern Pike were given fin clips during the first catch event and recorded as recaptures in any future catch events. See the footnotes section of the table for specific details regarding sampling gear and special notes relative to each sample.

	Year			
	<u>2002^a</u>	<u>2004^b</u>	<u>2007^c</u>	<u>2023^d</u>
*PACHAUG POND FIRST STOCKED WITH NORTHERN PIKE IN 1999				
All Size				
Number of Northern Pike captured in size class	60	21	217	80
Number of recaptured Northern Pike in size class	6	-	20	3
Number of mortalities	1 ^e	0	0	26 ^f
Estimated population size (N)	191	-	846	400
95% CI	87-519	-	549-1,338	136-2,000
Number per acre (Range)	0.2 (0.1-0.6)	-	1.0 (0.65-1.6)	0.5 (0.16-2.4)
Stock Size \geq14 Inches				
Number of Northern Pike captured in size class	60	21	214	78
Number of recaptured Northern Pike in size class	6	-	20	3

Number of mortalities	1 ^e	0	0	26 ^f
Estimated population size (N)	191	-	824	368
95% CI	87-519	-	535-1,351	125-1,840
Number per acre (Range)	0.2 (0.10-0.6)	-	1.0 (0.64-1.6)	0.4 (0.15-2.1)
Quality Size ≥24 Inches				
Number of Northern Pike captured in size class	26	17	143	72
Number of recaptured Northern Pike in size class	2	-	12	3
Number of mortalities	1 ^e	0	0	25 ^f
Estimated population size (N)	108	-	617	302
95% CI	30-1,075	-	353-1,195	103-1,508
Number per acre (Range)	0.1 (0.04-1.3)	-	0.4 (0.42-1.4)	0.4 (0.12-1.8)
Preferred Size ≥28 Inches				
Number of Northern Pike captured in size class	7	8	74	45
Number of recaptured Northern Pike in size class	1	-	7	1
Number of mortalities	1 ^e	0	0	17 ^f
Estimated population size (N)	14	-	279	322
95% CI	2-140	-	136-698	57-3,220
Number per acre (Range)	0.02 (0.003-0.2)	-	0.3 (0.16-0.8)	0.4 (0.07-3.8)
Memorable Size ≥34 Inches				
Number of Northern Pike captured in size class	0 ^g	0	16	3
Number of recaptured Northern Pike in size class	0	-	1	0
Number of mortalities	0	0	0	1 ^f
Estimated population size (N)	0	0	82	NC ^h
95% CI	0	0	15-820	-
Number per acre (Range)	0	0	0.1 (0.02-1.0)	-

^aSampling in 2002 was carried out using two trap nets and was done from March 1, 2002, to March 25, 2002, totaling 58 trap net days. (Trap net days are calculated by adding together the number of days each net was "working", meaning open in the water and actively catching fish).

^bSampling in 2004 was carried out using three trap nets and was done from March 18, 2004, to April 6, 2004, totaling 66 trap net days. No clips were given to captured fish so a population estimate could not be calculated.

^cSampling in 2007 was carried out using five trap nets and was done from March 19, 2007, to April 5, 2007, totaling 110 trap net days. Additionally, one night of boat electrofishing was carried out in various locations around the lake for a total of 1.01 hours. Also, 10 gill nets were set in two locations in Pachaug Pond totaling 45 gill netting hours.

^dSampling in 2023 was carried out using five trap nets and was done from February 21, 2023, to April 3, 2023. A total of 210 trap net days of sampling was performed.

^eOne fish was removed from the lake to be used in a fish tank at the Hunting and Fishing Expo. It was returned after the expo was completed but was considered a mortality in the population estimate because it was removed from the catchable population during a portion of the sampling period.

^fA total of 24 Northern Pike of various sizes were retained for broodstock and were released into the Mansfield Hollow spawning marsh. These fish were counted as mortalities in the population estimate as they were removed from the population during the sampling period. Additionally, one Northern Pike was actually found dead in one of the trap nets. Making the total "mortalities" 25.

^gNo fish captured in this size class in 2002.

^hNC - Not calculated because no recaptures.

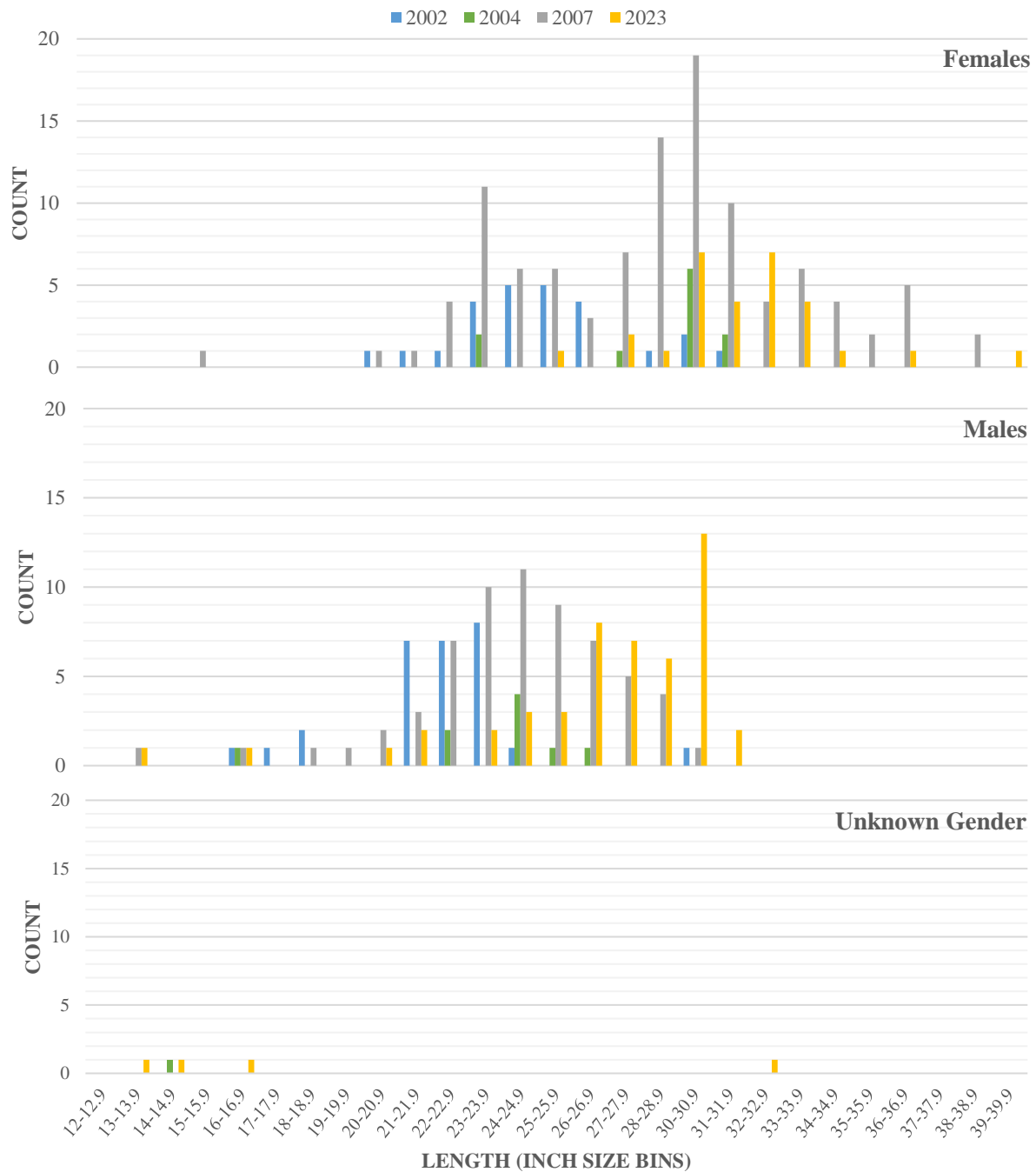


Figure 5. Length-frequency graphs for Northern Pike captured during four separate sampling periods from 2002 through 2023 at Pachaug Pond. Capture methods involved trap netting in 2002, 2004 and 2023. In 2007, trap netting, nighttime boat electrofishing, and gillnetting were the methods of capture. Graphs are broken out by gender.

- A boat-based roving angler survey ran from March 1, 2023, until October 31, 2023, at Pachaug Pond. This angler survey was conducted to assess angler effort, catch, harvest, and opinions regarding Northern Pike in the lake. Results can be found in Mallette et al. (2024).

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

- No action taken towards this objective in 2023-2024.

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 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.
 - Managed marsh cost-per-recruit was not estimated in 2023, but is historically extremely variable because it is driven by highly variable production.
- In our efforts to maintain a diverse portfolio of fingerling sources three methods were utilized during 2023 to try to reach our PML stocking goals:
 - On June 26, 2023, the Fisheries Division received 18,200 Northern Pike fingerlings (average length 2.2 inches, range 1.2-3.8 inches) from West Central Bait & Fisheries Co. Inc., MN. (Figure 4). The fish were split evenly and stocked into Bantam Lake and Pachaug Pond.
 - On March 17, 2023, hatchery reared Northern Pike fry were stocked into the Mansfield Hollow Northern Pike spawning marsh.
 - Between February 23-27, 2023, pre-spawn broodstock from Pachaug Pond were stocked into the Mansfield Hollow Northern Pike spawning marsh.
 - A population estimate was scheduled for Mansfield Hollow Lake in spring of 2024 at which time 24 broodstock Northern Pike were slated to be collected for release into the Mansfield Northern Pike spawning marsh. However, high water levels made it impossible for the FD to set trap nets.
 - In order to capture the required broodstock for the 2024 marsh season, trap nets were set in Pachaug Pond. The results of this trap netting will be reported in the next segment report.

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 2023-24.

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.
 - In 2022 CT DEEP’s legal team began working with an adjacent landowner to gain a right of way access through the historical location FD and the angling public have used for decades. This legal work is ongoing.
- Purchase Northern Pike “frylings” from a private vendor to augment numbers of Northern Pike produced in the Connecticut marshes.
- Revamp and rename the Northern Pike management program plan to include Chain Pickerel and tiger muskie.

References

Mallette, S., A. Ransom, A. Bade, C. McDowell and L. Glynos. 2024. Lake and Large River Angler Surveys. Federal Aid in Sportfish Restoration F-57-R-42. Annual Performance Report – F22AF01153. State of Connecticut Department of Energy and Environmental Protection Bureau of Natural Resources, Fisheries Division, Hartford, CT. 19pp.



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
4/1/2023 to 3/31/2024

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
Andrew Bade, Program Coordinator

Overview: Walleye (Figure 1) are 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, 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 2). 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.

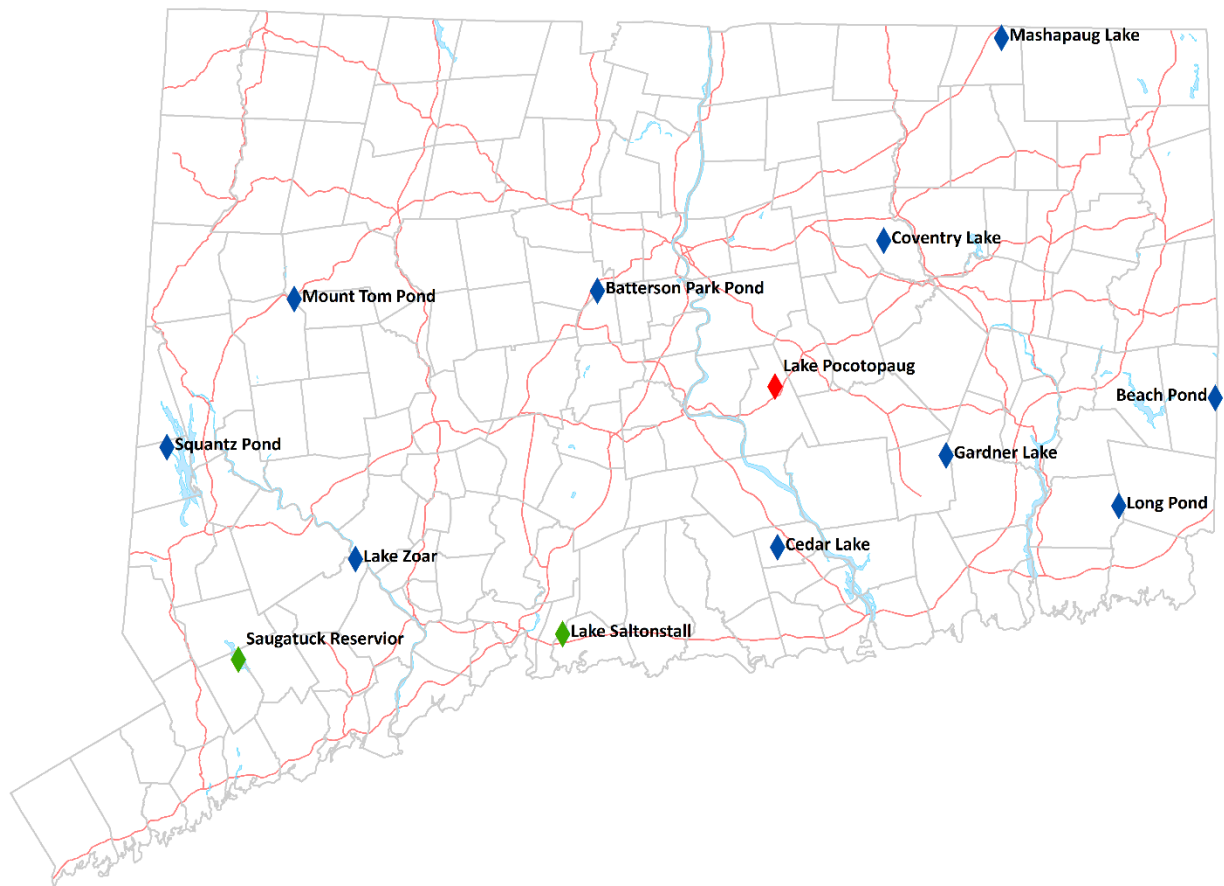


Figure 2. Connecticut waters stocked with Walleye fingerlings on October 30, 2023. (Cedar Lake however was not stocked in 2023 and is being removed from the Walleye stocking program due to poor recruitment as determined from population estimate work carried out during spring 2023.) Blue diamonds denote 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 quasi-private waterbody (Lake Pocotopaug). The Walleye purchased by the water companies and quasi-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 27,238 (23,779 “small” 4-6 inch and 3,459 “large” 6-8 inch) Walleye fingerlings from West Central Bait and Fisheries Company, Inc (Minnesota) were stocked into nine of the ten State-managed WMLs on October 30, 2023 (Table 1).
 - Transport and handling mortality was 2.4% for 2023, which is below the three-year average of 4.9 % for the State-purchased fish.

- Like previous years, the Fisheries Division purchased 14.5% of the fingerlings in the “large” category (Figure 3). 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), 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).
 - Cedar Lake was dropped from further stocking in fall of 2023 due to low performance as assessed through multiple targeted spring 2023 nighttime boat electrofishing surveys to calculate a population estimate of the Walleye population (see Objective 2 for results), and lack of angler reports of Walleye being caught over the years.

- 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 10,342 Walleye fingerlings (Table 1). These fish were delivered on the same truck and distributed by Fisheries Division staff.
 - The South Central Regional Water Authority opted to stock a mixed load of “small” and “large” Walleye fingerlings into Lake Saltonstall. They requested 2,690 fingerlings (700 “large” and 1,990 “small”), but due an issue with the vendor’s transport tank that resulted in approximately 659 mortalities, only 2,031 were stocked.
 - Aquarion requested 7,194 “small” Walleye fingerlings, but due an issue with the vendor’s transport tank that resulted in approximately 329 mortalities, only 6,865 were stocked.
 - The Town of East Hampton requested 1,500 “small” Walleye fingerlings this year. After accounting for transport and handling mortality, an approximate total of 1,446 fingerlings was stocked.

- An ice creel was conducted on Mount Tom Pond to assess fishery quality. Please see Study 2 Job 2 for more information.



Figure 3. 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. 2023 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.

<u>Waterbody</u>	<u>Town</u>	<u>Approximate Number Stocked</u>	<u>Size Class</u>
Batterson Park Pond	Farmington/New Britain	2,044	Small
Beach Pond	Voluntown/Exeter, RI	3,540	Small
Coventry Lake	Coventry	1,060	Small
Gardner Lake	Bozrah/Montville/Salem	2,259	Large
Lake Pocotopaug ^a	East Hampton	1,446	Small
Lake Saltonstall ^b	Branford/East Haven	2,031 (1,660 & 371)	Small & Large
Lake Zoar	Monroe/Oxford/Newtown/Southbury	10,207	Small
Long Pond	Ledyard/North Stonington	1,575	Small
Mashapaug Lake	Union	1,200	Large
Mount Tom Pond	Morris/Litchfield/Washington	822	Small
Saugatuck Reservoir ^b	Easton/Redding/Weston	6,865	Small
Squantz Pond	New Fairfield/Sherman	4,531	Small

^aLake 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.

^bLake 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.

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

- Scales were taken on Walleye captured during 2023 and will be aged when time allows.
- From March 20, 2023, to April 28, 2023, a multi-gear Walleye population estimate was performed in Beach Pond (Voluntown/Exeter, Rhode Island) using five trap nets and multiple nighttime boat electrofishing samples. This population was last assessed in 2007.
 - Beach Pond was first stocked in 2001 and has been stocked annually through 2023. From 2001 through 2011, Beach Pond was stocked with an average of

5,888 fingerlings, a rate of 15.8 Walleye fingerlings per acre. In 2012 through 2023, the number of fingerlings stocked dropped to an average of 3,597 Walleye fingerlings per year, a rate of 9.6 Walleye fingerlings per acre. This stocking change was done because it was determined a fishable population had been established and so stocking rates could be decreased to a maintenance level.

- Table 2 shows the results of the 2023 Walleye population assessment, as well as the past estimate carried out in 2007. The results show a small population of catchable size Walleye in various size classes.
 - The estimated population size in 2023, though lower for all size classes than the 2007 estimate, is likely more accurate because of more recaptures and more sampling effort. It was mentioned in the field notes from 2007 that trap nets were likely removed from the lake too soon so the population was likely not sampled effectively. In 2007, nets were set for 21 days from March 28, 2007, to April 18, 2007, and only one night of boat electrofishing was done on April 18, 2007; whereas in 2023 nets were set for 42 days from March 17, 2023, to April 28, 2023, and there were 12 nights of boat electrofishing performed between March 21, 2023, and April 26, 2023. Eleven of which were specifically to target Walleye, Chain Pickerel and bass, and one sample which was an “all fish species” sample.

Table 2. Beach Pond (Voluntown/Exeter, Rhode Island) Walleye mark-recapture population estimate summary table for the two years where population estimate work was carried out. Captured Walleye were given fin clips during the first catch event and recorded as recaptures in any future catch events. See the footnotes section of the table for specific details regarding sampling gear and special notes relative to each sample.

*BEACH POND WAS FIRST STOCKED WITH WALLEYE IN 2001	Year	
	2007^a	2023^b
All Size		
<i>Number of Walleye captured in size class</i>	79	119
<i># of recaptured Walleye in size class</i>	6	39
<i>Estimated population size (N)</i>	320	132
<i>95% CI</i>	146-872	96-186
<i>#/Acre (Range)</i>	0.9 (0.4-2.3)	0.4 (0.3-0.5)
Stock Size ≥9.8 Inches		
<i>Number of Walleye captured in size class</i>	79	116
<i># of recaptured Walleye in size class</i>	6	38
<i>Estimated population size (N)</i>	320	129
<i>95% CI</i>	146-872	94-183
<i>#/Acre (Range)</i>	0.9 (0.4-2.3)	0.3 (0.2-0.5)
Quality Size ≥14.9 Inches		
<i>Number of Walleye captured in size class</i>	78	103

# of recaptured Walleye in size class	6	35
Estimated population size (N)	309	110
95% CI	142-843	79-158
#/Acre (Range)	0.8 (0.4-2.3)	0.3 (0.2-0.4)
Preferred Size ≥ 17.7 Inches		
Number of Walleye captured in size class	55	72
# of recaptured Walleye in size class	4	25
Estimated population size (N)	241	70
95% CI	94-962	48-109
#/Acre (Range)	0.6 (0.2-2.6)	0.2 (0.1-0.3)
Memorable Size ≥ 19.7 Inches		
Number of Walleye captured in size class	24	60
# of recaptured Walleye in size class	2	24
Estimated population size (N)	98	50
95% CI	27-980	33-77
#/Acre (Range)	0.3 (0.1-2.6)	0.1 (0.1-0.2)
^a 2007 - Nets were set for 21 days from March 28, 2007, to April 18, 2007, and only one night of boat electrofishing was done on April 18, 2007.		
^b 2023 - nets were set for 42 days from March 17, 2023, to April 28, 2023, and there were 12 nights of boat electrofishing performed between March 21, 2023, and April 26, 2023.		

- Table 3 shows relative abundance results for four common size classes for targeted Walleye nighttime boat electrofishing on Beach Pond. For 2004 through 2017 only a single night of boat electrofishing was carried out in April of each year. In 2023, 12 nights of nighttime boat electrofishing were carried out to sample the Walleye population. Eleven of these samples targeted only Walleye, Chain Pickerel and bass. One sample was an “all fish species” sample. Results point to a steadily decreasing population of Walleye in Beach Pond, the reasons for which are currently unknown.

Table 3. Beach Pond relative abundance estimates for Walleye from nighttime boat electrofishing from 2001 through 2023 for all sizes captured and three other popular sizes that anglers would find desirable. (Note – years that are not present had no sampling event.)

Year	Date	All Size	$\geq 38\text{cm}$	$\geq 45\text{cm}$	$\geq 50\text{cm}$
2004	4/15/2004	14.4	11.7	3.6	0.0
2005	4/14/2005	62.3	56.8	40.3	7.3
2006	4/5/2006	37.9	31.9	24.0	6.0
2007	4/18/2007	41.1	41.1	26.4	10.8
2008	4/14/2008	85.2	74.4	44.4	18.0
2009	4/20/2009	66.1	59.0	29.5	9.4
2011	4/13/2011	15.5	15.5	7.2	2.4
2017	4/11/2017	15.5	8.3	2.4	1.2
2023	3/21, 3/23, 3/27, 3/30, 4/5, 4/6, 4/12, 4/13, 4/17, 4/19, 4/21/2023	2.8	1.6	0.9	0.8

- Figure 4 is a combined length-frequency graph showing number of Walleye captured per inch size-bin. This graph was built from data collected during targeted Walleye only nighttime boat electrofishing and trap netting surveys from 2004 through 2023.

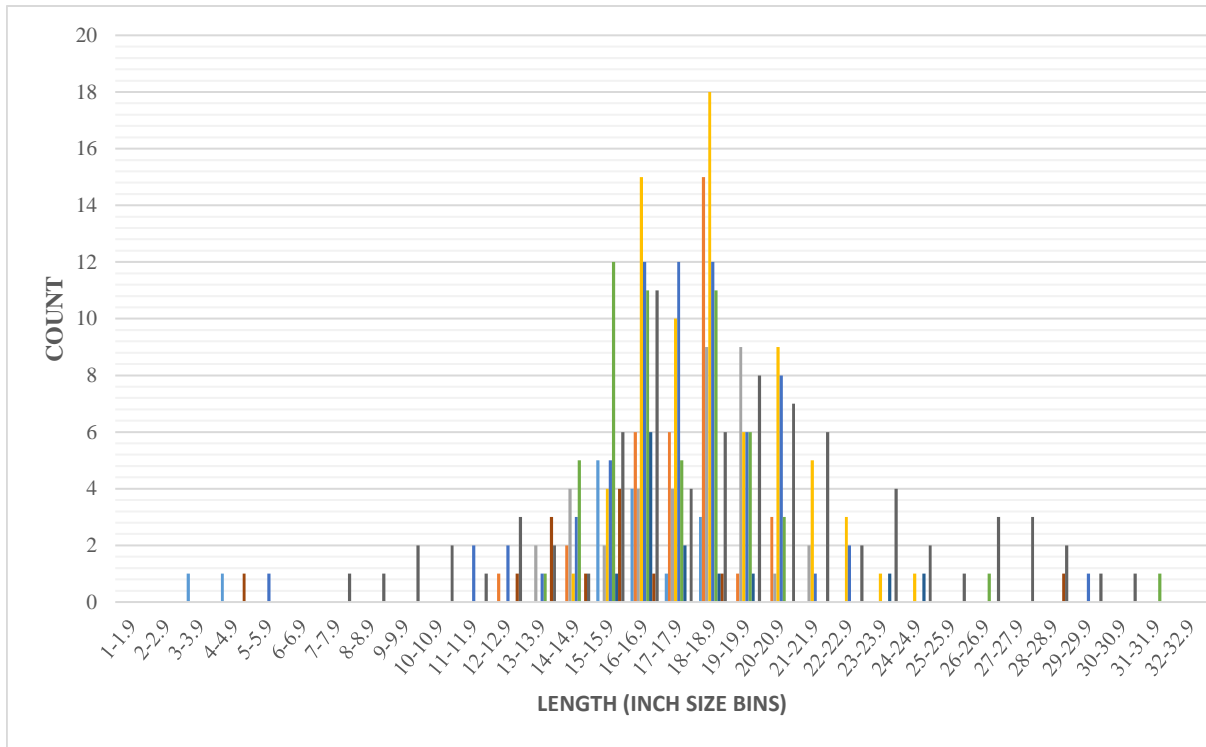


Figure 4. Beach Pond length-frequency graph showing number of Walleye captured per inch size-bin. The graph was built from data collected during targeted Walleye nighttime boat electrofishing and trap netting surveys from 2004 through 2023.

- Long Pond was first stocked in 2017 and has been annually stocked since with an average of 1,621 4-6 inch “small” Walleye fingerlings. This equates to an average of 14.9 Walleye fingerlings per acre. Newly stocked Walleye lakes receive approximately 15 Walleye fingerlings per acre until it is deemed that a fishable population with multiple size-classes has been established. Between March 22, 2023, and April 20, 2023, four nighttime boat electrofishing samples were carried out on Long Pond (Ledyard/North Stonington) that targeted Walleye, Chain Pickerel and bass. These samples were performed to assess the Walleye population size within the lake. Walleye were given a distinguishing fin clip so a population estimate could be attempted. Very few Walleye were captured (eight) with only one recapture, making any definitive statements impossible at this time. However, there were multiple size-classes of Walleye captured including some sub-legal (i.e., below 18 inches) fish and fish of legal size and greater (i.e., >18 inches) (Table 4 and Figure 5).

Table 4. - Long Pond Walleye population assessment summary table based on four nighttime boat electrofishing events between March 22, 2023, and April 20, 2023. Captured Walleye were given fin clips during the first catch event and recorded as recaptures in any future catch events.

*LONG POND WAS FIRST STOCKED WITH WALLEYE IN 2017	Year
	2023
All Size	
<i>Number of Walleye captured in size class</i>	8
<i># of recaptured Walleye in size class</i>	1
<i>Estimated population size (N)</i>	12
<i>95% CI</i>	2-120
<i>#/Acre (Range)</i>	0.1 (0.02-1.10)
<i>Night Boat Electrofishing Walleye Only Relative Abundance</i>	2.4/hr.
Stock Size \geq9.8 Inches	
<i>Number of Walleye captured in size class</i>	8
<i># of recaptured Walleye in size class</i>	1
<i>Estimated population size (N)</i>	12
<i>95% CI</i>	2-120
<i>#/Acre (Range)</i>	0.1 (0.02-1.10)
<i>Night Boat Electrofishing Walleye Only Relative Abundance</i>	2.4/hr.
Quality Size \geq14.9 Inches	
<i>Number of Walleye captured in size class</i>	8
<i># of recaptured Walleye in size class</i>	1
<i>Estimated population size (N)</i>	12
<i>95% CI</i>	2-120
<i>#/Acre (Range)</i>	0.1 (0.02-1.10)
<i>Night Boat Electrofishing Walleye Only Relative Abundance</i>	2.4/hr.
Preferred Size \geq17.7 Inches	
<i>Number of Walleye captured in size class</i>	5
<i># of recaptured Walleye in size class</i>	0
<i>Estimated population size (N)</i>	UC ¹
<i>95% CI</i>	-
<i>#/Acre (Range)</i>	-
<i>Night Boat Electrofishing Walleye Only Relative Abundance</i>	1.5/hr.
Memorable Size \geq19.7 Inches	
<i>Number of Walleye captured in size class</i>	4
<i># of recaptured Walleye in size class</i>	0
<i>Estimated population size (N)</i>	UC ^a
<i>95% CI</i>	-

	#/Acre (Range)	-
Night Boat Electrofishing Walleye Only Relative Abundance		1.2/hr.
<i>^aUC - unable to calculate due to no recaptures.</i>		

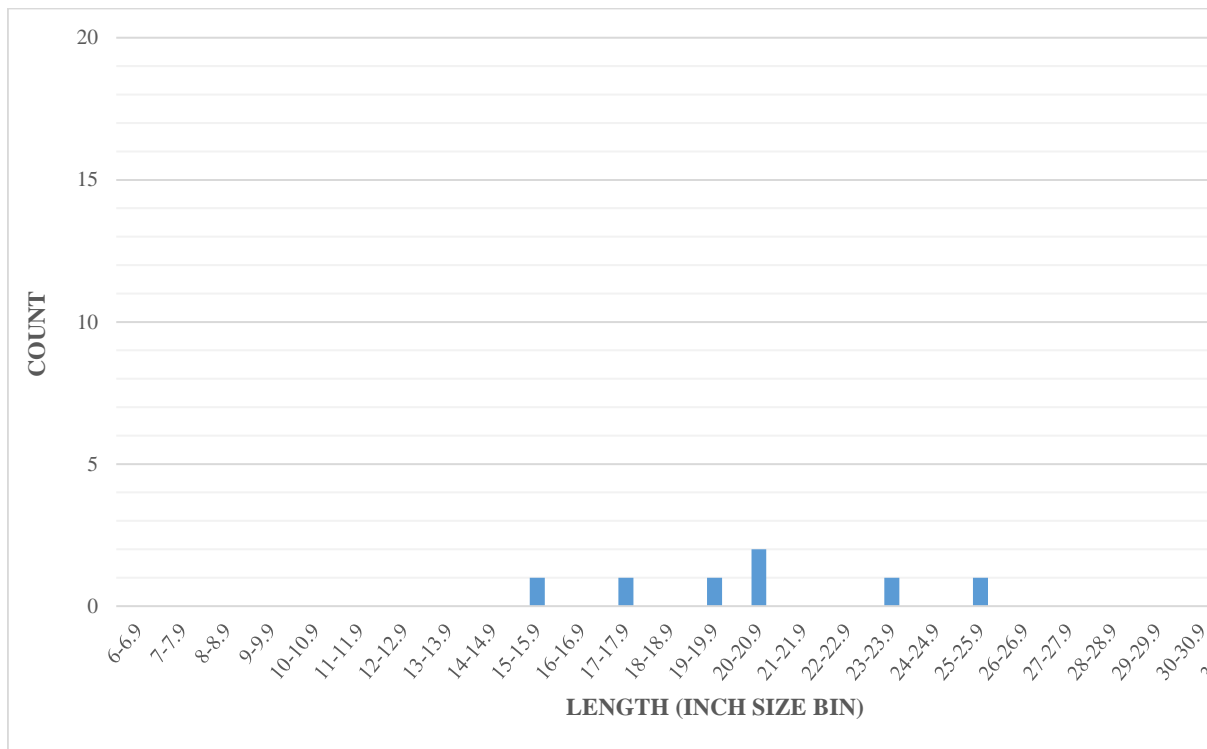


Figure 5. Long Pond length-frequency graph showing number of Walleye captured per inch size-bin. The graph was built from data collected during nighttime boat electrofishing performed between March 22, 2023, and April 20, 2023.

- Cedar Lake was first stocked in 2012 and annually thereafter through 2022 with an average of 1,032 4–6 inch “small” Walleye fingerlings. This equates to 15 Walleye fingerlings per acre. Between March 20, 2023, and April 24, 2023, four nighttime boat electrofishing samples were carried out on Cedar Lake (Chester) that targeted Walleye, Chain Pickerel, and bass. These samples were performed to assess the Walleye population size within the lake. Walleye were given a distinguishing fin clip so a population estimate could be attempted. Very few Walleye were captured (5) with only one recapture. Typically, this small of a sample size would result in the FD being unable to make any definitive statements about the Walleye population size in Cedar Lake, however two additional nighttime boat electrofishing samples were carried out on Cedar Lake in 2015 and 2017 that specifically targeted Walleye. Low catch per effort and estimated population size (Table 5 and Figure 6), a lack of positive reports from anglers, and poor habitat suitability for Walleye, led the Fisheries Division to discontinue stocking Walleye at Cedar Lake.

Table 5. Cedar Lake Walleye population assessment summary table based on nighttime boat electrofishing for 2015, 2017 and 2023 for “all size” Walleye and four other size categories.

*CEDAR LAKE WAS FIRST STOCKED WITH WALLEYE IN 2012	Year		
	2015^a	2017^b	2023^c
All Size			
<i>Number of Walleye captured in size class</i>	0	3	5
<i># of recaptured Walleye in size class</i>	0	0	1
<i>Estimated population size (N)</i>	-	-	8
<i>95% CI</i>	-	-	1.4-80.0
<i>#/Acre (Range)</i>	-	-	0.1 (0.02-1.15)
<i>Night Boat Electrofishing Walleye Only Relative Abundance</i>	0.0/hr.	4.2/hr.	1.2/hr.
Stock Size \geq9.8 Inches			
<i>Number of Walleye captured in size class</i>	0	2	4
<i># of recaptured Walleye in size class</i>	0	0	1
<i>Estimated population size (N)</i>	-	-	5
<i>95% CI</i>	-	-	0.9-50.0
<i>#/Acre (Range)</i>	-	-	0.1 (0.01-0.72)
<i>Night Boat Electrofishing Walleye Only Relative Abundance</i>	0.0/hr.	2.8/hr.	1.2/hr.
Quality Size \geq14.9 Inches			
<i>Number of Walleye captured in size class</i>	0	2	4
<i># of recaptured Walleye in size class</i>	0	0	1
<i>Estimated population size (N)</i>	-	-	5
<i>95% CI</i>	-	-	0.9-50.0
<i>#/Acre (Range)</i>	-	-	0.01 (0.01-0.72)
<i>Night Boat Electrofishing Walleye Only Relative Abundance</i>	0.0/hr.	2.8/hr.	1.2/ hr.
Preferred Size \geq17.7 Inches			
<i>Number of Walleye captured in size class</i>	0	2	4
<i># of recaptured Walleye in size class</i>	0	0	1
<i>Estimated population size (N)</i>	-	-	5
<i>95% CI</i>	-	-	0.9-50.0
<i>#/Acre (Range)</i>	-	-	0.1 (0.01-0.72)
<i>Night Boat Electrofishing Walleye Only Relative Abundance</i>	0.0/hr.	2.8/hr.	1.2/ hr.
Memorable Size \geq19.7 Inches			
<i>Number of Walleye captured in size class</i>	0	2	4
<i># of recaptured Walleye in size class</i>	0	0	1
<i>Estimated population size (N)</i>	-	-	5
<i>95% CI</i>	-	-	0.9-50.0

#/Acre (Range)	-	-	0.1 (0.01-0.72)
Night Boat Electrofishing Walleye Only Relative Abundance	0.0/hr.	2.8/hr.	1.2/ hr.

^aSample date was April 15, 2015.

^bSample date was April 19, 2017.

^cSample dates were March 20 and 28, 2023, and April 3 and 18, 2023. During this sampling a mark-recapture strategy was employed where fish were given a distinguishing fin clip and during subsequent sampling when fish were captured that had said mark they were designated as a recapture.

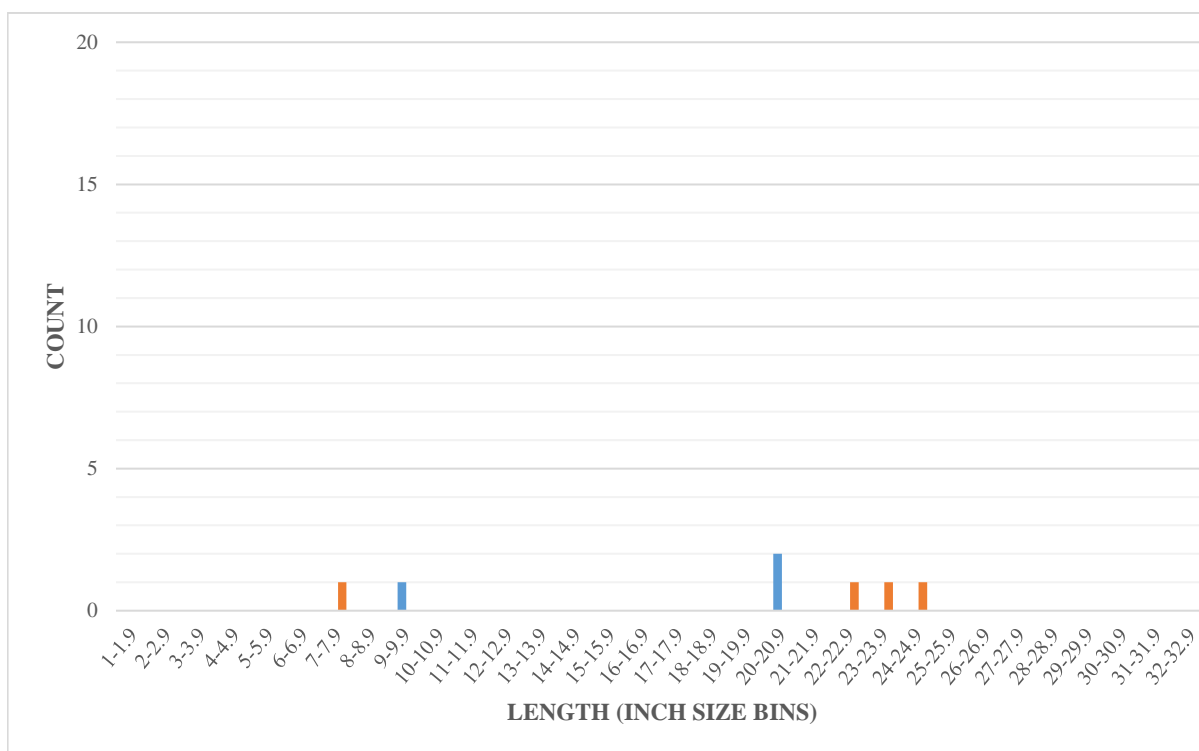


Figure 6. Cedar Lake length-frequency graph showing lengths of Walleye captured during Walleye only nighttime boat electrofishing on April 19, 2017, and four nighttime boat electrofishing samples carried out between March 22, 2023, and April 20, 2023. No Walleye were captured during a 2015

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

- No action was taken towards this objective during the 2023-2024 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 Gardner Lake, Salem/Bozrah/Montville in 2021 and Mashapaug Lake, Union in 2022.

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

- No action taken towards this objective during the 2023-24 grant period. The FD recommends removing this objective in the next segment period as we are not looking to expand the Walleye management program at this time.

Moving Forward

- Discontinue the stocking of Walleye at Cedar Lake, Chester.
- Look into purchasing all larger size Walleye for all state-owned Walleye Management Lakes in 2024 and suggest the two water companies and the Town of East Hampton consider switching over as well.
- Perform nighttime boat electrofishing on multiple western Connecticut Walleye lakes to examine relative abundance of those Walleye populations.
- Remove Objective 5: “Identify additional lakes that are likely to support successful Walleye fisheries” from the Walleye program. The FD is not looking to expand to other waterbodies at this time.

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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
4/1/2023 to 3/31/2024

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

Report Prepared by: Christopher McDowell
Job Personnel: Christopher McDowell, Job Leader
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Figure 1. A stocked adult Channel Catfish caught by Shawn Sims from Mohegan Park Pond.

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 catchable

size within 1-2 years. In 2007, the Fisheries Division expanded the number of waterbodies stocked with Channel Catfish to 24. However, 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 discontinued in the put-grow-and-take waters as assessments of the number and size of Channel Catfish in these waters indicates robust populations with multiple size classes..

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 did not receive its annual order of Channel Catfish from Farm Cat, Inc. (Arkansas), which would have been stocked into Community Fishing Waters (CFWs). The vendor was not able to coordinate with the Fisheries Division in time to receive Channel Catfish by May 26, 2023.
 - We instituted a cut-off date of May 26, 2023, because of our concern of water temperatures being above 75-degrees Fahrenheit (° F), which would result in additional stress above the existing stress due to the long transport time. Additionally, disease outbreaks with Channel Catfish are a concern when water temperatures exceed 75° F.

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 a mark-recapture sampling method was utilized on Scoville Reservoir (Wolcott) and Batterson Park Pond (Farmington/New Britain) using baited hoop nets to obtain an estimate of Channel Catfish abundance. Captured fish were given a distinguishing fin clip, which was looked for on subsequent samples. 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).
 - Scoville Reservoir is a Channel Catfish management lake that was stocked with yearling Channel Catfish (9-11 inch) for 7 years (2012-2018).

- 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 252 tandem net-days of sampling. Tandem net days are calculated by summing the number of days each net was “working” (i.e., in the water and actively able to capture fish). 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 inches and net total length 12 feet).
- The assessment confirms that the yearling stocking strategy at this waterbody was successful in creating a population of various size classes of catchable sized Channel Catfish (Table 1 and Figure 2). The number of Channel Catfish present in this lake indicates there is room for additional angler effort. Additionally, an estimated 76.8% of the Channel Catfish were equal to or greater than memorable size (≥ 19.7 inches).

Table 1. Scoville Reservoir, Wolcott, Channel Catfish 2023 mark-recapture population estimate summary.

*SCOVILLE RESERVOIR WAS STOCKED WITH YEARLING CHANNEL CATFISH FROM 2013-2018 AND ONE STOCKING OF ADULT CHANNEL CATFISH IN 2019.	
	YEAR
	2023^a
All Size	
<i>Number of Channel Catfish captured in size class</i>	143
<i># of recaptured Channel Catfish in size class</i>	26
<i># of mortalities</i>	0
<i>Estimated population size (N)</i>	284
<i>95% CI</i>	194-434
<i>#/Acre (Range)</i>	2.3 (1.6-3.6)
Stock Size ≥ 7.9 Inches	
<i>Number of Channel Catfish captured in size class</i>	142
<i># of recaptured Channel Catfish in size class</i>	25
<i># of mortalities</i>	0
<i>Estimated population size (N)</i>	292
<i>95% CI</i>	199-451
<i>#/Acre (Range)</i>	2.4 (1.6-3.7)
Quality Size >12.0 Inches	
<i>Number of Channel Catfish captured in size class</i>	142

<i># of recaptured Channel Catfish in size class</i>	25
<i># of mortalities</i>	0
<i>Estimated population size (N)</i>	292
<i>95% CI</i>	199-451
<i>#/Acre (Range)</i>	2.4 (1.6-3.7)
Preferred Size \geq15.7 Inches	
<i>Number of Channel Catfish captured in size class</i>	142
<i># of recaptured Channel Catfish in size class</i>	25
<i># of mortalities</i>	0
<i>Estimated population size (N)</i>	292
<i>95% CI</i>	199-451
<i>#/Acre (Range)</i>	2.4 (1.6-3.7)
Memorable Size \geq19.7 Inches	
<i>Number of Channel Catfish captured in size class</i>	119
<i># of recaptured Channel Catfish in size class</i>	23
<i># of mortalities</i>	0
<i>Estimated population size (N)</i>	218
<i>95% CI</i>	146-343
<i>#/Acre (Range)</i>	1.8 (1.2-2.8)

“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 252 tandem net-days of sampling. Tandem net days are calculated by summing the number of days each net was “working”. 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).

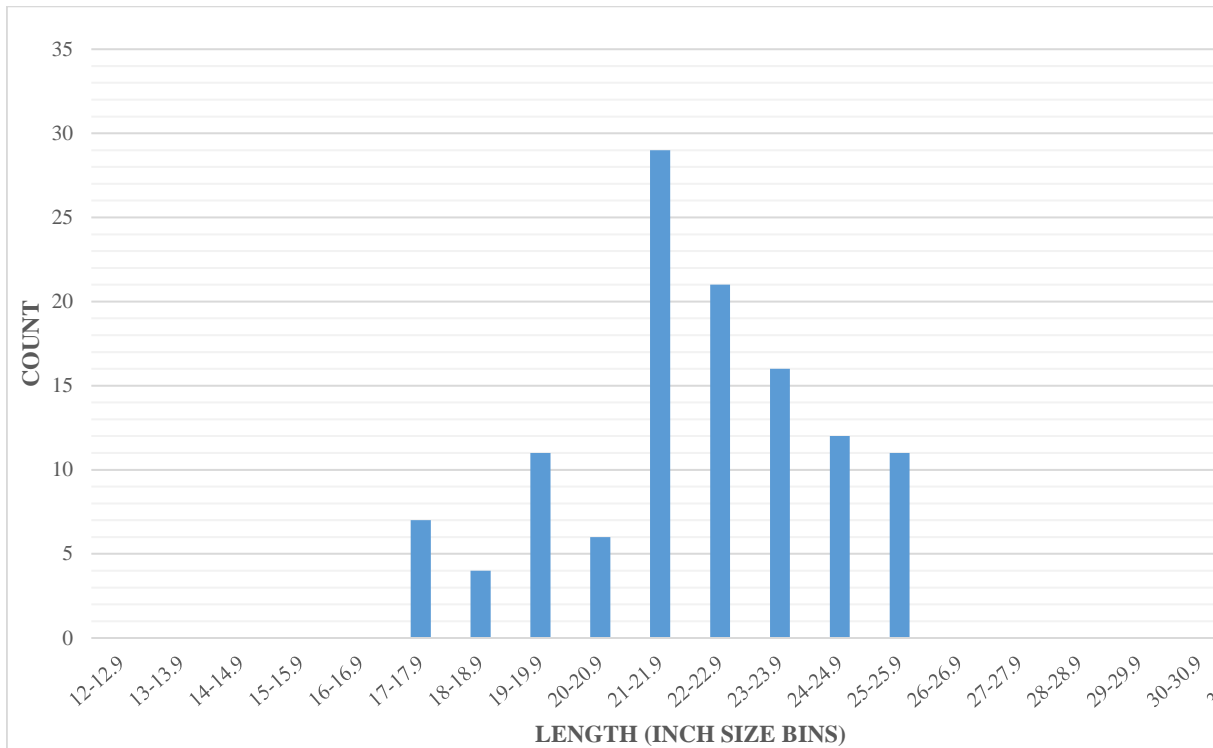


Figure 2. 2023 Channel Catfish single gear hoop netting length frequency results for Scoville Reservoir, Wolcott, Connecticut. Fish were grouped into one inch length bins.

- Batterson Park Pond is a Channel Catfish management lake that was stocked with yearling Channel Catfish (9-11 inch) for 6 years (2013-2018).
 - In both 2019 and 2023, five and six tandem hoop net sets, respectively, were deployed at various depths and in various orientations (i.e., parallel to shore or perpendicular to shore) resulting in 45 tandem net-days in 2019 and 252 tandem net-days in 2023. Tandem net days are calculated by summing the number of days each net was “working” (i.e., in the water and actively able to capture fish). 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).
 - The assessment confirms that the yearling stocking strategy at this waterbody was successful in creating a population of various size classes (Table 2 and Figure 3) of catchable sized Channel Catfish. The size of the Channel Catfish population appears sufficient to maintain a fishery moving forward with no need for supplemental stocking at this time.

- It should be noted that the population estimate in 2019 should be interpreted cautiously due to a few factors, which include the low numbers of recaptures, the short time period the nets were working, and the fact that the recaptures were not measured, which makes calculating population size for various size classes impossible.

Table 2. Batterson Park Pond, Farmington/New Britain, Channel Catfish population estimate summaries for mark-recapture work carried out in 2019 and 2023.

*BATTERSON PARK POND WAS STOCKED WITH YEARLING CHANNEL CATFISH FROM 2013-2018.		
	YEAR	
	<u>2019^a</u>	<u>2023^b</u>
All Size		
<i>Number of Channel Catfish captured in size class</i>	51	91
<i># of recaptured Channel Catfish in size class</i>	2	20
<i># of mortalities</i>	0	0
<i>Estimated population size (N)</i>	373	157
<i>95% CI</i>	104-3,730	102-157
<i>#/Acre (Range)</i>	2.7 (0.7-26.6)	1.1 (0.7-1.8)
Stock Size \geq7.9 Inches		
<i>Number of Channel Catfish captured in size class</i>	N/A	91
<i># of recaptured Channel Catfish in size class</i>	N/A	20
<i># of mortalities</i>	0	0
<i>Estimated population size (N)</i>	UC ^c	157
<i>95% CI</i>	UC	102-257
<i>#/Acre (Range)</i>	UC	1.1 (0.7-1.8)
Quality Size \geq12.0 Inches		
<i>Number of Channel Catfish captured in size class</i>	N/A	91
<i># of recaptured Channel Catfish in size class</i>	N/A	20
<i># of mortalities</i>	0	0
<i>Estimated population size (N)</i>	UC	157
<i>95% CI</i>	UC	102-257
<i>#/Acre (Range)</i>	UC	1.1 (0.7-1.8)
Preferred Size \geq15.7 Inches		
<i>Number of Channel Catfish captured in size class</i>	N/A	84
<i># of recaptured Channel Catfish in size class</i>	N/A	20
<i># of mortalities</i>	0	0

<i>Estimated population size (N)</i>	<i>UC</i>	131
<i>95% CI</i>	<i>UC</i>	85-215
<i>#/Acre (Range)</i>	<i>UC</i>	0.9 (0.6-1.5)
Memorable Size \geq19.7 Inches		
<i>Number of Channel Catfish captured in size class</i>	<i>N/A</i>	76
<i># of recaptured Channel Catfish in size class</i>	<i>N/A</i>	19
<i># of mortalities</i>	0	0
<i>Estimated population size (N)</i>	<i>UC</i>	112
<i>95% CI</i>	<i>UC</i>	72-185
<i>#/Acre (Range)</i>	<i>UC</i>	0.8 (0.5-1.3)

^aSix tandem baited hoop nets were deployed in various depths around the lake from October 30, 2019, to November 7, 2019, resulting in a total of 40 net-days. Nets were pulled earlier than desired due to weather related issues. Tandem net days are calculated by summing the number of days each net was "working". 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).

^cUC = Unable to calculate because recaptured fish were not measured.

^bSix tandem baited hoop net sets were deployed at various depths around the lake from October 4, 2023, until November 13, 2023, resulting in 274 tandem net-days of sampling.

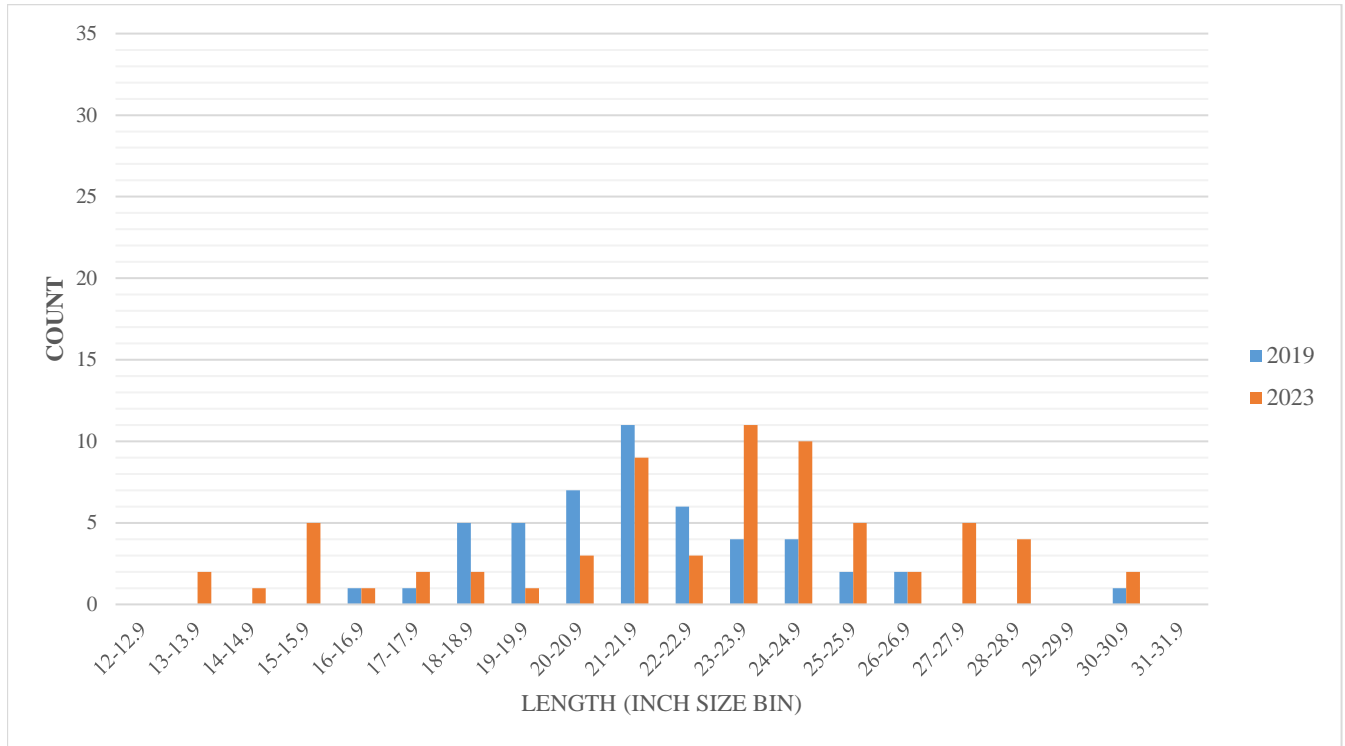


Figure 3. 2019 and 2023 Channel Catfish single gear hoop netting length frequency results for Batterson Park Pond, Farmington/New Britain, Connecticut. Fish were grouped into one inch length bins.

Objective 3: Conduct angler surveys to assess angler effort, total catch and harvest, and opinions in CMLs as resources permit.

- A boat-based roving angler survey at Quinebaug Lake (a former yearling stocked put-grow-and-take Channel Catfish Lake) ran from March 1, 2023, to October 31, 2023. This angler survey was conducted to assess angler effort, catch, harvest, and opinions regarding Channel Catfish in the lake. Results can be found in Mallette et al. (2024).
- A roving shore-based angler survey was begun on March 1, 2024, at all CFWs to assess angler usage, catch, harvest and opinion data on the Channel Catfish program.

Moving Forward

- Collaborate with the Connecticut Aquatic Resources Education Program (CARE) 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 2024 per the request of CARE.

- Periodically re-assess fish abundance and angler interest Channel Catfish management lakes where yearling Channel Catfish were stocked to determine the 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
4/1/2023 to 3/31/2024

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., fish needed for contaminant analysis, 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 2024 Fishing Guide in English and Spanish.
- 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 56,000+ followers) and on Instagram (currently 6,000+ followers).
- Twenty-two presentations were made to fishing organizations, school groups, technical audiences, and the media on the benefits of Sport Fish Restoration to Connecticut’s fisheries.
- 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 (14,334 subscribers).
- Technical assistance, to avoid biological issues, was provided 1) to anglers participating in 787 fishing tournaments, 2) to individuals making 130 requests to import and 263 requests to liberate fish, 3) to approximately 35 individuals or organizations requesting authorization to collect scientific data on fish, and 4) to retail bait dealers making 127 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.

- Routine efforts to ensure data can be collected where and when needed to evaluate programs continued, however, there are no additional activities or results to report this reporting

period.

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.

- There were no requirements for minor maintenance to provide adequate physical access to support all fisheries management activities during this reporting cycle.

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.
- Continue to perform minor maintenance at existing access areas as necessary.



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
4/1/2023 to 3/31/2024

Grant Title: Inland Fisheries Research and Management
Study 3: Inland Fisheries Coordination and Administration
Job 2: Fisheries Historical Data Restoration

Report Prepared by: Andrew Bade
Job Personnel: Andrew Bade, Job Leader/Program Coordinator

Overview: Historical records of fish sampling events and associated data can be used to aid analyses of range shifts, population dynamics, climate change, run timing and even local extirpations across space and time. As environmental variability increases under climate change, detecting signal from noise requires, now more than ever, time series of data to support fisheries management decisions.

Historic data digitization and organization into a modern database with associated metadata allows fisheries agencies to query the data and undertake analyses that are otherwise not possible. Much of this data can exist on paper, but some of the most vulnerable to being lost can be found on hard drives in remote fisheries offices or on CD-ROMs and other outdated storage media. Consolidating and modernizing these types of data has been referred to as ‘data rescue’.

This project has three main goals. First is to locate and retrieve as much of the freshwater fisheries data held by the CT DEEP fisheries division as is possible. This will involve site visits to the field offices and interviews with current employees and recent retirees to find existing data. We expect to find much data already digitized, but others may predate digital formats while others have been lost and now can only be found in paper reports. Second, we will digitize and organize these disparate data sources into a few, flexible relational databases. Third, we will undertake an example analysis with the newly organized data. This example analysis will be used to create a process document highlighting how fisheries biologists can interact with the databases to support fisheries decision making. The specific topic of the analysis will be selected in consultation with the Fisheries Division once data are organized and cataloged, but questions about fish community shifts and population size structure changes over time are promising possibilities.

The project will be led by a post-doctoral scholar that has prior experience working with large datasets. The scholar will engage with a small group of representative fisheries biologists from the Fisheries Division during the database design phase of the project, especially to better envision the needed uses of the databases, which is a key step to informed database design.

University of Connecticut students will be hired to support the data digitization under the supervision of the post-doctoral scholar.

Objectives:

1. Facilitate site visits and interviews with Fisheries Division staff and the scholar.
2. Create a comprehensive file of all data obtained and associated metadata.
3. Develop relational databases to house, at minimum, all available electrofishing (including associated ageing results), angler survey, and fish distribution data.
4. Develop a process document and conduct trainings to ensure Fisheries Division staff can use and maintain database products.
5. Demonstrate the utility of the databases through quantitative modeling efforts targeting the effects of climate and urbanization on fisheries resources over time and space, leading to the development of one or more peer-reviewed publications.

Key Findings

No work was completed towards the listed objectives during this performance period. However, the Fisheries Division and UConn established a contract to begin work on this project that was executed in January of 2024. The project is to run for two years starting on August 26th, 2024 (the start date of the post-doctoral scholar who will lead the project). The Fisheries Division will have more progress to report on these objectives during the 4/1/2024 to 3/31/2025 grant period.

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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