

Beech Hill Pond Fishery Progress Report

By: Gregory A. Burr
Grand Lakes Region



December 2019
Maine Department of
Inland Fisheries & Wildlife
Fisheries and Hatcheries Division

SUMMARY

Sport fishery surveys were conducted at Beech Hill Pond to gather biological and sport fishery information on Landlocked Salmon (*Salmo salar*), Brook Trout (*Salvelinus fontinalis*) and Lake Trout (*Salvelinus namaycush*) fisheries during the winters of 2012, 2014, 2015 and 2018. Trap net surveys were conducted to collect length, weight, condition and age data on wild and hatchery origin Landlocked Salmon as well as wild Lake Trout from 2012 – 2018. Aerial counts of anglers were conducted to derive winter and open-water use estimates on sport fisheries in the winter and open-water seasons of 2015.

The size quality of stocked Landlocked Salmon and wild Lake Trout in Beech Hill Pond has improved since 2012. This is due to a multifaceted effort of reducing over abundant Lake Trout numbers with liberalized regulations, fishing derby harvest incentives, planting smelt eggs and stocking salmon annually at low rates. MDIFW's outreach to the public regarding harvesting increased numbers of abundant lake trout occurs during winter angler interviews, Beech Hill Pond fisheries focus angler group discussions, pond association presentations, annual newsletter information and perhaps most effectively, through added prize incentives at local winter ice fishing derbies. The use estimates derived from the winter and open-water aerial counts in 2015 showed an effort of 0.53 anglers per acre, with a point estimate of 715 angler days in the ice fishing season and 0.46 anglers per acre effort, with a point estimate 622 angler days in the open-water season. Of the waters surveyed, Beech Hill Pond ranked third highest in winter angler use and sixth highest of open-water angler use for Hancock County in 2015.

KEYWORDS: LANDLOCKED SALMON, LAKE TROUT, RAINBOW SMELT, CREEL CENSUS, TRAP NET, ANGLER USE, REGULATIONS

INTRODUCTION

Beech Hill Pond is known as one of the “sister lakes” in a series of larger deep, clear water oligotrophic lakes located on the western side of the lower Union River drainage. The pond supports fisheries for Landlocked Salmon, Brook trout, Lake Trout and Smallmouth Bass (*Micropterus dolomieu*). The pond’s primary management species are Lake Trout and Landlocked Salmon. Other fish species present are: Rainbow Smelt (*Osmerus mordax*), Chain Pickerel (*Esox niger*), White Perch (*Morone americana*), Pumpkinseed Sunfish (*Lepomis gibbosus*), Common Shiner (*Luxilus cornutus*), White Sucker (*Catostomus commersoni*), Hornpout (*Ameiurus nebulosus*), American Eel (*Anguilla rostrate*), Fallfish (*Semotilus corporalis*), Banded Killifish (*Fundulus diaphanous*), and Threespine Stickleback (*Gasterosteus aculeatus*).

**Note: In the fall of 2018, trap net sampling for Landlocked Salmon and Lake Trout captured dozens of invasive Landlocked Alewives (*Alosa pseudoharengus*) in all nets located at both the north and south ends of the pond. This is a confirmed new introduction and one that could be detrimental to the pond’s ecosystem and gamefish fisheries.*

Brook Trout are the only game species that are historically native to Beech Hill Pond and are produced in five tributaries. The pond has been stocked periodically with Landlocked Salmon since 1937 with a period of stocking secession from 1979 to 1982 due to the loss of public access. The pond is currently being stocked annually with Landlocked Salmon and there is a modest amount of natural reproduction in one tributary and in the outlet. Lake Trout are all wild after becoming established through MDIFW stockings starting in 1935 and ending in 1990. Beginning in the 1950’s and extending into the early 1990’s the pond was well known as a consistent producer of trophy Lake Trout. Beech Hill Pond still holds the state record for the largest Lake Trout, caught in 1958 by Hollis Grindle of Otis. The fish measured 41 ½ inches and weighed 31 pounds 8 ounces. From the mid-1990s to 2012 Lake Trout were generally over-abundant, small and in poor condition. Smallmouth Bass were established through illegal stockings that occurred in the late 1980s and reproduction was confirmed by MDIFW in the summer of 1991. In 1995 a no size or bag limit regulation (S-13) was put in place on Smallmouth Bass to reduce numbers and interspecific competition.

STUDY AREA

Beech Hill Pond has a surface area of 1,351 acres and mean and maximum depths of 38 ft and 121 ft, respectively. A small dam structure exists on the outlet. It’s drainage area is 9.5 square miles and it has a flushing rate of 0.2 per/year. It has a transparency of 35 ft and an acidity of 6.5 ppm. It is part of the Union River drainage and is located in Otis, Maine.

Mid- summer water temperatures, oxygen levels and the pond’s physical habitat are optimal for cold-water fish species. Most of the pond’s five significant tributaries provide some cold-water summer refugia, spawning, and nursery habitats for wild Brook Trout. Brook Trout in the tributaries and pond are managed under general law bag and length limit regulations. Although, Brook Trout are present in pond’s fishery, particularly in the winter fishery, their numbers are so low that assessing population status and age distribution is difficult. The few Brook Trout that were reported (not seen by biologists) in the 2015 winter census ranged between eight and twelve inches.

Landlocked Salmon are stocked annually and mature hatchery origin fish spawn in the middle tributary, located in Salisbury Cove, and in the outlet. Wild fish contributions to the fishery occasionally result in up to 22% of the trap net catch.

Lake Trout stocking beginning in 1935 and continuing until 1990, produced a self-sustaining population that now primarily spawns on shoals located just northwest of “Dunn’s Beach” on the eastern side of the pond.

Rainbow smelt have access to the pond’s tributaries to spawn but currently very little spawning takes place in these inlets. Most smelt spawning occurs in shallows along the shore.

In 1995, a no size or bag limit regulation on Smallmouth Bass was put in place to reduce the number of newly introduced invasive species.

In 2003, a six Lake Trout bag limit over 14 inches, only one of which could be over 23 inches’ regulation was put in place to reduce the abundant Lake Trout population. In 2013, the Lake Trout bag limit was liberalized even further with the passage of a no minimum length limit or bag limit under 23 inches and only one fish over 23 inches. Starting January 1, 2014, the regulation was modified to a no kill slot limit from 23 to 33 inches with only one over 33 inches to increase size quality and apply top down predatory control. The pond and tributaries were also closed to the taking of Rainbow Smelt to maintain the population as forage for Landlocked Salmon and Lake Trout. In 2016, proposals to reduce the bag limit of Lake Trout to two fish and catch & release on Landlocked Salmon in the months of January and February were enacted.

METHODS

Sport fishery surveys were conducted in the winters of 2012, 2014, 2015 and 2018. These surveys were conducted on weekends in January, February, and March to gather data on Landlocked Salmon, Lake Trout and Brook Trout. Anglers were interviewed on one or two weekend days per week starting in early January and extending through the end of safe ice conditions in March. Information gathered from interviews provided catch rates, age and growth, length, weight, and fish condition data.

In addition to winter sport fishery surveys, fall trap netting was completed in 2012, 2013, 2014, 2015, 2016, 2017 and 2018 to determine mean lengths, weights, condition and relative abundance of Landlocked Salmon and Lake Trout.

An Oneida trap net was set near the middle tributary in the northwest cove in mid-October. Two Oneida trap nets were also set on the Lake Trout spawning shoals located on the northeastern shore between Dunn’s Beach and Johnson Cove. Usually the middle tributary trap net caught a sample of Landlocked Salmon within a few days. The Lake Trout spawning shoal trap nets were proficient at capturing spawning Lake Trout as well as Landlocked Salmon and were generally fished between October 18 and November 1st.

Winter and open-water aerial counts of anglers were conducted by contracted pilots, who flew one week day and one weekend day per week starting in early January continuing through the end of

September. These counts were then expanded from ground survey daily use curves to estimate the winter use. The range of use from lowest to highest was estimated by the standard error around the point estimate. The 2015 aerial count was a replication of the methodology that was used in similar counts conducted in the winters and open-water seasons of 1995, 1996, and 2000. Flight times on the week and weekend days were derived from daily use curves generated from voluntary record keepers of their fishing times and catches. The flights were flown within the suggested peak use time between 10 AM and 2 PM.

RESULTS/DISCUSSION

Landlocked Salmon:

The fall trap netting results for the years 2012 to 2018 showed that age II+ Landlocked Salmon (used as an indicator for growth and condition of the current Landlocked Salmon growing environment) remained very good with mean lengths ranging from 16.0 to 19.7 inches (see Figure 1.), but most years averaged between 18 and 19 inches. Also, age II+ Landlocked Salmon condition factors (Fulton's K) were very good with a range from 0.85 to 1.01. The results of age II+ Landlocked Salmon are largely from a consistent stocking rate of 350 spring yearlings annually (0.26 fish/acre).

The decline in mean length and condition of age II+ Landlocked Salmon (see Figures 1. & 2.) in the 2016 fall trap netting season could have been due to poor ice conditions in the winter of 2015, coupled with the new 2015 no-kill Salmon regulation in January and February. These two factors may have helped retain more fish in the fishery, putting more pressure on the forage base and resulted in a decrease mean length and condition. Thus, the lower use and therefore harvest/mortality in the winter of 2015 likely precipitated the increase percentage of age IV+ and older (see Figure 3.) in the 2016 trap net catch from seven percent in 2015 to thirty three percent in 2016. This result should be considered an anomaly because on normal ice condition years, a higher Landlocked Salmon harvest/mortality will occur with the expected results of holdover for older aged Landlocked Salmon being between 15 and 20 percent in the next year's trap net catch, as occurred in 2017. This resulted in a catch with 16 percent older age Landlocked Salmon in the fall.

The decline in mean length and condition of age II+ Landlocked Salmon (see Figures 1. & 2.) in the 2018 fall trap netting season could have been due to an increase in the Lake Trout population in 2016 and 2017 (see Figure 9.), coupled with the increased protection of Landlocked Salmon in the winter season. To counter act this, a proposal to increase the bag limit on Lake Trout will be put floated to IFW leadership for consideration as well as an adjustment decrease in the Landlocked Salmon stocking rate.

Wild Landlocked Salmon represented 0 to 22 percent of the catch in the fall trap netting. (see Figure 4.) The range is likely due to two factors, early inconsistent annual stocking numbers and recent placement of the trap nets near the main spawning tributary located at the extreme northwest end of the pond. The inconsistent annual stocking numbers provided fewer spawning parents to contribute to the overall wild population produced in the middle northwest tributary and in the outlet. The placement of the fall trap nets also influence the overall wild percent number as nets placed close to the middle tributary has biased the recent catch with higher numbers of wild fish. A normal catch of wild fish is estimated to be

between 5 and 15 percent with the consistent annual stocking of 350 spring yearling Landlocked Salmon.

The mean Landlocked Salmon lengths by age from 2014 and 2015 sport fishery surveys (see Figures 5. and 6.) showed good growth for each age class represented. The growth increment between age II and age III was approximately 4 inches. The growth increments between the older aged fish in both years shows a smaller difference, presumably due to harvest and increased handling mortality of larger fish. The mean Landlocked Salmon lengths from the 2012 and 2018 were not displayed due to a lack of samples.

The winter sport fishery mean catch rates for Landlocked Salmon for 2012, 2014, 2015 and 2018 show an increase from 0.09 legal fish per angler day in 2012 to 0.20 legal fish per angler day in 2015. This increase is due to a more consistent annual stocking rate of 300 to 350 spring yearling Landlocked Salmon that occurred from 2011 to 2014. The Landlocked Salmon winter catch rate in 2018 was low due to decreased targeting precipitated by the catch and release regulation in January and February.

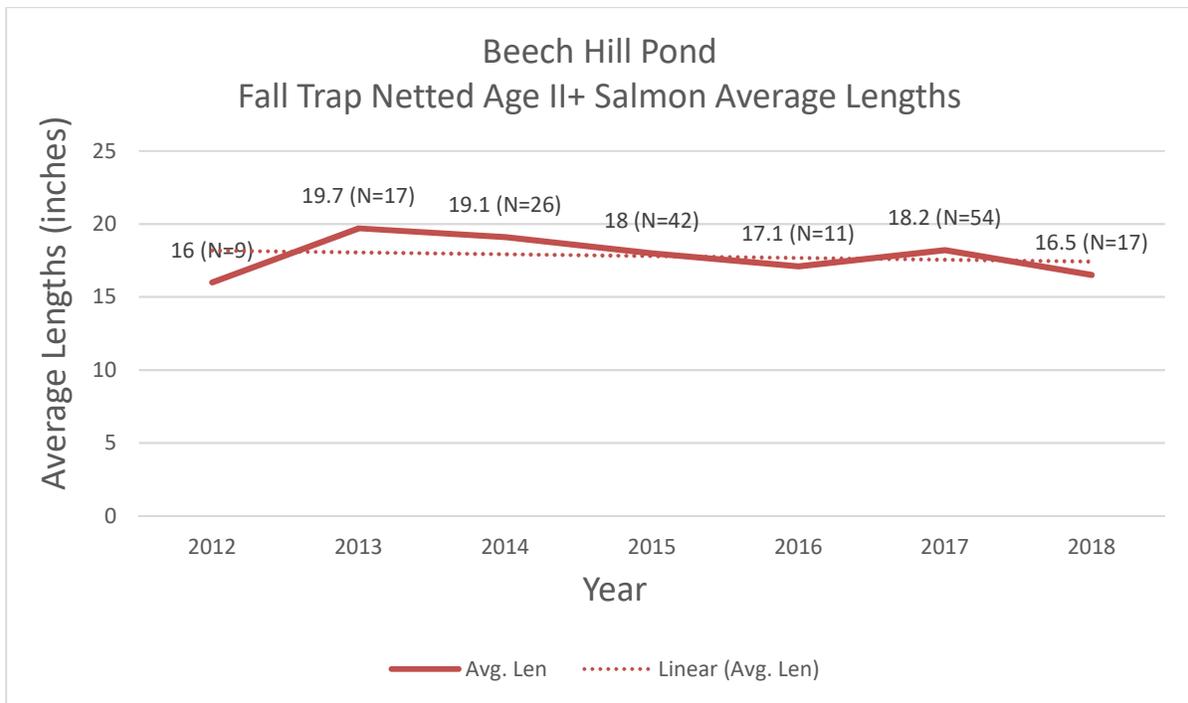


Figure 1. Beech Hill Pond Mean Length Age II+ Landlocked Salmon from Fall Trap netting.

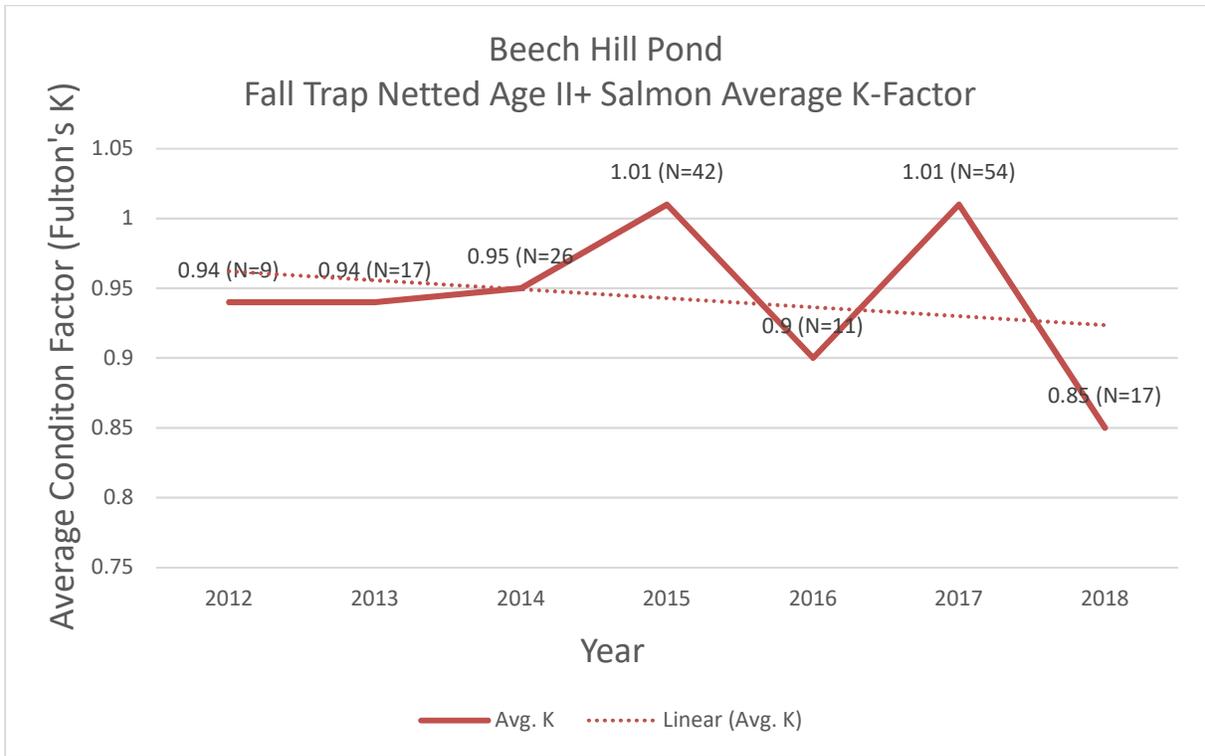


Figure 2. Beech Hill Pond Mean Condition Factor Age II+ Landlocked Salmon from Fall Trap netting.

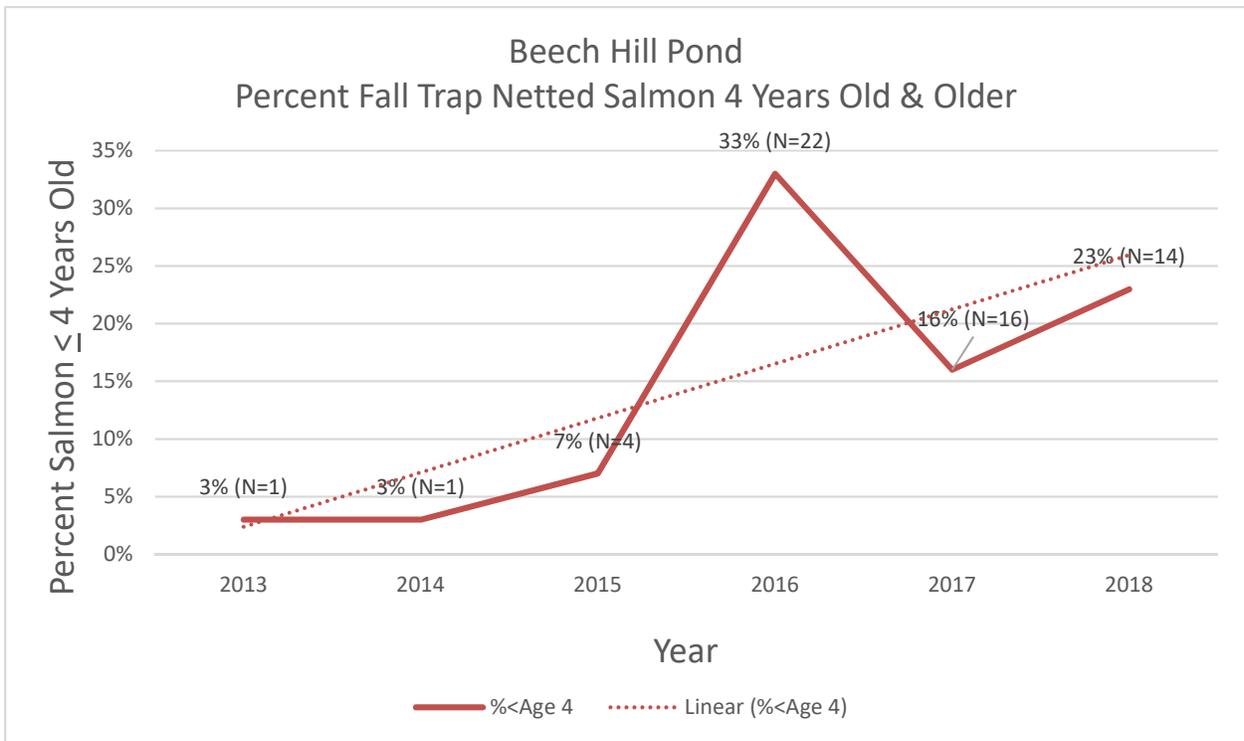


Figure 3. Beech Hill Pond Percentage of Fall Trap netted Landlocked Salmon Age IV+ and Older

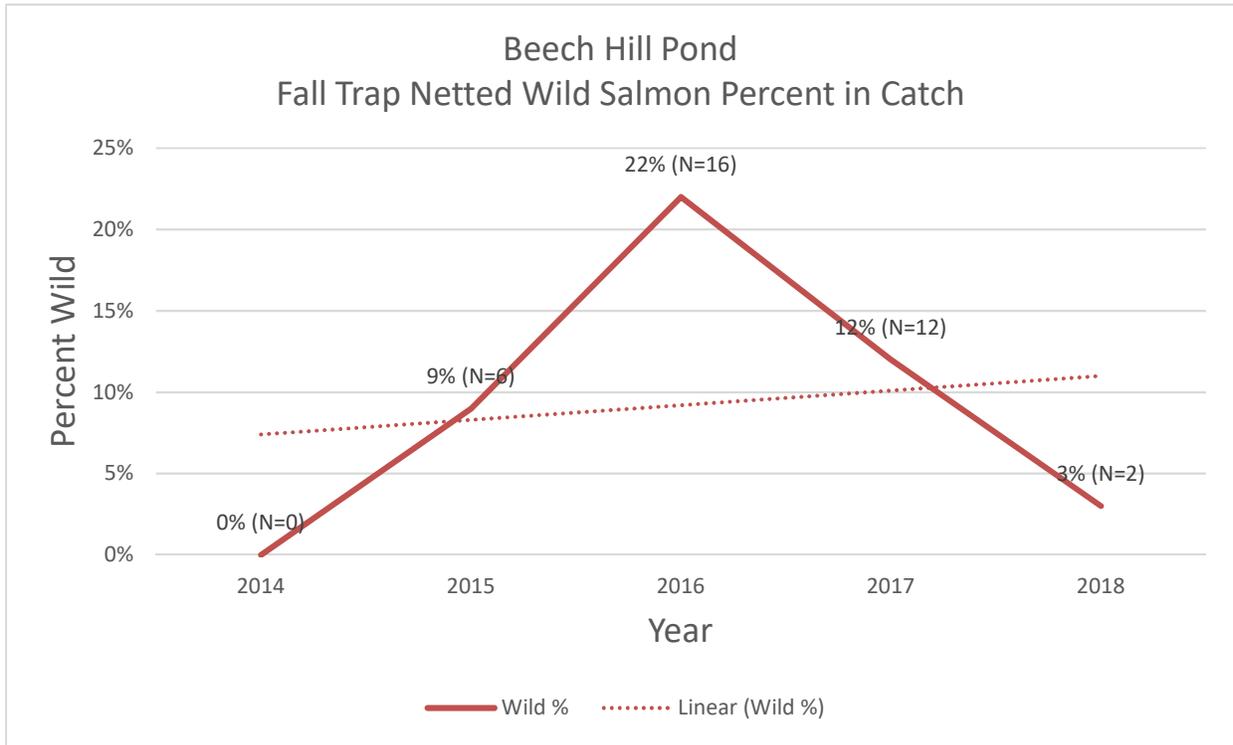


Figure 4. Beech Hill Pond Percentage of Wild Landlocked Salmon in Fall Trap Net Catch.

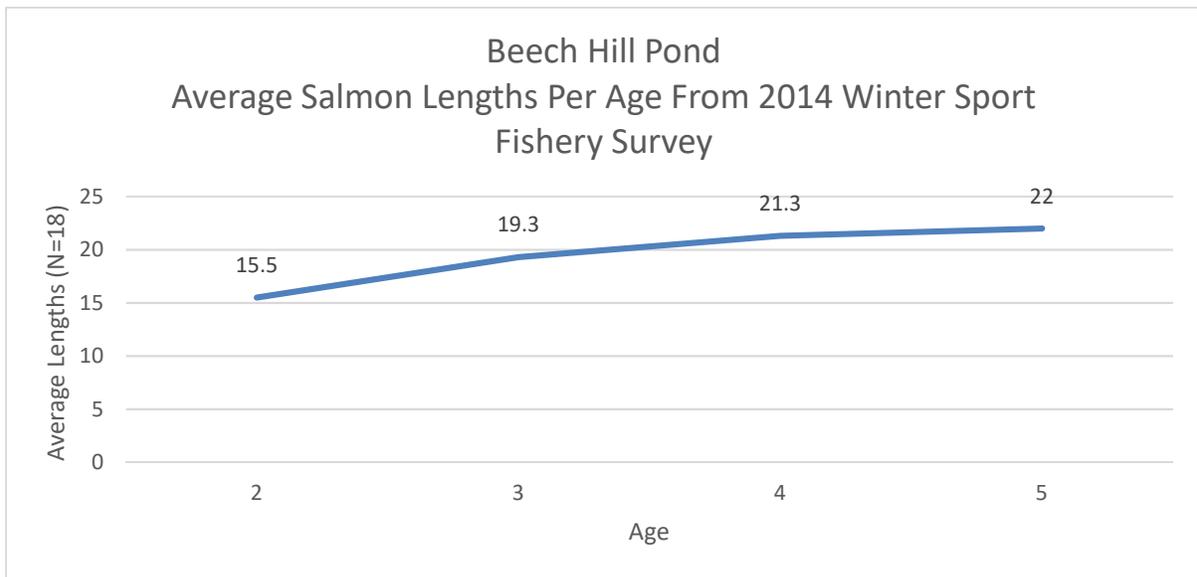


Figure 5. Beech Hill Pond Mean Length per Age of Landlocked Salmon 2014 Winter Sport Fishery Survey.

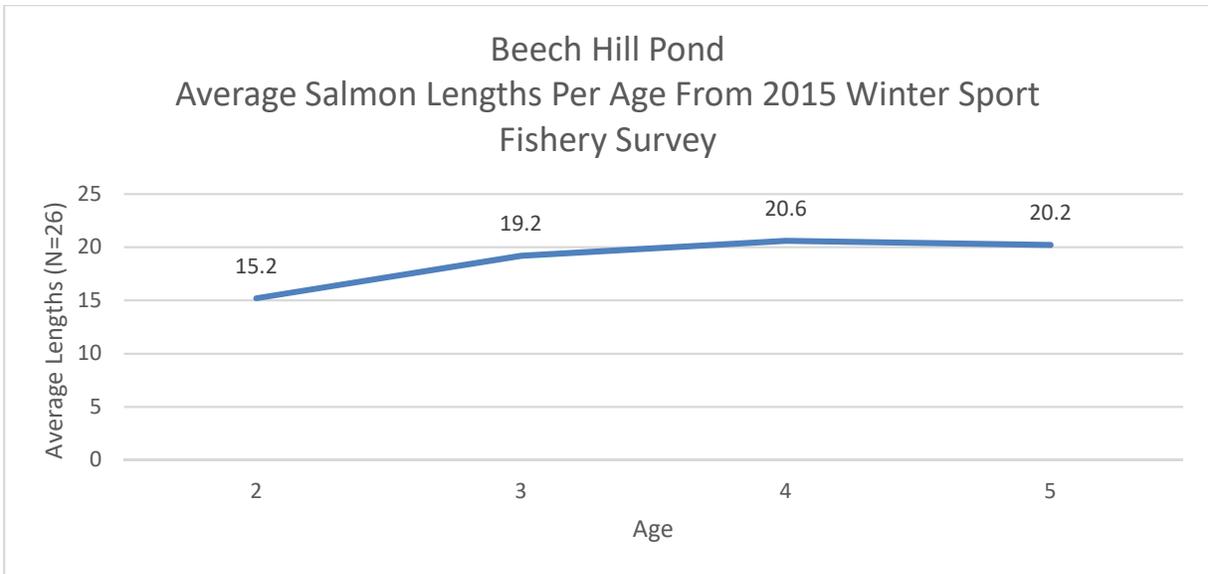


Figure 6. Beech Hill Pond Mean Lengths of Landlocked Salmon per Age 2015 Winter Sport Fishery Survey.

Lake Trout:

The increased mean length and condition of Lake Trout in the fall trap netting samples between 2012 and 2017 (Figures 7. and 8.) are likely the results of an overall increase in the smelt forage compared to prior years, due to large scale smelt egg planting by Department biologists that occurred every spring from 2008 to 2014. Currently, smelt eggs plantings are being done on a limited every other year or every two-year basis, depending on need, supply, and priorities set for other waters. The decrease in Lake Trout condition in the 2018 fall trap netting sample is likely due to an increase in the population and the subsequent decrease in the Smelt population.

The increased catch of wild Lake Trout on their spawning shoals in trap nets in 2009 (see Figure 9.), lead to a regulation change that increased the bag limit from 6 fish to no size or bag limit below 23 inches starting in January 2013. However, due to increased harvest following messaging by regional biologists to decrease the population starting in the winter of 2010, coupled with the winter ice fishing derby cash prize incentives; wild Lake Trout numbers decreased and were under control by the fall of 2012. By the fall of 2014 the wild Lake Trout catch rate had bottomed out at 0.89 fish/trap net day and a subsequent catch of 1.10 fish/trap net day in 2015. Due to these low catches of wild Lake Trout on fall spawning shoals, regulations returned to a 2-fish bag limit starting January 1, 2016. In the falls of 2016 and 2017 numbers of spawning Lake Trout increased to 5.9 and 10.0 lake trout/trap net day, respectfully. These catch increases will likely spur a proposal to consider increasing the bag limit under 23 inches in the future. The Lake Trout fall trap net catch rate in 2018 fell to .71 lake trout/trap net day, but this was seen as an anomaly, due to net malfunction in the first week of Lake Trout sampling.

The mean winter length (Figure 10.) and condition (Fulton’s K) of Lake Trout (Figure 11.) between 2012 and 2015 improved dramatically due to an increase in the overall smelt population and a subsequent

increase in the growth rate. The increase in the forage base was, as stated above, due to Department smelt egg plantings that occurred between 2008 and 2014, as well as a population reduction caused by the 6-Lake Trout bag limit, and the Department partnering with ice fishing derby organizers giving out cash incentives for large catches of smaller Lake Trout. In 2017 the mean length of Lake Trout in the fall trap netting decreased to 18.2 inches, signaling a possible increase in the population. However, the overall mean condition factor remained high. In the winter of 2018 mean length and condition of Lake Trout fell (see Figures 10. & 11.) to due and up-swing in the population.

The declining catch rate of Lake Trout in the winter sport fishery surveys from 2012 to 2015 (See Figure 12) was due to a liberalized bag limit and increased harvest, especially in the winter season and directly attributable to harvest incentives of winter fishing derbies.

A no-kill slot limit from 23 to 33 inches was put in place starting on January 1, 2014 to increase the number of larger Lake Trout.

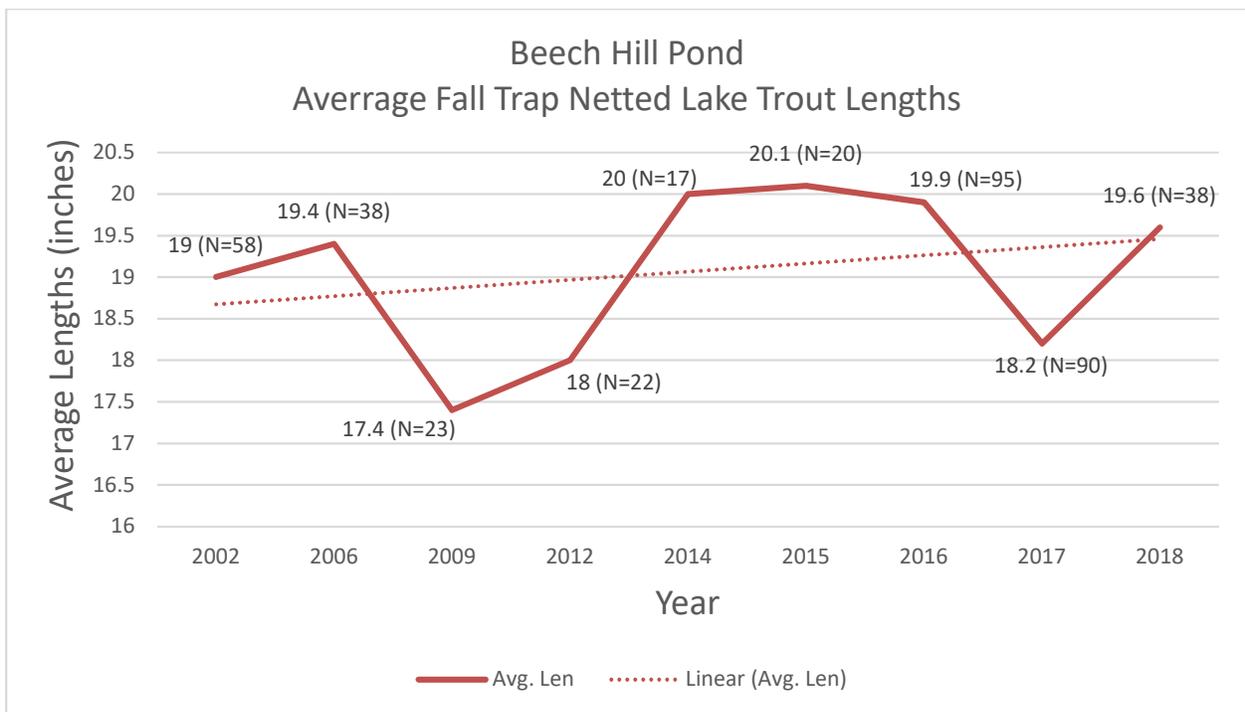


Figure 7. Beech Hill Pond Fall Trap Netting Mean Lake Trout Lengths.

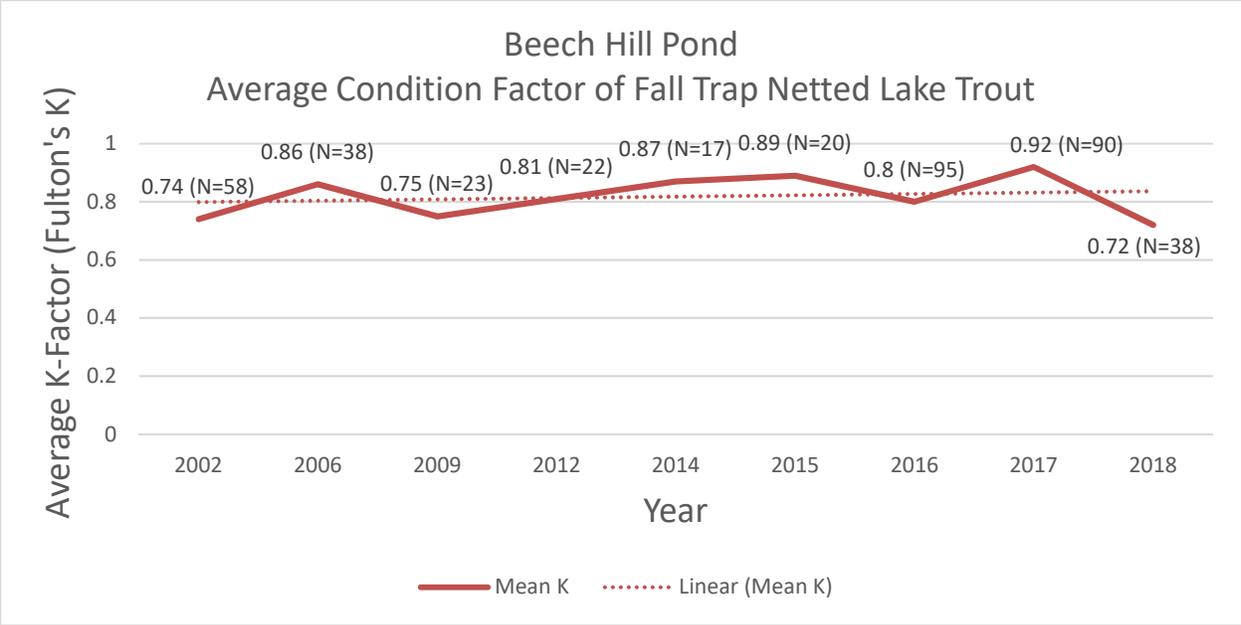


Figure 8. Beech Hill Pond Fall Trap Netting Mean Lake Trout Condition Factor.

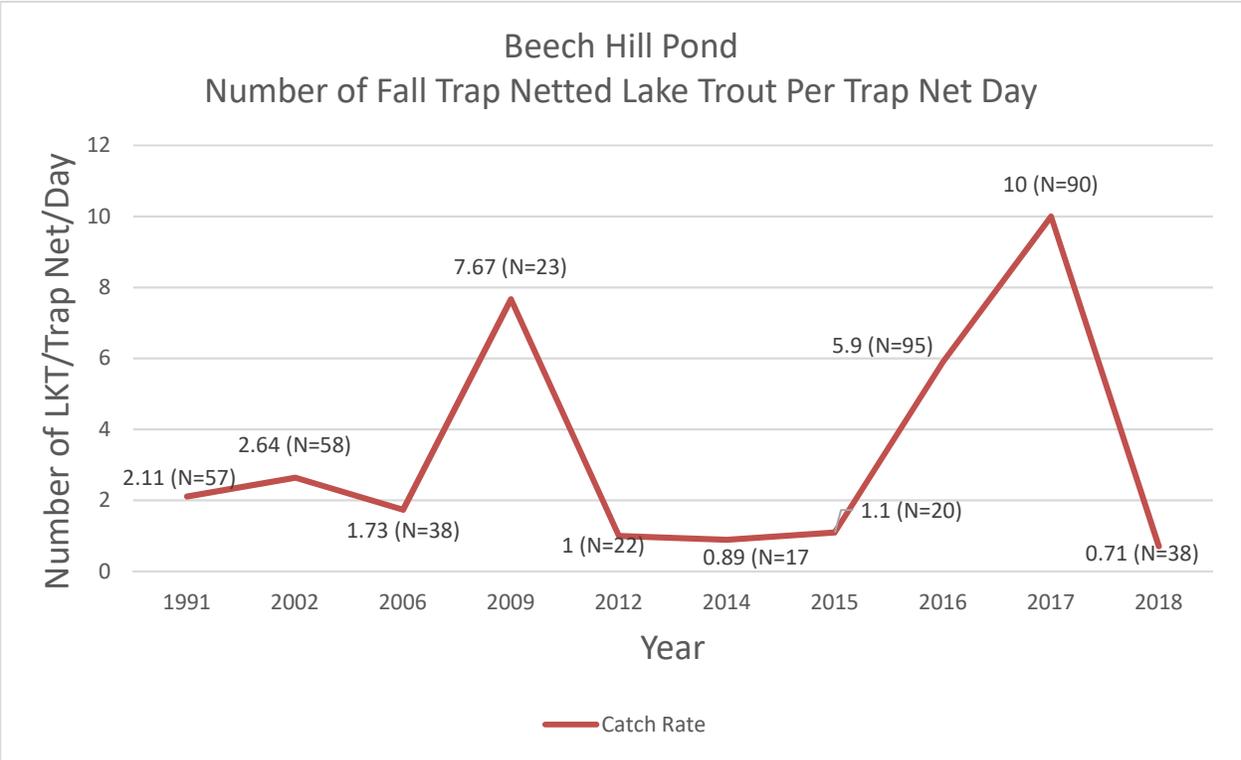


Figure 9. Beech Hill Pond Fall Trap Netting Lake Trout Catch Rate.

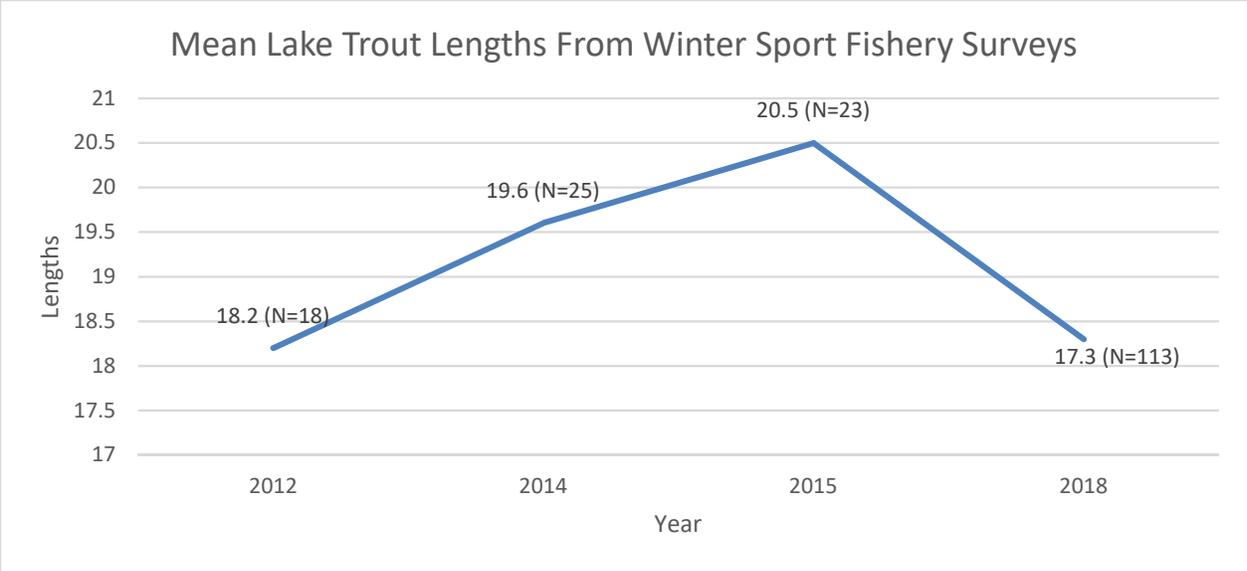


Figure 10. Beech Hill Pond Mean Lake Trout Lengths Winter Sport Fishery Surveys.

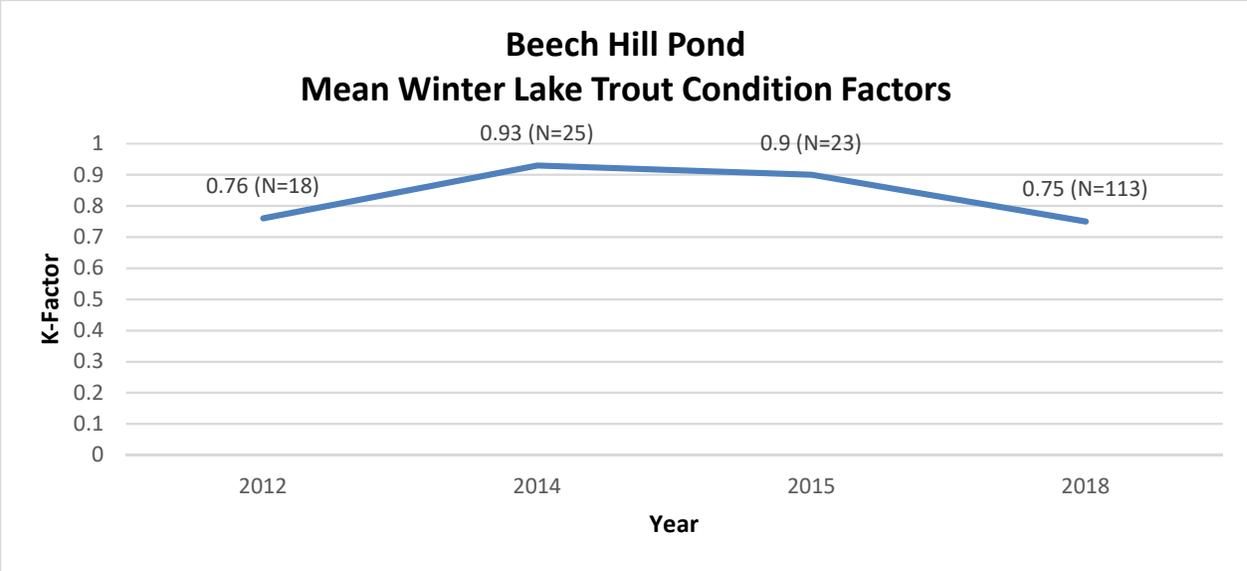


Figure 11. Beech Hill Pond Mean Lake Trout Winter Condition Factors.

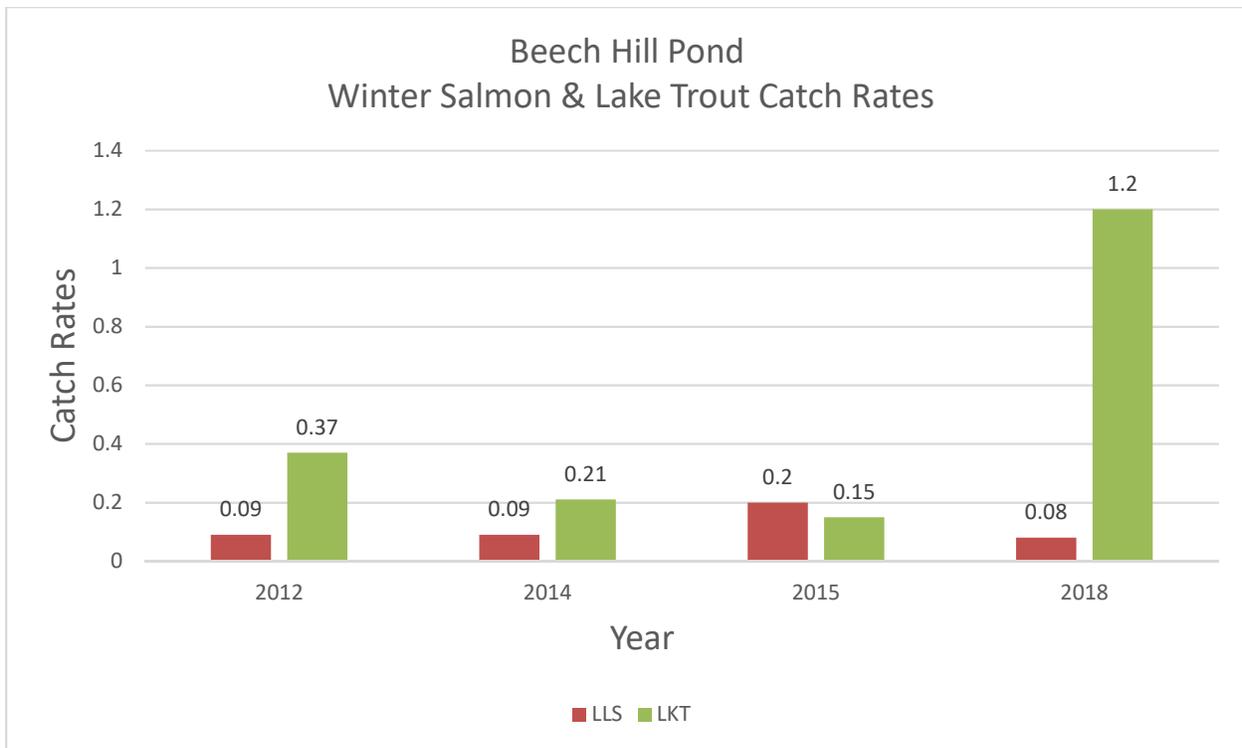


Figure 12. Beech Hill Pond Winter Sport Fishery Catch Rates for Lake Trout and Landlocked Salmon.

Angler Effort & Estimates of Economic Contribution:

The 2015 winter estimate of 715 angler days was lower than the 1995 and 1996 estimate. A contributing factor may have been the severe winter conditions in 2015 when angler access and movement to and around the pond was limited by deep snow and cold temperatures. The winter use of anglers/acre for the years of 1995, 1996, 2000 and 2015 were 0.72, 1.00, 0.45 and 0.53 respectively. These estimated angler/acre estimates represent moderate to high use on per acre basis. The 2015 open-water estimate of 622 angler days is a decrease from the point estimates from the years of 1995, 1996 and 2000. A colder spring and inhospitable spring fishing conditions may have contributed to this apparent reduction. The open-water use estimates for the years of 1995, 1996, 2000, and 2015 were 0.89, 0.65, 1.02, and 0.46 anglers/acre respectively and are overall higher than the winter use but still represent moderate to high use. While recent use estimates appear to be lower than some previous samples, a trend observed elsewhere in the state (Wood, 2017), Beech Hill Pond was among the most heavily used waters sampled in Hancock County in 2015.

Estimates of money spent by anglers were calculated to derive a monetary value of the winter and open-water fisheries values. Winter and open-water fishing values for the years 1995, 1996, and 2000 were estimated using \$39/trip (Boyle et al 1999). For 2015 winter and open-water seasons, a value of \$47/trip was used as the total angler days are multiplied by the average amount spent per trip. See Table 1 below for estimates of angler use and money spent per season. It is possible that during high

use years, estimates of winter and open-water angling could generate nearly \$100,000 annually to the local economy.

Table 1.

Water	Year, Season	Point Estimate	Range	Anglers per acre	Potential Revenue Range	Point Estimate Potential Revenue
Beech Hill	2000, Ice	612 Anglers	259-965	0.45	\$10,101 - \$37,635	\$23,868
Beech Hill	2015, Ice	715 Anglers	540-890	0.53	\$25,380 - \$41,830	\$33,605
Beech Hill	1995, Open Water	1209 Anglers	871-1547	0.89	\$33,969 - \$60,333	\$47,151
Beech Hill	1996, Open Water	880 Anglers	644-1116	0.65	\$25,116 - \$43,524	\$34,320
Beech Hill	2000, Open Water	1374 Anglers	933-1816	1.02	\$36,387 - \$70,824	\$53,586
Beech Hill	2015, Open Water	622 Anglers	432-812	0.46	\$20,304 - \$38,164	\$29,234

RECOMMENDATIONS

The current Beech Hill Pond fisheries focus angler group that is made up of area anglers, guides, lakeside camp and home owners as well as local business leaders was formed to identify angler desires regarding fishing opportunities, fish habitat protection, and population enhancement. The following are the goals and objectives for gamefish and smelts:

Landlocked Salmon

- Strive to maintain mean length of 18 inches or above in both the open-water and ice fishing seasons
- Strive to maintain a catch rate range between 0.20 and 0.25 fish/angler/day both in the open-water and ice fishing seasons
- Strive to maintain 0.90 and above Fulton’s K body condition
- Strive to maintain that age IV fish represent 10% of open-water and ice fishing catch
- Strive to maintain that Age V fish represent 5% of the open-water and ice fishing catch
- Maintain a percent older age fish component (fish over 4 years of age) in fall trap netting catch between 15% and 20%

Lake Trout

- Strive to maintain integrity of spawning shoal
- Strive to maintain a mean length of 21 inches or above in both the open-water and ice fishing seasons

- Strive to maintain a catch rate range between 0.20 and 0.30 fish/angler/day in both the open-water and ice fishing seasons
- Strive to maintain a 0.85 and above Fulton's K body condition
- Strive to maintain 15% of the spawning population above 23 inches
- Strive to maintain 10% of the spawning population above 25 inches
- Strive to maintain 5% of the spawning population above 30 inches
- Strive to maintain 3% of the spawning population above 33 inches

Brook Trout

- Strive to maintain Brook Trout pond tributary rearing and adult habitat
- Strive to maintain Brook Trout pond tributary connectivity by installing and maintaining 1.2 times the bankfull width stream crossing structures for all Brook Trout stream roads

Smallmouth Bass

- Maintain current S-13, no size or bag limit regulation to help suppress fish numbers and interspecific competition for forage

Chain Pickerel

- Help suppress this uncommon invasive population by harvesting all pickerel caught

Rainbow Smelt

- Strive to maintain population at high level to optimize forage for Lake Trout and Landlocked Salmon

In keeping with the above angler goals and objectives we recommend the following:

- Stocking Landlocked Salmon at rates between 0.25 and 0.30 fish/surface acre
- Put regulations in place that limit winter Landlocked Salmon harvest
- Put regulations in place that will maintain wild Lake Trout population to meet above angler catch rate, length, and body condition goals
- Enhance tributary habitat and connectivity for wild Brook Trout production
- Maintain S-13 bass regulation to help reduce interspecific competition
- Protect smelt population and reproduction with restrictive regulations over and above general law

REFERENCES

Boyle, K et al. 1999. Economic Study of Maine Natural Resources, University of Maine, Orono. Orono, Me

U.S. Fish & Wildlife Service. 2010. Study of the Economic Impact of Natural Resources in the US 2010.

Wood, J. 2017. Observations of Angler Use in Northern Maine Lakes, 1996-2016. Maine Department of Inland Fisheries and Wildlife.

ACKNOWLEDGEMENTS

Sincere thanks to the following anglers who volunteered their help working with biologists on Beech Hill Pond: Rob & Christine Norwood, Alex Wade, Matt Gillie, Rob Dunnett and Matt Whitegiver as well as the members of the Beech Hill Pond Fisheries Focus Group for their guidance on the wishes of the anglers. Fishery Biologists Joe Overlock, Colin Shankland, and Jake Scoville were a tremendous help in collecting winter and fall fish data.