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Annual Performance Report

*Connecticut Fisheries Division*

# Coldwater Lakes Management



Connecticut Department of Energy &  
Environmental Protection  
Bureau of Natural Resources  
Fisheries Division  
79 Elm Street, Hartford, CT 06106  
860-424-3474  
[www.ct.gov/deep/fishing](http://www.ct.gov/deep/fishing)  
[www.facebook.com/ctfishandwildlife](https://www.facebook.com/ctfishandwildlife)





**State of Connecticut**  
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**Bureau of Natural Resources**  
**Fisheries Division**



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Report Prepared by: Edward Machowski and Brian Eltz

Job Personnel: Brian Eltz, Job Leader  
Edward Machowski, Job Leader  
Neal Hagstrom, Primary Staff  
Christopher McDowell, Primary Staff  
Timothy Barry, Program Coordinator/Project Leader  
Robert Jacobs, Assistant Program Coordinator

Date Submitted: September 4, 2017

Approved by: Peter Aarrestad  
Director, Fisheries Division

William A. Hyatt  
Chief, Bureau of Natural Resources



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Cover photos: (Left) Female Kokanee Salmon awaiting spawning at the Burlington State Hatchery, (Right) a deceased Rainbow Smelt specimen collected from a private lake, (Bottom) a spectacular looking male Seeforellen-strain Brown Trout prior to being stocked into Highland Lake.

## Summary

*During 2016 trout stocking within Connecticut's Trout Management Lakes (TMLs) and other important coldwater lakes went as prescribed by the lake categorization (See 2016 Final Report). A new trout stocking initiative, stocking of large (>16 inch; 3 -5 lbs.) broodstock Brook Trout into Black Pond (Woodstock) and Mohawk Pond (Goshen), was viewed favorably by anglers based on responses received during a winter angler survey at Mohawk Pond. A total of 117,000 Cortland strain yearling Brown Trout were stocked into Lake Wononskopomuc and Saugatuck Reservoir as part of an experimental put-grow-and-take stocking strategy. An estimated 2 million fertilized Rainbow Smelt eggs were collected in a private reservoir and transferred during 2016 to West Hill Pond in hopes of restoring an extirpated population, enhancing the forage base, and increasing angling opportunities in the future.*

*Oxygen/Temperature profiles were obtained at coldwater lakes during the summer of 2016. Kokanee Salmon management followed standard procedures in 2016. Three lakes were stocked during the spring with Kokanee fry, and broodstock were collected from West Hill Pond and East Twin Lake in the fall for spawning at Burlington State Fish Hatchery.*

## Background

Over the past 30+ years, the Connecticut Department of Energy and Environmental Protection (DEEP), Fisheries Division (FD) has studied various aspects of Brown Trout (*Salmo trutta*) in many of the state's coldwater lakes (for a detailed description of historical management see Eltz and Machowski, 2016 Final Report). During this period, management efforts largely focused on maintaining and enhancing holdover Brown Trout in select lakes through size and timing of trout stocked, and also through fishing regulations (e.g., length limits, slot limits, and season closures) and forage fish assessment (i.e., Landlocked Alewife).

Management efforts worked to produce viable and in some cases, notable fisheries for trophy Brown Trout. Throughout this management history both habitat and biological changes have occurred within our 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). In addition to the physical/biological changes within our TMLs, there have also been alterations in trout production within our state hatchery system which may impact trout lakes management. For example, the Seeforellen Brown Trout strain was brought into Connecticut in 1990, primarily for use it as a coldwater lake management fish due to its growth

potential and longevity. Unfortunately, due to cost-savings measure instituted in early 2016, this strain is no longer produced in our hatchery system.

In 2013 FD biologists developed a classification system (Eltz and Machowski, 2016) based on a lake's current potential for producing holdover Brown Trout and other coldwater fishes (e.g., Kokanee Salmon (*Onchoryncus nerka*) and Rainbow Smelt (*Osmerus mordax*)). 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 new classification system is now being used as a guideline in determining appropriate stocking and management options for each coldwater lake.

Historically, West Hill Pond supported a robust, holdover Brown Trout fishery until the disappearance of an important forage fish species, Rainbow Smelt in the late 1980's (Eltz and Machowski, 2016). In 2013, FD biologists embarked on a management project to restore Smelt in West Hill Pond. It was anticipated that if successful, this could provide forage for the lakes Brown Trout and also potentially restore a once popular winter fishery for Landlocked Smelt.

Kokanee Salmon have been managed in Connecticut beginning with East Twin Lake in the 1940's. Since then, this landlocked variety of salmon have been introduced in a total of 18 Connecticut lakes in hopes of generating new and unique fisheries. Unfortunately, in most of those lakes, efforts failed to produce fishable populations. Presently Kokanee Salmon are only actively managed in West Hill Pond and East Twin Lake. Lake Wononskopomuc was also actively managed through 2015 with annual stockings, but the continued presence of Landlocked Alewife (another pelagic zooplanktivore and competitor) negated Kokanee management in this lake. Connecticut is currently one of only three states east of the Rocky Mountains that provide Kokanee Salmon fisheries through active stocking and management.

**The purpose of Job 7** is to evaluate and manage coldwater fisheries in Connecticut's lakes. This report summarizes work conducted during 2016 at TMLs, and other important lakes that have the potential for supporting coldwater fisheries.

### **Objectives**

- ◆ Assess abundance and size distribution of Brown Trout and Alewives in TMLs (e.g., Crystal, East Twin, and Highland lakes), and other important coldwater lakes (e.g. Lake Wononskopomuc, and Saugatuck Reservoir) as time permits.
- ◆ 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).
- ◆ Investigate options for producing quality trout fisheries in coldwater lakes through stocking manipulation, special regulations, or forage enhancement, and the potential for managing

other lentic coldwater fishes.

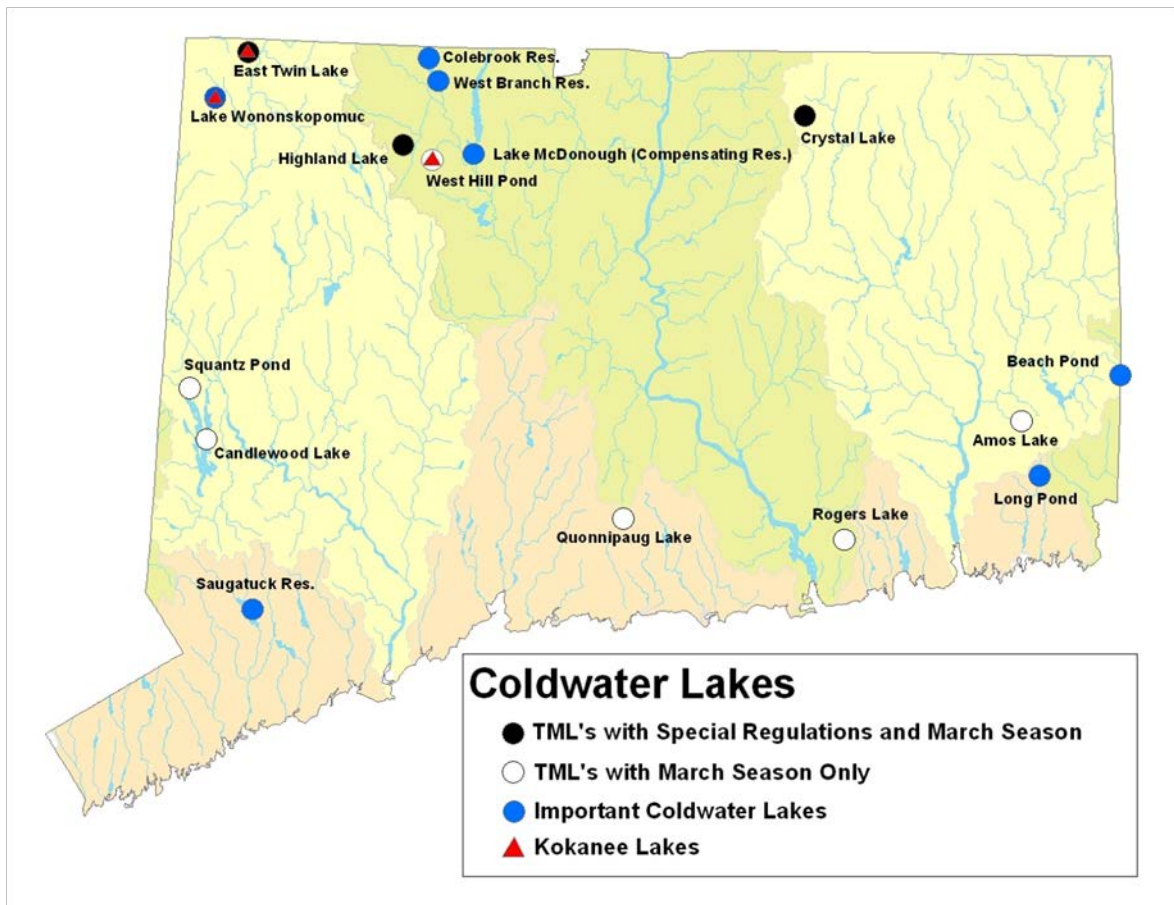
- ◆ Maintain and manage Kokanee Salmon fisheries in two of Connecticut’s best coldwater lakes and continue to explore the potential for management in additional waterbodies.
- ◆ Determine the need for continuing or changing special regulations on TMLs.

## Approach

- ◆ TMLs and selected coldwater lakes (Figure 1) are:
  - Stocked with trout during the spring and fall. Timing, species and size of trout stocked are determined by lake categorization and management potential.
  - Sampled by standard boat electrofishing (pulsed DC) in October or early November to assess holdover trout and Landlocked Alewife abundance (number sampled per hour of standardized electrofishing).
  - Sampled by trap nets in October or early-November to assess holdover trout. Brown Trout population size is estimated using the Schnabel mark-recapture method (Everhart et al. 1975); trout are captured, marked with unique fin clips, and recaptured using only trap nets.
  - Sampled with vertical gill nets (hereafter referred to as a “gang” of gillnets; 5 vertical gillnets each of a different mesh size, varying from 9.5mm to 22.2mm) during the summer to estimate relative abundance (number sampled per day with a standard gang of vertical gill nets) and age structure of Alewife.
  - Sampled with YSI Pro-20 oxygen/temperature meters during mid to late summer to obtain dissolved oxygen (DO) and temperature profiles.
- ◆ Enhance coldwater fishing opportunities in TMLs and important coldwater lakes by:
  - Restoring a viable Rainbow Smelt population in West Hill Pond. Fertilized smelt eggs are collected via spawning mats constructed out of PVC pipe or rebar that are wrapped with artificial substrate (Burlap fabric). Mats are placed along the shore and in tributaries of a drinking water supply reservoir that is closed to angling. Eggs that adhere to the artificial substrate are then transferred to West Hill Pond. Materials for the construction of spawning mats are donated by the Northwest Connecticut Sportsman’s Council.
- ◆ Activities related to the assessment and management of Kokanee Salmon in two coldwater lakes (West Hill Pond and East Twin Lake) (Figure 1) are completed by:
  - Collecting mature kokanee for broodstock each fall (mid-October), prior to spawning, using trap nets at West Hill Pond and if necessary, at East Twin Lake.

- Sampling with trap nets in October to assess the sexually mature component of the Kokanee Salmon populations. Kokanee population size is estimated using the Schnabel mark-recapture method (Everhart et al. 1975); salmon are captured, marked with unique fin clips, and recaptured using only trap nets.
- Manually spawning mature kokanee at Burlington State Fish Hatchery, where the resulting progeny are raised to the small fingerling (2 – 3 inch) stage.
- Stocking 50,000 fingerlings into West Hill Pond, 75,000 into East Twin Lake each spring, and stocking surplus fingerlings into Beach Pond beginning in 2016.
- ◆ Roving angler surveys with a stratified random design (Malvestuto et al. 1978) are conducted as time permits in selected lakes (Study 2, Job 2) to determine angler effort, catch, harvest, and satisfaction.
- ◆ Summer fish kills in coldwater management lakes, when they occur, are investigated on an as needed basis.





**Figure 1.** Location of TMLs, important coldwater lakes, and Kokanee Salmon lakes. Major watersheds are represented by color shading.

## Key Findings

### Stocking

- ◆ Seeforellen-strain Brown Trout were stocked as yearlings (> 6 in.), large adults (> 12 in.), and broodstock (avg. weight 5 lbs) in 2016 (Appendix 1). This is the final stocking of Seeforellen-strain Brown Trout in Connecticut lakes due to cost-cutting measures and the hopefully temporary elimination of this strain from hatchery production.

The State of Maine accepted 110,000 Seeforellen eggs from our hatchery into their hatchery system. Under an improved future fiscal environment, the Fisheries Division would anticipate re-establishing production of the Seeforellen strain within our hatchery system with eggs supplied back to us from the State of Maine.

- ◆ Lake Wononskopomuc and Saugatuck Reservoir received special stockings of Cortland-

strain Brown Trout yearlings (Appendix 1) in the fall of 2016. These lakes were selected to receive these fish as they have the best potential of all the State's coldwater lakes to grow and produce holdover trout.

- ◆ As part of a new trout angling initiative, two waterbodies (Black Pond, Woodstock and Mohawk Pond, Goshen) were selected as "Brook Trout Management Lakes." These lakes were chosen based on their suitable habitat, small size, and rural locations, reminiscent of back-country Adirondack or northern New England Brook Trout waters.
  - Both lakes were stocked in late October of 2015 with large surplus broodstock Brook Trout (Black Pond received 180 and Mohawk Pond received 205). These stockings and the "Brook Trout Management Lake" idea were announced on the agency's Fish and Wildlife Facebook page.
  - Additionally, both ponds will be stocked exclusively with Brook Trout beginning in the spring of 2017.

#### ***Trout and Forage Fish Sampling***

- ◆ No TMLs were sampled by electrofishing or trap netting in 2016. Of note, Highland Lake was not sampled as usual due to severe drought conditions coupled with the annual fall drawdown. The combination of conditions would have resulted in an abnormal/inefficient sample (i.e. typical locations (stream mouths and spring seeps) where pre-spawn trout congregate in the fall were non-existent due to the drought) (Appendix 2).
- ◆ East Twin Lake was sampled for Alewife using a standard gang set of five vertical gill nets (one overnight set) in August 2016. No Alewife were sampled indicating that they remain absent from the lake (Alewife last sampled in 2010) or at such low levels that they are undetectable by our method of sampling (Appendix 2).
- ◆ Lake Wononskopomuc was sampled for Alewife using a gang set of vertical gill nets (two overnight sets with 5 nets) in August of 2016.





*Landlocked Alewives collected from Lake Wononskopomuc in summer 2016*

- In 2016, Alewife abundance in Lake Wononskopomuc had increased (16/net-day) over the average for the past 5 year period (10.6/net-day; Appendix 2). Based on length frequency of the Alewives captured there appeared to be three distinct year classes, indicating a stable population exists in the lake.

#### ***Forage Fish Enhancement in West Hill Pond***

- ◆ In the spring of 2016, 22 spawning mats (9 large 1.5'X3' and 13 small 1'x1.5') were deployed in two tributaries along the eastern shoreline of a unfished drinking water reservoir in northwest, Connecticut to collect fertilized eggs from spawning Rainbow Smelt. Spawning mats were not placed in the reservoir itself, as had been done the previous 2 years, because of low water levels due to drought conditions.
  - An estimated 2 million eggs were collected and transported to the recipient stream at West Hill Pond. Three spawning mats were destroyed by bears. The eggs were consumed (along with the Burlap substrate!) shortly after the smelt had successfully spawned.
  - Prior to relocating the egg-laden spawning mats in the recipient stream at West Hill Pond, the mouth of the stream was inspected for possible adult smelt spawning activity (this would have been as a result of the egg relocations from the 2014 and/or 2015 year class(es)). Approximately 1 dozen eggs were found on moss covered rocks in the stream mouth indicating that a low level of spawning activity had occurred.
  - The use of Astroturf as an artificial spawning substrate was discontinued in 2016. Visual observations suggested that the smelt utilized the burlap mats more readily than the Astroturf mats in the previous two years.



*Photos: (Top) Fisheries seasonal (Frank Beres) placing egg-filled spawning mats in mouth of recipient tributary at West Hill Pond, (Bottom-left) a close-up view of Rainbow Smelt eggs on Burlap fabric spawning mat, (Bottom-right) post-spawn smelt along shore of the donor tributary stream.*

### **Temperature/Oxygen Profiles**

- ◆ Water temperature and DO measurements taken July through September 2016 show:
  - At Highland Lake the layer of suitable coldwater habitat ( $\leq 19^{\circ}\text{C}$ , with  $\geq 4$  mg/l of DO) deteriorated steadily from July (5 meters thickness) through September (1 meter thickness) (Appendix 3).
  - East Twin Lake, Lake Wononskopomuc, and West Hill Pond showed the greatest volumes and most persistent layer of optimum coldwater habitat throughout the summer (Appendix 3).
- ◆ Colebrook and West Branch Reservoirs can be considered flow-through riverine impoundments whereby cool/cold water entering the system via the Farmington River sinks to depths of similar temperature and essentially “pushes” cold water habitat through the system. This allowed both Colebrook Reservoir and West Branch Reservoir to maintain excellent cold/oxygenated water through July, 2016 (Appendix 3). However, this favorable condition most likely deteriorated drastically throughout the remainder of the summer/fall because of severe drought conditions. Because of the drought, water from the reservoirs was drawn from the deeper, oxygenated layers to maintain and enhance low flow conditions in the West Branch Farmington River. Due to the severity of the drought,

Colebrook Reservoir was drawn down to near record low levels by late summer.

### ***Kokanee Salmon Management***

- ◆ In the spring of 2016, Kokanee Salmon fry produced from the 2015 egg-take were stocked into East Twin Lake, West Hill Pond, and Beach Pond (Appendix 4).
  - Fingerlings (~11,000) surplus to the stocking needs of the other management lakes were stocked into Beach Pond. This was the first year since 1978 that Beach Pond was stocked with Kokanee fingerlings. The lake was chosen because alewives, considered to be a competitor of Kokanee, were still abundant in Lake Wononskopomuc; and conversely, alewife numbers have been steadily decreasing to the point of being undetectable by our sampling methods as of 2016 in Beach Pond.
- ◆ In the fall of 2016, 329 mature Kokanee (151 males, avg. length = 19.4 inches; 178 females avg. length = 18.6 inches) were captured in trap nets at West Hill Pond (Appendix 4). Both male and female kokanee combined averaged 19.0 inches which is close to 1.0 inch larger than the next largest recorded broodstock from 2015 at 18.1 inches. All adult Kokanee were brought to Burlington Hatchery to be used as broodstock.
  - This number of adult Kokanee fell short of the 225 male/female spawning pairs target, therefore it was necessary to also set nets at East Twin Lake.
- ◆ Trap nets set at East Twin Lake produced 228 mature Kokanee all of which were taken as broodstock. These adult Kokanee were much smaller (151 males, avg. length = 12.8 inches; 77 females, avg. length = 12.2 inches) than those captured at West Hill Pond.
- ◆ Of the adult salmon brought to Burlington Hatchery, 244 pairs were spawned to produce ~227,792 eggs of which ~187,855 eyed (82% eye-up; typical range for eye-up = 75 – 85%) for the 2017 fry production cycle (Appendix 4). Due to the large body size of the female kokanee, the number of eggs/female (avg. = 1,867 eggs/female) is the highest ever recorded and much higher than the average over the past ten year period (avg. 2006-2015 = 925 eggs/female; range = 678 – 1,500).
- ◆ Kokanee abundance was 10.3 fish/net-day at West Hill Pond (avg. 2006 – 2015 = 43/net-day) and 22.8 fish/net-day at East Twin Lake (avg. 2014 – 2015 = 41/net-day) (Appendix 4). East Twin Lake has only been used to augment numbers of broodstock collected from West Hill Pond twice (2014 and 2015) since the Kokanee population recovered in 2008.



*Male Kokanee Salmon netted from West Hill Pond.*

### **Mohawk Pond Creel**

- ◆ Once safe ice formed (1/14/2016) a winter ice fishing angler survey was conducted on Mohawk Pond to assess catch of the recently stocked Brook Trout and also assess angler attitudes toward the idea of Mohawk Pond becoming a “Brook Trout Management Lake.”
  - A total of 51 anglers were interviewed during the abbreviated (39 day; 2015-2016) ice fishing season on Mohawk Pond. Total angler effort expanded to 605 angler hours (AH) of which, 70% (429 AH) was directed toward trout (Appendix 5).
  - Total trout catch during the short ice fishing season at Mohawk Pond was 15 of which 11 were harvested. Out of that total, 7 of the 15 estimated trout caught were Brook Trout and every Brook Trout was harvested (Appendix 6).
  - As part of this angler survey, fishermen were asked their opinion of this lake becoming a “Brook Trout Management Lake.” Of the anglers interviewed, 82% were “In Favor” or “Highly In Favor” of this management strategy, while eight percent were “Opposed”, and 10 percent had “No Opinion”.
- ◆ No fish kills were reported at any of the TMLs, or other important coldwater lakes in 2016. This despite the fact that the entire state remained in a severe drought throughout the year.
- ◆ Based on the FD Trophy Fish awards program, anglers reported catching 7 trophy Brown Trout from TMLs and important coldwater lakes in 2016.

#### **Kept:**

- At Crystal Lake, a 7 lb 7 oz., 23.5 inch-long and a 6 lb 2 oz., 24 inch-long Brown Trout
- At Beach Pond, a 6 lb 4 oz., 23 inch-long Brown Trout.

#### **Released:**

- At Wononskopomuc Lake, an 8 lb 12 oz., 28 inch-long and a 27.5 inch-long Brown Trout.
- At Saugatuck Reservoir, two 24 inch-long Brown Trout.

## Discussion

### ***Stocking***

The long-term impact on trout management resulting from the loss of the Seeforellen-strain Brown Trout from Connecticut's hatchery system remains unknown. While this strain was never fully assessed and evaluated in our coldwater lakes, anecdotal evidence over the years indicated that this strain consistently produced some of the largest holdover Brown Trout ever grown in Connecticut lakes. Management strategies will now depend on the availability of Cortland-strain Brown Trout which have shown some ability to holdover (Schluntz et al., 1999) and grow in Connecticut lakes. Some information may be gleaned by assessing the Cortland yearlings that were stocked into both Lake Wononskopomuc and Saugatuck Reservoir in the fall of 2016 or spring of 2017. However, this assessment may prove difficult because the yearling trout were not marked prior to stocking.

Surplus broodstock Brook Trout were stocked into the two "Brook Trout Management Lakes" (Black Pond and Mohawk Pond) during fall 2016 but were not assessed. Based on the responses by anglers during the winter creel at Mohawk Pond in 2016, the FD will move toward stocking only Brook Trout in both waterbodies during 2017, in an attempt to create a unique and different trout fishing experience in CT.

### ***Forage Sampling***

The success of holdover Brown Trout in Connecticut lakes largely depends on the ability of fish to survive and grow, which is primarily linked to the availability of forage and suitable coldwater habitat. In most Connecticut lakes managed for trout, the primary forage is Landlocked Alewife, whose populations are known to fluctuate considerably from year-to-year. Because Landlocked Alewife population size fluctuates, so too can holdover trout numbers and growth, since predator populations often respond to available forage. Although estimation of Landlocked Alewife population size can be difficult, abundance trend data indicate numbers have increased in Lake Wononskopomuc. Prior to this sample, Landlocked Alewife abundance in the lake appeared to have been declining. While the presence of Alewives has negated management of Kokanee Salmon in this location, the consistent forage base that Landlocked Alewife provides appears to be the key to this lake's ability to support a consistent fishery for large holdover Brown Trout.



### ***Forage Fish Enhancement in West Hill Pond***

Historical Trophy Fish Awards information/records show that West Hill Pond frequently produced trophy-sized Brown Trout when Rainbow Smelt were present. As early as 1929, smelt spawned in a West Hill Pond tributary. From the 1970's through the mid-1980's, a large water pump circulated lake water for a short distance upstream into the tributary to augment spring flows and improve access to spawning habitat by Smelt. In addition, a local State Conservation Officer occasionally "trapped and transferred" Rainbow Smelt eggs from other nearby donor populations and transplanted them in the same tributary stream. After pump operations ceased, Rainbow Smelt were extirpated due to diminished flows and the inability of smelt to gain access to suitable spawning habitat. The last Rainbow Smelt was sampled by FD biologists in 1989.

A donor population of Rainbow Smelt from an unfished drinking water reservoir was identified in 2013, and utilized in 2014 - 2016. Over this 3 year period an estimated 12 million+ smelt eggs have been successfully transferred to the recipient tributary at West Hill Pond. Due to manpower constraints we were unable to fully document spawning Smelt at West Hill Pond during the spring of 2016. However, visual observations of the moss covered rocks at the mouth of the tributary stream revealed a small number of Smelt eggs, indicating that smelt from one of the previous years' egg transfers survived, reached sexual maturity and spawned. This is the first time that Smelt have spawned in the tributary of West Hill Pond since the late 1990's. Continued monitoring will be necessary at West Hill Pond to determine if these initial transplants have established a new population at any level. If successful even at low-modest levels, then possible habitat augmentation, to ensure adequate access to more spawning habitat, should be considered to further Smelt re-establishment. It is hoped that a viable smelt population will once again support a previously popular winter ice fishery, and also improve the lake's potential to grow holdover Brown Trout and increase angling opportunities.

### ***Kokanee Salmon Management***

Anecdotal angler reports during 2016 indicated that Kokanee Salmon numbers at West Hill Pond may have declined, but the size of the salmon was the largest seen in many years. This observation was confirmed during FD efforts to collect broodstock in the fall of 2016. After a week of netting at West Hill Pond, FD biologists had not collected enough broodstock to reach the target of 225 spawning pairs (ratio = 1 male:1 female). However, the size of the salmon was the largest ever recorded throughout the history of Kokanee management in West Hill Pond. It is possible that fewer salmon in the lake resulted in less intraspecific competition, allowing for increased growth.



Regardless of the shortfall in broodstock from West Hill Pond, the remaining broodstock needed were quickly obtained from East Twin Lake. Since the reestablishment of Kokanee in East Twin in 2008, the population has remained robust, but the size structure of the adult Salmon population has declined over the last two years likely due to the increase in number of Kokanee stocked, which could be causing increased competition for limited forage. Starting in 2013 the number of fry stocked into East Twin was increased from 70,000 to approximately 95,000 annually. Because of this, the FD reduced the fry stocked in 2016 back to 70,000. This practice will continue over the next few years and the size of adult salmon will be monitored for changes. It should be noted that although Landlocked Alewife remain extirpated from East Twin Lake, the lake does have a thriving population of Zebra Mussels (*Dreissena polymorpha*) which could have some competitive interaction with Kokanee, primarily for zooplankton forage.

### ***Mohawk Pond Creel***

The angler survey conducted at Mohawk Pond shows that the vast majority of anglers target trout and while only one large (16 inch) Brook Trout was actually measured during the survey, there were anecdotal reports, along with angler photographs and Facebook responses of additional large Brook Trout being caught. In addition, many anglers commented favorably on the new idea of managing the lake just for Brook Trout, and this was supported by the fact that over 80% of the anglers interviewed were in favor of this new initiative.

## **Recommendations**

- ◆ Investigate management and stocking options/strategies based on the recent categorization of TMLs and important coldwater lakes.
  - Determine hatchery production targets of “large” Brown Trout (16 inch avg. length) for stocking recommendations to manage certain coldwater lakes with suitable habitat, but little or no holdover potential.
  - Investigate the relationships between trout stocking densities and catch rates in select management lakes and determine if improvements are possible or feasible.
  - Investigate and determine the feasibility of producing a “Survivor” strain of Brown Trout, similar to what has been done for the Farmington River (Hagstrom et al. 2011), and determine if this strain has better potential for use in Connecticut’s coldwater lakes.
  - Investigate the potential of producing or procuring sterile, triploid Brown or Rainbow trout for use in TML management. Triploid trout have higher growth rate potential because they are not expending energy producing gametes, and as such may have greater potential to achieve larger sizes in our TMLs.

- ◆ Locate, map, and assess the inflow from thermal refuges in all TMLs and important coldwater lakes.
  - Data demonstrate that Highland Lake’s thermal refuges are critical for holdover production. Given possible long-term climactic changes and the potential for further declines in suitable coldwater lake habitat, the FD should evaluate the pros/cons of enacting special regulations that reduce or restrict fishing in the lake’s refuges during the critical summer months.
- ◆ Begin monitoring (2017) the Rainbow Smelt population in West Hill Pond by gill netting, underwater video recording, and/or visual observation of smelt during the spring spawning run.



*A male Kokanee Salmon from West Hill Pond during fall broodstock collection*

## Expenditures

Total Cost:	\$73,760
Federal Share:	\$55,320
State Share:	\$18,440

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## Appendices

**Appendix 1.** Numbers, sizes, and lakes stocked with Seeforellen-strain Brown Trout in 2016 and early 2017. Special stockings of Brook Trout (BK) into Mohawk Pond and Black Pond (Woodstock), and Cortland-strain Brown Trout yearlings into Lake Wononskopomuc and Saugatuck Reservoir are indicated.

Lake	Special Stockings	Seeforellen-strain Brown Trout Stocked		
		> 6 inches	> 12 inches	> 16 inches
Beach Pond		0	0	0
Crystal Lake		0	400	535
East Twin Lake		0	100	0
Highland Lake		0	400	505
Lake Wononskopomuc	35,000 Cortland Yrlng	1,000	0	0
Long Pond		0	100	0
Mohawk Pond	205 BK SBS <sup>a</sup>	0	0	0
Black Pond (Woodstock)	180 BK SBS <sup>a</sup>	0	0	0
Saugatuck Reservoir	82,000 Cortland Yearling	8,850	0	0
Squantz Pond		0	0	0
West Hill Pond		0	0	0
<b>Total</b>		9,850	1,000	1,040

<sup>a</sup>SBS denotes Surplus Broodstock

**Appendix 2.** Relative abundance of Brown Trout (number sampled per hour of standardized electrofishing) and Alewife (number sampled per day with a standard gang of 5 vertical gill nets, and per hour standardized electrofishing) in 2016. Dashes indicate no sampling occurred. <sup>1</sup>Net-days (shown in parentheses) equal the number of nets set in the lake times the number of days (24 hr period) the nets fished.

Lake	Brown Trout			Alewife	
	No. per electro-hr			No. per electro-hr	No. per net-day (no. net-days) <sup>1</sup>
	<12 inches	12-16 inches	>16 inches	All sizes	All sizes
Crystal Lake	--	--	--	--	--
Highland Lake	--	--	--	--	--
East Twin Lake	--	--	--	--	0 (5)
Lake Wononskopomuc	--	--	--	--	16 (10)

**Appendix 3.** Layer of optimum cold, oxygenated Brown Trout water ( $\leq 19^{\circ}\text{C}$ , with DO levels  $\geq 4$  mg/l) and depths where they were observed for selected coldwater lakes sampled in the summer of 2016. Zeros indicate no optimum coldwater layer was detected.

Lake	Sample Date	Layer of cold oxygenated water (m)	Upper limit of cold oxygenated water (m)	Lower limit of cold oxygenated water (m)
<b>Trout Management Lakes</b>				
Crystal Lake	8/9/2016	2	6.5	8.5
East Twin Lake	8/16/2016	7	7.5	14.5
Highland Lake	7/28/2016	5	5.5	10.5
Highland Lake	8/12/2016	3	6.5	9.5
Highland Lake	9/8/2016	1	7.5	8.5
<b>Other Coldwater Lakes</b>				
Lake Wononskopomuc	8/16/2016	7	6.5	13.5
Mohawk Pond	8/11/2016	0	--	--
Colebrook Res.	7/22/2016	14	10.5	24.5
West Branch Res.	7/22/2016	22	2.5	24.5
Squantz Pond	8/23/2016	0	--	--
West Hill Pond	8/12/2016	5	6.5	11.5

**Appendix 4.** Numbers and locations of Kokanee fry stocked, numbers and relative abundance of Kokanee captured during trap netting efforts, and number of eggs taken for spawning in 2016. Dashes indicate no netting occurred

Lake	Number of Kokanee fry stocked	Number of Kokanee trap netted (broodstock) <sup>1</sup>	Number of Kokanee per net-day (no. net-days) <sup>2</sup>	Number of eggs taken <sup>3</sup>
East Twin Lake	76,000	228 (228)	22.8 (10)	0
West Hill Pond	51,000	329 (329)	10.3 (32)	227,792
Beach Pond	11,000	--	--	--

<sup>1</sup> Numbers in parentheses indicate the number of mature fish captured in trap nets that were taken as broodstock to Burlington Hatchery for spawning.

<sup>2</sup> Net-days (shown in parentheses) equal the number of nets set in the lake times the number of days nets were set.

<sup>3</sup> Total number of eggs taken were a mix of both West Hill and East Twin Kokanee adult.

**Appendix 5.** Estimated **total angler effort** (angler-hrs) at Mohawk Pond during the 2015 - 2016 ice fishing season. The  $\pm$  95% confidence limits (**CL**) around effort estimates are shown in parentheses. Estimated **Directed effort (DE)** (angler-hrs) for Brook Trout and Other fish at Mohawk Pond during the 2015 - 2016 ice fishing season. The percent of Total Effort is shown in parentheses. "Trout" directed effort includes only effort targeting trout species.

Lake	Dates	Total Days	Total Angler Effort (CL)	Trout (DE)	Other (DE)
Mohawk P.	1/14/16 - 2/28/16	39	605 (62%)	427 (70%)	178 (30%)

**Appendix 6.** Estimated **total catch and harvest** (All Trout and Brook Trout) at Mohawk Pond during 2015 – 2016 ice fishing season. The  $\pm$  95% confidence limits (**CL**) around catch and harvest estimates are shown in parentheses.

Mohawk Pond	Dates	Safe Ice Days	Catch (CL)	Harvest (CL)
All Trout	1/14/16 - 2/28/16	39	15 (22%)	11 (29%)
Brook Trout	" "	" "	7 (221%)	7 (221%)