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Sebec Lake Fishery Management

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Summary

Sebec Lake provides important recreational fishing opportunities for landlocked salmon, lake trout, smallmouth bass, and pickerel in southern Piscataquis County. Anglers primarily target lake trout in the winter while salmon and smallmouth bass dominate the summer catch. The lake is one of Maine's original landlocked salmon waters. Lake trout were present in low abundance and recorded in the 1954 creel survey prior to the stocking program which began in 1961. Sebec Lake has a reputation for slow growing wild salmon; however, there are some larger, older fish in the catch. There is a trophy component to the lake trout fishery which is supported by annual stocking. Lake trout exceeding 20 lbs. have been documented at Sebec Lake and fish over 10 lbs. are reported frequently, making this a highly desirable fishery and important to the local economy, especially in the winter.

It was determined that salmon were having difficulty passing the falls on Wilson Stream during their annual fall spawning migration. Flow studies and direct observations led to the development of a new water management plan for Sebec Lake and Wilson Pond that would provide the necessary stream flows and lake elevations to allow salmon passage into the primary spawning tributary. Since the plan was implemented in 1993, densities of young salmon in the nursery habitat have stabilized and catch rates for adult salmon in the lake have improved.

The cold water temperatures in this large oligotrophic lake limit the growth of smallmouth bass. In some years, young smallmouth bass do not reach a sufficient length to survive the long winters and the associated starvation period. We also modeled mortality related to low water temperatures during the nesting phase of spawning.

A comprehensive fishery management plan was developed by the Maine Department of Inland Fisheries and Wildlife and a group of stakeholders representing the interests of Sebec Lake anglers. The plan sets overarching goals to maintain and enhance water quality, habitat, access, and the current summer and winter fisheries. The plan sets specific, measurable objectives and lists the problems and strategies associated with these objectives. This plan will be used to guide the management of the fisheries resources of Sebec Lake in the future.

Abstract

Sebec Lake is a large oligotrophic lake in northwestern Maine with principal fisheries for landlocked salmon (*Salmo salar*), lake trout (*Salvelinus namaycush*), smallmouth bass (*Micropterus dolomieu*), and white perch (*Morone americana*). The first creel survey of Sebec Lake occurred in 1954. Since then, the Maine Department of Inland Fisheries and Wildlife (MDIFW) has conducted numerous studies to evaluate the fisheries. Summer catch rates for salmon averaged 0.060 legal fish/hour, while winter catch rates for salmon averaged 0.013 legal fish/hour during the study. The mean catch rate for legal lake trout was 0.050 in the winter and 0.042 in the summer. Smallmouth bass were rarely recorded in the winter, but the mean catch rate in the summer was 0.695 legal fish/hour.

Annual angler use ranged from 9,558 angler days in 1988 to a low of 6,146 angler days in 1997. The estimated harvest was well within the established goals based on the morphoedaphic index. Over 600 salmon and lake trout stomachs were examined during the winter clerk surveys on Sebec Lake. Rainbow smelt (*Osmerus mordax*) and white perch were the most important food items for both game species. Natural waterfalls were obstructions to the fall migration of spawning salmon. Excessive stream flows severely reduced passage and hence reproduction in several years during the study. A new water management plan was developed and implemented in 1993 resulting in higher catch rates for adult salmon.

The mean spawning date for smallmouth bass was June 10th at Sebec Lake. A bass model developed by MDIFW estimated the mean YOY smallmouth bass length at 85mm while observed lengths were 25% smaller than predicted lengths. Based on the observed lengths, YOY smallmouth bass exhibited over 50% mortality in most years because they had not reached a critical length by the onset of the winter starvation period.

Keywords: LLS, LKT, SMB, CATCH RATES, GROWTH RATES, NATURAL REPRODUCTION, USE ESTIMATES, HARVEST ESTIMATES, WATER MANAGEMENT, PSD, RSD, MORTALITY

Introduction

Sebec Lake is perhaps best known as one of Maine's original landlocked salmon waters (Warner and Havey 1985). Landlocked salmon are considered native in just four river basins in Maine, including the Penobscot/Piscataquis drainage in Piscataquis County. Sebec Lake has a rich cultural history including sporting camps, steam-powered boats, spool and lumber mills, and a hatchery. The lake is as important today for its recreational values including freshwater fishing and boating. There is a power generating facility on the outlet and most of the east basin is developed with homes and seasonal camps. The history of recreational fishing dates back to the late 1800's with the opening of the Lake House in Willimantic, which later became known as Packard's Camps (Packard 1975). The fishing was primarily for landlocked salmon, but smallmouth bass and white perch were favored by some guests. Lake trout were occasionally caught in Sebec Lake, even prior to the stocking program that began in earnest in 1961. These fish were likely dropping downstream from wild lake trout waters upstream of Sebec Lake. Today, lake trout are an important principal fishery in Sebec Lake.

The Maine Department of Inland Fisheries and Wildlife (MDIFW) has spent a considerable amount of effort to evaluate Sebec Lake over the past 50 years because of its importance as a large, multi-species fishery in southern Piscataquis County. This report provides a comprehensive summary of the information collected to date.

Study Area

Sebec Lake is a 6,803-acre oligotrophic lake situated in the towns of Dover-Foxcroft, Sebec, Bowerbank, and Willimantic in southern Piscataquis County, Maine. Sebec Lake has both warmwater and cold water fish assemblages. The 326 mile^2 drainage area extends north to the town of Beaver Cove. It also includes Bowdoin College Grant West, Bowdoin College Grant East, Greenville, T7 R9 WELS, Elliotsville, Monson, Guilford, Bowerbank, Dover-Foxcroft, Sebec, and Barnard. Salmon are native to Sebec Lake but were also stocked in the early 1900's through the 1950's (Table 1). In fact, a fish hatchery was operated around the turn of the century on Ship Pond Stream. It is unclear whether the salmon produced at this hatchery originated exclusively from Sebec Lake or if other species were raised here as well. Other species present in Sebec Lake include: lake trout, white perch, smallmouth bass, rainbow smelt, three-spine stickleback, banded killifish, brook trout, brown bullhead, creek chub, common shiner, burbot, American eel, fallfish, golden shiner, northern redbelly dace, chain pickerel, pumpkinseed sunfish, white sucker, and yellow perch. While brook trout, burbot, and yellow perch are present, they offer very limited fishing opportunity and were rarely observed during creel surveys.

The lake has an upper and lower basin, often referred to as the "Big Lake" and the "Lower Lake" which are separated by "The Narrows". The upper basin is lightly developed, primarily with camps in Tim's Cove and in the town of Willimantic at Packard's Camps. Peaks-Kenny State Park is also located in this basin in the town of Dover-Foxcroft. The park has a small beach and campsites, but no boat launch facility. The upper basin is deep with a maximum depth of 155 feet. The shoreline is very rocky and provides excellent habitat for smallmouth bass. The lower basin is highly developed with permanent homes and seasonal camps and the associated docks

and retainer walls. This basin is not as deep. It has a maximum depth of 86 feet. Water quality is excellent in both basins. The lake typically stratifies in late spring and has sufficient oxygen at all depths to maintain salmonids through the summer and early fall periods.

There are 4 boat access sites on Sebec Lake. The town-owned boat launch at Greeley's Landing in Dover-Foxcroft is the primary access site. There are two well-maintained ramps at Greeley's Landing and one older ramp which is not maintained, but occasionally used. The town installs floating docks at this site and there is ample parking most times of the year. There is also a commercial marina at this site which is open seasonally. The towns of Sebec and Bowerbank also have constructed boat access sites but with much less capacity. There is only one boat access site on the upper basin and it is located at Packard's Camps. The launch is on private property but the public can use the ramp after checking with the owner.

In addition to Peaks-Kenny State Park, there are three other parcels of property held by public entities for conservation (Figure 1). The MDIFW owns a 6-acre parcel at Earley's Falls. The property is located on the south side of the falls and extends downstream. This site is a popular fishing and site-seeing location. In particular, landlocked salmon can be observed jumping the falls in the month of September and early October (Figure 2). The Maine Coast Heritage Trust donated an easement on a 25-acre parcel to the MDIFW in 1997. The property is owned by the town of Bowerbank and was donated by the Hartley family and it is located in Granny Cross Cove with 2,300 feet of water frontage on Sebec Lake. The conservation easement conditions include managing the property to assure the natural and undeveloped condition and provide low-impact outdoor recreation on the premises. The town of Willimantic owns a parcel on Deer Point and a Sebec Lake landowner gifted an abutting parcel to the MDIFW in 1996. This property is also to be maintained in its undeveloped condition.

There are two major inlets to Sebec Lake and both are located in the upper basin. Wilson Stream flows south from Wilson Pond in Greenville and enters Sebec Lake in Willimantic. There is a water storage dam and power generating facility on Wilson Stream at the outlet of Wilson Pond. However, the remainder of the watershed is mostly unregulated which provides highly variable annual flows. There are many smaller tributaries to Wilson Stream. These tributaries and the main stem provide important spawning and nursery habitat for wild landlocked salmon from Sebec Lake. There are also several waterfalls on Wilson Stream which impact fish movement. Tobey Falls, located about 4.5 miles upstream of Sebec Lake, is a barrier to upstream movement of salmonids. Only American eels have successfully negotiated Tobey Falls. Earley's Falls is located at the confluence of Wilson Stream and Sebec Lake. There are actually two sets of falls at this location and both are obstacles to fish passage at high flows. The lower set of falls has eliminated all salmon passage during the spawning run in some wet years.

The other major tributary to Sebec Lake is Ship Pond Stream which drains several lakes including Onawa Lake, Big Benson Pond, and Long Pond. This tributary enters Sebec Lake in Buck's Cove in Willimantic. This is another large and unregulated drainage that is very flashy. Similar to Wilson Stream, Ship Pond Stream also has several waterfalls which are obstacles to fish passage. A small set of falls just upstream of Sebec Lake hinders movement but smallmouth bass and salmon are established upstream. Cowyard Falls is located approximately 2.3 miles upstream of Sebec Lake and is a serious impediment to fish passage. Smallmouth bass have not

successfully passed above these falls. There are wild salmon established above and below the falls. Marlborough Packard (personal comm.) observed adult salmon jumping and passing Cowyard Falls in the past but passage upstream is very difficult and likely only occurs sporadically due to the height of the falls. There is a modicum of salmon nursery habitat in Ship Pond Stream, primarily in the Cowyard Falls area. The downstream reaches of this stream are meandering deadwaters which are inhabited primarily by smallmouth bass.

There are many smaller tributaries to Sebec Lake but none offer significant wild salmon production. Smelt runs have been observed in Wilson Stream below Earley's Falls and just one other smaller brook.

There is a FERC-exempt hydro facility on the outlet of Sebec Lake. The dam is 15 feet high with a generating capacity of 867 KW. Prior to 2005, the project was operated as a typical water storage and generation facility. In 2005, the project operation was changed to run-of-river. Water management will be discussed in greater detail later in this document. There is no operating fishway in the outlet dam which flows into the Sebec River. A downstream opening near the dam intake allows fish to drop downstream but upstream passage is not possible. The Sebec River below Sebec Dam is predominantly deadwater habitat. There is a small amount of salmon spawning and nursery habitat just below the dam and further downstream at an area known as "The Rips" however, any salmon production that occurs here will not contribute to the lake population. This dam and the Milo Dam provide important barriers to invasive species such as northern pike which are present in the lower Penobscot drainage. In 2011, the Maine Legislature passed LD 134: An Act to Protect Native Landlocked Salmon Fisheries from Invasive Species (Appendix I). This law specifically prohibits the construction of fish passage devices in the Sebec and Milo Dams to prevent northern pike from gaining access to this lake. Adult salmon that drop down from Sebec Lake are occasionally caught in the Sebec River. Smallmouth bass and stocked brook trout are frequently caught in the Sebec River.

Methods

Sebec Lake has been the subject of many fisheries studies in the past 60 years. Sebec Lake was first inventoried in 1950 by the Maine Department of Inland Fish and Game. The original survey included basic water quality measurements, gillnetting, and bathymetry studies. Since then, various surveys have been conducted including summer and winter clerk creel surveys, water quality analysis, gillnetting, trapnetting, food habits studies, habitat surveys in all tributaries, electrofishing, experimental angling, trawling, hydroacoustics, spring smolt trapping, summer surface temperature profiles, and many hours of direct observation and flow analysis during the fall spawning run of salmon at Wilson Stream.

The first summer clerk survey was conducted in 1954 (Fenderson 1955). This survey was conducted in the spring at the major access locations on the weekends and holidays. The purpose of the survey was to determine some measure of angler use, catch per unit effort, and gear selection. Length, weight, and scale samples were also taken for age and growth analysis of lake trout, landlocked salmon, and brook trout.

More recently, summer clerk surveys were conducted on Sebec Lake in the following years: 1988, 1989 to 1992, 1994, 1995, 1997, 1998, and 2000 (Table 2). Clerk surveys were conducted on weekends from May through July at Greeley's Landing and Packard's Camps. Back trip and completed angler trip data were collected during these surveys. Fish were also measured, weighed, and salmon scales were collected for aging.

Winter clerk surveys were conducted at Sebec Lake in the following years: 1968, 1969, 1970, 1974, 1975, 1977-2001, 2004, 2006, 2008, and 2011 (Table 3). Sample sizes of angler catch data prior to 1980 were small and have not been included in this report. Clerks visited the lake primarily on weekends when angler use was the highest. Back trip and completed angler trip data were collected during these surveys. Fish were also measured, weighed, and salmon scales were collected for aging.

Summer and winter angler use estimates were calculated based on aerial angler counts in the following years: 1988, 1990, 1994, 1997, and 2000 (Table 4). The surveys were conducted using a stratified design in which two weekdays and one weekend day were selected for sampling in the summer, and one weekday and one weekend day in the winter. Annual harvest estimates were calculated using use estimates and concurrent creel survey data.

Water quality data (e.g. dissolved oxygen, pH, and temperature profiles) were collected during the following years: 1950, 1963, 1971, 1972, 1973, 1974, 1975, and 1995. The Maine Department of Environmental Protection collects water quality data on a number of Maine lakes including Sebec Lake through the Volunteer Lake Monitoring Program (Figure 3).

Stomachs were routinely collected from harvested lake trout and salmon during winter creel surveys. The stomachs were removed and frozen to be evaluated in the lab. Food items were identified, enumerated, and measured using volumetric displacement. In some cases, lengths were measured on food items such as smelt, white perch, and three-spine sticklebacks.

MDIFW fisheries staff periodically used gillnetting to assess lake trout growth and potential natural reproduction. In most years gillnets were set overnight, however, in 1980-1982 short daytime sets were made during October in an attempt to locate possible lake trout spawning activity. Gillnetting was performed in 1967, 1970, 1972, 1976 -1983, 1989, 1992, 1996, 2002, and 2005 using 200' and 500' gillnets with variable mesh size.

All of the tributaries to Sebec Lake were electrofished in 1988 and 1989 to determine presence or absence of landlocked salmon parr and fry. All tributaries were also examined for evidence of smelt runs in the spring. After it was determined which streams contributed to the natural reproduction of wild salmon for the lake, index sites were set up on each and more intensive electrofishing and habitat surveys were conducted. Stream surveys included measuring total channel widths and wetted widths every 200 feet. Nursery habitat was characterized and graded into low, medium, and high quality categories. These classifications were verified with population estimates in each stream section representing each of the quality categories. We collected electrofishing data on the following streams and in the following years: Wilson Stream: 1990-1999, 2003, and 2006. Davis Stream: 1990-1999 and 2006. Monson Stream: 1991-1999.

Trapnetting was conducted on Sebec Lake to assess landlocked salmon growth and movement patterns into the spawning tributaries. A single trapnet was set at Greeley's Landing to capture hatchery salmon returning to the stocking site in October of 1993, 1994, and 1995. Schnabel population estimates were calculated using mark and recapture techniques. Trapnets were set in Wilson Stream in the fall of 1976, 1989, 1992, 1997, and 1998 to capture wild salmon moving into the spawning tributaries. A single trapnet was set at the mouth of Ship Pond Stream in the fall of 1989.

Samples of smallmouth bass were experimentally angled in 1991 and 1999 to provide baseline data on age and length distribution. Hobotemp recording thermometers were deployed during the summer months in 1994-2000 in approximately 6 feet of water to evaluate smallmouth growth and survival using a model developed by MDIFW (unpublished). The model is a compilation of temperature related equations developed by Shuter et al. (1980) including spawning date estimates, dates that fry rise from the nest, fry growth rates, and the number of days in which growth occurs before entering the starvation period. The model also estimates temperature related mortality on eggs and fry. Growth equations make the assumption that food availability is not limited. Shoreline electrofishing for young-of-the-year smallmouth bass was conducted in the fall of 1998 to ground-truth the model. The electrofishing occurred after the surface water temperature was below 50^{o}F and therefore, young-of–the-year growth should have concluded for the year.

Rainbow smelt abundance was evaluated using hydroacoustic technology in 2001 and 2004. Ten transects were established (Figure 4) to sample all depths in both the upper and lower basins. A Biosonics DT-200 echosounder was used to estimate forage fish densities. The transducer was mounted on a Biosonics Biofin and towed at a speed of 5 mph. We then conducted stratified trawling to estimate species composition of the forage fish. One or more trawls at depths of 10 feet and 50 feet (i.e. above and below the thermocline) were made with a mid-water trawl with an opening of 10 feet. Trawl speeds were 1.5 – 2.0 mph for 30 minutes. Fish samples were separated by species and age class and enumerated. A subsample was measured and weighed.

In the spring of 1992, several attempts were made to assess smolt production in Wilson Stream and its tributaries. A smolt trap was designed and fabricated for use in Monson Stream. The trap was installed below the bridge crossing on the Willimantic Road and fished from May 6, 1992 to July 31, 1992. Trapnets were set in Davis Stream and the main stem of Wilson Stream during the same period. This effort was not successful due to high flows and difficulty capturing significant numbers of young salmon.

Flow stations were set up on Davis Stream, Monson Stream, and Wilson Stream in 1991, 1992, and 1998 to gage and estimate flows at time of fish passage at Earley's Falls. The gage sites were temporary and therefore the gages were recalibrated each year. The streams were divided into cells 5 to 10 feet wide depending on the total width of the stream section. Depth and velocity were measured at the center of each cell. The total stream flow in cubic feet per second was determined by summing the values from each cell. In the fall, flows were recorded on dates when fish were present and whether they were observed passing or not passing the falls. This information was then used to manipulate discharge from the upstream dam to optimize passage.

Sebec Lake has been stocked with brook trout, landlocked salmon, and lake trout (Tables 5-6). A hatchery was operated on Ship Pond Stream around the turn of the century. Records from this federal hatchery are scarce and nondescript. It is unclear whether this hatchery collected eggs from Sebec Lake fish and then distributed fish to other federal hatcheries along the rail system, or if eggs and fish from other sources were brought into the Ship Pond Stream hatchery. There were many hatcheries throughout Maine during this period and most were associated with the railroad. Partial records from the Federal stocking program indicate at least 24,000 salmon were stocked in Sebec Lake between 1909 and 1917. More detailed stocking information is available from State hatcheries beginning in the 1950s.

Results and Discussion

The fishery at Sebec Lake has very distinct seasonal differences. The summer catch is heavily skewed toward landlocked salmon and bass, while the winter fishery is predominantly for lake trout.

The Salmon Fishery

During the survey period of 1988-2000, summer catch rates for salmon ranged from 0.034 to 0.130 legal fish/hour (Figure 5). The mean catch rate over this period was 0.060 legal fish/hour, which is slightly lower than the statewide average of 0.072 legals/hour (Boucher 2006). By comparison, winter catch rates at Sebec Lake averaged just 0.013 legal fish/hour from 1980-2011. It is interesting to note however, that since the revised water management plan which provided flows and lake elevations more conducive for salmon passage at Earley's Falls went into effect in the mid-1990s, winter catch rates for salmon have improved (Table 7). From 1980 - 1991 the mean catch rate for salmon in the winter was 0.005 legal fish/hour. During the period of 1992 - 1997 there were some hatchery salmon in the system. These fish were meant to augment the salmon fishery while the wild fishery recovered after the new water management plan went into action. During this period, winter salmon catch rates increased to 0.025 legal fish/hour. By 1998 the hatchery fish had passed through the fishery and stocking had ceased. Only wild fish were recorded in the catch. From 1998 - 2011, the mean catch rate for salmon in the winter was 0.013 legal fish/hour. Therefore, winter catch rates for wild salmon have more than doubled since the new water management plan was implemented. We have not conducted a formal summer census on Sebec Lake since 2000 due to budgetary constraints; however, favorable anecdotal summer reports from anglers combined with information from the winter clerk surveys indicate that catch rates for salmon are improving at Sebec Lake.

Sample sizes of salmon in the summer were small, reflecting the high rate of voluntary release. For salmon greater than 14 inches in length, the combined summer sample (1988-2000, n = 59) yielded a mean condition factor of 0.81. By comparison, 124 salmon over 14 inches were sampled in the 1954 creel survey with a mean condition factor of 0.89. MDIFW staff recorded lengths on 256 salmon during winter clerk surveys in 1982-2008. Sebec Lake has always had a reputation for smaller, leaner, slower growing salmon (Table 8). In 1955, MDIFG biologists concluded that growth rates for salmon at Sebec Lake were approximately one year behind the statewide averages at the time and didn't enter the fishery (i.e. reach 14 inches) until their fifth year at large. Growth rates for age IV and V salmon have improved since 1954. The mean

length at age for winter caught wild salmon at Sebec Lake was compared to statewide trapnetting data for wild salmon (Table 8) from Boucher and Warner (2006). The trapnetted fish have an extra growing season compared to winter harvested fish at Sebec Lake, and therefore it is reasonable to expect them to be larger at any given age. However, with the exception of age IV/IV+ salmon, all other age classes of wild salmon at Sebec Lake exceed the recent statewide averages. There was and still is a quality component to the salmon fishery, primarily because Sebec Lake still has some older fish in the population. Wild salmon now enter the fishery at age IV+ with most having 2 years of stream life prior to entering the lake. Twenty-eight percent of the wild salmon harvested in the winter from 1982-2008 exceeded 18 inches. While a few larger individual fish were sampled in 1954, the percentage of salmon over 16 inches and over 18 inches was higher in the more recent sampling (Figure 6). Many of the fish observed in the winter were post-spawn adults (mean length and condition factor of 16.6" and 0.76, respectively) and were much leaner than samples collected in the spring or early fall.

The Lake Trout Fishery

The mean summer catch rate for lake trout was 0.042 legal fish/hour from 1988-2000 (Figure 7). The winter catch rate for lake trout was slightly higher at 0.050 legal fish/hour from 1980 -2011 (Figure 8). An 18-inch minimum length limit on lake trout was in effect during the entire study period. A small proportion of the age IV lake trout will enter the winter fishery at Sebec Lake. Ages V and VI comprise over 50% of the harvested lake trout (Figure 9). Fish up to 10 years old are routinely taken each year and the oldest fish recorded during the winter creel surveys was 19 years old.

Lake trout in the 20 lb class have been caught in recent history at Sebec Lake, which has given this water a reputation for producing trophy fish. Since 1980, lake trout harvested in the winter averaged 20.9 inches (Figure 10). Twenty-six percent of the lake trout examined in the winter exceeded 22 inches and the trend has increased over time (Figure 11). Mean winter condition factors have ranged from 0.78 to 0.95 since 1982 (Figure 12), and although mean lengths have increased, condition factors have declined since 1999. This is likely related to the increase in the abundance of wild salmon in the lake since the new water management plan was implemented. Stocking rates for lake trout have been reduced to try to reverse this trend while still maintaining the popular fishery.

Angler Use and Harvest

Seasonal and annual angler use estimates were calculated in 1988, 1990, 1994, 1997, and 2000 (Figure 13). Annual use estimates ranged from a high of 9,558 angler days in 1988 to a low of 6,146 angler days in 1997. Winter use was very steady over the study period, ranging from 2,105 to 2,838 angler days. Harvest was typically skewed in favor of winter anglers. Winter anglers caught an average of 57% of the total annual legal catch of lake trout and removed 71% of the total annual harvest. Summer anglers caught 28% of the total annual legal catch and accounted for 43% of the total annual harvest. Again, this is reflective of a higher tendency toward releasing legal fish in the summer months.

The Morphoedaphic Index (MEI) was developed by Ryder (1974) as a method to compare and evaluate sustainable lake trout harvest in oligotrophic Canadian lakes. The MEI, based on conductivity and mean depth, is an estimate of the potential annual fish production. This method has also been utilized in Maine for similar purposes. The State of Maine lake trout plan suggests that harvest should be limited to 0.45 lbs/acre per year for self-sustaining populations, but could be as high as 1.0 lbs/acre per year for stocked fisheries. Healy (1978) concluded that, in general, 0.50 lbs/acre was excessive for wild lake trout and lower harvest rates were required in order to manage for a high quality fishery. The MEI for Sebec Lake was estimated at 1.6 – 1.7 lbs/acre. The lake trout fishery is supported with hatchery fish; therefore, a slightly higher harvest rate could be sustained. However, it is also desirable to maintain the quality component of the fishery. Annual salmonid harvest at Sebec Lake has ranged from 0.27 to 0.56 lbs/acre over the study period (Figure 14). These rates are not excessive and should be sustainable.

Stomach Analysis

Stomach contents were collected from 491 lake trout and 195 salmon during winter creel surveys at Sebec Lake to evaluate food habits. Smelt was the most important food item, representing 74% of the total volume in salmon stomachs and 50% of the total volume of food examined in the stomachs of lake trout during the sampling period (Figure 15). White perch were also very important as lake trout forage representing nearly 30% of the total volume. By comparison, smelt represented 76% of the total volume of food examined in lake trout stomachs at Moosehead Lake during the same time period. White perch are present in Moosehead Lake but are not abundant and they represented just 2% of the total volume of food found in lake trout stomachs. The total mean volume of food per stomach examined at Sebec Lake was 11.7 cm^3 and just 6.6 cm^3 at Moosehead Lake. At Sebec Lake, the total volume of smelt per stomach examined averaged 5.2 cm^3 and at Moosehead Lake it was 5.0 cm^3. Therefore, young-of-the-year (YOY) and yearling white perch at Sebec Lake provide a good buffer against growth problems for lake trout, especially in times of low smelt abundance. Three-spine sticklebacks are very abundant in Sebec Lake yet they do not appear to be a preferred food item of lake trout. Only 3% of the volume of food was identified as stickleback remains. In general, condition factors improved or were maintained above 0.90 when the mean total food volume exceeded 10.0 cm^3 for the season (Figure 16). It should be noted that rubber bass lures are frequently found in lake trout stomachs during the winter at Sebec Lake. Unfortunately, we did not routinely enter that information in our electronic database, so it is difficult to quantify.

Landlocked Salmon Natural Reproduction

Salmon production was documented in the following tributaries to Sebec Lake: Wilson Stream, Monson Stream, Davis Stream, and Ship Pond Stream (Table 10). Impassable falls were documented on all of these tributaries except Davis Stream. Salmon production on Wilson Stream is limited to an area from Tobey Falls to a point approximately 1.2 miles downstream. This upper section of Wilson Stream contributes approximately 75% of the total estimated mean salmon production for Sebec Lake. The remaining 3.7 miles of Wilson Stream to the confluence with Sebec Lake is characterized by a sandy substrate and offers limited nursery habitat. Similarly, the upper section of Ship Pond Stream below Cowyard Falls contained most of the suitable salmon nursery habitat. There was considerable nursery habitat and salmon presence

above Cowyard Falls. However, passage for adult salmon is difficult, if not impossible. Salmon production above Cowyard Falls is primarily the result of adult salmon dropping downstream from Onawa Lake. It is likely that some of the salmon production that occurs above Cowyard Falls drops downstream and contributes to the Sebec Lake salmon population. The lower reaches of Ship Pond Stream are primarily meandering with sand and mud substrate. Smallmouth bass are abundant in these areas. There is a small quantity of high quality salmon nursery habitat in Monson Stream. Spawning occurs in the lower areas but parr migrate upstream over a set of small falls to occupy the rock/boulder habitat below a set of large impassable falls. In the nine years of sampling Monson Stream, only one young of the year was taken between the two sets of falls, but parr are very abundant. We have estimated as many as 22.9 parr/unit in this section. We estimated annual average parr production to be 8,731 fish in the tributaries to Sebec Lake. That figure could exceed 17,500 or 2.6 parr/acre in years with maximum production. In years where water conditions were not favorable for passage at the base of Wilson Stream, the only successful reproduction would occur in Ship Pond Stream since Monson Stream and Davis Stream are tributaries to Wilson Stream and their confluences are upstream of the obstacle. In these years, the resulting parr production was calculated at just a few hundred fish.

Direct observations of pre-spawning salmon passing the falls at the confluence of Wilson Stream and Sebec Lake began in 1988 and has continued annually. Flow and lake elevation data were collected from the dam operators upstream on Wilson Pond and downstream on the outlet of Sebec Lake. Flow gages in the stream were utilized to track the flow from natural sources not associated with the Wilson Pond Dam (Figure 17). All of this information was combined with direct observations of fish jumping at the falls and their presence upstream to identify the range of conditions in which fish could successfully navigate the falls. There are two limiting factors affecting fish passage: lake elevation and total flow in the stream. Adult salmon do not jump over the falls. Observers may witness dozens of fish jumping at the falls on any given day in September, but none of these fish pass the falls after becoming airborne. The unique shape of the falls requires fish to swim up a 3-4 foot vertical drop. Fish typically stage behind a large ledge at the base of the falls, swim over or skirt around the edge of this ledge then swim up the cascading water (Figure 2). Observations indicate that when the lake elevation is below full pond, this ledge becomes exposed to a point where fish are forced to leave the water or jump over it. This severely reduces their success at passing the larger falls. Excessive flow in the stream has the ability to totally eliminate fish passage, jeopardizing 95% of the total salmon production for this lake. In 1992, above normal temperatures delayed the entry of salmon into the mouth of Wilson Stream. By mid-September the lake was down 14 inches from full pond and the interior ledge was exposed. Heavy rain occurred on September 22nd. Trapnets set below the falls captured salmon but none were observed passing the falls. Subsequent checks of the falls and upstream pools indicated very few fish passed the falls in 1992. In August 1993, we estimated 0.4 YOY salmon/unit in Wilson Stream, compared to a mean estimate of 9.9 YOY salmon/unit and a maximum of 25.7 YOY salmon/unit. The results were similar in the fall of 1993. In 1994, we estimated 0.2 YOY salmon/unit in Wilson Stream. Subsequent parr estimates (ages I+ and II+) were very low, and back-to-back years of poor fish passage seemed to have severely compromised the salmon population in Sebec Lake.

Based on observations, flows approaching 150 cfs limit fish passage, and flows greatly exceeding 150 cfs prohibit all passage, but do attract fish into the stream to the base of the falls.

Rain events with more than 1 inch of precipitation in late September have the potential to generate excessive natural flows, and runoff could last for over a week. Therefore, it was advantageous to manipulate flows from the Wilson Pond Dam early in September when the weather was typically dry and natural flow was minimal. At the same time, lake elevations at Sebec Lake needed to be maintained near full pond (322.8 feet). In 1993, the Water Quality Certification for the Sebec Lake Dam was modified to include a requirement to maintain the lake between 322.0 – 322.8 feet until October 15th to enhance salmon passage at the falls. Flows from the storage facility upstream are regulated as needed. Typically, there is a release of 100 cfs after Labor Day for approximately 10 days to provide an attraction flow for salmon. Flows are then reduced based on concurrent natural flows with a target range of 60-100 cfs in total flow at the confluence with Sebec Lake. If time and conditions permit, this cycle is repeated in late September or early October. In general, salmon movement upstream ceases in early October and salmon redds have been observed as early as October 5th in Wilson Stream.

Electrofishing data and observations made at Earley's Falls indicated very poor recruitment in several years in the early 1990s. At the time, we recognized the need to improve passage over the falls during the spawning run, but it would take several years to finish the evaluation and implement a management change. The MDIFW stocked 1,200 to 3,000 spring yearling salmon annually between 1991 and 1995 in an effort to maintain the salmon fishery during this period. Although Sebec Lake is considered one of the 4 original salmon lakes, it was stocked with salmon extensively prior to 1957. The most recent hatchery fish were stocked on the east end of the lake at Greeley's Landing to avoid intermingling with the wild fish that were homing to Wilson Stream and Ship Pond Stream on the west end of the lake in the fall.

MDIFW evaluated the potential for placing a section of steep-pass fishway into the falls to provide salmon passage at a wider range of flows. Engineers for MDIFW and USFWS visited the site and determined that a section could be placed in the falls. The best scenario would involve placing pins in the ledge and lifting a section of steep pass onto the pins with backhoe or crane each August and then removing it in October/November. This would ensure that the fish ladder would not be damaged by heavy flows and ice in the spring. However, Maine law states that landowners with property on rivers and streams own to the center of the channel and the work would require crossing private property. At the time, the landowner was not interested in cooperating with this endeavor.

Most wild salmon at Sebec Lake remain in the stream environment for two years. They leave their juvenile habitat and drop into the lake at age II+ and generally range from 4.5-6.3 inches long (Table 11). Hatchery salmon have a growth advantage since they are stocked into the lake at age I+ and average 7 inches in length (Boucher and Warner 2006). Growth of hatchery fish (ages I+ to IV+) steadily improved from 1993 to 1995 (Table 12), and condition factors were satisfactory (Table 13). As noted earlier, these fish were stocked to provide fishing opportunity until the new water management plan was implemented and evaluated. Salmon catch rates improved as these hatchery fish entered the fishery, and now the salmon fishery is maintained solely by wild fish since the inception of the new water management plan.

Lake Trout Natural Reproduction

Recent gillnetting efforts on Sebec Lake have been focused on locating potential spawning areas for lake trout and verifying /quantifying natural reproduction. Sixty-six net sets were made during the falls of 1970, 1972, 1980, 1981, and 1982 around likely togue spawning habitat. Only 3 mature lake trout were caught during these 136 hours of netting. Mid-summer gillnetting was performed in 1981, 1989, 1992, 1996, 2002, and 2005 in deep regions of the lake in an attempt to capture young, unmarked (i.e. wild) lake trout. Older, unmarked lake trout are caught by anglers at Sebec Lake; however, it is unclear whether these fish originate in Sebec Lake, are hatchery fish without apparent fin clips, or are wild, drop-down lake trout from Big Benson Pond, Long Pond, and/or Big Greenwood Pond. Gillnetting substantial numbers of unmarked lake trout less than 14 inches would indicate a viable wild lake trout population in Sebec Lake. Forty different net sets were made for a total of 772 hours on Sebec Lake during this time frame, and only 1 unmarked lake trout (15.8") was collected. For comparison, in 2011 and 2012, forty-three net sets were made on Moosehead Lake for a total of 831 hours, and 59 wild lake trout (< 14") were collected.

Water Quality

Basic water quality parameters such as temperature and pH have remained stable at Sebec Lake since the original survey in 1950 where surface oxygen levels were 8.2 ppm and 9.6 ppm in 140 feet of water. The thermocline was detected at 45 feet on 8/15/50. On 8/20/95, we measured 9.0 ppm of oxygen on the surface and 12.0 ppm at 70 feet, with the thermocline around 30 feet. There was adequate oxygen throughout the lake profile and a well-defined thermocline in all sampling events since 1950. Similarly, pH readings on the surface ranged from 6.7 to 7.1 and 6.1 to 6.4 in the hypolimnion. Sebec Lake has excellent water quality for coldwater gamefish. Roughly 50% of the lake's total volume is below the thermocline during the summer months and there is ample oxygen at all depths.

Hydroacoustics

Hydroacoustic data indicated that smelt abundance ranged from 62 YOY/acre in 2001 to 219 YOY/acre in 2004. These figures are within the range found at similar lakes throughout Maine. Unfortunately, it is not possible to draw any strong management conclusions or to evaluate trends with just two years of data.

Smallmouth Bass Fishery

Smallmouth bass are very abundant in Sebec Lake and are very much sought after in the summer months by recreational anglers as well as tournaments anglers. However, unlike some waters in the region, there is virtually no winter fishery. Mean summer smallmouth bass catch rates ranged from 0.314 to 1.269 legal fish/hour with a mean catch rate of 0.695 legal fish/hour for anglers targeting bass. Although a few bass have been recorded in the winter catch, the mean catch rate was 0.000 legal fish/hour over the study period.

The smallmouth bass fishery at Sebec Lake is managed under General Law. While anglers report catches of larger smallmouth bass, length data collected by MDIFW indicate the lake is typical of many bass waters in northern Maine. Experimental angling was conducted in 1991 and 1999 to collect bass samples for length frequency analysis. One hundred–sixty seven bass were collected with 28% of the fish in the PSD_{12} (proportional stock density) category and an RSD_{15} (relative stock density) value of 5% (Table 14).

The rocky shoreline and many docks provide cover in the littoral area for adult and juvenile bass. However, smallmouth bass populations in this region of the State are susceptible to temperature-related mortality. Populations in smaller, warmer ponds would be less affected than those in large, cooler oligotrophic lakes such as Sebec and Moosehead Lakes. Data from recording thermometers placed in the littoral area near Greeley's Landing on Sebec Lake were evaluated using the Department's smallmouth bass model to analyze YOY growth and survival from 1994-2000 (Table 15). The mean spawning date was June 10th for Sebec Lake and YOY growth concluded on October 5th on average during this study period. Mean length of YOY smallmouth bass ranged from 71-106 mm according to the MDIFW model. As noted earlier, this model assumes that food availability is a limiting factor in YOY smallmouth bass growth. YOY smallmouth bass were collected by electrofishing the shoreline in 1998 to ground-truth the model. The model estimated that mean YOY smallmouth bass at 83mm, while the observed mean length was 63mm. This would suggest that food is limited for YOY smallmouth bass at Sebec Lake. YOY smallmouth bass exhibit size-dependent mortality over the winter during the starvation period when water temperatures are below 10^{o}C (Shuter et al., 1980). The model estimated that YOY survival was greater than 50% in all years (Figure 18). However, based on the 1998 ground truth data, the model may be over-estimating total annual growth by 25%. Survival estimates adjusted for this factor indicate that 4 of 6 year-classes in this study exhibited less than 50% survival (Figure 19).

The model predicted egg/fry mortality in 1994, 1998, and 1999. This mortality occurred when water temperatures dropped below 15.6^{o}C after eggs were deposited in the nests. In 1998, the surface water warmed unusually early at Sebec Lake resulting in an early onset of spawning. The mean spawning date was May 29th compared to an overall average of June 10th for Sebec Lake during this study. Spawning may have started as early as May 19th in 1998, however, because water temperatures declined in early June, any eggs or fry resulting from spawning activity before June 5th would have incurred 100% mortality. There would have been mortality at a lower rate for all of the remaining spawning activity for that year.

Sebec Lake Management Plan

A group of stakeholders including representatives from the MDIFW developed a fisheries management plan for Sebec Lake in accordance with Fisheries Division policy H1. The purpose of this fisheries management plan is to create a document with clear, measurable goals and objectives for the future management of the lake. This plan was developed using data collected by the MDIFW for over 50 years at Sebec Lake in conjunction with input from the Sebec Lake Stakeholders group which includes members from the business community, summer and winter anglers, campowners, and the Sebec Lake Association. The plan contains 3 overarching primary goals for the management of Sebec Lake and specific measureable objectives within each of the

goals. Potential problems associated with each objective have been identified along with possible strategies to overcome those problems. No priority was set in the objectives; however, the group felt it is most important to maintain the current fishing opportunities while attempting to reach the objectives. The entire plan is attached as Appendix II.

Prepared by: Timothy C. Obrey, April 2013

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Table 1. Stocking history from federal stocking records for Sebec Lake and associated waters (1907-1917).

Year	Species	Number	Age Group	Location
1907	Landlocked salmon	5,000	Fingerlings/yearlings/ adults	Ship Pond Stream
1907	Landlocked salmon	4,000	Fingerlings/yearlings/ adults	Wilson Stream
1907	Landlocked salmon	600	Fingerlings/yearlings/ adults	Onawa Lake
1907	Brook trout	6,170	Fingerlings/yearlings/ adults	Ship Pond Stream
1907	Brook trout	3,000	Fingerlings/yearlings/ adults	Onawa Lake
1909	Landlocked salmon	12,000	Fry	Sebec Lake
1913	Lake trout	10,000	Fry	Onawa Lake
1914	Landlocked salmon	6,000	Fingerlings/yearlings/ adults	Sebec Lake
1914	Lake trout	7,500	Fingerlings/yearlings/ adults	Onawa Lake
1914	Brook trout	14,000	Fingerlings/yearlings/ adults	Onawa Lake
1915	Rainbow trout	250	Fingerlings/yearlings/ adults	Little Benson Pond
1915	Landlocked salmon	750	Fingerlings/yearlings/ adults	Sebec Lake
1915	Lake trout	5,000	Fry	1st Buttermilk Pond
1916	Steelhead	3,500	Fingerlings/yearlings/ adults	1st Buttermilk Pond
1916	Landlocked salmon	8,000	Fry/eggs	Sebec Lake
1917	Atlantic salmon	312,000	Fingerlings/yearlings/ adults	Davis Stream
1917	Atlantic salmon	48,600	Fingerlings/yearlings/ adults	Greenwood Stream (trib to Onawa Lake)

Table 2. Summer clerk survey summaries for Sebec Lake (1988-2000).

Year	1988	1989	1990	1991	1992	1994	1995	1997	1998	2000
Parties	514	374	113	148	188	245	113	265	254	219
Anglers	1067	728	276	341	450	637	240	546	466	450
Hours	4149	2517	1025	1134	2618	2470	973	1824	1577	1440
BKT-k	3		0	1	1			0		2
BKT-r	3		0	0	1			2		0
BKT-s	1		2	0	2			0		0
LLS-k	86	42	17	15	11	29	20	27	32	19
LLS-r	22	19	4	2	22	65	79	44	43	47
LLS-s	217	54	7	47	97	106	61	76	112	72
LKT-k	62	20	12	20	13	10	4	24	23	15
LKT-r	29	4	4	13	7	51	22	37	38	37
LKT-s	42	17	8	25	15	31	7	32	41	27
SMB-k	110	71	96	3	2	1	2	2	0	2
SMB-r	372	399	14	163	365	379	82	447	131	75
SMB-s	0	0	0	0	0	0	0	210	154	70
PKL-k	1		1			2	0	0	0	0
PKL-r	4		0			4	4	2	2	26
WHP-k	277	9	70	84	90	27	12	19	5	6
WHP-r	118	14	6	13	33	28	9	16	77	20
YLP-k	1	0	4				0			0
YLP-r	0	2	0				1			4

Species Codes for Tables 2 and 3:

BKT – brook trout
LLS – landlocked salmon
LKT – lake trout
SMB – smallmouth bass
PKL – chain pickerel
WHP – white perch
YLP – yellow perch
EEL – American eel
CSK – cusk (burbot)
SLT – rainbow smelt

Other Codes:

k - kept
r - released
s - sublegal

Table 3. Winter clerk survey summaries for Sebec Lake (1980-2011).

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Parties	82	90	130	131	165	124	138	128	231	223
Anglers	224	266	380	406	432	280	388	362	590	647
Hours	1383	1586	3546	4093	3138	1701	2516	2336	4023	4703
BKT-k				1					2	
BKT-r				0					0	
BKT-s				0					0	
LLS-k	5	5	29	20	1	5	5	6	17	29
LLS-r	0	0	0	0	0	1	3	0	3	2
LLS-s	0	0	0	22	0	15	7	12	8	14
LKT-k	68	62	105	66	22	76	158	95	110	128
LKT-r	0	0	45	1	1	6	33	12	19	1
LKT-s	163	134	339	345	357	307	383	191	165	280
SMB-k									0	
SMB-r									1	
SMB-s									0	
PKL-k		4	2	4		1	5	1	6	1
PKL-r		0	0	0		0	0	0	0	0
WHP-k	28	28	41	18	30	23	23	44	37	87
WHP-r	0	0	0	0	0	0	0	0	0	0
YLP-k			1	2			4			2
YLP-r			0	0			0			0
SLT-k	1		2	1						
SLT-r	0		0	0						
CSK-k	2		1	1						
CSK-r	0		0	0						
EEL-k										3
EEL-r										0

Table 3. Winter clerk survey summaries for Sebec Lake (1980-2011) (continued).

Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Parties	137	136	103	79	153	154	154	217	122	198
Anglers	404	349	274	216	382	434	383	611	404	481
Hours	3006	2317	1919	1360	2652	3033	2631	4412	2852	2945
BKT-k	1	2		1	0		1			1
BKT-r	0	0		1	1		1			0
BKT-s	0	0		0	0		0			0
LLS-k	8	5	10	14	41	104	58	49	18	43
LLS-r	0	7	4	5	10	29	5	5	5	23
LLS-s	6	4	19	41	64	94	9	19	15	50
LKT-k	106	42	64	40	66	92	108	102	37	82
LKT-r	19	16	16	8	22	29	28	35	24	55
LKT-s	137	110	139	119	241	146	103	150	59	150
SMB-k				1		0		0	0	
SMB-r				1		1		1	1	
SMB-s				0		0		0	0	
PKL-k	2	2						1	1	1
PKL-r	0	0						0	0	0
WHP-k	6	35	21	15	14	13	12	46	69	94
WHP-r	0	0	2	0	0	0	0	7	3	1
YLP-k	1	1								
YLP-r	0	0								
SLT-k				6	1			1	22	11
SLT-r				0	0			0	0	0
CSK-k										
CSK-r										
EEL-k						1				
EEL-r						0				

Table 3. Winter clerk survey summaries for Sebec Lake (1980- 2011) (continued).

Year	2000	2001	2004	2006	2008	2011
Parties	182	92	89	100	73	60
Anglers	473	228	210	279	207	158
Hours	3261	1611	1528	1992	1494	1120
BKT-k	1	0	1	2	1	
BKT-r	1	1		1		
BKT-s	0	0				
LLS-k	37	11	6	6	11	14
LLS-r	22	5	5	2	17	8
LLS-s	28	5	1	1	26	8
LKT-k	65	56	49	36	50	27
LKT-r	24	40	31	25	62	8
LKT-s	144	103	98	96	182	66
SMB-k						
SMB-r					3	
SMB-s					1	
PKL-k		0				
PKL-r		1				
WHP-k	180	51		164	148	113
WHP-r	1	0	3	1	31	1
YLP-k						1
YLP-r						
SLT-k	67	8		38	7	3
SLT-r	0	0			18	
CSK-k						
CSK-r						
EEL-k					2	
EEL-r						

Table 4. Seasonal and annual use estimates (angler-days) for Sebec Lake (1988, 1990, 1994, 1997, & 2000).

YEAR		SUMMER		WINTER		ANNUAL
1988		7,453		2,105		9,558
1990		5,017		2,838		7,855
1994		3,821		2,448		6,269
1997		3,530		2,615		6,145
2000		4,224		2,640		6,864

Table 5. Landlocked salmon stocking history at Sebec Lake post-1950.

Year	Number stocked	Fin Clip
1952	10,000	
1953	10,000	
1955	15,000	
1956	10,000	
1991	3,000	BV
1992	3,000	RV
1993	3,000	AD
1994	3,000	LV
1995	1,200	BV

Table 6. Lake trout stocking history at Sebec Lake post-1950.

Year	Number stocked	Fin Clip
1961	12,500	
1962	12,500	
1963	23,684	
1964	12,795	
1965	40,000	
1966	25,000	
1973	20,500	
1975	63,947	
1976	45,000	
1977	15,650	
1978	10,000	
1979	6,250	
1980	7,800	
1981	8,000	
1982	6,800	
1986	4,400	
1988	1,809	
1989	2,500	BV
1990	2,500	LP-AD
1991	3,200	RP-AD
1992	3,483	RV-AD
1993	3,200	LV-AD
1994	3,200	BV-AD
1995	3,200	LP
1997	3,200	RV
1998	3,000	AD
1999	3,200	LV
2000	3,200	BV
2001	2,600	LP-AD
2002	3,200	RP
2003	3,200	RV-AD
2004	3,200	LV-AD
2005	3,200	BV-AD
2006	3,200	LP
2007	2,050	RP
2008	1,600	RV
2009	1,500	AD
2010	2,750	LV
2011	1,600	BV
2012	1,600	LP-AD

Table 7. Comparisons of salmon catch rates in relation to water management plan (1980-2011).

Period	Origin	Legals/hr	Sublegals/hr	All/hr
1980-1992	Pre- management plan- Wild salmon only	0.005	0.004	0.008
1993-1997	Development of new water management plan - Wild and hatchery salmon	0.025	0.019	0.043
1998-2011	After implementation of new water management plan- Wild salmon only	0.013	0.007	0.021

Table 8. Comparisons of mean lengths at age from Fenderson (1955).

		Age Group 3	4	5	6	7
Sebec Lake (1954)						
- Sample size		8	31	56	28	6
- Mean Length (inches)		12.9	14.9	16.6	20.0	23.5
Statewide (1954)*						
- Sample size		492	637	247	96	37
- Mean Length (inches)		15.2	18.1	20.3	22.2	22.5

* Includes hatchery fish

Table 9. Comparisons of mean length at age for wild salmon at Sebec Lake (1982-2001).

		Age Group 3	4	5	6	7
Sebec Lake (Winter Clerk surveys 1982-2008)						
- Sample size		n/a	83	90	47	5
- Mean Length (inches)		n/a	15.4	17.3	19.0	20.4
Statewide (1990-2001 Trapnet)						
- Sample size		592	596	344	130	n/a
- Mean Length (inches)		14.1	16.3	17.3	17.9	n/a

Table 10. Salmon parr production estimates for Sebec Lake tributaries.

Location	Mean parr abundance estimate/ habitat unit	Habitat Units	Mean parr abundance estimate		Maximum parr abundance estimate/ habitat unit	Maximum parr abundance estimate
Wilson Stream: Tobey Falls to ~ 800' below Willimantic Bridge	8.9	485	4,319		8.9	4,319
800' below Willimantic Bridge to ~ 800' above Island near Turner's Camp	4.6	451	2,075		16.1	7,263
From Island to Turner's Camp	0.0	206	0		0.0	0
No nursery habitat below this section of Wilson Stream						
Davis Stream	3.1	227	704		9.0	2,043
Willimantic Bridge to Wilson Stream						
Ship Pond Stream	2.1	260	546		2.1	546
Cowyard Falls to Lake						
Monson Stream	7.5	145	1,088		22.9	3,321
Falls to Gravel Pit						
Total	4.4	1,774	8,731		12.5	17,491

Table 11. Mean length at age for immature salmon electrofished in tributaries to Sebec Lake (1989 – 2006).

Age	N	Mean Length (in)
0+	211	2.4
I+	186	4.5
II+	8	6.3
III+	2	9.0

Table 12. Mean length (inches) at age for hatchery salmon at Sebec Lake (1993-1995).

	Age				
Year	**I+**	**II+**	**III+**	**IV+**	**ALL**
1993	11.2	14.4	15.5	----------	14.8
1994	11.7	14.1	16.7	17.2	15.7
1995	12.5	15.1	17.1	17.9	16.8
ALL	*11.6*	*14.3*	*16.3*	*17.6*	*15.4*

Table 13. Mean condition factor (K) at age for hatchery salmon at Sebec Lake (1993-1995).

	Age				
Year	**I+**	**II+**	**III+**	**IV+**	**ALL**
1993	0.91	0.78	0.81	----------	0.80
1994	0.85	0.88	0.96	0.99	0.93
1995	0.68	0.78	0.92	0.90	0.89
ALL	*0.84*	*0.82*	*0.90*	*0.93*	*0.87*

Table 14. Comparison of size quality among smallmouth bass waters in the Moosehead Lake Region.

LAKECODE	LAKE	PSD_{12}	RSD_{15}	Trophy $Index_{18}$
9865	BEAR P	26	0	0
4130	BRANNS MILL P	82	14	6
0838	BUTTERMILK P (1ST)	15	0	0
4090	INDIAN P	24	5	0
4118	LONG P	33	4	2
0758	HARLOW/MANHANOCK P	92	64	28
9791	PRONG P	22	1	0
0848	***SEBEC L***	***33***	***5***	***0***

Table 15. Results for MDIFW smallmouth bass model at Sebec Lake (1994-2000).

YEAR	Number of spawning days	Mean YOY length	Mean spawn date	Number of days with post spawn mortality	Daily growth increment (mm)	Number of growing days	End of growth	Actual starvation period
1994	11	84	06/16/94	4	0.770	98	10/02/94	232
1995	17	94	06/09/95	0	0.734	115	10/15/95	218
1996	13	78	06/11/96	0	0.657	105	10/03/96	239
1997	17	77	06/14/97	0	0.710	96	09/30/97	225
1998	20	83	05/29/98	13	0.670	110	10/04/98	222
1999	15	106	06/04/99	0	0.850	113	10/06/99	227
2000	11	71	06/19/00	2	0.630	99	10/08/00	n/a
Mean	*14.9*	*85*	*10-Jun*		*0.717*	*105*	*05- Oct*	*227*

Figure 1. Conservation land and access sites on Sebec Lake.

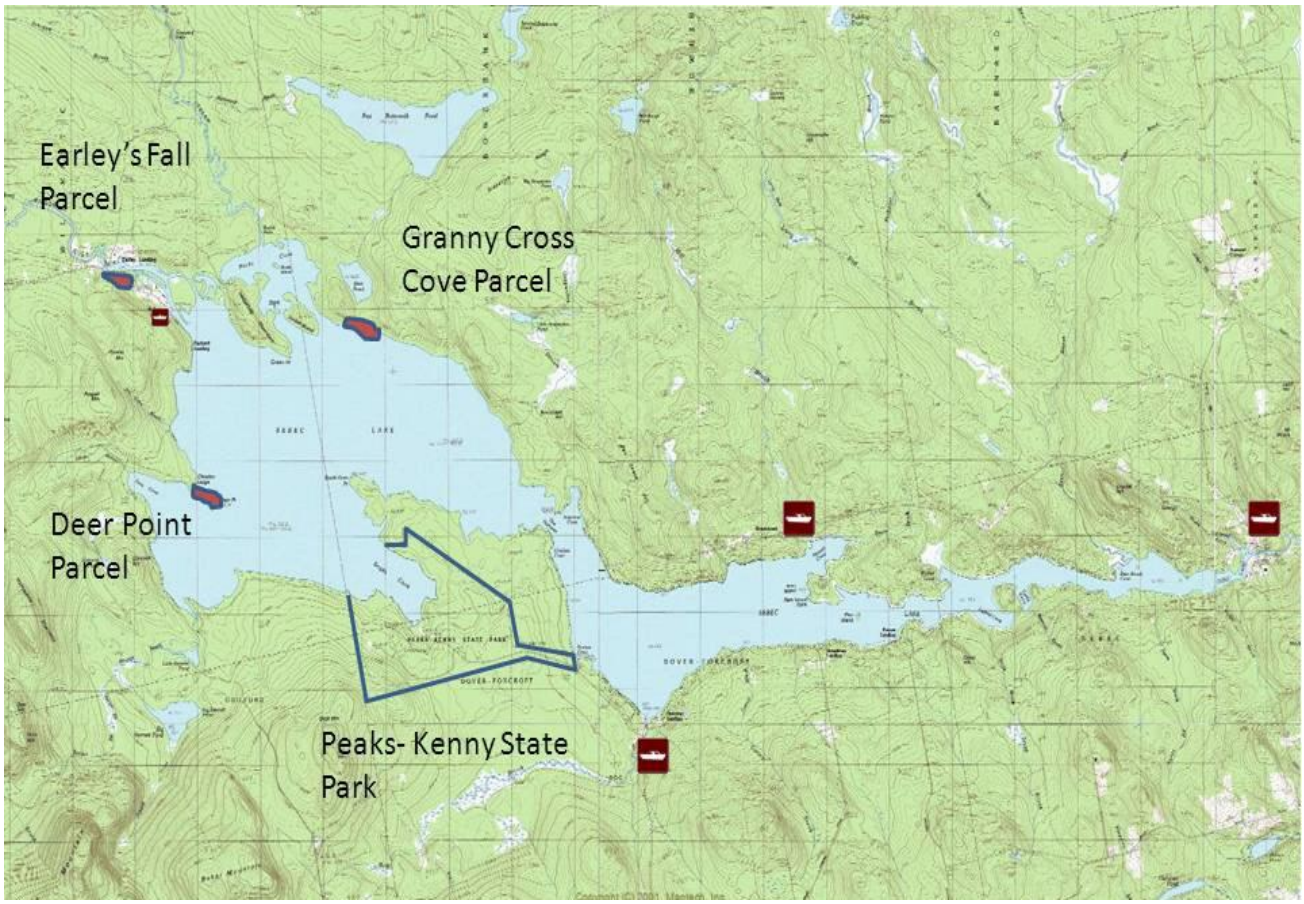


Figure 2. Earley's Falls at the confluence of Wilson Stream and Sebec Lake.

Figure 3. Sample of DEP water quality data available.

LAKE: SEBEC L (VLMP)
TOWN: WILLIMANTIC
COUNTY: PISCATAQUIS

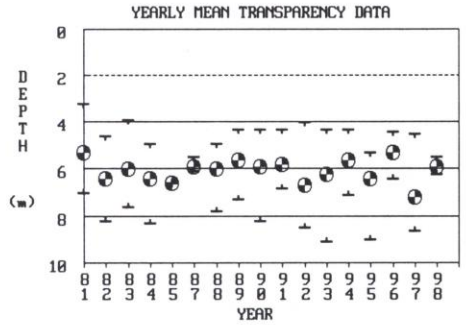
MIDAS: 848
*TRUE BASIN: 1
*SAMPLE STATION: 1

WHOLE LAKE INFORMATION
MAX. DEPTH: 47 m. (155 ft.)
MEAN DEPTH: 13 m. (42 ft.)
DELORME ATLAS #: 32
USGS QUAD: SEBEC LAKE
IFW REGION E: Moosehead Lake (Greenville)
IFW FISH. MANAGMENT: Warmwater & Coldwater

TRUE BASIN CHARACTERISTICS
SURFACE AREA: 2659.0 ha. (6570.3 a.)
FLUSHING RATE: 1.43 flushes/yr.
VOLUME: 349488384.0 cu. m. (283504 ac.-ft.)
DIRECT DRAINAGE AREA: 414.09 sq. km. (159.88 sq. mi.)

* PLEASE NOTE THE FOLLOWING: The SAMPLE STATION # refers to the location sampled. The term TRUE BASIN is used to define areas within a lake that are separated by shallow reefs or shoals and therefore function as separate lakes. There are approximately 50 lakes in the state that have more than 1 True Basin. True Basin Characteristics are now being included in the first section of these reports to enable users of the Phosphorous Loading Methodology to better evaluate the data. If there is no data for a particular True Basin, True Basin Characteristics must be obtained from the DEP. SEBEC L has 1 True Basin(s).

SECCHI DISK TRANSPARENCY GRAPH:



SUMMARY OF CHEMICAL AND TROPHIC STATE PARAMETERS:

	MEAN COLOR (SPU)	MEAN pH	MEAN ALK (mg/l)	MEAN COND. (uMHOS /cm)	TOTAL PHOS. MEANS (ppb) EPI CORE	SURF GRAB	BOT. GRAB	PRO. GRAB	SECCHI DISK (m.) MIN.	MEAN	MAX.	N	CHLOROPHYLL A(ppb) MIN.	MEAN	MAX.	TROPHIC STATE INDICES EPI PHOS C	G	SEC	CHL
YEAR																			
1981	-	-	-	-	-	-	-	-	3.2	5.3	7.0	5	-	-	-	-	-	45	-
1982	20	6.80	7.0	30	2	-	6	-	4.6	6.4	8.2	5	1.4	1.4	1.4	-	-	36	-
1983	-	-	-	-	-	-	-	-	3.9	6.0	7.6	5	-	-	-	-	-	39	-
1984	-	-	-	-	-	-	-	-	4.9	6.4	8.3	5	-	-	-	-	-	36	-
1985	25	-	7.0	30	4	-	3	-	6.6	6.6	6.6	1	-	-	-	-	-	-	-
1987	-	-	-	-	-	3	-	-	5.5	5.9	6.1	3	-	-	-	-	-	-	-
1988	-	-	-	-	-	-	-	-	4.9	6.0	7.8	4	-	-	-	-	-	-	-
1989	-	-	-	-	-	-	-	-	4.3	5.6	7.3	4	-	-	-	-	-	-	-
1990	-	-	-	-	-	-	-	-	4.3	5.9	8.2	4	-	-	-	-	-	-	-
1991	20	7.20	9.0	-	4	-	-	-	4.3	5.8	6.8	4	-	-	-	-	-	-	-
1992	-	-	-	-	-	-	-	-	4.0	6.7	8.5	3	-	-	-	-	-	-	-
1993	-	-	-	-	-	-	-	-	4.3	6.2	9.1	3	-	-	-	-	-	-	-
1994	-	-	-	-	-	-	-	-	4.3	5.6	7.1	4	-	-	-	-	-	-	-
1995	-	-	-	-	-	-	-	-	5.3	6.4	9.0	4	-	-	-	-	-	-	-
1996	-	-	-	-	-	-	-	-	4.4	5.3	6.4	5	-	-	-	-	-	45	-
1997	10	7.05	5.0	26	3	-	-	-	4.5	7.2	8.6	4	1.4	1.4	1.4	-	-	-	-

Figure 3. Sample of DEP water quality data available (continued).

LAKE: SEBEC L (VLMP)
TOWN: WILLIMANTIC
COUNTY: PISCATAQUIS

MIDAS: 848
*TRUE BASIN: 1
*SAMPLE STATION: 1

SUMMARY OF CHEMICAL AND TROPHIC STATE PARAMETERS:

	MEAN COLOR (SPU)	MEAN pH	MEAN ALK	MEAN COND. (uMHOS /cm)	TOTAL PHOS. MEANS (ppb) EPI CORE	SURF GRAB	BOT. GRAB	PRO. GRAB	SECCHI DISK (m.) MIN.	MEAN	MAX.	N	CHLOROPHYLL A(ppb) MIN.	MEAN	MAX.	TROPHIC STATE INDICES EPI PHOS C	G	SEC	CHL
YEAR																			
1998	-	-	-	-	-	-	-	-	5.5	5.9	6.2	3	-	-	-	-	-	-	-
SUMMARY:	19	6.98	7.0	29	3	3	5	-	3.2	6.1	9.1	17	1.4	1.4	1.4	-	-	40	-

LATE SUMMER TEMPERATURE / DISSOLVED OXYGEN PROFILES:

	SAMPLE DATE															
DEPTH	09/14/95		08/17/96		08/31/96		09/11/96		08/08/97		08/12/97		08/24/97		09/13/97	
m	°C	ppm	°C	ppm	°C	ppm	°C	ppm	°C	ppm	°C	ppm	°C	ppm	°C	ppm
0.0	17.3	8.8	21.8	8.4	20.5	8.8	19.8	8.2	21.0	8.6	23.1	8.8	20.0	9.1	19.0	9.0
1.0	-	-	-	-	-	-	-	-	-	-	23.1	8.7	-	-	-	-
2.0	17.2	8.6	21.6	8.4	21.0	8.3	19.8	8.2	20.5	8.8	23.1	8.9	19.5	9.4	18.7	9.4
3.0	17.1	8.6	21.6	8.2	21.0	8.3	19.8	8.2	20.0	8.8	23.0	8.9	19.5	9.4	18.6	9.3
4.0	-	-	-	-	-	-	-	-	-	-	22.9	8.9	-	-	-	-
5.0	17.0	8.3	21.5	8.2	21.0	8.3	19.8	8.1	20.0	8.9	22.6	8.9	19.5	9.4	18.6	9.3
6.0	17.0	8.2	18.0	7.8	21.0	8.3	19.8	8.1	20.0	8.8	21.6	8.9	19.5	9.3	18.5	9.3
7.0	-	-	-	-	-	-	-	-	-	-	18.9	8.5	-	-	-	-
8.0	16.5	8.3	17.0	7.4	17.0	7.3	19.5	8.2	16.5	9.2	18.3	8.5	19.0	9.2	18.5	9.3
9.0	16.0	8.2	15.0	7.6	15.0	7.4	13.0	7.3	14.0	9.4	16.7	8.6	17.0	9.0	16.9	9.2
10.0	-	-	-	-	-	-	-	-	-	-	11.8	9.6	-	-	-	-
11.0	13.2	8.2	13.0	8.0	14.0	7.6	12.0	7.4	11.0	10.0	10.5	9.8	12.0	10.0	12.4	9.0
12.0	10.2	8.4	10.8	8.6	12.0	7.7	10.1	7.8	9.0	10.4	9.9	9.9	10.0	10.2	10.1	10.5
13.0	-	-	-	-	-	-	-	-	-	-	9.5	10.1	-	-	-	-
14.0	8.5	8.6	9.8	9.3	11.0	8.1	9.0	8.5	8.5	10.4	9.1	10.1	9.0	10.5	9.0	10.5
15.0	7.1	9.0	8.9	9.6	10.0	8.2	8.3	8.6	8.0	10.8	8.9	10.2	8.5	10.8	8.7	10.5
16.0	-	-	-	-	-	-	-	-	-	-	8.4	10.3	-	-	-	-
17.0	7.0	8.8	8.0	9.7	8.0	8.6	8.0	8.9	7.5	10.8	8.2	10.4	8.0	10.8	7.5	10.8
18.0	6.2	8.8	7.9	9.7	8.0	8.8	7.3	8.9	7.0	10.8	8.0	10.4	7.5	10.8	7.5	10.8
19.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20.0	6.1	9.0	7.3	9.8	8.0	9.2	7.0	9.2	7.0	10.8	7.7	10.6	7.0	11.0	6.8	11.0
21.0	6.0	9.0	7.0	9.8	-	-	7.0	9.2	6.5	10.9	-	-	7.0	11.0	6.8	11.0
22.0	-	-	-	-	-	-	-	-	-	-	7.5	10.6	-	-	-	-
23.0	6.0	9.1	7.0	10.1	-	-	6.8	9.1	6.0	11.0	-	-	7.0	11.0	6.2	11.3
24.0	6.0	9.2	6.7	10.2	-	-	6.3	9.1	6.0	11.2	7.3	10.7	6.5	11.2	6.0	11.3
25.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
26.0	5.6	9.1	6.3	10.2	-	-	6.3	9.0	6.0	11.2	7.1	10.7	6.5	11.3	6.0	11.3
27.0	5.5	9.1	6.2	10.2	-	-	6.0	9.2	6.0	11.2	-	-	6.1	11.5	6.0	11.5
28.0	-	-	-	-	-	-	-	-	-	-	7.1	10.6	-	-	-	-
29.0	5.5	9.2	6.0	10.2	-	-	6.0	9.0	5.8	11.2	-	-	6.0	11.5	-	-
30.0	-	-	-	-	-	-	-	-	-	-	7.1	10.4	-	-	-	-
31.0	5.4	9.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
32.0	-	-	-	-	-	-	-	-	-	-	7.0	10.6	-	-	-	-
34.0	-	-	-	-	-	-	-	-	-	-	7.0	10.7	-	-	-	-
35.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
36.0	-	-	-	-	-	-	-	-	-	-	7.0	10.6	-	-	-	-
38.0	-	-	-	-	-	-	-	-	-	-	7.0	10.4	-	-	-	-
40.0	-	-	-	-	-	-	-	-	-	-	7.0	10.3	-	-	-	-
42.0	-	-	-	-	-	-	-	-	-	-	7.0	10.2	-	-	-	-

Figure 4. Hydroacoustic transects on Sebec Lake (2001 and 2004).

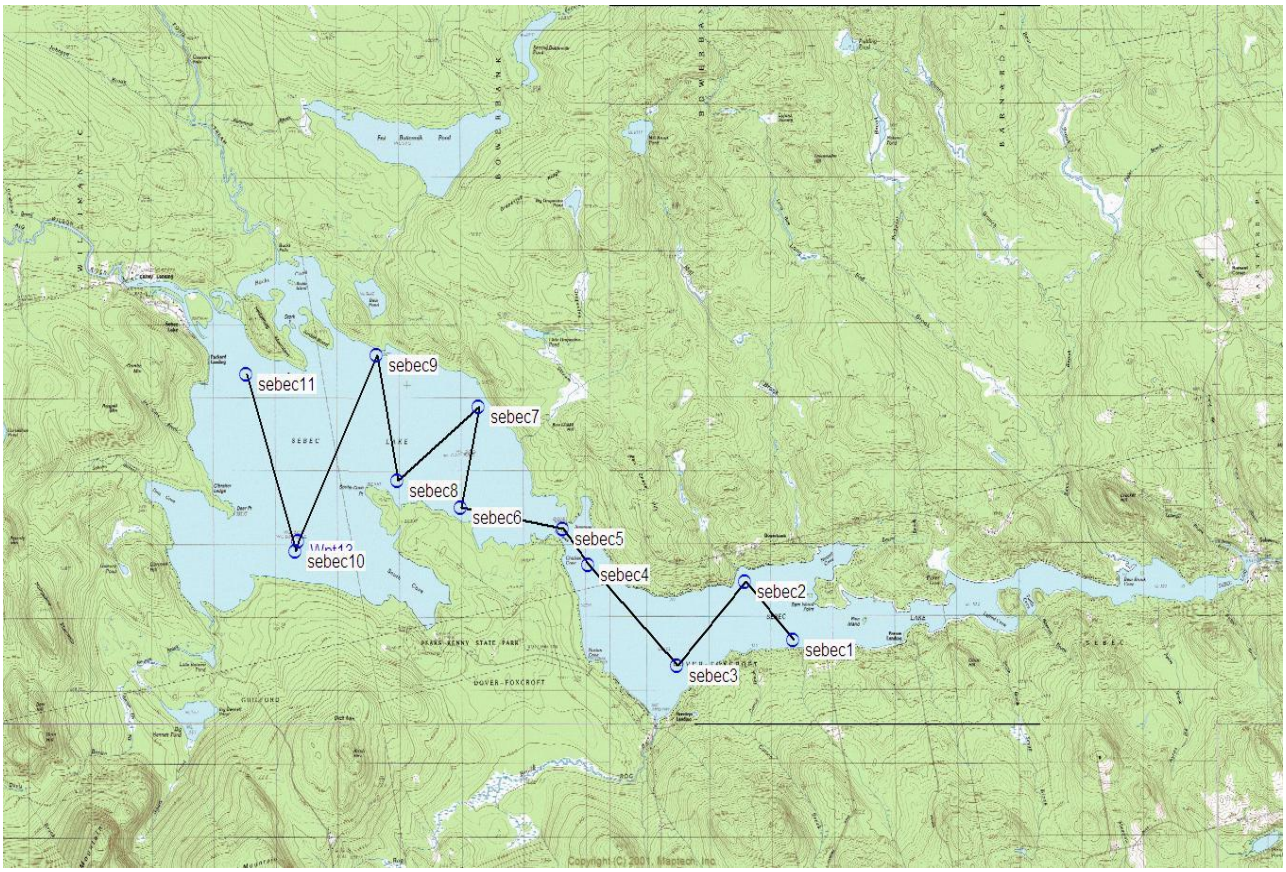


Figure 5. Summer catch rates for legal salmon in Sebec Lake (1988-2000).

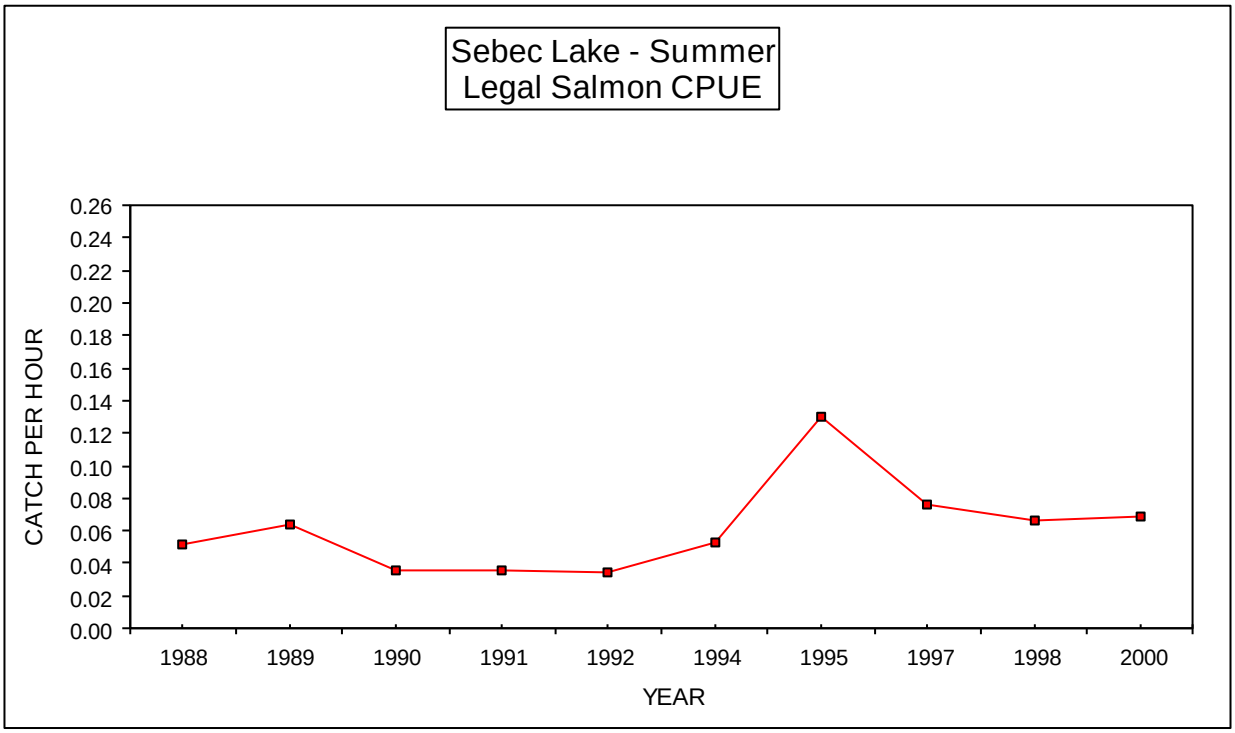


Figure 6. Length frequency of wild salmon from Sebec Lake (1954;1982-2008).

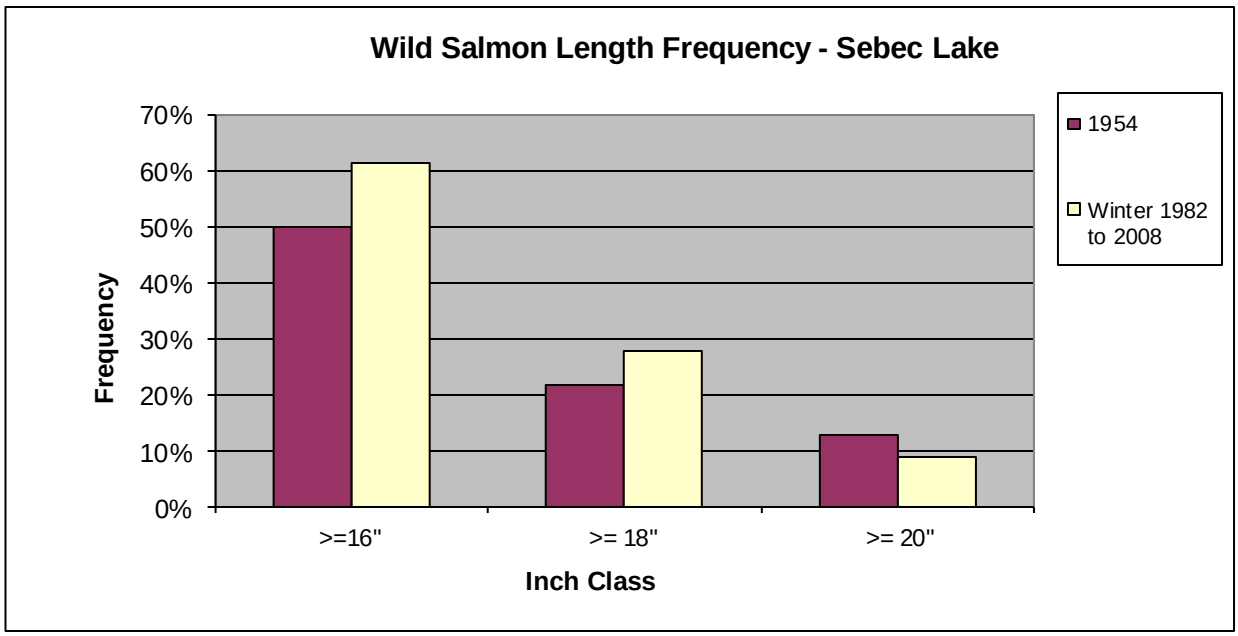


Figure 7. Summer catch rates for legal lake trout in Sebec Lake (1988, 1989, 1990, 1991, 1992, 1994, 1995, 1997, 1998, 2000).

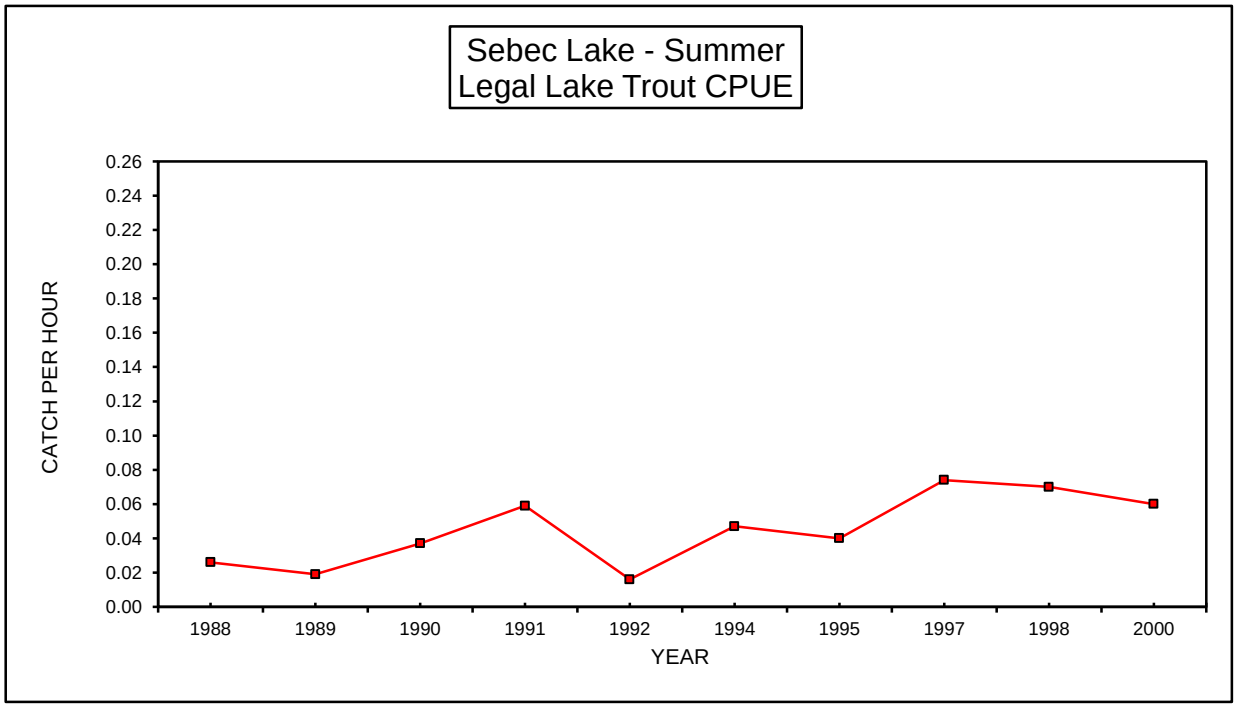


Figure 8. Winter catch rates for legal lake trout in Sebec Lake (1980 – 2009).

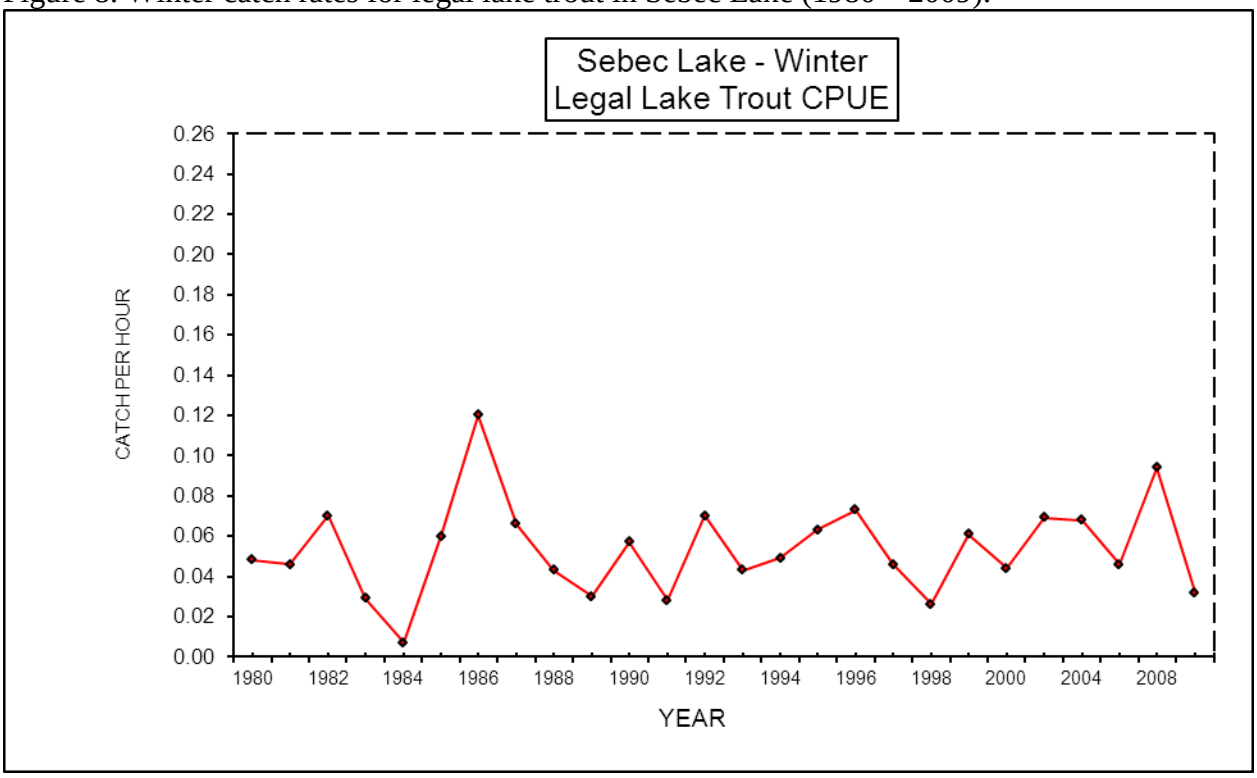


Figure 9. Age composition of lake trout caught during the winter at Sebec Lake (1980-2011).

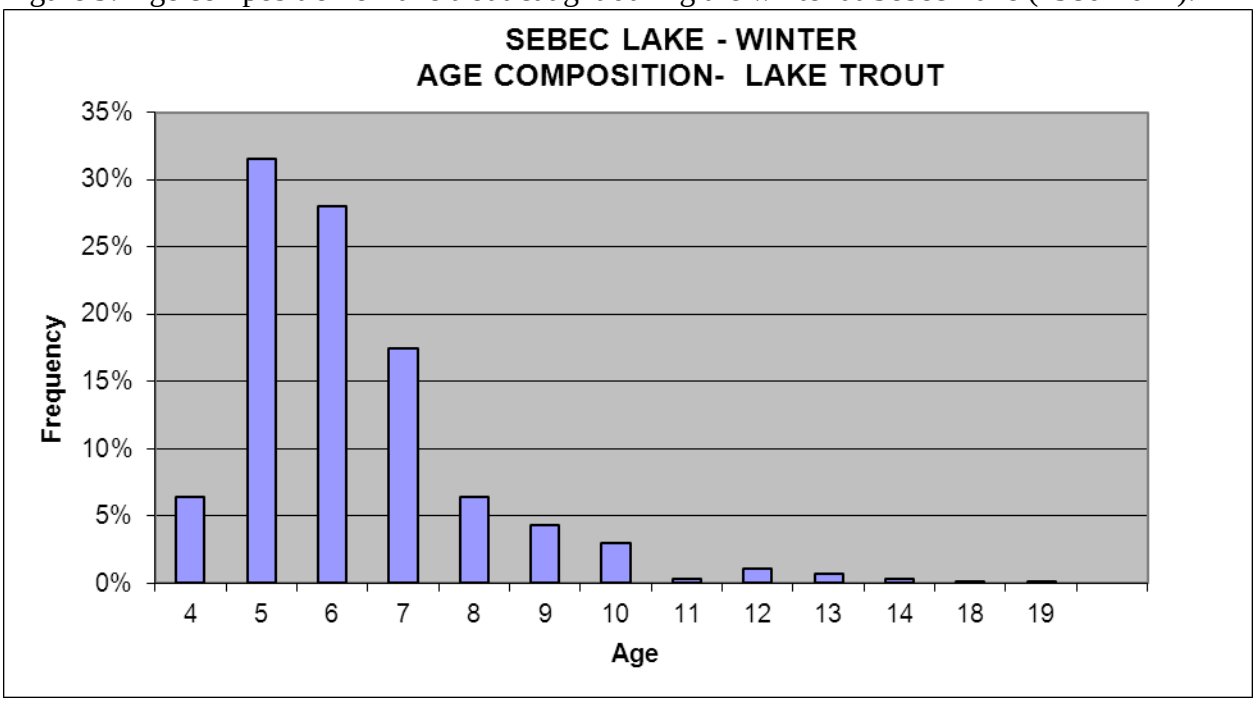


Figure 10. Mean length of lake trout harvested from Sebec Lake in the winter (1982-2009).

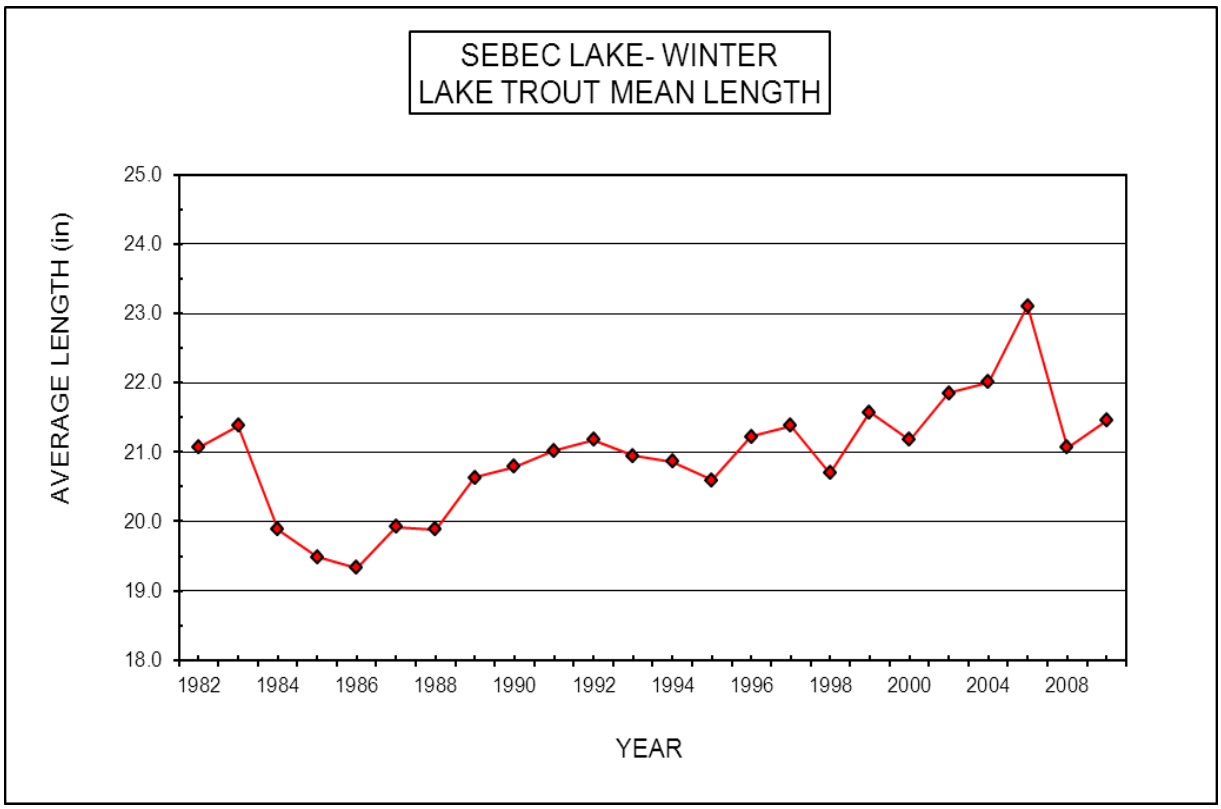


Figure 11. Index of quality for the winter lake trout fishery at Sebec Lake (1978-2009).

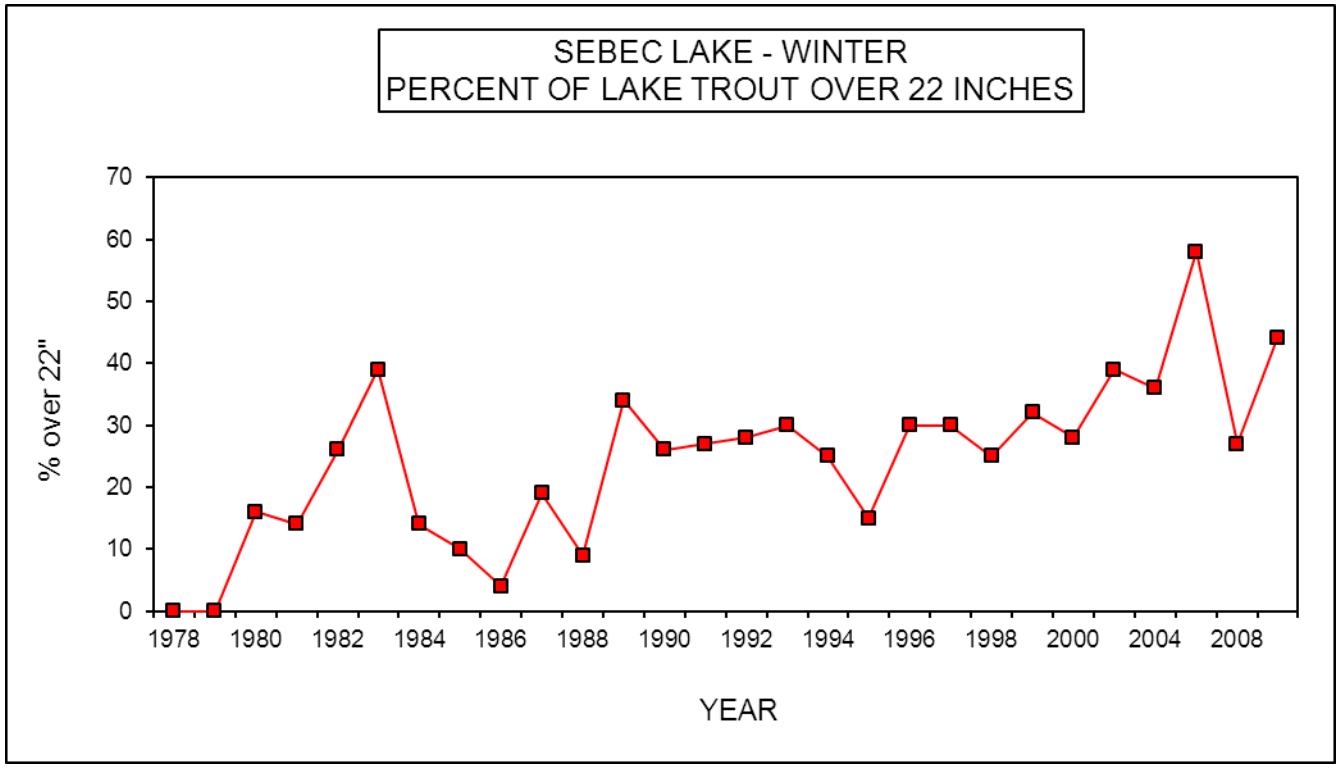


Figure 12. Mean condition factors for lake trout at Sebec Lake (1982-2009).

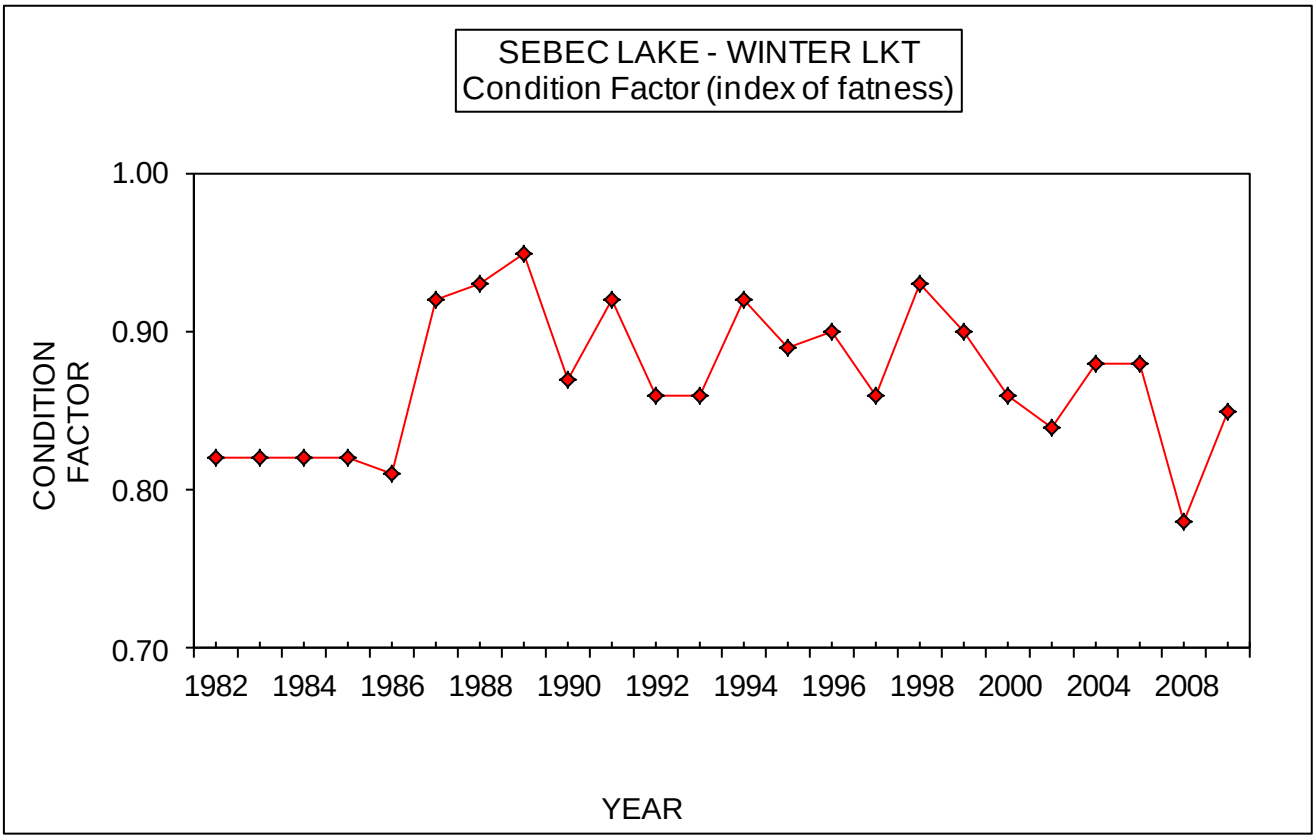


Figure 13. Angler use estimates for Sebec Lake (1988-2000).

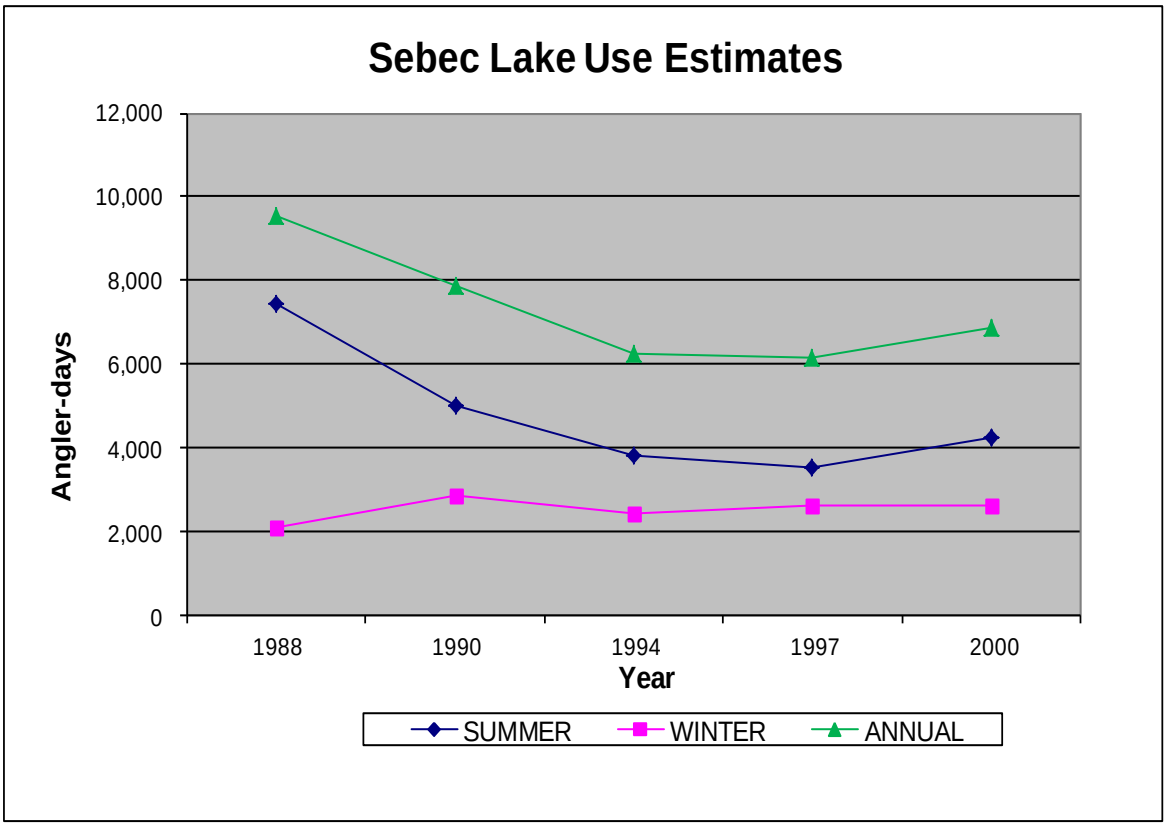


Figure 14. Lake trout and salmon harvest estimates for Sebec Lake (1988-2000).

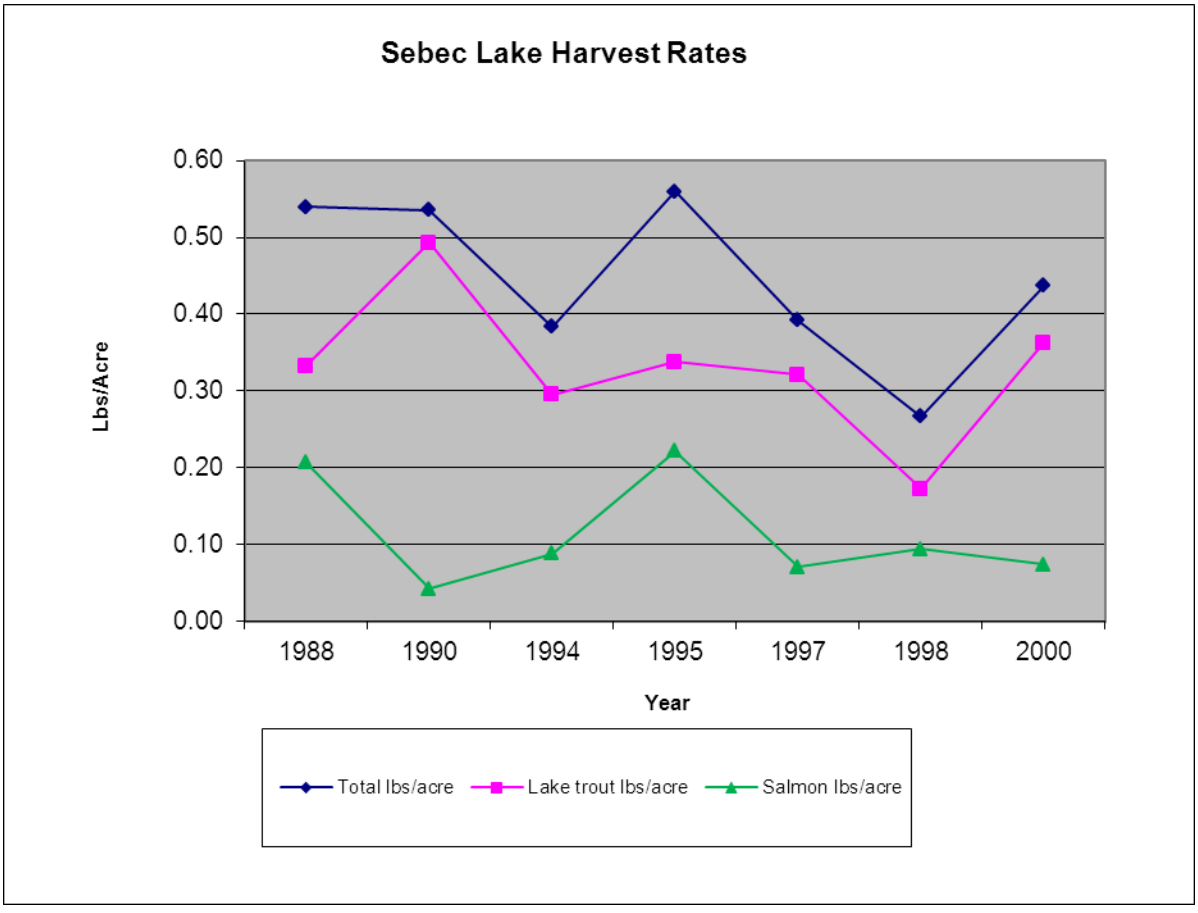


Figure 15. Food habits of lake trout from Sebec Lake (1990-2008).

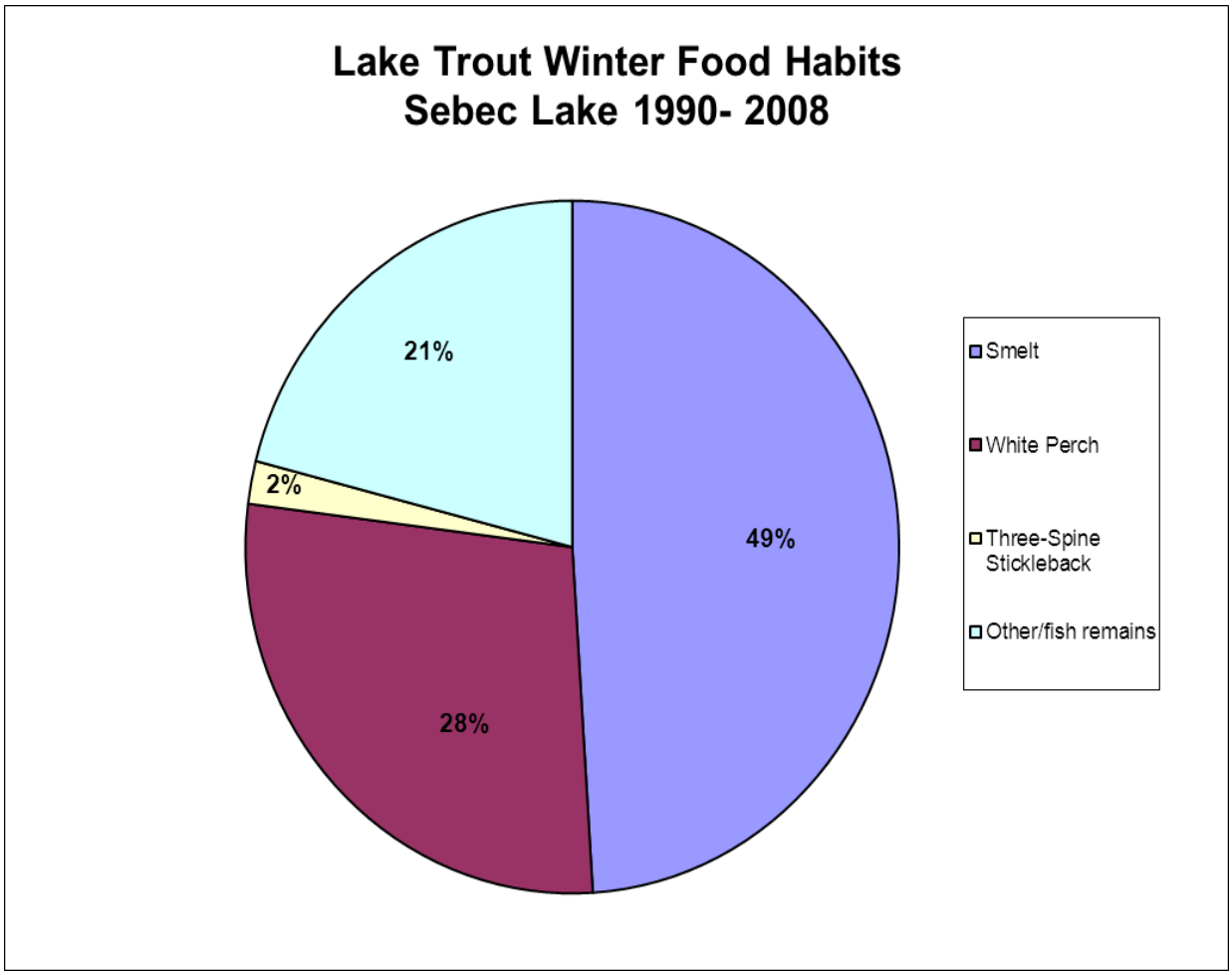


Figure 16. Mean Condition (K) Factor and volume of food in lake trout stomachs at Sebec Lake (1980-2011).

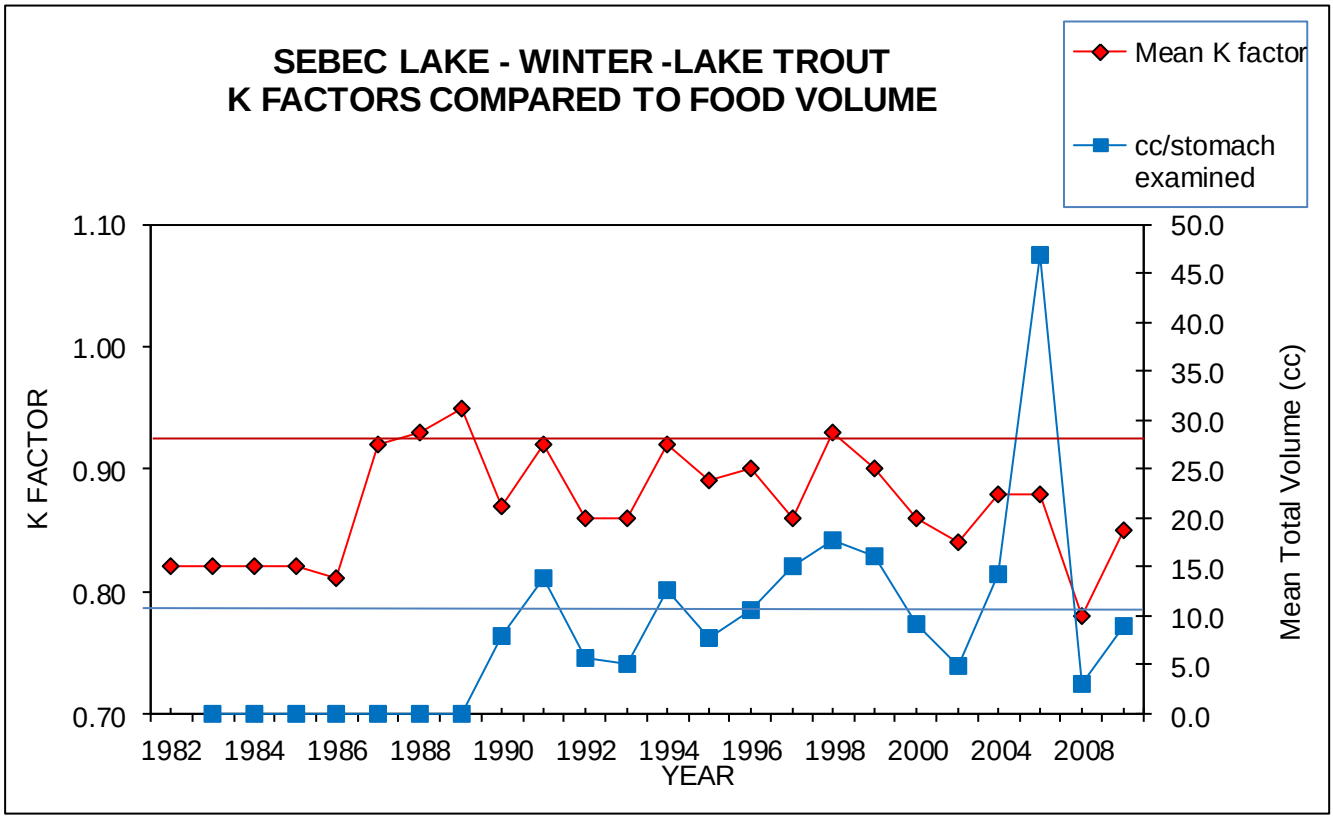


Figure 17. Locations of flow gaging stations on tributaries to Sebec Lake.

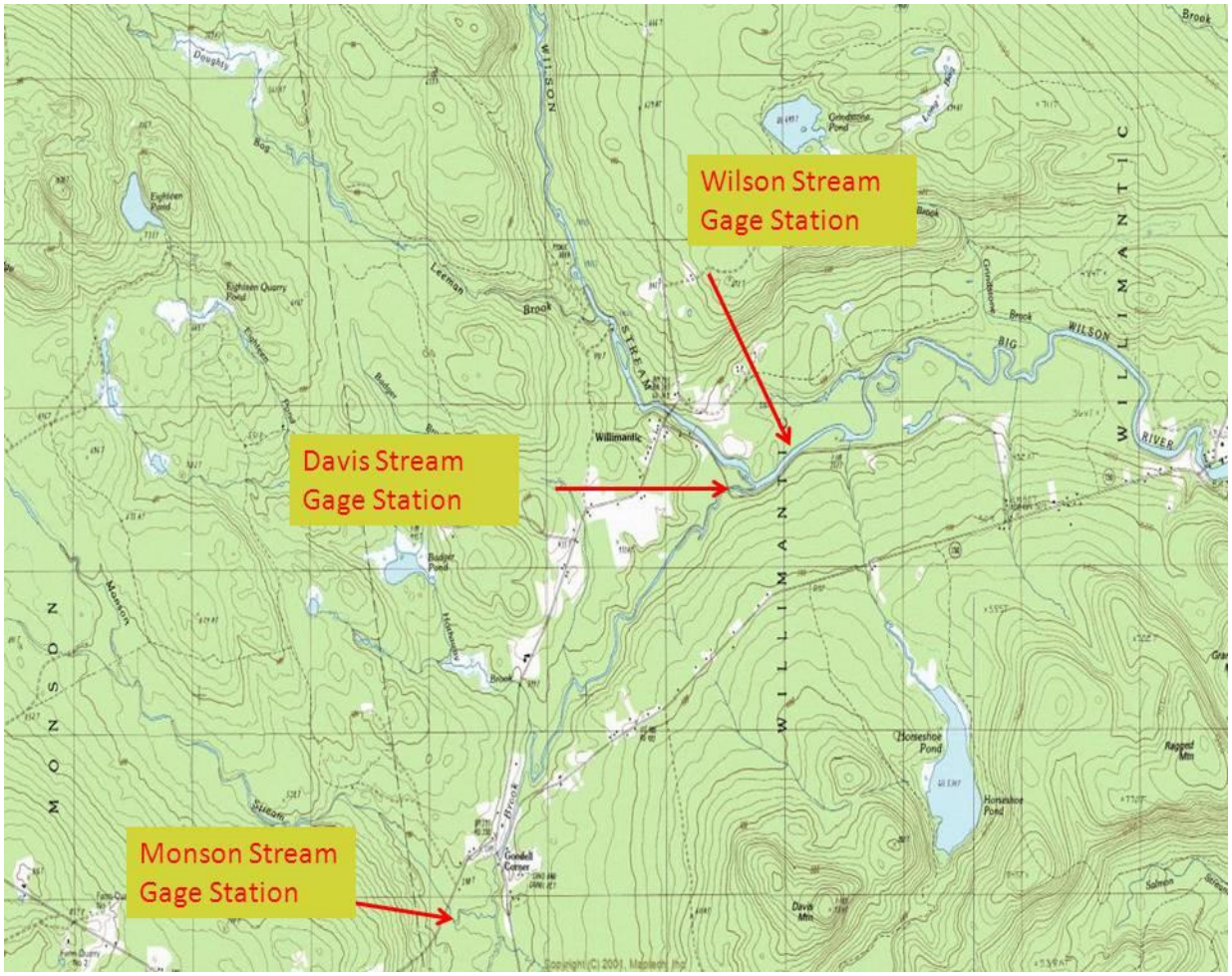
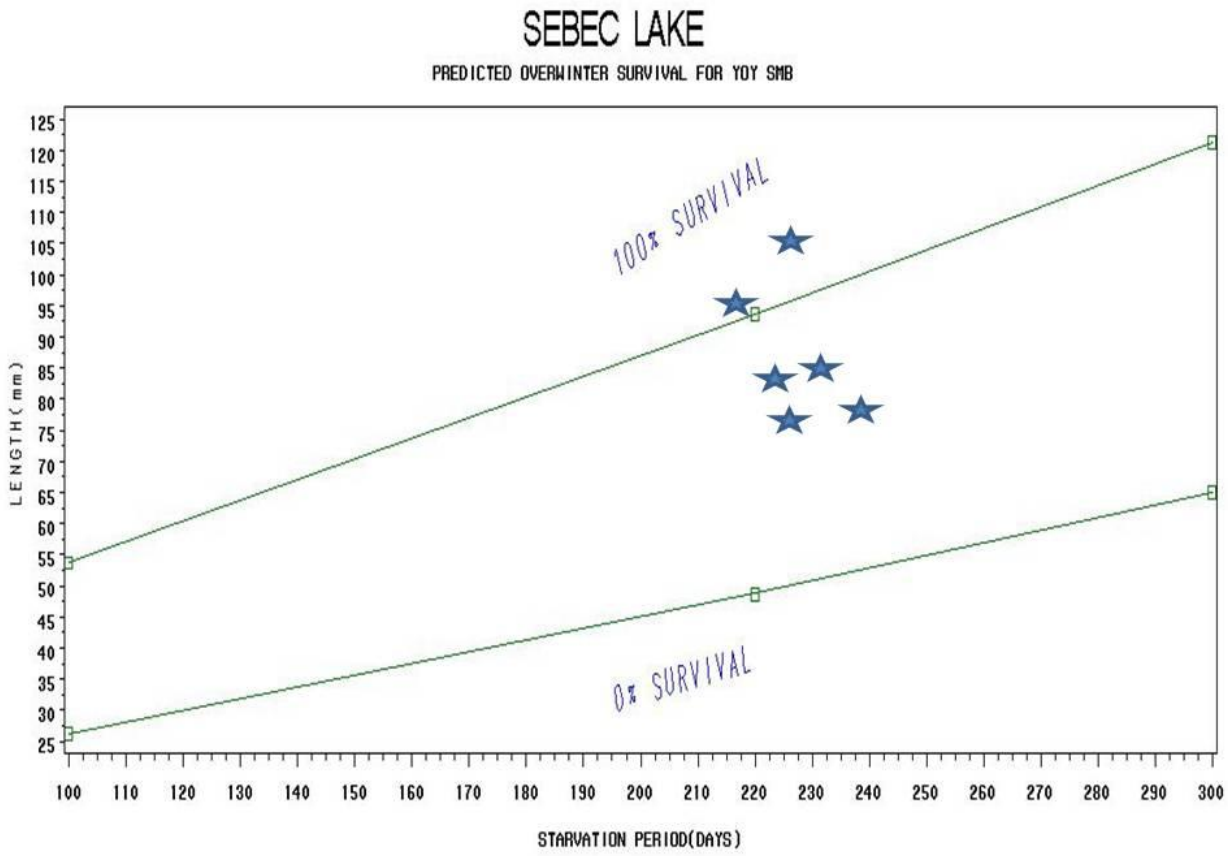
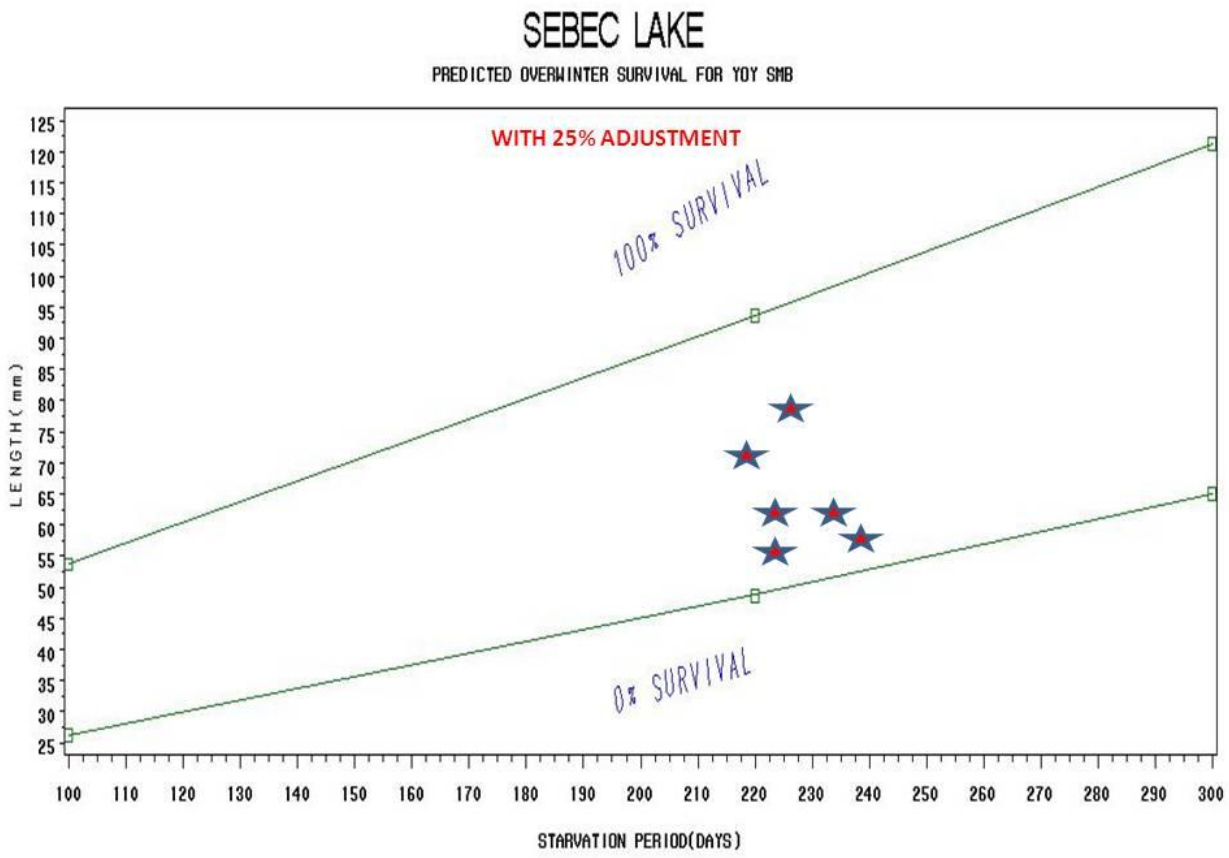


Figure 18. Predicted survival of YOY smallmouth bass at Sebec Lake (1994-2000).



Note: Stars indicate the predicted mean length in a given year.

Figure 19. Predicted survival of YOY smallmouth bass at Sebec Lake after 25% adjustment (1994-2000).



Note: Stars indicate the predicted mean length in a given year.

Appendix I.

LD 134- An Act To Protect Native Landlocked Salmon Fisheries from Invasive Fish Species

PLEASE NOTE: Legislative Information ***cannot*** perform research, provide legal advice, or interpret Maine law. For legal assistance, please contact a qualified attorney.

An Act To Protect Native Landlocked Salmon Fisheries from Invasive Fish Species

Be it enacted by the People of the State of Maine as follows:

Sec. 1. 12 MRSA §12760, sub-§1, as enacted by PL 2003, c. 414, Pt. A, §2 and affected by c. 614, §9, is amended to read:

1. Commissioner's authority. In order to conserve, develop or restore anadromous or migratory fish resources, the commissioner may require a fishway to be erected, maintained, repaired or altered by the owners, lessors or other persons in control of any dam or other artificial obstruction within inland waters frequented by alewives, shad, salmon, sturgeon or other anadromous or migratory fish species.

The commissioner may not require or authorize a fishway or fish bypass structure at a dam on the outlet of Sebec Lake in the Town of Sebec or at a dam on the Sebec River in the Town of Milo that would allow the upstream passage of an invasive fish species known to be present downstream in the Piscataquis River or Penobscot River drainage. For the purposes of this section, "invasive fish species" means those invasive fish species identified in the action plan for managing invasive aquatic species developed pursuant to Title 38, section 1872.

Sec. 2. 12 MRSA §12760, sub-§9 is enacted to read:

9. Sebec Lake and Sebec River dams; fishways prohibited. Notwithstanding any other provision of law to the contrary, the owners, lessors or other persons in control of a dam on the outlet of Sebec Lake in the Town of Sebec or a dam on the Sebec River in the Town of Milo may not construct or authorize the construction of a fishway or fish bypass structure that would allow the upstream passage of an invasive fish species known to be present downstream in the Piscataquis River or Penobscot River drainage.

A. A person who violates this subsection commits a civil violation for which a fine of not less than $500 or more than $1,000 may be adjudged.

B. A person who violates this subsection after having been adjudicated as having committed 3 or more civil violations under this Part within the previous 5-year period commits a Class E crime.

Effective 90 days following adjournment of the 125th Legislature, First Regular Session, unless otherwise indicated.

Appendix II.

Sebec Lake Fisheries Management Plan

Sebec Lake is a 6,800-acre oligotrophic lake located in northwestern Maine. It has popular fisheries for landlocked salmon, lake trout, and smallmouth bass. Other species such as smelt, pickerel, and white perch also contribute to the recreational fishing at Sebec Lake. The lake is one of the original landlocked salmon waters in Maine and the salmon population can best be characterized as slow growing. In the 1950's, salmon were managed with a 5 fish bag limit and 12-inch minimum length limit due to the abundance of smaller fish. The lake trout fishery is maintained through a stocking program that began in 1961. Lake trout were present in Sebec Lake prior to the stocking program and contributed to the fishery. It is unclear whether these fish were native to Sebec Lake or wild drop downs from lake trout waters further upstream in the drainage, such as Wilson Pond, Big Benson Pond, and Big Greenwood Pond. The lake trout fishery at Sebec Lake provides most of the winter fishing opportunity. Winter angler use is estimated to be between 2,000-3,000 angler-days and nearly all of this angling opportunity is directed at lake trout. It is important recreationally and economically to the region. While Sebec Lake is not managed exclusively for large lake trout, there is a trophy component to the fishery with fish between 10-25 lbs caught annually. The contribution of salmon to the winter fishery has been small; however, salmon and smallmouth bass are the principal components of the summer recreational fishery. The salmon at Sebec Lake have a unique challenge compared to most other Maine lakes. There are waterfalls on both of the spawning tributaries to the lake which are major obstacles for adult fish to negotiate. These falls undoubtedly increase stress and mortality and likely reduce the physical condition for mature salmon at Sebec Lake.

The purpose of this fisheries management plan is to create a document with clear, measurable goals and objectives for the future management of the lake using scientific data as well as public input. This plan was developed using data collected by the Maine Department of Inland Fisheries and Wildlife for over 50 years at Sebec Lake in conjunction with input from the Sebec Lake Stakeholders group which includes members from the business community, summer and winter anglers, campowners, and the Sebec Lake Association. The plan contains 3 overarching primary goals for the management of Sebec Lake and specific measureable objectives within each of the goals. Potential problems associated with each objective have been identified along with possible strategies to overcome those problems. No priority was set in the objectives; however, the group felt it is most important to maintain the current fishing opportunities while attempting to reach the objectives.

Management Plan for Sebec Lake

Management Goals

1. Maintain the excellent water quality, aquatic habitat, and current coldwater and warmwater gamefish species at Sebec Lake.

2. Maintain and improve current public access to Sebec Lake.

3. Maintain and improve the coldwater and warmwater fishery resources to provide winter and summer recreational fisheries.

Management Objectives

1. Maintain a mean July – August Secchi disc reading of 6.6 meters.
2. Maintain more than 5ppm of dissolved oxygen below the summer thermocline.
3. Maintain appropriate flows in Wilson Stream to support and promote wild landlocked salmon recruitment.
4. Maintain fall lake elevations to ensure salmon passage at Earley's Falls.
5. Maintain lake elevations to promote successful smelt spawning.
6. Maintain lake elevations to promote successful white perch and smallmouth bass spawning.
7. Maintain the following principal fisheries
    a. Self-sustaining landlocked salmon
    b. Hatchery lake trout
    c. Self-sustaining smallmouth bass
    d. Self-sustaining white perch
    e. Self-sustaining pickerel

8. Maintain the following access points for anglers
    a. Greeley's Landing – summer and winter
    b. Packard's Landing – summer and winter
    c. Bowerbank – summer
    d. Sebec Village – summer
    e. Peaks Kenney State Park – winter

9. Maintain and improve the coldwater and warmwater fisheries

Species	Mean Length (inches)	Mean Condition Factor	Gear/season
Landlocked salmon	**16.5"**	**0.85**	**Fall Trapnet/Winter Creel Survey**
Lake trout	**21.0"**	**0.87**	**Winter Creel Survey**
Smallmouth bass	**10.1"**		**Experimental Angling**
White perch	**11.3"**		**Winter Creel Survey**

Species	Quality Index (Length/inches)	% greater than QI	Gear/season
Landlocked salmon	**18"**	**25%**	**Winter Creel Survey**
Lake trout	**22"** **25"**	**26%** **6%**	**Winter Creel Survey**
Smallmouth bass	**12"**	**20%**	**Spring Experimental Angling**
White perch	**12"**	**30%**	**Winter Creel Survey**

Species	Minimum Standard Legals/hr	Minimum Standard Sub/hr	Gear/season
Landlocked salmon	**0.013**	**0.028**	**Winter Creel Survey**
Lake trout	**0.047**	**0.087**	**Winter Creel Survey**
White perch	**0.025**	**n/a**	**Winter Creel Survey**

Problems and Strategies

P1a. ME IFW does not have the staff to conduct water quality routinely on Sebec Lake.

S1a. Work with the Sebec Lake Association and the Volunteer Lakes Monitoring Program (VLMP) to maintain continuity in data collection.

P1b. Land use practices can impact water clarity.

S1b. Work with the Sebec Lake Association and the ME DEP to provide campowners with information regarding clearing, fertilizers, and other potential threats to Sebec Lake water quality.

P2a. Land use practices can impact dissolved oxygen levels.

S2b. Work with the Sebec Lake Association and the ME DEP to provide campowners with information regarding clearing, fertilizers, and other potential threats to Sebec Lake water quality.

P3a. The Wilson Stream watershed is mostly unregulated except for Wilson Dam in Greenville. Naturally occurring summer flows are adequate to maintain young salmon in the stream; however, fall flows need to be closely regulated for salmon to negotiate Earley's Falls.

S3a. Continue to closely communicate with the Wilson Dam operators to provide higher attraction flows (approximately 100cfs) then lower flows to allow fish to swim upstream (approximately 40-50 cfs of total flow).

S3b. Re-examine the possibilities of constructing a fish passage device at the falls.

P4a. The lake must be maintained at nearly full pond for successful passage. Fall rains and especially tropical storms can cause flooding and erosion around the lake shore.

S4a. Make sure dam operators at Sebec Dam understand they can release water when there is severe risk of flooding in the forecast.

S4b. IFW staff should call dam operators as soon as adequate numbers of fish have passed the falls so drawdown can begin early if possible.

P4b. Campowners and the public believe spring and summer high lake elevations were the result of the IFW requesting the lake be held full for salmon.

S4c. Educate the campowners and public via fishing reports and the Sebec Lake Association's newsletter regarding the water level agreement and any future issues.

S4d. Work with the Sebec Lake Association to monitor lake levels in the summer. IFW has inadequate staff to monitor the lake elevations, but IFW and DEP need to be notified if lake elevations fall outside of the DEP Water Quality Certification.

P5a. Sebec Lake is typically drawn down in the early spring to allow the installment of flashboards. This drawdown often occurs during or just after the smelt run causing the dewatering of eggs.

S5a. Discuss the issue with the dam operators so they understand the problem.

S5b. Investigate possible alternatives with the dam operators.

S5c. Attempt to create additional smelt runs using egg transfers.

P6a. White perch and smallmouth bass typically spawn in the spring after water levels have stabilized.

S6a. Work with the Sebec Lake Association to monitor lake elevations.

P7a. We have seen wild lake trout populations created from hatchery stocking programs in other Maine waters similar to Sebec Lake. These populations can quickly become overabundant and stress the forage base for both salmon and lake trout. Data indicate the cessation of stocking can actually exacerbate the situation. Sebec Lake has a quality lake trout fishery comprised primarily of stocked lake trout with a small component of wild lake trout.

S7a. Continue to stock lake trout and adjust stocking rates to meet objectives for growth and catch rates while maintaining current fishing opportunities.

S7b. Work with the dam operators to maximize winter drawdowns that will discourage successful lake trout reproduction.

P8a. Boat launching facilities can become crowded and fall into disrepair.

S8a. Work with the municipalities to maintain existing sites. Use IFW/DOC funds where appropriate.

P8b. Packard's boat launch is privately owned and maintained. It has always been available for public use, however, it is uncertain whether this can be maintained in the future and it is an important summer and winter access site.

S8b. Work with the owner to develop a plan for permanent public access at this site that does not require the landowner to maintain the site.

P8c. Winter access at Peaks Kenny State Park can be difficult in some years because the gate is left closed and the placement of boulders to eliminate vehicle access makes snowmobiling dangerous.

S8c. Discuss with BPL to ensure consistent access at this location and the possibility of a parking area at the entrance to the park.

S8d. Educate the public through fishing reports about the importance of the site and stress that vehicle (Cars/trucks) access through the park gate in the winter is not permitted and causes access problems for others.

P9a. Low smelt abundance can affect survival, growth, and the condition of Sebec Lake salmon and lake trout.

S9a. Develop a work plan to include monitoring smelt runs at Sebec Lake.

S9b. Develop a source of smelt eggs that can be used as a donor for transfers to Sebec Lake and other waters.

S9c. Monitor winter food habits of lake trout and salmon to track smelt abundance.

P9b. Excessive salmon and/or lake trout abundance can cause the smelt abundance to decrease.

S9d. Adjust stocking rates to meet growth and catch rate objectives while maintaining current fishing opportunities.

S9e. Adjust bag limit and size limits on salmon and lake trout to meet growth and catch rate objectives.

S9f. Continue to monitor salmon densities in Wilson Stream and correlate to adult abundance in summer and winter.

P9c. Sebec Lake has a history of smaller than average salmon with slower growth rates.

S9g. Determine spawning mortality to identify what percentage of mature fish successfully return to the lake to grow to larger sizes.

S9h. Develop length and age frequency index for long- term monitoring of spawning salmon at Sebec Lake.

S9i. Investigate possible weir sites for future evaluation of spawning run of wild landlocked salmon.