A REVIEW OF RIVER AND STREAM BLACK BASS DATA FROM THE NEW YORK STATEWIDE FISHERIES DATABASE 2004-2013

Photo by: Ryan Coulter, NYSDEC

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Executive Summary

Black bass [largemouth bass (*Micropterus salmoides*) and smallmouth bass (*M. dolomieu*)] provide popular fisheries in many of New York's warmwater rivers and streams, but these populations have not been comprehensively assessed, and thus are not as well understood as their lake and pond counterparts. The New York State Department of Environmental Conservation Bureau of Fisheries maintains a long-term fisheries database that afforded an opportunity to assess recent river and stream survey data. Black bass population data (length, weight, ages) from the Statewide Fisheries Database (SWFD) from 2004-2013 were summarized and key population metrics (catch rates, condition, growth) were assessed and compared among stream (all lotic waters, including large rivers), lake (all lentic waters), and St. Lawrence River populations throughout the state.

For both black bass species, there were over twice the number of surveys, fish collected and waterbodies sampled for lakes than there were for streams. Mean smallmouth bass lengths, weights, and ages were smallest in streams and largest in the St. Lawrence River ($p<0.001$). Mean largemouth bass lengths, weights and ages were smaller in streams than they were in lakes ($p<0.001$). The limited number of largemouth bass from the St. Lawrence River precluded detection of statistical differences in most metrics among waterbody types. Lake surveys were more likely to be designed for warmwater sportfish population assessments (i.e., Centrarchid and Percid surveys) than stream surveys, which likely influenced the size and age structure of fish collected from each waterbody type.

The number of streams where boat electrofishing catch rates of bass ≥ 254mm (10 inches) were calculated was relatively small (25 streams for smallmouth bass, 18 streams for largemouth bass). Grand mean smallmouth bass catch rates were similar for lakes (10/h±6) and streams (8/h±2), whereas grand mean largemouth bass catch rates were higher in lakes (19/h±5) than streams (11/h±8). Sample sizes were too low to statistically differentiate catch rates for most waterbody types by season; however, mean catch rates were higher for both species in lakes in the spring (smallmouth bass: 17/h±25; largemouth bass: 24/h±27) than they were for streams in the summer (smallmouth bass: 6/h±5, $p<0.001$; largemouth bass: 4/h±4, $p<0.001$) and lakes in the fall (smallmouth bass: 8/h±9, $p<0.001$; largemouth bass: 18/h±22, $p=0.004$). Variability in mean catch rate data was high for most waterbody types by season, an indication that there were large catch rate differences among individual surveys and waterbodies.

Condition, as measured by relative weights (W_r) derived from species-specific equations, of each black bass species in streams and lakes was similar, but largemouth bass tended to be in better condition than smallmouth bass and condition tended to increase from spring through fall within species/waterbody type groups. Mean W_r ranged from 89±13 for smallmouth bass from lakes in the spring to 111±12 for largemouth bass from streams in the fall. The St. Lawrence River was the only waterbody type where condition didn't improve from the summer to the fall, but this was likely influenced by a very limited sample of fall collected smallmouth bass.

Small sample sizes of aged bass limited age distribution and growth assessments, particularly for streams. The limited data suggested that both species typically reach 254mm (10 inches) by age 3 and 305mm (12 inches) by age 4 in all waterbody types, and that lake and St. Lawrence River

smallmouth bass mean lengths were slightly higher than those for stream smallmouth bass for ages 3-6. Mean lengths at ages for smallmouth bass from the St. Lawrence River and lakes are indicative of fast growth through age 5, and average growth thereafter. Von Bertalanffy growth curve assessments were limited by small sample sizes. For largemouth bass, growth curves differed significantly between lakes and streams only during the fall ($p<0.001$), but this should be viewed with caution as only 43 fall-aged bass from streams were included in this comparison. All growth curves for smallmouth bass among waterbody types by season were different ($p\leq0.021$), and stream sample sizes were typically higher than they were for largemouth, which provided more confidence in these comparisons. However, growth curve patterns only showed a consistent pattern in the fall, with lake smallmouth bass having a higher growth curve past age 2 than stream and St. Lawrence River bass. Growth rates (K) were only different in the summer, but because stream smallmouth bass were heavily skewed to younger fish (ages 1 and 2), the growth rate comparison was unclear.

This project highlighted the extent and limitations of stream black bass population data in the SWFD. Few stream surveys provided the data necessary for a comprehensive assessment of bass populations, which limited the assessment of statewide population metrics and stream/lake comparisons. Even for streams where an apparently adequate sample of bass were collected, the lack of standard methods casts doubt into how representative collected bass were of the actual populations. Of particular concern is the paucity of age data, which severely restricts assessments of growth rates and longevity, which are necessary in order to comprehensively evaluate stream population status and to evaluate the need for the 10 inch minimum size limit regulation which is in place for many streams throughout the state. Establishment of standard warmwater stream sampling and assessment methods would allow for a more uniform and comprehensive assessment approach, which would greatly enhance our ability to reliably assess individual bass populations and make comparisons among streams throughout the state. Standard sampling methods appropriate for New York rivers and streams should be developed using currently available protocols as templates. Also, more comprehensive assessments of river and stream black bass populations and fisheries should be conducted by further evaluating growth, longevity, and exploitation.

Introduction

New York State has an abundance of warmwater streams and rivers and many provide popular fisheries. Large warmwater rivers such as the St. Lawrence, Lower Hudson, Mohawk, Upper and Lower Niagara, Susquehanna, and Seneca rivers are some of the most fished waters in the state (Connelly and Brown 2009). Black bass [largemouth bass (*Micropterus salmoides*) and smallmouth bass (*M. dolomieu*)] are typically the most prevalent, and sought after, sportfish in these systems. Most riverine black bass populations are managed under the statewide regulations which include an open “harvest” season from the 3rd Saturday in June to November 30, a daily possession limit of 5, a 12 inch minimum size limit, and a catch and release only season from December 1 to the “harvest” season opener. However, some river populations are managed under special regulations, with the most widely applied one being a 10 inch minimum size limit to allow some angler harvest of bass from populations that are generally believed to not grow as large as their lake and pond counterparts, either because of reduced longevity, slower growth rates, or both (Green et al. 1992). The characteristics of lake and pond black bass populations throughout New York State were recently assessed by Perry et al. (2014a, 2014b), but there have been no comprehensive statewide assessments of riverine populations and therefore their characteristics in these systems are not as well understood. Fortunately, the New York State Department of Environmental Conservation Bureau of Fisheries (NYSDEC BOF) maintains a long-term fisheries database (1988 – present), which affords an opportunity to assess recent riverine survey data. The objectives of this study were to summarize river and stream black bass data from the NYSDEC BOF Statewide Fisheries Database (SWFD), assess river and stream population metrics from throughout New York State, and compare metrics between river/stream and lake populations.

Methods

The NYSDEC BOF SWFD (release #49) was queried for all black bass data collected from lakes (all lentic waters, including ponds, reservoirs and lakes) and streams (all lotic waters, ranging from small brooks and creeks to large rivers such as the Niagara and Hudson rivers) from 2004 – 2013. This 10-year time frame was selected to focus the assessment on recent survey data. The St. Lawrence River is a big, diverse, impounded river system with many lake-like characteristics (Green et al. 1992); therefore, it was removed from the stream dataset and assessed separately as a unique waterbody type. Waters where at least one black bass was collected were selected for assessment, regardless of survey purpose or type of gear used. Length, weight, and age data were obtained for each bass, if available, and means and ranges of each variable were calculated for each species at each site. The percent of surveys by survey code type and gear used was also determined. For streams, length frequency distributions of both species were determined by gear types where at least 100 fish were collected.

Mean boat electrofishing catch rates [number caught/h from surveys labeled 'Electrofishing (Boat)'] of black bass ≥ 254 mm (10 inches) in length were calculated and compared for each species among waterbody types and among three seasons: spring (May and June), summer (July and August), and fall (September and October). Mean catch rates were calculated from catch rates of individual survey runs for all surveys where at least one black bass was captured.

Relative weights[1] (W_r) of all bass ≥150 mm (~6 inches) in length were determined and seasonal comparisons were made among waterbody types. The standard W_r equations were $\log10 (W_s) = -5.528 + 3.273 (\log10 L)$ for largemouth bass (Henson 1991) and $\log10 (W_s) = -5.329 + 3.200 (\log10 L)$ for smallmouth bass (Kolander et al. 1993). A minimum of 20 black bass per waterbody type in each season were required for W_r assessments. Relative weights <50 and >150 were considered outliers and discarded from the assessment.

Mean lengths at age for all age groups, with a minimum of 10 aged bass per age group, of both species were calculated for each waterbody type in each season. Age distributions for streams with at least 20 aged bass age 1 or greater were determined, and the mean age distribution from all lakes, all streams, and the St. Lawrence River for each species were compared. Survey data were combined among years for waters where survey methods were the same.

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[1] Relative weight is a measure of condition which compares the weight of an individual fish of a certain length to a standard weight for that length predicted from a length-weight regression developed from data throughout the species' geographic range. Generally, relative weight scores from 95 – 105 are indicative of fish in good condition (Pope and Kruse 2007).

For growth assessments, von Bertalanffy growth curves[2] were fit to plotted age (x-axis) and length (y-axis) data for both species, and stream, lake, and St. Lawrence River curves were compared for each season using the growth parameter estimates L-infinity, K, and t0. L-infinity is a measure of the asymptotic length of the growth curve at which growth is zero (i.e., the top end of the curve), K is the growth rate, and t0 is the age at which the bass would have zero size (i.e., the starting point on the curve). The nls function in Program R (R Core Team 2014) was used to fit the models. Likelihood ratio tests (Kimura 1980) were used to determine if the three parameters of the von Bertalanffy curves differed significantly among waterbody types within each season.

To identify significant differences in length frequencies by gear type for smallmouth bass in streams, and lengths, weights, ages, and seasonal catch rates for both bass species among waterbody types, one-way ANOVA tests were used, followed by Tukey-HSD multiple comparisons. A T-test was used to assess the difference in the length frequencies by gear types of largemouth bass in streams. Program R (R Core Team 2014) was used for statistical tests.

Results

Smallmouth bass data were obtained from 170 surveys from 84 streams (Appendix A), 348 surveys from 168 lakes, and 18 St. Lawrence River surveys (Table 1). All smallmouth bass (n=17,389) were measured for length, 75% (n=13,119) were weighed, and 46% (n=8,071) were aged. Mean lengths, weights and ages were smallest in streams and largest in the St. Lawrence River (Table 1). All metrics were significantly different among waterbody types ($p<0.001$).

Largemouth bass data were obtained from 195 surveys from 100 streams (Appendix B), 480 surveys from 246 lakes, and 12 St. Lawrence River surveys (Table 1). Almost all largemouth bass were measured for length (99.9%, n=24,387), 61% (n=14,963) were weighed, and 30% (n=7,296) were aged. As with smallmouth bass, mean lengths, weights and ages were smallest in streams and largest in the St. Lawrence River. Lengths of largemouth bass in streams differed from those in lakes ($p<0.001$) and the St. Lawrence River ($p<0.001$), but lengths from lakes and the St. Lawrence River were not different ($p=0.544$). Weights of largemouth bass only differed significantly between streams and lakes ($p<0.001$), not between lakes and the St. Lawrence River ($p=0.657$) nor between streams and the St. Lawrence River ($p=0.600$). Largemouth bass ages differed between streams and lakes ($p<0.001$) and between streams and the St. Lawrence River ($p=0.025$), but not between lakes and the St. Lawrence River ($p=0.792$).

The numbers of fish collected, surveys, and waterbodies were similar between smallmouth bass and largemouth bass in streams, but there were large differences between the species for lakes and the St. Lawrence River (Table 1). Almost twice as many largemouth bass were collected from lakes as smallmouth bass, and the vast majority of bass collected from the St. Lawrence River were smallmouth bass. A higher percentage of smallmouth bass from streams were weighed (44%) and aged (24%) than largemouth bass from streams (21% weighed, 5% aged). A similar, but less extreme pattern was evident in lakes (smallmouth bass: 83% weighed, 48% aged; largemouth bass: 70% weighed, 35% aged). In general, a higher percentage of both species were weighed and aged in lakes compared to streams.

[2] Von Bertalanffy growth curve models are commonly used to assess fish growth in length (Isely and Grabowski 2007).

Table 1. Black bass data selected for assessment from streams, lakes, and the St. Lawrence River, New York, 2004-2013.

Waterbody type	Number collected	Number of surveys	Number of waterbodies	Length[a] (mm)	Weight (g)	Age (yrs)
Smallmouth bass						
Stream	4,405	170	84	208±117 (31-530) 4,405 bass	367±406 (1–2,080) 2,140 bass	2.7±2.1 (0-16) 1,058 bass
Lake	10,805	348	168	283±106 (10-670) 10,805 bass	492±467 (1-3,519) 8,990 bass	4.2±2.4 (0-17) 5,219 bass
St. Lawrence River	2,179	18	1	326±80 (55-635) 2,179 bass	657±462 (32-2,775) 1,989 bass	4.6±1.8 (1-14) 1,792 bass
Largemouth bass						
Stream	4,216	195	100	169±115 (23-535) 4,216 bass	600±553 (2-2,560) 867 bass	3.0±2.6 (0-11) 227 bass
Lake	20,096	480	246	246±119 (15-635) 20,090 bass	426±443 (0-3,220) 14,073 bass	4.1±2.5 (0-15) 7,047 bass
St. Lawrence River	81	12	1	260±122 (42-531) 81 bass	508±556 (30-1,850) 23 bass	4.5±2.8 (1-11) 22 bass

[a]Values for length, weight and age: mean ± SD (top), range (middle), number measured (bottom)

Survey categories

There were 19 different survey purpose categories used among all waterbody types for smallmouth bass (Figure 1). Fourteen categories were used for both stream and lake surveys and four categories were used for St. Lawrence River surveys. Lake surveys were primarily categorized as General Biological (30%), Percid (22%), Centrarchid (17%), and Other (16%) surveys. Streams were primarily categorized as General Biological (31%) and Other (19%) surveys. The majority of St. Lawrence River surveys were General Biological surveys (61%).

For largemouth bass, there were 20 different survey purpose categories used among all waterbody types (Figure 2). Seventeen categories were used for lakes, 15 were used for streams, and 4 were used for the St. Lawrence River. Lake surveys were primarily categorized as General Biological (29%), Centrarchid (17%), Other (15%) and Percid (14%) surveys, whereas stream surveys were mainly categorized as General Biological (23%), EBTJV[3] (23%), Other (15%), and CROTS[4] (14%). Most of the St. Lawrence River surveys were General Biological surveys (58%).

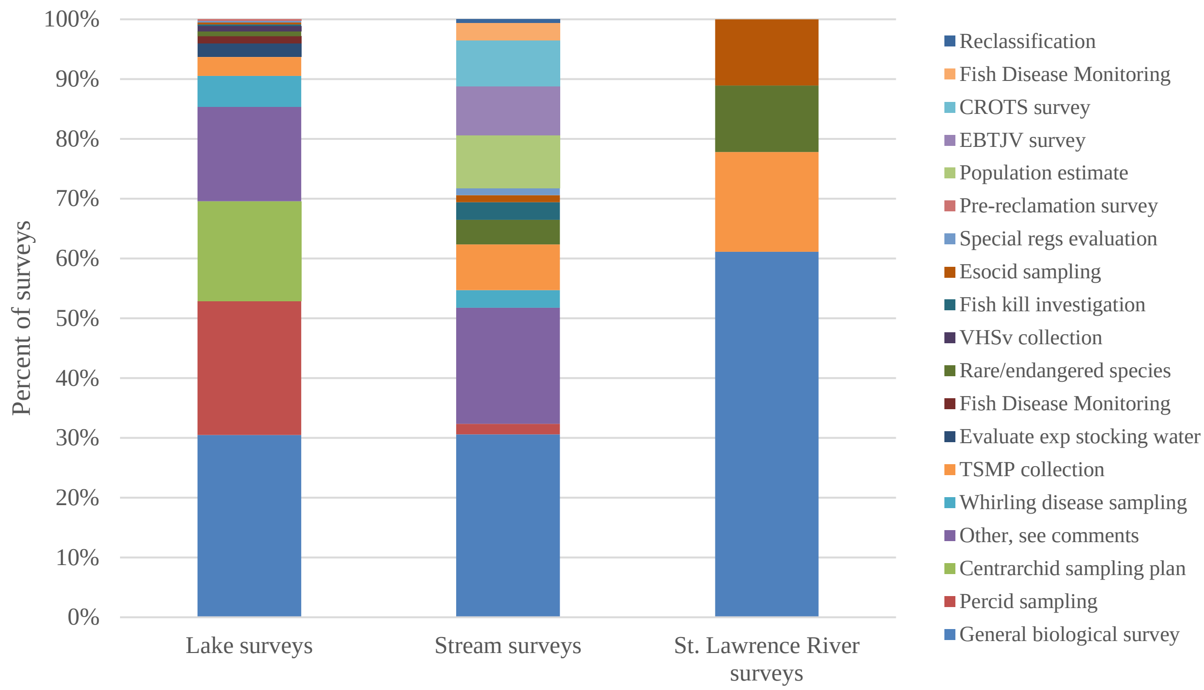

Figure 1. Percent of surveys from the SWFD, by purpose code type, that provided smallmouth bass data for assessment, 2004-2013.

[3] Eastern Brook Trout Joint Venture Survey
[4] Catch Rate Oriented Trout Survey

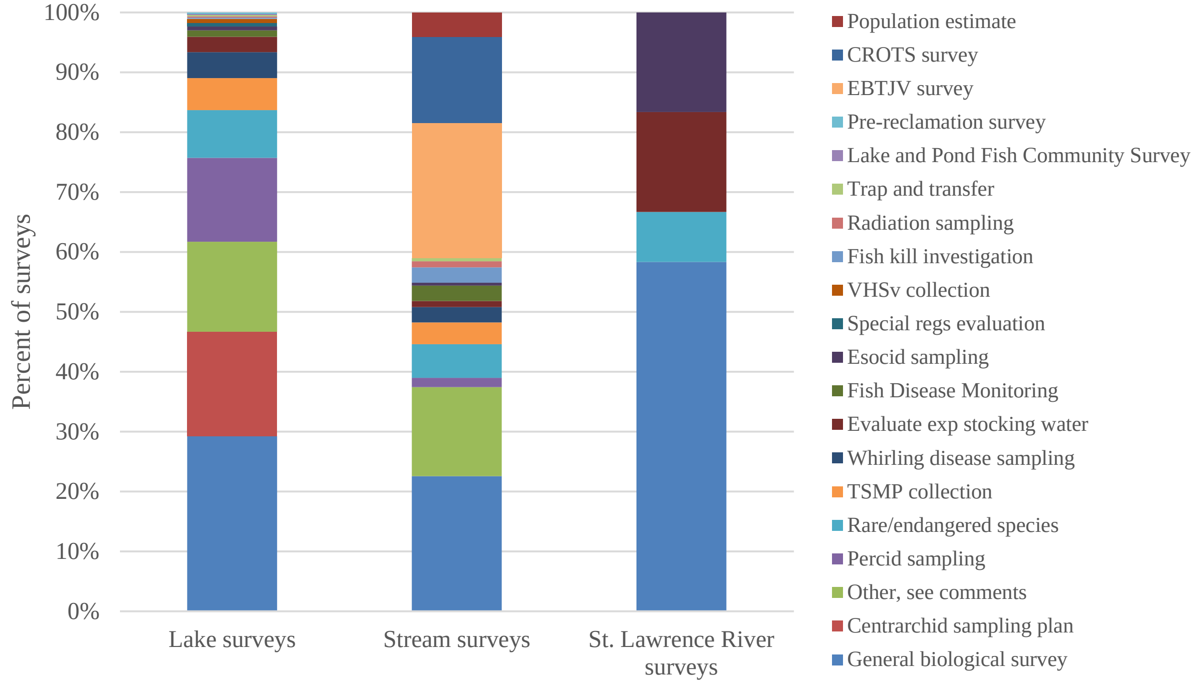

Figure 2. Percent of surveys from the SWFD, by purpose code type, that provided largemouth bass data for assessment, 2004-2013.

Gear types

Seven different gears were used for both lake and stream smallmouth bass surveys (Figure 3). Most stream surveys used either boat electrofishing (42%) or electrofishing (i.e., backpack or barge electrofishing) (37%). For lake surveys, boat electrofishing (48%) and gill netting (44%) were the primary gears used for sampling lakes. Smallmouth bass from the St. Lawrence River were sampled mainly by gill netting (84%).

Largemouth bass were sampled with seven gears in stream surveys and 11 gears in lake surveys (Figure 4). The primary gears used in stream surveys were electrofishing (59%) and boat electrofishing (30%). For lake surveys, boat electrofishing (58%) and gill netting (21%) were the principal gears. Largemouth bass from the St. Lawrence River were sampled with only three gears: gill netting (54%), seining (31%), and boat electrofishing (15%).

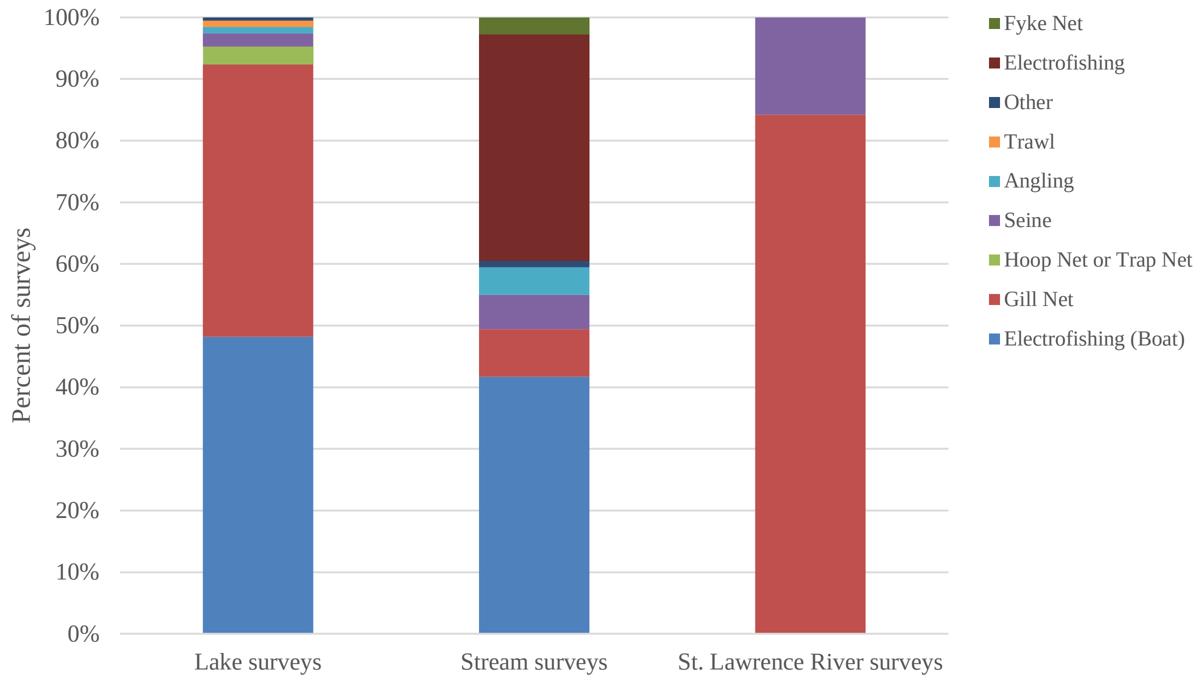

Figure 3. Percent of surveys from the SWFD, by sampling gear type, that provided smallmouth bass data for assessment, 2004-2013.

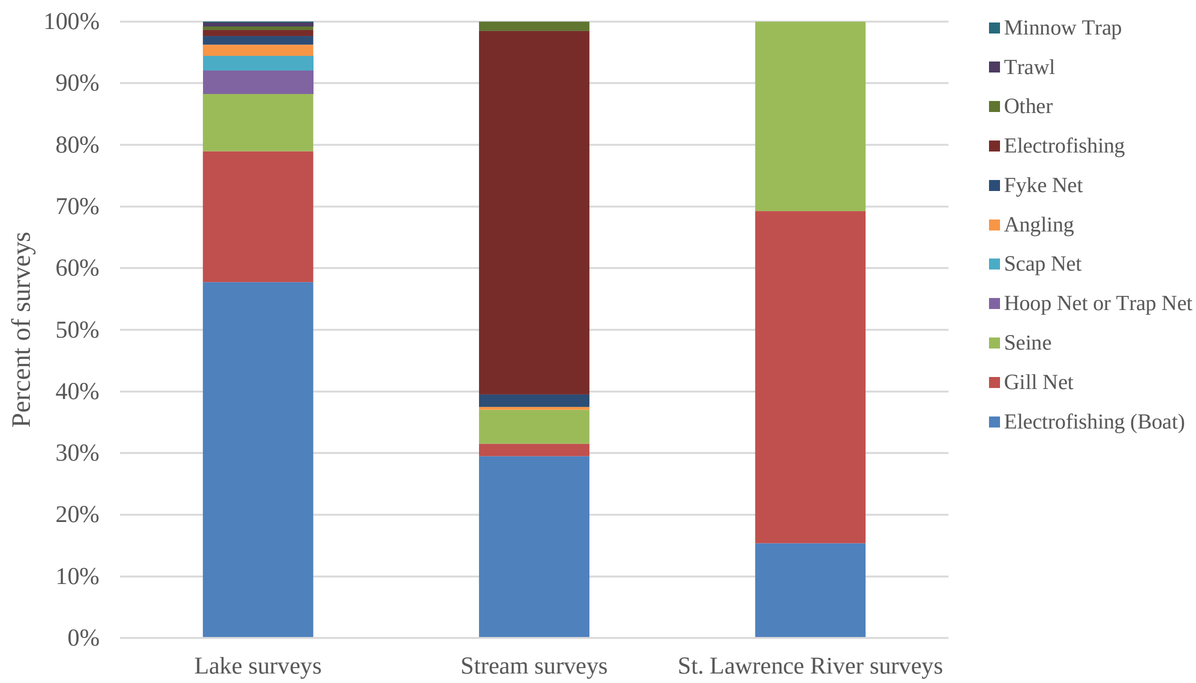

Figure 4. Percent of surveys from the SWFD, by sampling gear type, that provided largemouth bass data for assessment, 2004-2013.

Length by gear type

More smallmouth bass in streams were collected by boat electrofishing (n=3,205) than by backpack/barge electrofishing (n=963) and angling (n=103). Most of the smallmouth bass caught by backpack/barge electrofishing were under 200mm (7.9 inches), whereas those caught via boat electrofishing and angling had a more even distribution through 400mm (15.7 inches) (Figure 5). Mean lengths (mean±SD) of smallmouth bass caught via angling (248mm±87) and boat electrofishing (227mm±114) were not different (p=0.126), but both were higher than the mean length of backpack/barge electrofishing caught bass (129mm±92, p<0.001) (Figure 6).

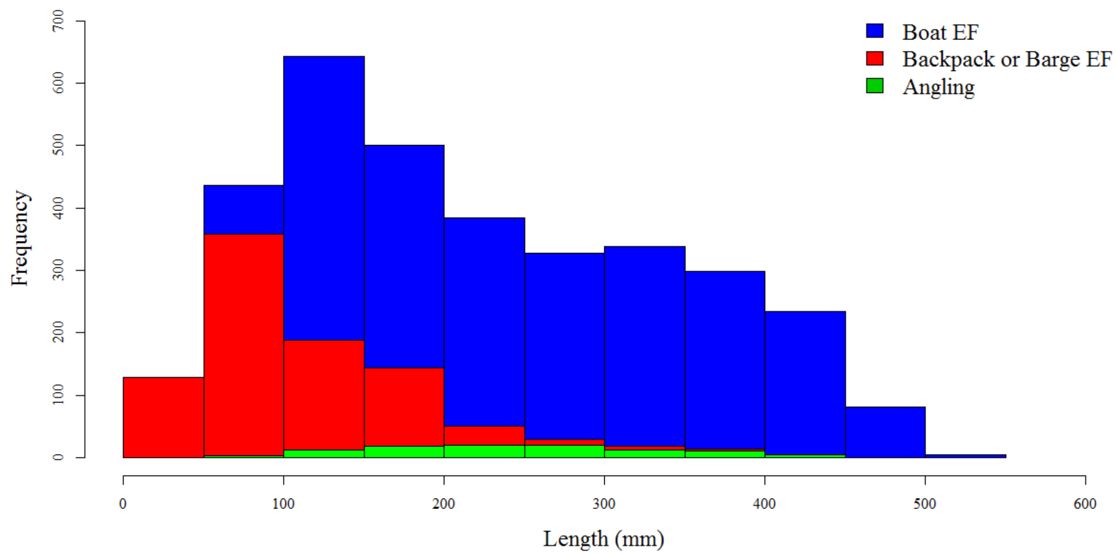

Figure 5. Length frequency of smallmouth bass caught by boat electrofishing, backpack/barge electrofishing, and angling in streams, 2004-2013.

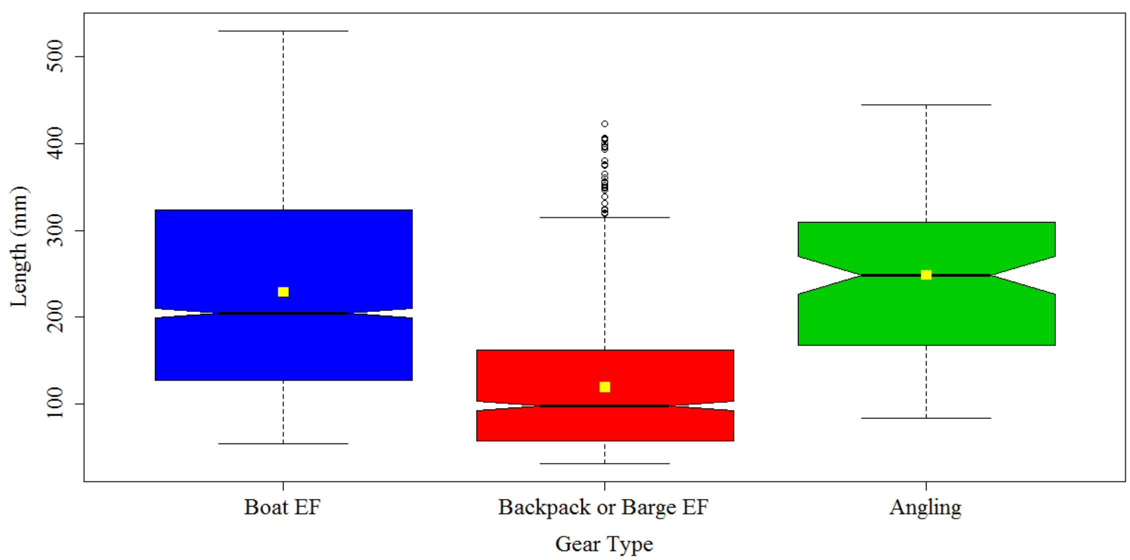

Figure 6. Median lengths of smallmouth bass captured by boat electrofishing, backpack/barge electrofishing, and angling. The bottom and top ends of the box are 1st and 3rd quartiles. Whiskers indicate the minimum and maximum values, excluding outliers. Means are represented by the yellow square.

For largemouth bass, length comparisons were only made for boat electrofishing (n=3,743) and backpack/barge electrofishing (n=383). For both gear types, the majority of bass collected were between 50mm (2 inches) and 150mm (5.9 inches), but there was a higher proportion of larger fish caught by boat electrofishing (Figure 7). The mean length of boat electrofishing caught largemouth bass (174mm±115) was higher than for those caught with backpack/barge electrofishing gear (118mm±89, p<0.001) (Figure 8).

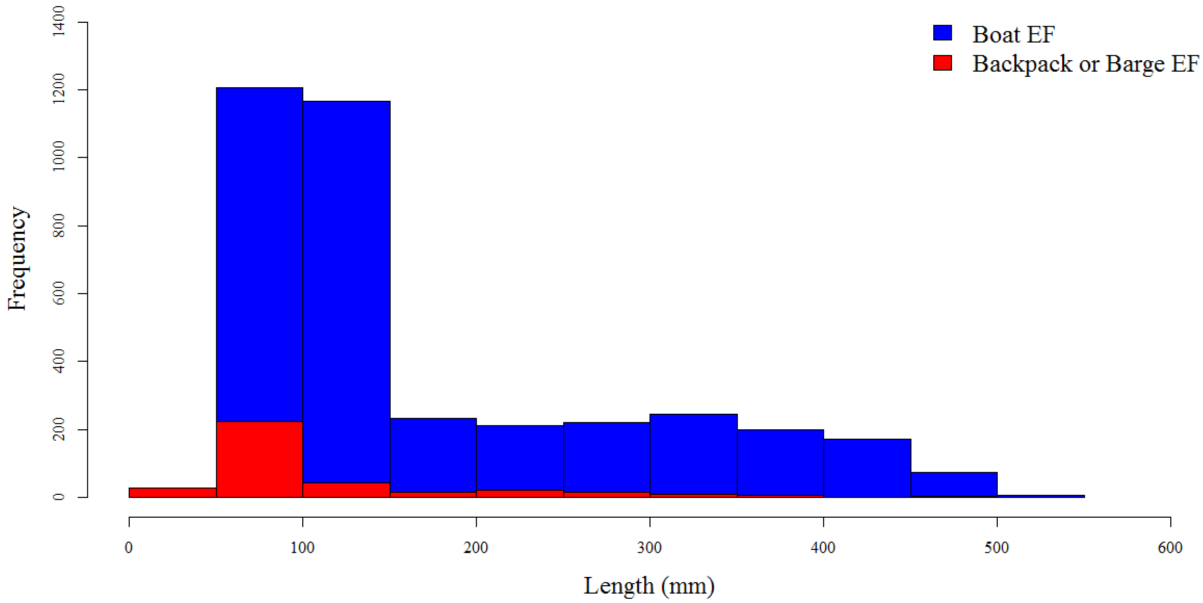

Figure 7. Length frequency of largemouth bass caught by boat electrofishing, backpack/barge electrofishing, and angling in streams, 2004-2013.

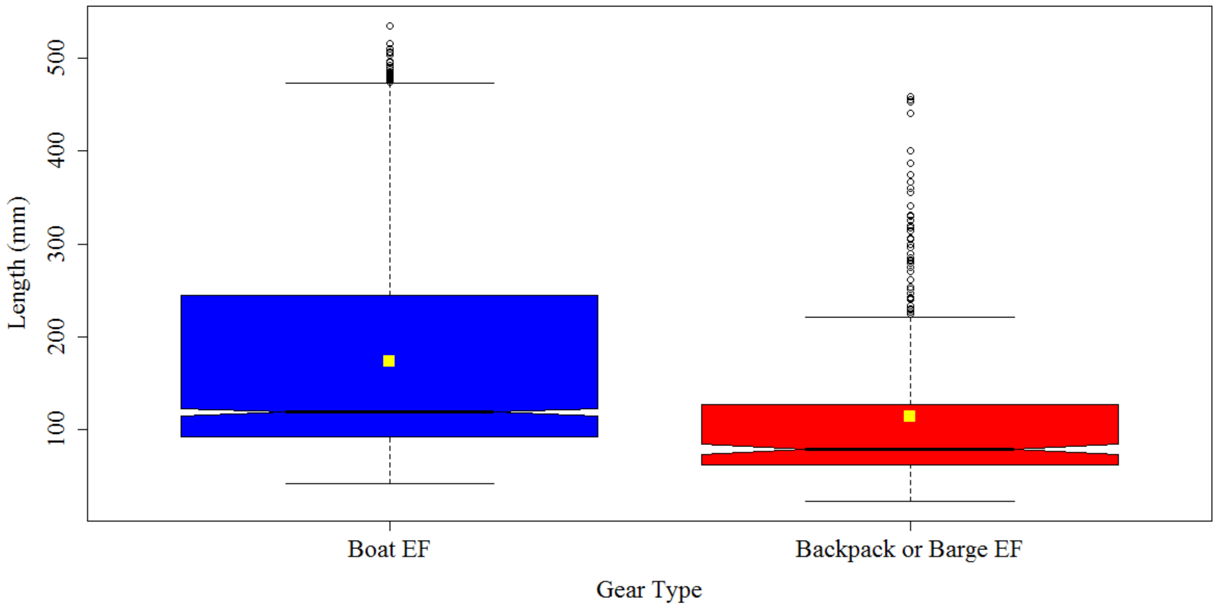

Figure 8. Median lengths of largemouth bass captured by boat electrofishing, backpack/barge electrofishing, and angling. The bottom and top ends of the box are 1st and 3rd quartiles. Whiskers indicate the minimum and maximum values, excluding outliers. Means are represented by the yellow square.

Catch rates

Mean smallmouth bass catch rates were calculated for 156 surveys from 87 lakes and 69 surveys from 25 streams. There were some seasonal differences in mean catch rates [F (5,750)=10.22, p-value<0.001], but patterns were generally similar between streams and lakes (Figure 9). The mean catch rate was higher in lakes sampled in the spring (17/h±25) than for streams sampled in the summer (6/h±5, p<0.001), and streams (9/h±8, p=0.005) and lakes (8/h±9, p<0.001) sampled in the fall. There were no significant differences in catch rates among seasons for streams and lakes in summer and fall. The grand mean catch rates for streams and lakes were 8/h ±2 and 10/h±6, respectively. There were no smallmouth bass collected from boat electrofishing surveys from the St. Lawrence River.

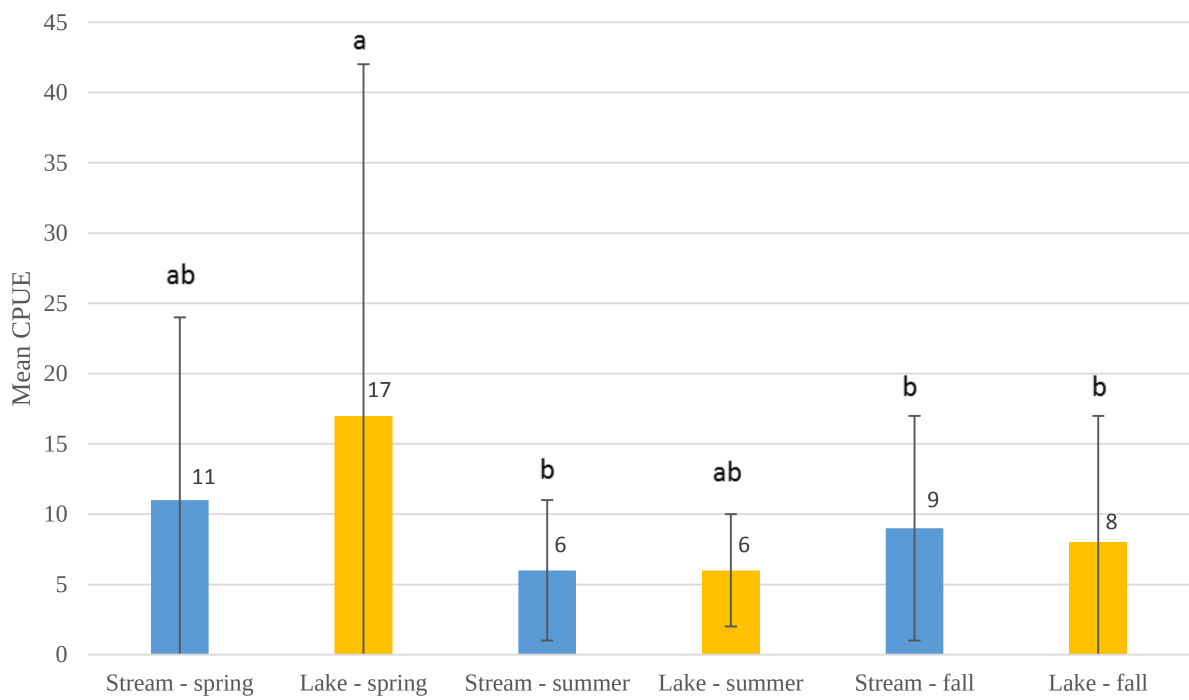

Figure 9. Mean seasonal boat electrofishing catch rate of smallmouth bass ≥254 mm (10 inches) from New York streams and lakes, 2004-2013. Error bars represent standard deviations. Categories with the same letters above the bars were not significantly different.

Mean largemouth bass catch rates were calculated for 278 surveys from 154 lakes and 43 surveys from 18 streams. There were some seasonal and waterbody type differences in catch rates [F (6,1242)=6.58, p-value<0.001] (Figure 10). Mean catch rates from lakes in the spring (24/h±27) were higher than those from lakes in the fall (18/h±22, p=0.004) and streams in the summer (4/h±4, p<0.001). Also, the mean catch rates from lakes and streams (19/h±26) in the fall were higher than those from streams in the summer (p<0.035). The grand mean catch rates for streams and lakes were 11/h ±8 and 19/h±5, respectively. The only largemouth bass collected from the St. Lawrence River via boat electrofishing were from a single survey in the fall (mean catch rate: 12/h±2). There was no significant difference between the mean catch rate from the St. Lawrence River and any other waterbody type/season combination due to the limited sample size.

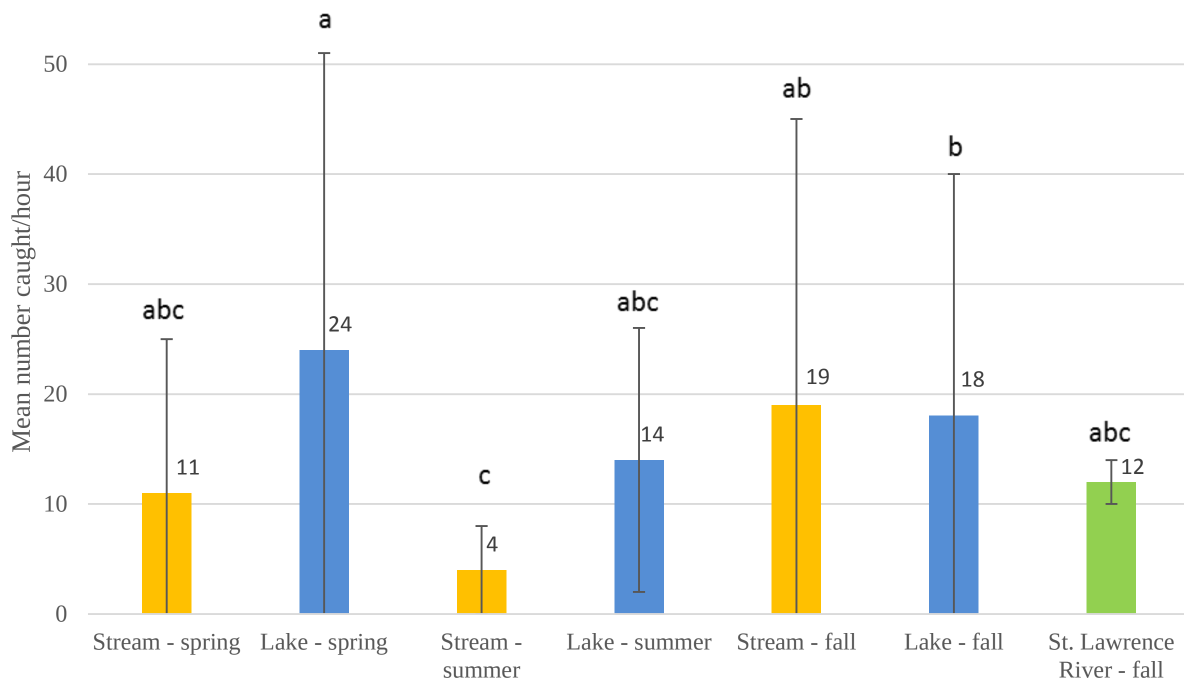

Figure 10. Mean seasonal boat electrofishing catch rate of largemouth bass ≥254 mm (10 inches) from New York streams and lakes, 2004-2013. Error bars represent standard deviations. Categories with the same letters above the bars were not significantly different.

Relative weight

Mean W_r for both species varied by season within each waterbody type (Figure 11). Mean W_r ranged from 89±13 for smallmouth bass from lakes in the spring to 111±12 for largemouth bass from streams in the fall. Mean W_r of largemouth bass was higher than those of smallmouth bass in streams and lakes for each season (Figure 11). All stream and lake smallmouth bass mean W_r were less than 100, whereas all but one mean W_r from largemouth bass (spring-lake) were above 100. Three of the highest four mean W_r were from largemouth bass from streams. Mean St. Lawrence River smallmouth bass W_r were higher in the summer (108±11) than they were in the fall (100±9). Mean smallmouth bass W_r were similar for streams and lakes within seasons and waterbody types, whereas mean largemouth bass W_r were higher in streams than in lakes within waterbody types and seasons.

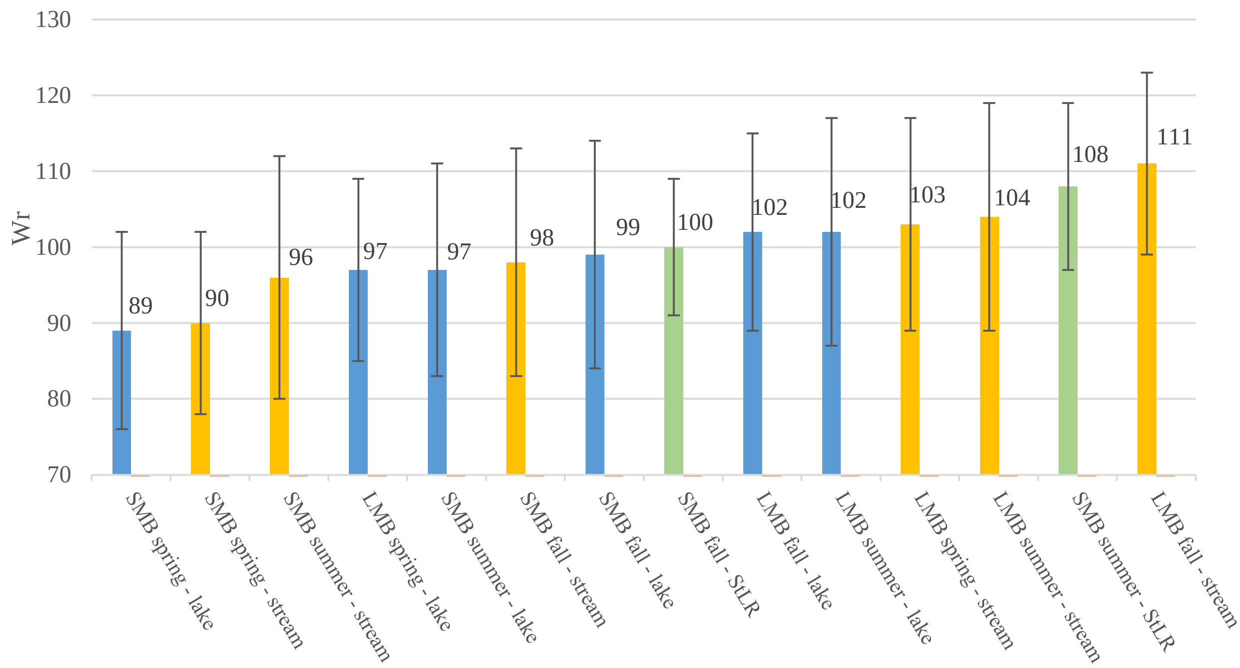

Figure 11. Mean seasonal W_r for smallmouth bass (SMB) and largemouth bass (LMB) from New York streams (yellow), lakes (blue) and the St. Lawrence River (green), 2004 – 2013. Error bars represent standard deviations.

Age and growth

Mean lengths at age were calculated through ages 7, 12, and 10 for smallmouth bass from streams, lakes, and the St. Lawrence River, respectively, but this varied by season for streams and lakes (Table 2, Figure 12). Mean length at age only increased by season for age 1 and 2 smallmouth bass from streams, otherwise there was an inconsistent seasonal pattern. In lakes, there was a generally increasing pattern of lengths at age from spring through fall. Mean lengths at ages were similar among waterbody types for spring and summer, however, in the fall lengths at age in lakes were greater than those in streams for all but age 1 (Figure 12).

Mean lengths at age were calculated through ages 6 and 13 for largemouth bass from streams and lakes, respectively (Table 2). Stream data were only available for the fall, and St. Lawrence River data were lacking. Mean lengths in the fall were higher in lakes than they were in streams for age 1 – 3 fish. Otherwise data were too limited to make any meaningful comparisons between waterbody types.

Age distributions were determined for 10 individual streams for smallmouth bass (Figure 13) and 4 individual streams for largemouth bass (Figure 14). These were the only streams with at least 20 age 1 or greater black bass in the dataset. For individual smallmouth bass streams, ages ranged from 1 – 16, with the majority of samples in the age 1 – 5 year range for most streams. The age distribution from all streams was skewed more towards younger aged bass, with 70% of aged bass in the 1-3 year range (Figure 15). In contrast, the age distribution for smallmouth bass in lakes was more evenly distributed from age 2 – 6. There also was a higher percentage of age 7 and greater bass (18%) in lakes than there was in streams (7%). Smallmouth bass from the St. Lawrence River were primarily in the age 3 – 6 range (78%), with a slightly lower percentage of fish age 7 and greater (15%) than those in lakes.

Table 2. Mean lengths (mm) at age of stream, lake, and St. Lawrence River black bass, by season[a], in New York, 2004-2013.

	Age (year)												
	1	2	3	4	5	6	7	8	9	10	11	12	13
Smallmouth bass													
Streams (spring)	125	188	262	310	334								
Streams (summer)	146	191	237	287	327	386	415						
Streams (fall)	188	220	258	296	327	352	392						
Lakes (spring)	127	173	244	295	336	364	400	416	435	454	466		
Lakes (summer)	150	201	271	333	355	386	395	429		443			
Lakes (fall)	167	238	295	336	376	415	439	455	466	468	487	492	
St. Lawrence R. (summer)	170	188	268	321	350	376	405	430	448	461			
Largemouth bass													
Streams (fall)	131	161	249			381							
Lakes (spring)	120	189	250	298	335	370	397	416	437	454	465	467	463
Lakes (summer)	158	200	254	305	328	356	393						
Lakes (fall)	155	219	270	313	351	375	401	428	448	455	476		

[a]May and June = spring; July and August = summer; September and October = fall

Age distributions for largemouth bass from individual streams varied widely (Figure 14). The age distribution of largemouth bass from all streams was more evenly distributed among ages 2-6 than smallmouth bass from all streams (Figures 15 and 16).

Likelihood ratio tests comparing three growth curve parameters [L-inf (asymptotic length), K (growth rate), and t0 (initial length)] among lakes, streams and the St. Lawrence River, by season, revealed that for largemouth bass captured in the spring and summer, none of the parameters differed significantly among waterbody types (Figure 17, Table 3). For largemouth bass captured in the fall, t0 and the three parameters combined differed significantly between streams and lakes. For smallmouth bass captured in the spring, none of the parameters considered independently differed significantly between lakes and streams, but significant differences were observed between the growth curves when all three parameters were combined (Figure 17, Table 4). For smallmouth bass captured in the summer, all three of the growth curve parameters differed significantly between lakes and streams and between streams and the St. Lawrence River. All but the t0 parameter differed significantly between lakes and the St. Lawrence River for smallmouth bass captured during the summer. For smallmouth bass captured during the fall, the Linf, t0, and all 3 parameters combined differed significantly between lakes and streams. None of the parameters considered independently differed significantly between the St. Lawrence River and lakes or streams, but if all three parameters were combined, there were significant differences between these groups.

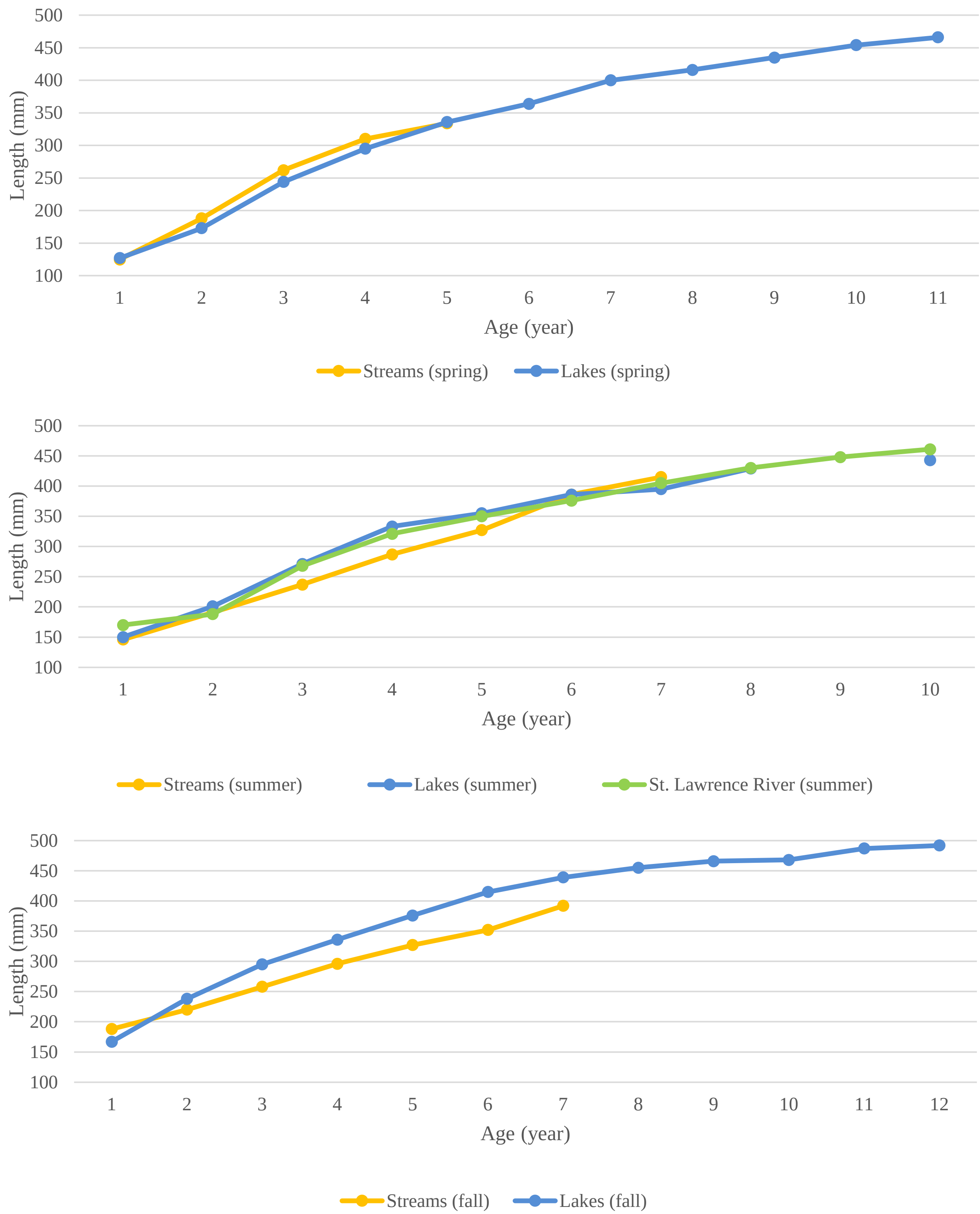

Figure 12. Seasonal comparisons of mean lengths at age for smallmouth bass among streams, lakes, and the St. Lawrence River in New York, 2004-2013.

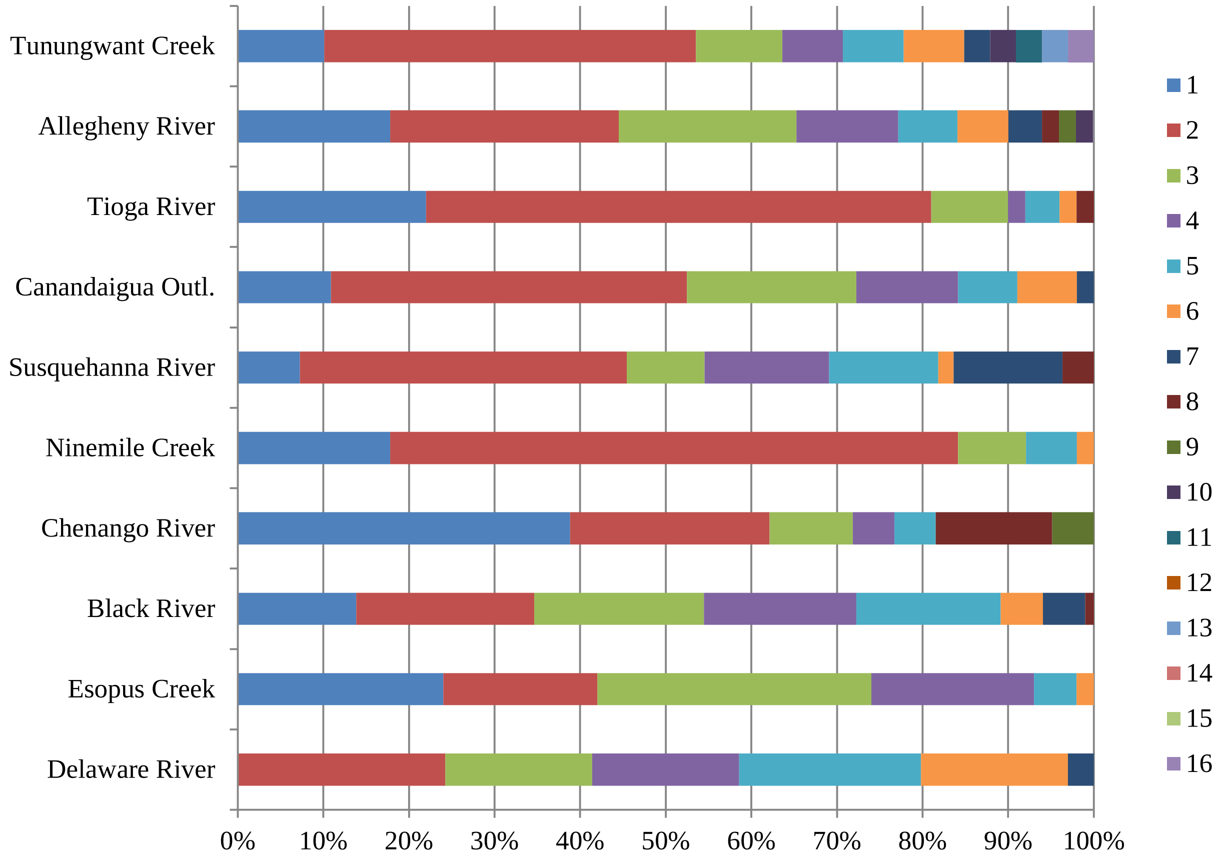

Figure 13. Percent of smallmouth bass at ages 1-16 collected from streams with at least 20 aged bass, 2004-2013.

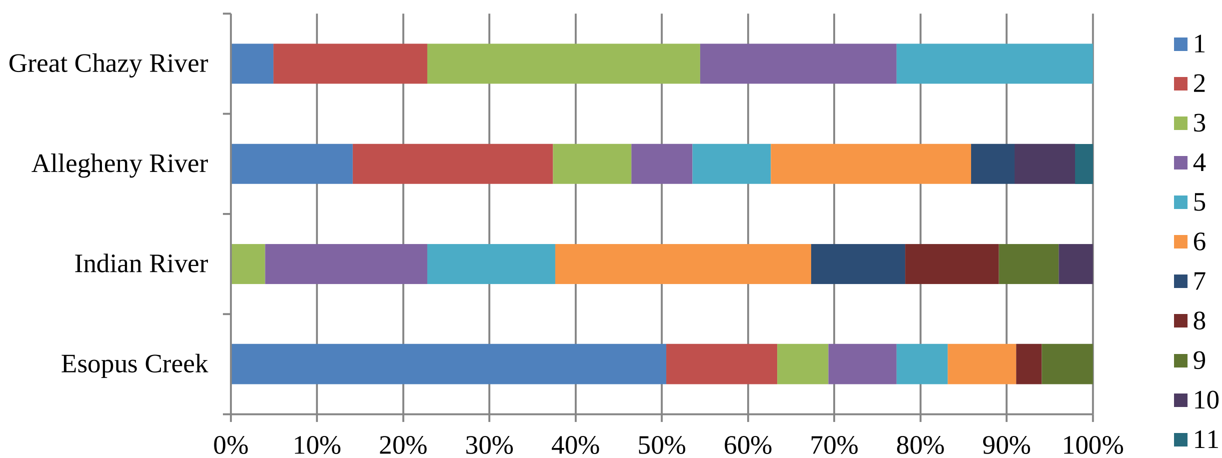

Figure 14. Percent of largemouth bass at ages 1-11 collected from streams with at least 20 aged bass, 2004-2013.

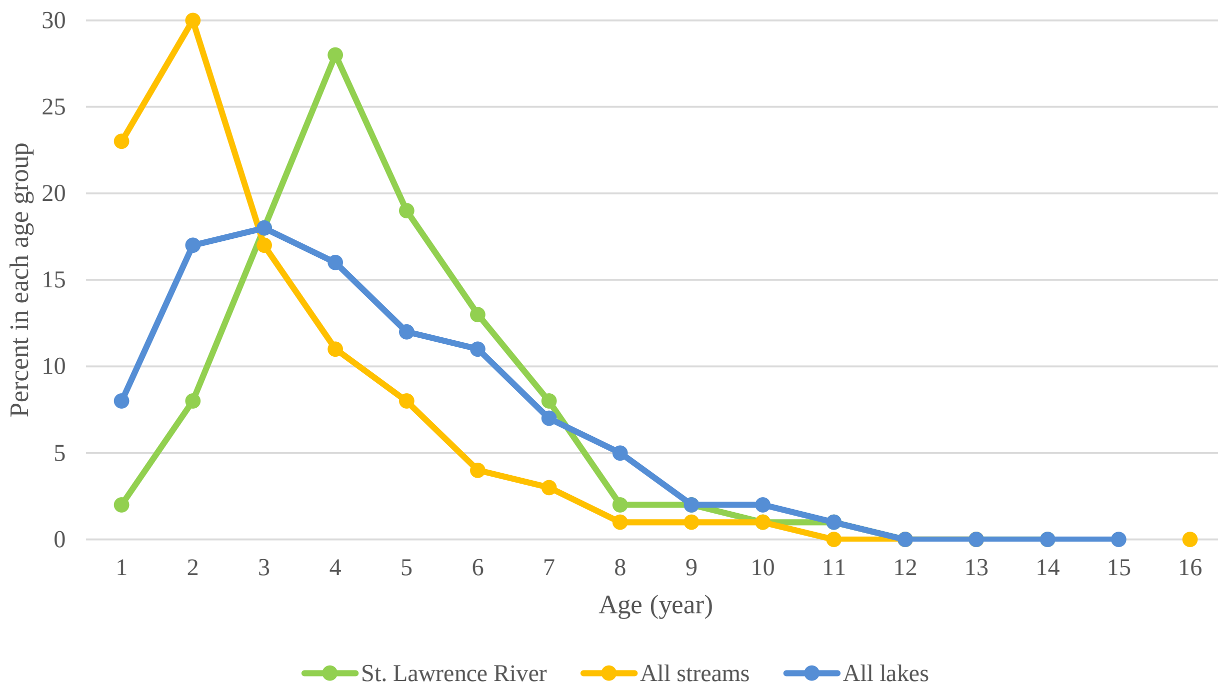

Figure 15. Percent distribution of age 1-16 smallmouth bass from streams, lakes, and the St. Lawrence River, New York, 2004-2013.

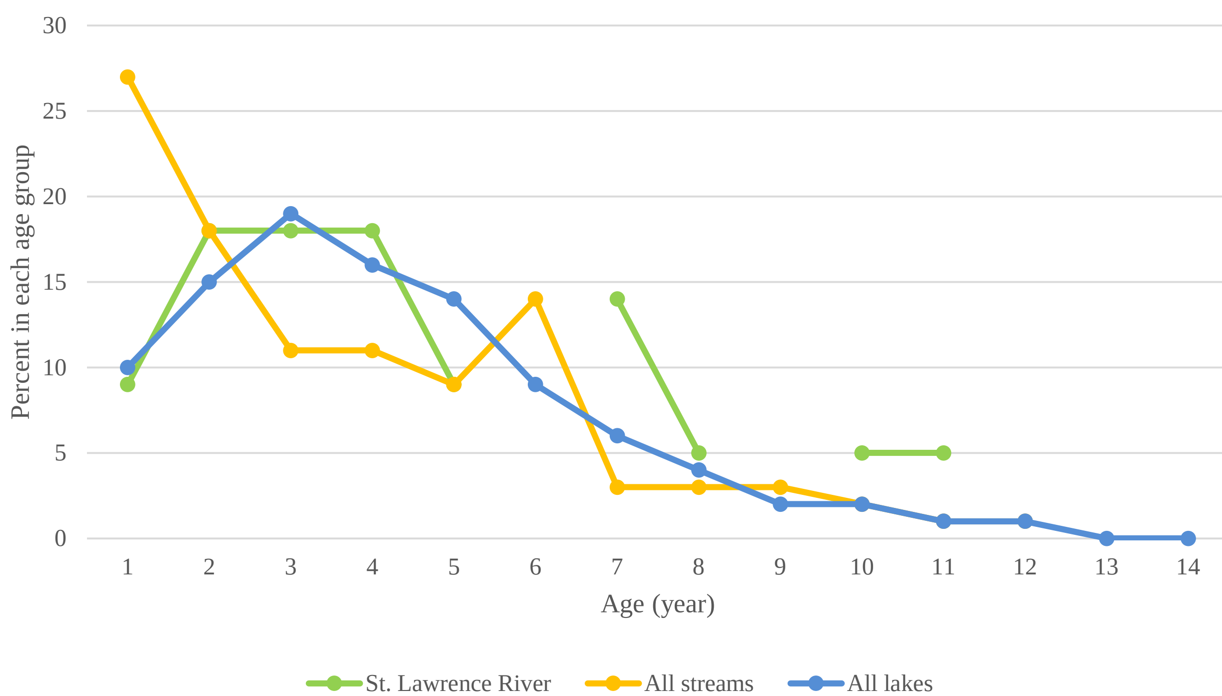

Figure 16. Percent distribution of age 1-14 largemouth bass from streams, lakes, and the St. Lawrence River, New York, 2004-2013.

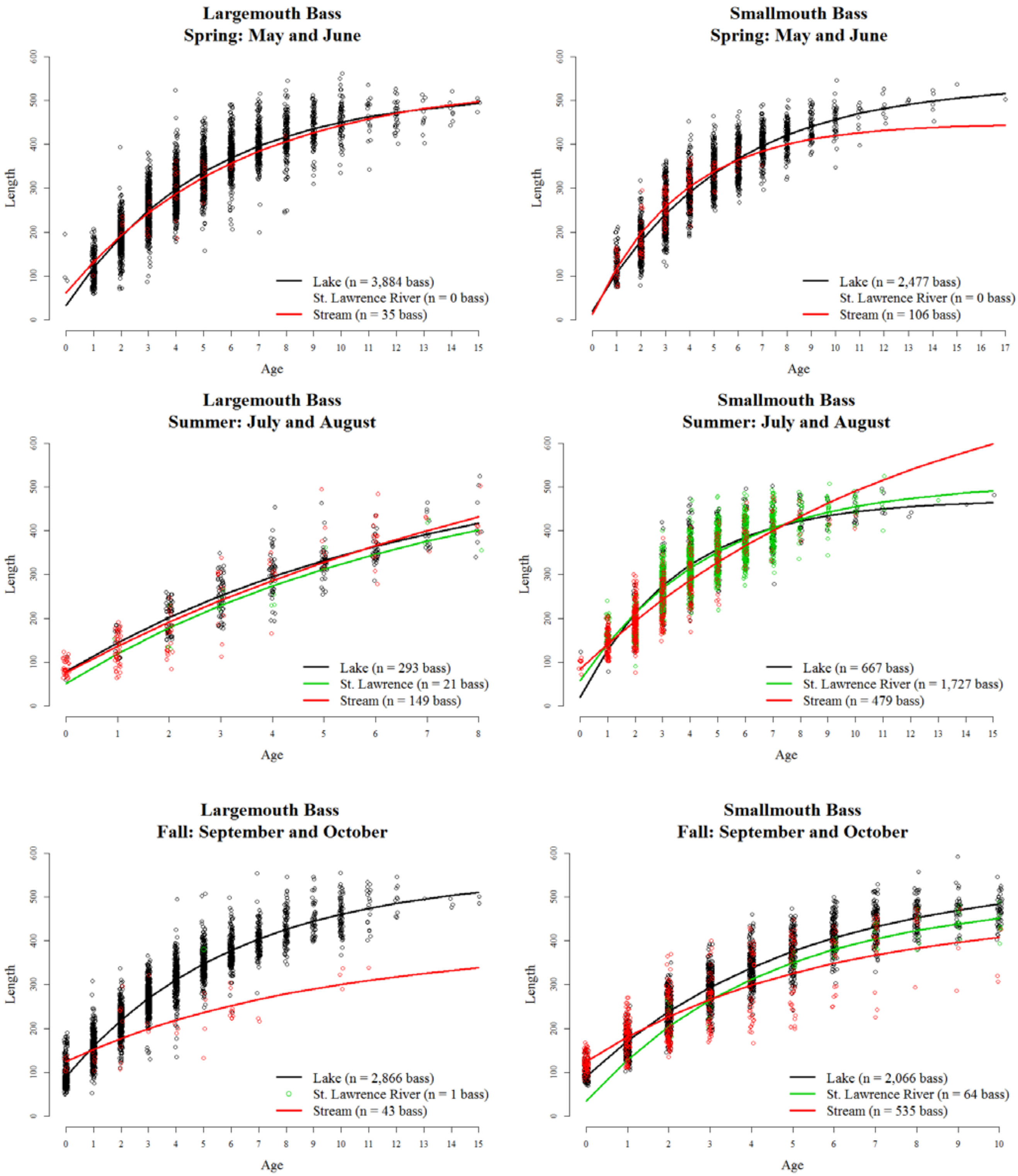

Figure 17. von Bertalanffy growth curves for smallmouth and largemouth bass depicted for streams, lakes, and the St. Lawrence River for spring (May and June), summer (July and August), and fall (September and October) using data from the NYSDEC BOF SWFD 2004 – 2013 (Release #49). Includes captures from all gear types.

Table 3. Results of likelihood ratio tests to determine if von Bertalanffy curve parameters differed significantly among largemouth bass collected in streams, lakes and the St. Lawrence River. L-infinity is a measure of the asymptotic length of the growth curve at which growth is zero (i.e., the top end of the curve), K is the growth rate, and t0 is the age at which the bass would have zero size (i.e., the starting point on the curve). P-values <0.05 indicate significant differences.

Spring	Lakes vs. Streams			Lakes vs. St. Lawrence			Streams vs. St. Lawrence		
hypothesis	chisq	df	p	chisq	df	p	chisq	df	p
Linf1 = Linf2, K1 = K2, t01 = t02	2.08	3	0.556						
Linf1 = Linf2	0.03	1	0.862						
K1 = K2	0.15	1	0.699						
t01 = t02	0.47	1	0.493						

Summer	Lakes vs. Streams			Lakes vs. St. Lawrence			Streams vs. St. Lawrence		
hypothesis	chisq	df	p	chisq	df	p	chisq	df	p
Linf1 = Linf2, K1 = K2, t01 = t02	4.06	3	0.255	6.58	3	0.087	0.70	3	0.873
Linf1 = Linf2	2.68	1	0.102	0.09	1	0.764	0.07	1	0.791
K1 = K2	2.99	1	0.084	0.02	1	0.888	0.00	1	1.000
t01 = t02	1.03	1	0.310	1.24	1	0.265	0.05	1	0.823

Fall	Lakes vs. Streams			Lakes vs. St. Lawrence			Streams vs. St. Lawrence		
hypothesis	chisq	df	p	chisq	df	p	chisq	df	p
Linf1 = Linf2, K1 = K2, t01 = t02	295.19	3	**0.000**						
Linf1 = Linf2	0.41	1	0.522						
K1 = K2	0.40	1	0.527						
t01 = t02	6.65	1	**0.010**						

Table 4. Results of likelihood ratio tests to determine if von Bertalanffy curve parameters differed significantly among smallmouth bass collected in streams, lakes and the St. Lawrence River. L-infinity is a measure of the asymptotic length of the growth curve at which growth is zero (i.e., the top end of the curve), K is the growth rate, and t0 is the age at which the bass would have zero size (i.e., the starting point on the curve). P-values <0.05 indicate significant differences.

Spring	Lakes vs. Streams			Lakes vs. St. Lawrence			Streams vs. St. Lawrence		
hypothesis	chisq	df	p	chisq	df	p	chisq	df	p
Linf1 = Linf2, K1 = K2, t01 = t02	14.18	3	**0.003**						
Linf1 = Linf2	1.49	1	0.222						
K1 = K2	1.50	1	0.221						
t01 = t02	0.63	1	0.427						

Summer	Lakes vs. Streams			Lakes vs. St. Lawrence			Streams vs. St. Lawrence		
hypothesis	chisq	df	p	chisq	df	p	chisq	df	p
Linf1 = Linf2, K1 = K2, t01 = t02	106.37	3	**0.000**	10.74	3	**0.013**	102.19	3	**0.000**
Linf1 = Linf2	30.60	1	**0.000**	3.92	1	**0.048**	26.19	1	**0.000**
K1 = K2	47.54	1	**0.000**	5.28	1	**0.022**	38.52	1	**0.000**
t01 = t02	12.94	1	**0.000**	1.04	1	0.308	9.07	1	**0.003**

Fall	Lakes vs. Streams			Lakes vs. St. Lawrence			Streams vs. St. Lawrence		
hypothesis	chisq	df	p	chisq	df	p	chisq	df	p
Linf1 = Linf2, K1 = K2, t01 = t02	268.95	3	**0.000**	42.35	3	**0.000**	9.75	3	**0.021**
Linf1 = Linf2	9.59	1	**0.002**	3.50	1	0.061	1.69	1	0.194
K1 = K2	1.27	1	0.260	0.89	1	0.345	0.08	1	0.777
t01 = t02	56.90	1	**0.000**	2.70	1	0.100	1.41	1	0.235

Discussion

Streams are diverse and complex, and they can be difficult to access and traverse. These characteristics often preclude using sampling methods traditionally used for lakes, such as boat electrofishing. Standardized methods have not been developed for sampling warmwater streams in New York, thus reliable comparisons among waters, and even surveys, are often limited. Stream black bass data in the SWFD reflected the lack of standardized warmwater sampling techniques. Generic survey codes such as General Biological and Other, and surveys targeting trout such as CROTS and EBTJV were the primary codes used for surveys where black bass data were collected from streams. Stream surveys targeting trout are generally conducted by wading using a backpack or barge electrofisher. These types of surveys are most likely to pick up young, small black bass in shallow water environments, and this was evident in the data for this assessment (Figures 5-8, Appendix A and B). Lake surveys were primarily conducted via boat electrofishing and many of these surveys were designed to comprehensively sample warmwater sportfish populations in a standardized way via Centrarchid (Green 1989) and Percid (Forney et al. 1994) surveys. Because of the differences in sampling purposes and methods between stream and lake surveys, data comparisons were primarily limited to metrics that are not biased by the gear used to make collections, such as W_r and growth. Catch rates were also determined for a subset of surveys where boat electrofishing was used to make cursory assessments of relative abundance.

There were over twice the number of surveys, fish collected and waterbodies sampled for lakes than there were for streams. On average, lake collected bass were longer, weighed more, and were older than stream collected bass (Table 1), but, as noted, stream data were biased towards smaller fish due to sampling methods. The St. Lawrence River is regularly and comprehensively monitored, primarily for smallmouth bass using gill nets. The unique nature of the system and the use of gill nets as the primary sampling tool clearly distinguish the St. Lawrence from other rivers in the state, and the large differences in mean lengths, weights, and ages (Table 1) reflect this.

The number of streams where boat electrofishing catch rates of bass ≥ 254mm (10 inches) were calculated was relatively small (25 streams for smallmouth bass, 18 streams for largemouth bass). Variability in the catch rate data was high for most waterbody type/season means, suggesting that there were large catch rate differences among surveys and waterbodies. A closer examination of the data is necessary to more fully understand this variability and how it impacts mean catch rate values. From the stream data, seasonal differences were apparent, with the highest catch rates in the spring and fall. Largemouth bass stream catch rates were much higher than smallmouth bass stream catch rates in the fall, but this was heavily influenced by fall sampling in Hudson River tributaries (Rondout and Esopus Creeks),which are known overwintering locations for largemouth bass, where catch rates of adult bass are much higher than they would be during other times of the year. Without data from these two rivers, the fall catch rate would drop from 19/h±26 to 12h±12. From the lake data, the high variability in smallmouth spring catch rates is influenced by exceptionally high catch rates in Dunkirk Harbor in Lake Erie (two survey runs: 337/h and 132/h). Dunkirk Harbor apparently is uniquely positioned as an attractive spawning location for the Eastern Basin of Lake Erie’s smallmouth bass population. These are the highest catch rates in the database, and by removing this one survey from the assessment the mean catch rate drops from 17/h±25 to 15/h±17, despite the relatively high number of surveys assessed (n=93).

Condition of each black bass species in streams and lakes was similar, but largemouth bass tended to be in better condition than smallmouth bass and condition tended to increase from spring through fall within comparative groups (species/waterbody type). Mean W_r for spring collected smallmouth bass for both streams and lakes indicated that these fish were in sub-standard or "lean" condition relative to US and Canadian standards. Most other species/season/waterbody combinations were within a range of mean W_r (95-105) that are typically indicative of fish in good condition (Pope and Kruse 2007), but largemouth bass tended to be on the high end of this range (except in lakes in the spring) and smallmouth bass tended to be on the low end. Mean W_r for smallmouth bass from the St. Lawrence River in the summer and largemouth bass from streams in the fall are at levels indicative of fish in excellent condition. The St. Lawrence River was the only waterbody type where condition didn't improve through the fall. However, there was a large disparity in the number of samples between summer (n= # bass from # years) and fall (n=71 bass, from 2004 only) from the St. Lawrence River, and thus the fall data doesn't represent condition throughout the same time frame that the summer data do. If St. Lawrence River summer data are limited to 2004, the mean W_r (99.5) is similar to the fall mean W_r (100).

Small sample sizes of aged bass limited the age distribution and growth assessment, particularly for streams. Only 24% of stream collected smallmouth bass and 5% of stream collected largemouth bass were aged. In contrast, 48% of lake collected smallmouth bass and 35% of lake collected largemouth bass were aged. It is therefore not surprising that a more complete assessment of ages, including older age classes of fish, was possible for lake populations.

Smallmouth bass typically reached 254mm (10 inches) at age 3 and 305mm (12 inches) at age 4 in both streams and lakes. However, for streams, there were less than 30 aged fish for all age categories of smallmouth bass, and only 10 at age 5, which resulted in abnormal progressions of length at age from spring through fall. The spring length is longer than summer and fall lengths for ages 3, 4 and 5, and the summer length at ages 6 and 7 are longer than the lengths in the fall. Ideally, the minimum sample sizes to assess length at age should be much higher than 10 (the minimum for this assessment) and samples should be widely representative of a variety of stream systems; therefore, the mean lengths at age presented in this report should be considered rough estimates and viewed with caution.

There were adequate samples (n>100) from summer collected smallmouth bass from the St. Lawrence River to fairly represent lengths at ages 2-7, and the progressively larger lengths at age from age 8-10 suggest that these are reasonable estimations as well. St. Lawrence River smallmouth bass reached 254mm (10 inches) by age 3, 305mm (12 inches) by age 4, and likely reached 356mm (14 inches) by the fall of age 5. This was similar to the same lengths at ages achieved by summer collected smallmouth bass in lakes. Mean lengths at ages for smallmouth bass from the St. Lawrence River and lakes are indicative of fast growth through age 5, and average growth thereafter (Green 1989).

Stream length at age data could only be assessed for four age classes in the fall for largemouth bass due to very small sample sizes. Even in the fall, there were less than 15 aged fish per age category beyond age 2, thus there is little value in further assessing mean lengths at ages for stream collected largemouth bass until sample sizes are substantially increased. Lengths at ages for lake-collected largemouth bass generally indicate average growth through all age categories.

A higher percentage of young bass (ages 1 and 2) were collected from stream surveys than from lake and St. Lawrence River surveys, but this was likely a product of the respective sampling methods used in each waterbody type. Backpack and barge electrofishing constituted a high percentage of stream surveys and because these methods are used in wadeable sections of streams they are apt to collect smaller fish in shallow water. A much higher percentage of lake surveys were conducted using boat electrofishing, which tends to sample a more representative size, and age, range of the population (Green 1989). Despite this, age distributions among waterbody types did not clearly indicate that stream bass did not live as long as lake bass. The oldest bass in the dataset was a 16 year old smallmouth from Tunungwant Creek, and most individual streams assessed had at least some age 7 and older bass. Again, sample sizes were much smaller for streams than they were for lakes, thus, age distribution comparisons should be viewed with caution.

Von Bertalanffy growth curve assessments were limited by small sample sizes, particularly for stream largemouth bass. Largemouth bass growth curves were different between lakes and streams only during the fall ($p<0.001$), but this should be viewed with caution as only 43 fall-aged bass from streams were included in this comparison (Figure 17). There were only a few older age bass in the stream sample, and these were unusually small, which dramatically influenced the growth curve. Until a more robust sample of stream largemouth bass is procured, growth curve comparisons should be deemed unreliable. All growth curves for smallmouth bass among waterbody types by season were different ($p\leq0.021$). Stream sample sizes were typically higher than they were for largemouth, allowing for more robust statistical comparisons. However, growth curve patterns only showed a consistent pattern in the fall, with lake smallmouth bass having a higher growth curve past age 2 than stream and St. Lawrence River bass. Growth rates (K) were only different in the summer ($p\leq0.022$), but because stream smallmouth bass were heavily skewed to younger fish (ages 1 and 2), the growth rate comparison was unclear.

This project highlighted the extent and limitations of stream black bass population data in the SWFD. During 2004-2013, only 21% of the black bass collected, 30% of the surveys, and 31% of the waterbodies with black bass data were from streams. Streams were sampled under a variety of generic and other survey purpose codes that were not intended for warmwater sportfish assessments. Few stream surveys provided the data necessary for a comprehensive assessment of bass populations, which limited the assessment of statewide population metrics and stream/lake comparisons. Even for streams where an apparently adequate sample of bass were collected, the lack of standard methods casts doubt into how representative collected bass were of the actual populations. Of particular concern is the paucity of age data, which severely restricts assessments of growth rates and longevity. These metrics are necessary in order to comprehensively evaluate stream population status and to evaluate the need for the 10 inch minimum size limit regulation which is in place for many streams throughout the state where bass may not grow much larger than the statewide minimum size (12 inches) due to shorter life spans or slower growth rates, or both. Establishment of standard warmwater stream sampling and assessment methods would allow for a more uniform and comprehensive assessment approach, which would greatly enhance our ability to reliably assess individual bass populations and make comparisons among streams throughout the state.

Management Recommendations

Generic standardized sampling methods have recently been developed for warmwater fish in wadeable streams (Rabeni et al. 2009) and larger rivers (Guy et al. 2009). These methods include a number of sampling gears that were selected to provide the best representation of the fish assemblages in these types of systems, but not all gears will work in all situations. The primary benefit of these methods is that they provide fisheries biologists with a basis for developing standardized methods appropriate for the types of riverine systems they monitor and the management priorities they have for these systems. Standard methods for New York rivers and streams should be developed, using these generic methods as templates. NYSDEC BOF standard lake sampling methods for Centrarchids (Green 1989), Percids (Forney et al. 1994), and warmwater fish communities (Holst and Loukmas 2013) should also be consulted to build in as many common links as possible among these protocols. Standard river and stream sampling methods should then be field tested in a variety of lotic systems to determine their viability and utility.

There also remains a need to further evaluate river and stream black bass populations. More information on longevity, growth and exploitation is necessary for the proper management of these species in lotic ecosystems. The current level of black bass exploitation in streams is unknown, but is probably very low based on general statewide angler harvest patterns (Connelly and Knuth 2013). However, proper management of the resource should be based on sound, reliable angler use and population information, thus creel surveys of important warmwater river and stream fisheries should be conducted in conjunction with population surveys. Standard population survey methods should be developed to collect samples of bass that are representative of the entire population, and not just those bass that occupy shallow water, or easy to access, environments. Growth and longevity are the key metrics necessary for effectively evaluating the 10 inch minimum size limit regulation on many streams throughout the state and both metrics require that age data be collected, thus sampling protocols should stress the importance of collecting these data. Also, fisheries managers should be aware that some black bass populations may seasonally occupy both lotic and lentic environments during the year and should consider the potential for this when assessing rivers and streams. For example, potadromous smallmouth bass occur in Lake Erie and tributaries. These fish move into the lower reach of certain tributaries in the spring for spawning and guarding nests, then subsequently move back into Lake Erie (D. Einhouse, NYSDEC Lake Erie Unit Leader, pers. comm.). This behavior likely occurs in other large lakes and their tributaries in New York, but is undocumented.

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Appendices

Appendix A. Smallmouth bass summary data from stream surveys, 2004 – 2013.

Region	River	Year(s)	Survey Purpose	Gear type	Length (mm)[a]	Weight (g)	Age (yrs)
3	Delaware River	2007	Whirling disease sampling	Electrofishing (Boat)	290 ± 78 (151 - 392) 30 bass	361 ± 228 (50 - 720) 30 bass	4 ± 1.6 (2 - 7) 29 bass
	Esopus Creek	2009, 2011 - 2013	Other, see comments	Electrofishing (Boat)	235 ± 88 (54 - 463) 182 bass	308 ± 230 (30 – 1,120) 93 bass	2.6 ± 1.3 (0 - 6) 120 bass
		2006	Percid Sampling	Electrofishing (Boat)	274 ± 53 (176 - 414) 25 bass	447 ± 729 (60 – 2,080) 7 bass	
		2010	Population estimate	Other	69 ± 12 (57 - 85) 4 bass		
		2010	TSMP	Electrofishing (Boat)	263 ± 162 (148 - 377) 2 bass	700 1 bass	4 ± 2.8 (2 - 6) 2 bass
	Halfway Brook	2006	General Biological Survey	Electrofishing	229 1 bass		
	Hankins Creek	2004, 2005	Population estimate	Electrofishing	95 ± 22 (78 - 120) 3 bass	12 ± 12 (5 - 25) 3 bass	
	Neversink River	2006	Population estimate	Electrofishing (Boat)	389 ± 64 (343 - 434) 2 bass	860 ± 396 (580 – 1,140) 2 bass	6 1 bass
	Rondout Creek	2009	Other, see comments	Electrofishing (Boat)	311 ± 104 (130 - 390) 5 bass	486 ± 279 (30 - 760) 5 bass	
		2007	Percid sampling	Electrofishing (Boat)	211 ± 86 (88 - 440) 68 bass	290 ± 317 (5 – 1,020) 18 bass	
	Wallkill River	2007	Percid sampling	Electrofishing (Boat)	228 ± 94 (78 - 396) 158 bass	296 ± 287 (20 - 920) 35 bass	
4	Batavia Kill	2005, 2013	CROTS survey	Electrofishing	72 ± 14 (52 - 95) 17 bass	4 ± 2 (2 - 7) 11 bass	
	Butternut Creek	2011	CROTS survey	Electrofishing	150 1 bass		
	Cadosia Creek	2010	CROTS survey	Electrofishing	83 ± 14 (67 - 106) 8 bass		
	Collins Creek	2006	General biological survey	Seine	153 1 bass		
	Delaware River	2010	General biological survey	Angling	214 ± 91 (92 - 330) 5 bass		
	East Br Delaware River	2009	TSMP collection	Electrofishing (Boat)	375 ± 49 (340 - 410) 2 bass		

Region	River	Year(s)	Survey Purpose	Gear type	Length (mm)[a]	Weight (g)	Age (yrs)
4	Fall Clove Brook	2010	EBTJV survey	Electrofishing	77 ± 23 (60 - 93) 2 bass		
	Fly Creek	2009	EBTJV survey	Electrofishing	55 1 bass		
	Gee Brook	2010	EBTJV survey	Electrofishing	103 1 bass		
	Hubble Hill Brook	2010	EBTJV survey	Electrofishing	49 ± 5 (44 - 53) 4 bass		
	Hudson River	2009	Other, see comments	Electrofishing (Boat)	421 ± 76 (145 - 530) 44 bass	1139 ± 494 (35 – 1,900) 44 bass	
		2010	Other, see comments	Electrofishing (Boat)	347 ± 108 (100 - 490) 44 bass	870 ± 551 (100 – 1,700) 40 bass	
		2012	TSMP collection	Electrofishing (Boat)	367 ± 54 (319 - 470) 7 bass	591 ± 270 (357 – 1,137) 7 bass	
	Humphries Brook	2010	General biological survey	Electrofishing	85 ± 9 (72 - 99) 6 bass		
	Little Delaware River	2010	CROTS survey	Electrofishing	99 ± 22 (60 - 127) 10 bass		
	Mohawk River	2007	Fish Disease Monitoring	Electrofishing (Boat)	388 ± 42 (323 - 458) 16 bass		
		2006	General biological survey	Seine	103 ± 33 (79 - 126) 2 bass		
		2012	Other, see comments	Electrofishing (Boat)	355 ± 95 (130 - 475) 22 bass		
		2006	Other, see comments	Electrofishing (Boat)	355 ± 95 (130 - 471) 158 bass	850 ± 368 (50 – 1,590) 144 bass	
		2011	TSMP collection	Electrofishing (Boat)	316 ± 76 (230 – 425) 8 bass	606 ± 455 (180 – 1,300) 7 bass	
		2005	TSMP collection	Electrofishing (Boat)	378 ± 46 (306 - 444) 20 bass	774 ± 296 (390 – 1,240) 20 bass	
		2008	Whirling disease sampling	Electrofishing (Boat)	393 ± 75 (267 - 481) 7 bass	1140 ± 396 (730 – 1,640) 6 bass	
	Nancokus Brook	2010	EBTJV survey	Electrofishing	85 1 bass		
	Normans Kill	2013	Special regs evaluation	Angling	204 ± 68 (84 - 369) 49 bass		

Region	River	Year(s)	Survey Purpose	Gear type	Length (mm)[a]	Weight (g)	Age (yrs)
4	Oaks Creek	2008	CROTS survey	Electrofishing	164 ± 19 (148 - 185) 3 bass		
	Ocquianis Creek	2008	CROTS survey	Electrofishing	93 ± 8 (84 - 103) 5 bass		
	Otego Creek	2005	CROTS survey	Electrofishing	103 ± 10 (85 - 130) 59 bass		0 3 bass
	Pork Island Hollow Brook	2011	EBTJV survey	Electrofishing	44 1 bass		
	Read Creek	2010	CROTS survey	Electrofishing	74 ± 10 (57 - 83) 6 bass		
	Schoharie Creek	2006	General biological survey	Seine	152 1 bass		
		2008	Population estimate	Electrofishing	116 ± 44 (39 - 190) 39 bass	28 ± 26 (1 - 80) 35 bass	
		2013	Special regs evaluation	Angling	254 ± 79 (110 - 445) 25 bass	231 ± 135 (87 - 488) 6 bass	
		2009	TSMP collection	Angling	352 ± 48 (270 - 419) 10 bass	618 ± 247 (240 – 1,080) 10 bass	
	Susquehanna River	2011	General biological survey	Electrofishing (Boat)	199 ± 108 (91 - 410) 50 bass	436 ± 327 (20 - 970) 23 bass	
	Unadilla River	2010, 2012	General biological survey	Electrofishing (Boat)	173 ± 119 (77 - 451) 58 bass	723 ± 453 (80 – 1,400) 15 bass	
	Unnamed Water	2009 - 2011	EBTJV survey	Electrofishing	86 ± 34 (52 - 135) 6 bass		
	West Br Delaware River	2004 - 2007, 2009, 2011	Population estimate	Electrofishing (Boat)	330 ± 101 (95 - 480) 288 bass	647 ± 342 (30 – 1,450) 214 bass	
5	Champlain Canal	2008	General biological survey	Seine	127 1 bass		
	Chateaugay River	2006	CROTS survey	Electrofishing	122 ± 42 (63 - 161) 4 bass		
	Great Chazy River	2012	General biological survey	Electrofishing (Boat)	276 ± 70 (201 - 369) 5 bass	318 ± 237 (100 - 680) 5 bass	3 ± 1 (2 - 4) 5 bass
	Halfway Creek, T8	2006	Other, see comments	Electrofishing	108 1 bass		

Region	River	Year(s)	Survey Purpose	Gear type	Length (mm)[a]	Weight (g)	Age (yrs)
5	Hudson River	2007	Fish Disease Monitoring	Electrofishing (Boat)	284 ± 92 (142 - 446) 21 bass	410 ± 327 (40 – 1,150) 21 bass	
		2008	General biological survey	Electrofishing (Boat)	381 1 bass		
		2008	Whirling disease sampling	Electrofishing (Boat)	198 ± 61 (73 - 301) 27 bass		
	Kennyetto Creek	2004	CROTS survey	Electrofishing	142 ± 45 (98 - 187) 3 bass		
	Lake Ozonia Outlet	2007	General biological survey	Electrofishing	184 ± 32 (161 - 206) 2 bass		
	Northwest Bay Brook	2008	CROTS survey	Electrofishing	243 1 bass	150 1 bass	
	Raquette River	2007	General biological survey	Seine	126 1 bass		
	Schroon River	2007	General biological survey	Angling	430 1 bass		
6	Black River	2005 - 2008, 2010	Fish kill invest.	Electrofishing (Boat)	164 ± 109 (54 - 452) 329 bass	321 ± 358 (26 – 1,300) 39 bass	3.3 ± 1.8 (1 - 8) 84 bass
		2007	General biological survey	Electrofishing	281 ± 114 (104 - 400) 7 bass		
		2006, 2010	General biological survey	Electrofishing (Boat)	251 ± 70 (63 - 387) 37 bass		3.6 ± 1 (1 - 5) 16 bass
		2010	General biological survey	Gill Net	283 ± 38 (238 - 344) 7 bass		3.7 ± 0.8 (3 - 5) 6 bass
	Brandy Brook	2012	General biological survey	Fyke Net	417 ± 39 (369 - 481) 10 bass		
	Deer River	2007	CROTS survey	Electrofishing	122 ± 44 (90 - 193) 8 bass		
		2007	General biological survey	Angling	228 1 bass		
	East Branch Fish Creek	2007	Other, see comments	Electrofishing	68 1 bass		
	Erie Canal	2007	General biological survey	Gill Net	150 2 bass	42 2 bass	
		2004, 2013	TSMP collection	Gill Net	295 ± 90 (191 - 473) 11 bass	378 ± 303 (80 - 992) 11 bass	

Region	River	Year(s)	Survey Purpose	Gear type	Length (mm)[a]	Weight (g)	Age (yrs)
6	Fall Brook	2006	General biological survey	Electrofishing	102 1 bass		
	Grass River	2010	General biological survey	Electrofishing (Boat)	198 ± 91 (103 - 354) 9 bass		3.1 ± 1.5 (2 - 5) 7 bass
	Indian River	2008	General biological survey	Electrofishing (Boat)	140 ± 58 (85 - 219) 8 bass		2.5 ± 1 (1 - 3) 4 bass
		2012, 2013	Rare/endan species	Gill Net	339 ± 113 (188 - 440) 6 bass		
	Lawrence Brook	2007	General biological survey	Electrofishing	228 1 bass		
	Lindsey Creek	2005	Population estimate	Electrofishing	82 ± 14 (67 - 95) 3 bass		
	Little Deerlick Creek	2006	General biological survey	Electrofishing	58 ± 4 (55 - 60) 2 bass		
	Little Sucker Brook	2012	General biological survey	Fyke Net	429 1 bass		
	Mohawk River	2012	General biological survey	Electrofishing (Boat)	315 ± 79 (165 - 421) 38 bass	467 ± 258 (62 - 918) 32 bass	
		2005, 2007	Other, see comments	Electrofishing (Boat)	262 ± 95 (136 - 470) 18 bass	220 ± 168 (100 - 510) 5 bass	
		2013	TSMP collection	Angling	332 ± 57 (232 - 401) 11 bass	532 ± 241 (158 - 859) 11 bass	4.3 ± 1.7 (2 - 7) 9 bass
		2004	TSMP collection	Electrofishing (Boat)	244 ± 24 (202 - 271) 6 bass	167 ± 40 (116 - 214) 6 bass	
		2004, 2013	TSMP collection	Gill Net	244 ± 76 (135 - 335) 11 bass	252 ± 160 (34 - 461) 11 bass	2.5 ± 0.7 (2 - 3) 2 bass
	Mud Creek	2007	General biological survey	Electrofishing	203 1 bass		
	Mullet Creek	2013	General biological survey	Fyke Net	365 ± 35 (310 - 402) 5 bass		
	Oswegatchie River	2006	General biological survey	Angling	279 1 bass		
		2007, 2008	General biological survey	Seine	279 2 bass		

Region	River	Year(s)	Survey Purpose	Gear type	Length (mm)[a]	Weight (g)	Age (yrs)
6	Oswegatchie River	2013	Rare/endan species	Electrofishing (Boat)	253 ± 93 (84 - 447) 61 bass		
		2009, 2012, 2013	Rare/endan species	Gill Net	288 ± 96 (200 - 485) 11 bass		
		2013	Rare/endan species	Seine	73 1 bass		
	Raquette River	2007	General biological survey	Gill Net	238 ± 56 (159 - 352) 8 bass	300 ± 152 (180 - 615) 7 bass	
		2009, 2012, 2011	TSMP collection	Gill Net	181 ± 16 (159 - 199) 4 bass		
	Scanondoa Creek	2008	General biological survey	Electrofishing	262 1 bass		
	Skinner Creek	2005	Whirling disease sampling	Electrofishing	85 ± 39 (61 - 130) 3 bass		
	St. Lawrence River	2006, 2007	Esocid sampling	Seine	67 ± 3 (65 - 69) 2 bass		
		2004 - 2013	General biological survey	Gill Net	323 ± 77 (91 - 635) 1977 bass	653 ± 456 (32 – 2,775) 1976 bass	4.6 ± 1.8 (1 - 14) 1792 bass
		2009, 2010	Rare/endan gered species	Gill Net	355 ± 69 (176 - 510) 185 bass		
		2009	Rare/endan gered species	Seine	58 ± 4 (55 - 60) 2 bass		
		2012, 2013	TSMP collection	Gill Net	389 ± 106 (211 - 513) 13 bass	1210 ± 840 (125 – 2,582) 13 bass	
	Sucker Brook	2012	General biological survey	Fyke Net	428 ± 83 (340 - 505) 3 bass		
	Tibbits Creek	2013	General biological survey	Fyke Net	417 ± 65 (304 - 495) 18 bass		
	Unnamed Water	2008	General biological survey	Electrofishing	356 1 bass		
	West Br St Regis River	2011	General biological survey	Electrofisher	162 ± 54 (105 - 339) 20 bass		
7	Button Creek	2011	EBTJV survey	Electrofishing	102 1 bass		

Region	River	Year(s)	Survey Purpose	Gear type	Length (mm)[a]	Weight (g)	Age (yrs)
7	Chenango River	2008	Esocid sampling	Electrofishing (Boat)	295 ± 107 (167 - 474) 21 bass	575 ± 568 (70 – 1,680) 21 bass	3.1 ± 2.8 (1 - 9) 21 bass
		2010	Other, see comments	Electrofishing	75 1 bass		
	Ninemile Creek	2004	General biological survey	Electrofishing	153 ± 14 (141 - 178) 5 bass	46 ± 20 (22 - 78) 5 bass	1.8 ± 0.5 (1 - 2) 4 bass
		2007	Other, see comments	Electrofishing	178 ± 47 (60 - 299) 95 bass	90 ± 33 (46 - 202) 29 bass	2.2 ± 1.1 (1 - 6) 47 bass
	Oswego River	2010	Rare/endangered species	Gill Net	340 1 bass		
	Otselic River	2011	Population estimate	Electrofishing	168 ± 126 (87 - 355) 4 bass		
	Susquehanna River	2009, 2012	Fish Disease Monitoring	Electrofishing	50 ± 18 (31 - 200) 185 bass		
		2012	Fish Disease Monitoring	Electrofishing (Boat)	177 ± 86 (83 - 425) 83 bass	152 ± 262 (3 – 1,240) 83 bass	1.7 ± 1.5 (0 - 7) 43 bass
		2007	Other, see comments	Electrofishing	107 ± 13 (87 - 141) 40 bass	15 ± 6 (6 - 32) 40 bass	
		2005, 2007 - 2010	Other, see comments	Electrofishing (Boat)	153 ± 86 (56 - 471) 494 bass	404 ± 415 (15 – 1,760) 110 bass	1.5 ± 1.9 (0 - 8) 173 bass
		2012	TSMP collection	Electrofishing (Boat)	399 ± 31 (350 - 447) 15 bass	1023 ± 210 (662 – 1,393) 15 bass	5.8 ± 1.4 (4 - 8) 15 bass
	Thomas Creek	2008	EBTJV survey	Electrofishing	47 1 bass		
	Trowbridge Creek	2005	Reclass.	Electrofishing	174 1 bass		
	Unadilla River	2012	General biological survey	Electrofishing	129 ± 49 (84 - 197) 8 bass	39 ± 43 (6 - 100) 8 bass	1 ± 0 (1 - 1) 3 bass
8	Canandaigua Outlet	2004, 2007	General biological survey	Electrofishing	149 ± 97 (41 - 423) 273 bass	151 ± 239 (1 – 1,220) 212 bass	2.9 ± 1.5 (1 - 7) 89 bass
	Erie Canal	2005	TSMP collection	Electrofishing (Boat)	295 ± 46 (243 - 376) 11 bass	495 ± 191 (172 - 865) 11 bass	
	Genesee River	2008	General biological survey	Electrofishing (Boat)	209 ± 78 (55 - 395) 48 bass	179 ± 204 (11 - 823) 43 bass	
	Johnson Creek	2008	General biological survey	Electrofishing	267 ± 197 (127 - 406) 2 bass		

Region	River	Year(s)	Survey Purpose	Gear type	Length (mm)[a]	Weight (g)	Age (yrs)
8	Marsh Creek	2007	General biological survey	Seine	101 1 bass		
	Tioga River	2007	General biological survey	Electrofishing (Boat)	200 ± 70 (53 - 483) 61 bass	129 ± 180 (13 – 1,210) 60 bass	2.2 ± 1.3 (1 - 8) 54 bass
9	Allegheny River	2012, 2013	Other, see comments	Electrofishing (Boat)	213 ± 88 (80 - 483) 583 bass	210 ± 293 (4 – 1,511) 522 bass	3.1 ± 2.3 (0 - 13) 261 bass
	Chautauqua Creek	2008, 2010	Population estimate	Electrofishing	97 ± 21 (53 - 136) 72 bass		
	Erie Canal	2008	Whirling disease sampling	Electrofishing (Boat)	248 ± 76 (84 - 357) 37 bass		
	Great Valley Creek	2012	Other, see comments	Electrofishing	380 1 bass		5 1 bass
	Ischua Creek	2012	Other, see comments	Electrofishing	137 1 bass		
		2012	Other, see comments	Electrofishing (Boat)	132 1 bass	31 1 bass	1 1 bass
	Niagara River	2009	Esocid sampling	Electrofishing (Boat)	251 ± 36 (212 - 282) 3 bass		
		2006 - 2008	General biological survey	Electrofishing (Boat)	110 ± 33 (63 - 348) 75 bass		
	Oil Creek	2012	Other, see comments	Electrofishing	143 ± 25 (116 - 181) 9 bass	49 ± 29 (28 - 69) 2 bass	1.8 ± 0.4 (1 - 2) 9 bass
		2012	Other, see comments	Other	150 1 bass	42 1 bass	2 1 bass
	Olean Creek	2012	Other, see comments	Electrofishing	376 1 bass	705 1 bass	5 1 bass
		2012	Other, see comments	Electrofishing (Boat)	204 ± 83 (123 - 373) 10 bass	187 ± 200 (25 - 660) 9 bass	1.9 ± 1 (1 - 4) 10 bass
	Oswayo Creek	2012	Other, see comments	Electrofishing (Boat)	184 ± 102 (113 - 363) 5 bass	171 ± 297 (22 - 701) 5 bass	2 ± 1.4 (1 - 4) 4 bass
	Red House Brook	2012	Other, see comments	Electrofishing	205 ± 118 (67 - 325) 4 bass	243 ± 201 (39 - 440) 3 bass	2.7 ± 1.2 (2 - 4) 3 bass
	Tonawanda Creek	2007	General biological survey	Electrofishing	279 1 bass		
		2007	General biological survey	Electrofishing (Boat)	256 ± 95 (96 - 390) 15 bass		
		2007	General biological survey	Seine	253 1 bass		

Region	River	Year(s)	Survey Purpose	Gear type	Length (mm)[a]	Weight (g)	Age (yrs)
9	Tonawanda Creek	2007	Rare/endan species	Electrofishing (Boat)	210 1 bass		
	Tunungwant Creek	2012	Other, see comments	Electrofishing (Boat)	209 ± 71 (126 - 463) 30 bass	170 ± 236 (25 – 1,244) 30 bass	4.2 ± 3.8 (1 - 16) 30 bass

[a]Values for length, weight and age: mean ± SD (top), range (middle), number measured (bottom)

Appendix B. Largemouth bass summary data from stream surveys, 2004 – 2013.

Region	River	Year(s)	Survey Purpose	Gear type	Length (mm)[a]	Weight (g)	Age (yrs)
1	Carmans River	2013	CROTS survey	Electrofishing	341 ± 79 (240 – 458) 5 bass	642 ± 532 (197 – 1,415) 4 bass	
		2011	Evaluate exp stocking water	Electrofishing	227 ± 176 (82 – 453) 4 bass	1522 1 bass	
		2013	Other, see comments	Electrofishing	282 1 bass		
		2008	Rare/endang species	Electrofishing	99 ±50 (80 – 285) 16 bass		
	Connetquot River	2009	CROTS survey	Electrofishing	191 ± 13 (182 – 200) 2 bass	99 ± 31 (77 – 121) 2 bass	
		2013	Fish Disease Monitoring	Electrofishing	230 1 bass	168 1 bass	
		2010	Whirling disease sampling	Electrofishing	193 1 bass	89 1 bass	
	Massapequa Creek	2012	CROTS survey	Electrofishing	193 ± 69 (46 – 270) 29 bass	159 ± 62 (24 – 246) 24 bass	
		2013	Evaluate exp stocking water	Electrofishing	81 ± 50 (53 – 290) 46 bass	220 ± 128 (60 – 373) 4 bass	
	Peconic River	2007	Radiation sampling	Electrofishing	98 ± 47 (73 – 254) 13 bass	23 ± 56 (4 – 209) 13 bass	
		2007, 2008	Radiation sampling	Fyke Net	313 ± 78 (225 – 440) 5 bass	465 ± 338 (185 – 1,052) 5 bass	
		2008, 2009	Rare/endang species	Seine	57 ± 6 (51 – 66) 9 bass		
3	Catlin Creek	2008	Other, see comments	Other	203 ± 82 (145 – 261) 2 bass	130 ±141 (30 – 230) 2 bass	
	Esopus Creek	2009, 2011 - 2013	Other, see comments	Electrofishing (Boat)	249 ± 138 (44 – 515) 351 bass	751 ± 645 (20 – 2,400) 199 bass	1.5 ± 1.9 (0 – 9) 81 bass
		2006	Percid sampling	Electrofishing (Boat)	270 ± 94 (70 – 497) 78 bass	913 ± 883 (60 – 2,200) 7 bass	
		2010	Population estimate	Other	61 1 bass		
		2010	TSMP collection	Electrofishing (Boat)	136 ± 106 (42 – 401) 51 bass	674 ± 248 (350 – 1,020) 9 bass	3.2 ± 3.3 (0 – 9) 23 bass
	Haviland Hollow Brook	2005	General biological survey	Electrofishing	67.5 ± 3.5 (65 – 70) 2 bass	3 1 bass	

Region	River	Year(s)	Survey Purpose	Gear type	Length (mm)[a]	Weight (g)	Age (yrs)
3	Mianus River	2005	CROTS survey	Electrofishing	92 ± 37 (60 – 145) 4 bass	14.5 ± 17 (3 – 40) 4 bass	
	Rondout Creek	2009	Other, see comments	Electrofishing (Boat)	348 ± 91 (75 – 510) 182 bass	843 ± 531 (30 – 2,380) 180 bass	
		2007	Percid sampling	Electrofishing (Boat)	165 ± 41 (112 – 320) 75 bass	81 ± 146 (5 – 300) 4 bass	
	Rutgers Creek	2004	CROTS survey	Electrofishing	62 1 bass	5 1 bass	
	Unnamed Water	2006	General biological survey	Electrofishing	85 1 bass		
	Wallkill River	2007	Percid sampling	Electrofishing (Boat)	196 ± 73 (118 – 382) 61 bass	170 ± 238 (10 – 1,100) 35 bass	
	Wiccopee Creek	2006	General biological survey	Electrofishing	101 1 bass	20 1 bass	
	Woodbury Creek	2006	General biological survey	Electrofishing	159 ± 23 (140 – 184) 3 bass	100 ± 36 (70 – 140) 3 bass	
4	Basic Creek	2007	CROTS survey	Electrofishing	315 ± 178 (115 – 455) 3 bass		
	Batavia Kill	2005	CROTS survey	Electrofishing	63 ± 3 (61 – 67) 3 bass		
	Big Brook	2009	EBTJV survey	Electrofishing	320 1 bass		
	Butler Brook	2006	General biological survey	Electrofishing	79 ± 27 (61 – 110) 3 bass		
	Catskill Creek	2005	CROTS survey	Electrofishing	65 ± 13 (52 – 90) 17 bass		
	Center Valley Brook	2009	EBTJV survey	Electrofishing	49 1 bass		
	Claverack Creek	2005	CROTS survey	Electrofishing	98 ± 21 (68 – 112) 4 bass	20 1 bass	
	East Kill	2007, 2013	CROTS survey	Electrofishing	78 ± 13 (67 – 97) 4 bass	9 ± 1 (8 – 10) 2 bass	
	Fly Creek	2009	EBTJV survey	Electrofishing	48 ± 6 (43 – 52) 2 bass		
	Hayden Creek	2005	CROTS survey	Electrofishing	84 1 bass		

Region	River	Year(s)	Survey Purpose	Gear type	Length (mm)[a]	Weight (g)	Age (yrs)
4	Herkimer Creek	2009	EBTJV survey	Electrofishing	70 1 bass		
	Hudson River	2009	Other, see comments	Electrofishing (Boat)	320 ± 96 (107 – 478) 108 bass	699 ± 535 (20 – 2,200) 108 bass	
		2010	Other, see comments	Electrofishing (Boat)	261 ± 101 (74 – 484) 119 bass	744 ± 440 (80 – 2,000) 68 bass	
		2012	TSMP collection	Electrofishing	348 ± 35 (323 – 373) 2 bass	632 ± 169 (512 – 751) 2 bass	
	Ives Corner Brook	2010	EBTJV survey	Electrofishing	72 ± 1 (71 – 73) 3 bass		
	Kiskatom Brook	2008	EBTJV survey	Electrofishing	220 1 bass		
	Kortright Creek	2009	EBTJV survey	Electrofishing	47 1 bass		
	Lawyers Creek	2009	EBTJV survey	Electrofishing	92 1 bass		
	Lisha Kill	2010	CROTS survey	Electrofishing	68 ± 13 (58 – 77) 2 bass		
		2006	General biological survey	Electrofishing	23 1 bass		
	Mill Creek	2011	CROTS survey	Electrofishing	95 ± 11 (86 – 107) 3 bass	12 ± 5 (8 – 18) 3 bass	
	Mohawk River	2007	Fish Disease Monitoring	Electrofishing (Boat)	371 1 bass		
		2006	General biological survey	Seine	126 1 bass		
		2012	General biological survey	Electrofishing	122 ± 14 (112 – 132) 2 bass		
		2006	Other, see comments	Electrofishing (Boat)	242 1 bass	160 1 bass	
		2005	TSMP collection	Electrofishing (Boat)	320 ±25 (299 – 355) 4 bass	459 ±104 (350 – 600) 4 bass	
		2008	Whirling disease sampling	Electrofishing	197 ±75 (140 – 347) 9 bass	525 ± 120 (440 – 610) 2 bass	
	Normans Kill	2013	Special regs evaluation	Angling	225 ±4 (223 – 228) 2 bass		
	Oaks Creek	2008	CROTS survey	Electrofishing	60 1 bass		

Region	River	Year(s)	Survey Purpose	Gear type	Length (mm)[a]	Weight (g)	Age (yrs)
4	Ocquianis Creek	2008	CROTS survey	Electrofishing	72 ± 20 (55 – 135) 15 bass		
	Punsit Creek	2011	CROTS survey	Electrofishing	73 1 bass		
	Quacken Kill	2010	CROTS survey	Electrofishing	76 1 bass		
	Stony Kill	2010	General biological survey	Electrofishing	86 ± 32 (57 – 146) 9 bass		
	Susquehanna River	2011	General biological survey	Electrofishing (Boat)	286 ± 82 (201 – 360) 4 bass	343 ± 240 (120 – 570) 4 bass	
	Tackawasick Creek	2008	CROTS survey	Electrofishing	174 1 bass		
	Taghkanic Creek	2005	CROTS survey	Electrofishing	77 ± 18 (56 – 108) 9 bass		
	Tenmile Creek	2005	CROTS survey	Electrofishing	53 ± 10 (41 – 70) 7 bass		
	Tremper Kill	2010	CROTS survey	Electrofishing	176 1 bass	80 1 bass	
	Trout Brook	2011	EBTJV survey	Electrofishing	300 1 bass		
	Unadilla River	2010, 2012	General biological survey	Electrofishing (Boat)	141 ± 85 (59 – 482) 26 bass	633 ± 840 (130 – 1,880) 4 bass	
	Unnamed Water	2008 - 2011	EBTJV survey	Electrofishing	130 ± 98 (26 – 400) 43 bass		
	Vly Creek	2009	CROTS survey	Electrofishing	65 ± 3 (63 – 67) 2 bass		
	West Br Delaware River	2006, 2007, 2011	Population estimate	Electrofishing (Boat)	294 ± 73 (218 – 382) 4 bass	410 ± 245 (170 – 660) 3 bass	
	West Creek	2006	General biological survey	Electrofishing	38 1 bass		
	West Kill	2013	CROTS survey	Electrofishing	83 ± 10 (72 – 92) 4 bass		
	Wright Brook	2010	EBTJV survey	Electrofishing	384 ± 23 (367 – 400) 2 bass		
5	Batten Kill	2009	CROTS survey	Electrofishing	56 1 bass		
	Chateaugay River	2006	CROTS survey	Electrofishing	76 ± 36 (53 – 147) 6 bass		

Region	River	Year(s)	Survey Purpose	Gear type	Length (mm)[a]	Weight (g)	Age (yrs)
5	Chateaugay River	2007	Fish kill invest.	Electrofishing	132 ± 140 (57 – 341) 4 bass		
	Dwaas Kill	2008	General biological survey	Electrofishing	213 1 bass		
	Geyser Brook	2006	General biological survey	Electrofishing	64 1 bass		
	Great Chazy River	2012	General biological survey	Electrofishing (Boat)	262 ± 67 (130 – 363) 23 bass	303 ± 210 (40 – 680) 23 bass	3.4 ± 1.2 (1 – 5) 22 bass
	Hudson River	2007	Fish Disease Monitoring	Electrofishing (Boat)	246 ± 73 (145 – 480) 31 bass	294 ± 381 (60 – 1,780) 31 bass	
		2008	Whirling disease sampling	Electrofishing (Boat)	201 ± 131 (108 – 293) 2 bass		
	Unnamed Water	2006, 2008	General biological survey	Electrofishing	318 ± 18 (305 – 330) 2 bass		
6	Black River	2006	Fish kill invest.	Electrofishing	69 1 bass		
		2005, 2006, 2010	Fish kill invest.	Electrofishing (Boat)	108 ± 55 (78 – 352) 32 bass		3 1 bass
		2010	General biological survey	Electrofishing (Boat)	163 ± 195 (44 – 388) 3 bass		6 1 bass
	Chippewa Creek	2009	Rare/endang species	Seine	68 ± 9 (55 – 95) 23 bass		
	Coles Creek	2010	Rare/endang species	Seine	131 1 bass		
	Crooked Creek	2009	Rare/endang species	Seine	64 1 bass		
	Erie Canal	2007	General biological survey	Gill Net	440 1 bass	1,389 1 bass	
		2004	TSMP collection	Gill Net	398 1 bass	850 1 bass	
	Fish Creek	2013	Rare/endang species	Electrofishing (Boat)	353 ± 61 (266 – 462) 24 bass		
	Gulf Stream	2006	CROTS survey	Electrofishing	81 ± 6 (76 – 85) 2 bass		

Region	River	Year(s)	Survey Purpose	Gear type	Length (mm)[a]	Weight (g)	Age (yrs)
	Indian River	2008	General biological survey	Electrofishing (Boat)	298 ± 158 (48 – 505) 41 bass		6.1 ± 1.8 (3 – 10) 27 bass
		2013	Rare/endang species	Gill Net	365 1 bass		
6	Little Deerlick Creek	2006	General biological survey	Electrofishing	57 ± 8 (48 – 67) 7 bass		
	Mill Creek	2007	General biological survey	Electrofishing	62 ± 51 (35 – 198) 9 bass		
	Mohawk River	2004	TSMP collection	Electrofishing (Boat)	323 ± 65 (213 – 435) 15 bass	600 ± 341 (132 – 1,187) 15 bass	
		2004	TSMP collection	Gill Net	95 1 bass	10 1 bass	
	Mud Creek	2007	General biological survey	Seine	76 1 bass		
	Mullet Creek	2013	General biological survey	Fyke Net	360 ± 56 (269 – 420) 7 bass		
	Oswegatchie River	2013	Rare/endang species	Electrofishing (Boat)	366 ± 56 (327 – 405) 2 bass		
		2013	Rare/endang species	Seine	67 ± 19 (49 – 115) 13 bass		
	Skinner Creek	2005	Whirling disease sampling	Electrofishing	50 1 bass		
	St. Lawrence River	2007, 2008	Esocid sampling	Seine	223 ± 85 (132 – 354) 7 bass		
		2006	Evaluate exp stocking water	Electrofishing (Boat)	302 ± 104 (152 – 531) 41 bass		
		2004, 2007, 2010, 2012, 2013	General biological survey	Gill Net	271 ± 109 (130 – 468) 23 bass	508 ± 556 (30 – 1,850) 23 bass	4.5 ± 2.8 (1 – 11) 22 bass
		2006	General biological survey	Seine	83 ± 9 (76 – 89) 2 bass		
		2009	Rare/endang species	Gill Net	360 1 bass		
		2009	Rare/endang species	Seine	56 ± 9 (42 – 65) 7 bass		

Region	River	Year(s)	Survey Purpose	Gear type	Length (mm)[a]	Weight (g)	Age (yrs)
6	Tibbits Creek	2013	General biological survey	Fyke Net	360 ± 74 (261 – 485) 16 bass		
	Unnamed Water	2007	General biological survey	Electrofishing (Boat)	203 1 bass		
	Vrooman Creek	2007	General biological survey	Electrofishing	177 1 bass		
	West Br Oswegatchie River	2007	General biological survey	Seine	177 1 bass		
7	Button Creek	2011	EBTJV survey	Electrofishing	146 1 bass		
	Mill Brook	2011	EBTJV survey	Electrofishing	46 1 bass		
	Ninemile Creek	2004	General biological survey	Electrofishing	37 1 bass		
	North Branch Salmon River	2006	General biological survey	Electrofishing	24 ± 1 (23 – 25) 2 bass		
	Rice Creek	2006	General biological survey	Seine	152 1 bass		
	Susquehanna River	2012	Fish Disease Monitoring	Electrofishing (Boat)	217 1 bass	166 1 bass	2 1 bass
		2008, 2010	Other, see comments	Electrofishing (Boat)	159 ± 77 (93 – 322) 13 bass	189 ± 212 (28 – 530) 7 bass	1.3 ± 1.1 (0 – 3) 7 bass
		2012	TSMP collection	Electrofishing (Boat)	240 1 bass	184 1 bass	2 1 bass
	Unnamed Water	2011	EBTJV survey	Electrofishing	240 1 bass		
		2008	General biological survey	Electrofishing	305 ± 72 (254 – 356) 2 bass		
		2010, 2011	Other, see comments	Electrofishing	117 ± 25 (90 – 140) 3 bass		
	Yaleville Brook	2012	Other, see comments	Electrofishing	60 1 bass		
8	Buttonwood Creek	2008	Rare/endangered species	Electrofishing (Boat)	54 ± 2 (52 – 55) 2 bass		
	Canandaigua Outlet	2004, 2007	General biological survey	Electrofishing	109 ± 67 (63 – 306) 13 bass	76 ±156 (2 – 458) 8 bass	1.8 ± 1.4 (0 – 4) 9 bass
	Cohocton River	2007	CROTS survey	Electrofishing	387 1 bass		

Region	River	Year(s)	Survey Purpose	Gear type	Length (mm)[a]	Weight (g)	Age (yrs)
8	Erie Canal	2008	Fish Disease Monitoring	Electrofishing (Boat)	347 ± 97 34 bass	2560 1 bass	
		2005	TSMP collection	Electrofishing (Boat)	304 ± 51 (183 – 417) 25 bass	440 ± 252 (94 – 1,146) 25 bass	
	Genesee River	2008	General biological survey	Electrofishing (Boat)	209 ± 172 (87 – 330) 2 bass		
	Goff Creek	2006	Fish kill invest.	Electrofishing	118 1 bass		
	Marsh Creek	2007	General biological survey	Seine	355 1 bass		
	Naples Creek	2007	Population estimate	Electrofishing	55 1 bass		
	Sodus Creek	2008	General biological survey	Electrofishing	54 1 bass		
	Springwater Creek	2009	Population estimate	Electrofishing	125 1 bass		
	Unnamed Water	2010	EBTJV survey	Electrofishing	80 1 bass		
9	Allegheny River	2012, 2013	Other, see comments	Electrofishing (Boat)	197 ± 79 (62 – 389) 52 bass	179 ± 201 (3 – 805) 47 bass	4 ± 2.8 (0 – 11) 46 bass
	Battle Creek	2005	General biological survey	Electrofishing	82 ± 39 (55 – 150) 5 bass		
	Chautauqua Creek	2008	Population estimate	Electrofishing	126 1 bass		
	Dodge Creek	2012	Other, see comments	Electrofishing	101 1 bass		1 1 bass
	Erie Canal	2008	Whirling disease sampling	Electrofishing (Boat)	104 1 bass		
	Great Valley Creek	2012	Other, see comments	Electrofishing	67 1 bass		
	Ischua Creek	2012	Other, see comments	Electrofishing (Boat)	187 1 bass	101 1 bass	3 1 bass
	Little Genesee Creek	2012	Other, see comments	Electrofishing	134 1 bass		1 1 bass
	Little Valley Creek	2012	Other, see comments	Electrofishing	129 ± 13 3 bass		2 ± 0 3 bass
	Meetinghouse Run	2013	Other, see comments	Electrofishing	117 ± 7 (108 – 130) 9 bass		
	Mud Creek	2007	General biological survey	Electrofishing	440 1 bass		

Region	River	Year(s)	Survey Purpose	Gear type	Length (mm)[a]	Weight (g)	Age (yrs)
9	Niagara River	2009	Esocid sampling	Electrofishing (Boat)	130 ± 79 (55 – 404) 166 bass		
		2006 - 2008	General biological survey	Electrofishing (Boat)	124 ± 74 (42 – 476) 2,200 bass		
		2012	Population estimate	Electrofishing (Boat)	483 1 bass		
	Oil Creek	2012	Other, see comments	Electrofishing	135 1 bass		2 1 bass
		2012	Other, see comments	Other	45 1 bass		
	Tonawanda Creek	2007	General biological survey	Electrofishing (Boat)	290 ± 113 (210 – 456) 4 bass		
		2006	Rare/endangered species	Electrofishing (Boat)	381 1 bass		
	Tunungwant Creek	2012	Other, see comments	Electrofishing (Boat)	225 1 bass	153 1 bass	6 1 bass

[a]Values for length, weight and age: mean ± SD (top), range (middle), number measured (bottom)