Coolwater Assessment Report 2015

Investigations and Management of New Jersey's Freshwater Fisheries Resources

By
Scott Collenburg, Assistant Fisheries Biologist

New Jersey Department of Environmental Protection
Division of Fish and Wildlife
Bureau of Freshwater Fisheries

Sportfish Restoration Grant F-48-R

NEW JERSEY DIVISION OF
Fish and Wildlife

COOLWATER ASSESSMENT PROGRAM - 2015

The Coolwater Fisheries Assessment was initiated in 2013 to assess current status of coolwater fisheries that are maintained by annual stockings (Muskellunge, Northern Pike, Walleye, and Hybrid Striped Bass). In 2013 the focus was on developing sampling techniques and protocols for assessing Muskellunge, which are stocked in ten waterbodies statewide. Three of these lakes (Carnegie Lake, Furnace Lake, and Mountain Lake) were selected for sampling in 2013 using trap nets during the spring when mature muskies congregate for spawning and are more vulnerable to capture. In 2014, the second year of the Coolwater Assessment, four waterbodies (Farrington Lake, Lake Hopatcong, Monksville Reservoir, and Pompton Lake) were selected for spring trap netting surveys to assess one or more species (Northern Pike/Muskellunge/Walleye).

In 2015 seven waterbodies were sampled (Canistear Reservoir, Furnace Lake, Manasquan Reservoir, Mercer Lake, Monksville Reservoir, Spruce Run Reservoir, and Swartswood Lake). Trap net sampling for muskies and pike (which was delayed by late ice-out) commenced in early April, multiple nighttime boat electrofishing surveys were conducted in the fall to target Walleye, and gill nets were set in the fall to target Hybrid Striped Bass. A total of 73 trap nets, 9 overnight gill nets, and 5 nights of boat electrofishing were utilized to capture the target species of interest from each waterbody.

CANISTEAR RESERVOIR

Location: Sussex County, Vernon Twp.   Acres: 519
Drainage: Pequannock River   Avg. Depth: 25 ft.
Target Species: Walleye   Max Depth: 54 ft.

Methods
To assess the Walleye fishery at Canistear Reservoir nighttime electrofishing was conducted on October 13. Largemouth Bass, Smallmouth Bass, and Walleye were measured for total length and weight, and scales collected for growth analysis and age.

Biological Data
A total of 21 Walleye, 67 Smallmouth Bass, and 13 Largemouth Bass were captured during nighttime electrofishing. A total of 1.2 hours of electrofishing was conducted and Smallmouth Bass were found to be most abundant (CPUE of 42 fish/hr, Table 14). The Smallmouth Bass population was well balanced indicated by a PSD of 52 and RSD_p of 22. The Walleye population was only moderately abundant with a CPUE of 8 fish/hr (Table 15). Of those that were captured, most were larger individuals indicated by a PSD of 80 and RSD_p of 30. The Walleye population will continue to be monitored here to obtain more data. Fall nighttime electrofishing for Walleye in general resulted in low CPUE. Of the three waterbodies sampled, Walleye CPUE effort averaged about 4 Walleye/hr and the catch rate on Canistear Reservoir was double that average. This catch rate is still low so additional sampling needs to be done on Canistear Reservoir to assess this fishery further.

Management Recommendations
1. Recommendations for Walleye will be made at the time of project completion.

Table 14. Catch per unit effort (CPUE) and stock density indices for fall nighttime electrofishing on Canistear Reservoir in 2015.

Species	Total Number Caught	Number > Stock Size Caught	% of Captured	Hours sampling	CPUE (stock size)	PSD	95% CI (+/-)	RSD$_p$	RSD$_m$
Largemouth Bass	13	10	12.9	1.2	8	50	45	50	0
Smallmouth Bass	67	50	66.3	1.2	42	52	17	22	0
Walleye	21	10	20.8	1.2	8	80	38	30	0
Total	**101**								

Coolwater Assessment 2015

Table 15. Condition of fish species captured from Canistear Reservoir in the Fall of 2015 indicated by Relative Weight (W_r) index. Relative Weight quantifies fish condition based on how much a fish weighs for its length. A W_r of 95-105 is a typical objective for most species. Values well below 100 for a size group may be indicative of a problem in food and feeding relationships, and values well above 100 for a size group may be indicative of fish not making the best use of available prey.

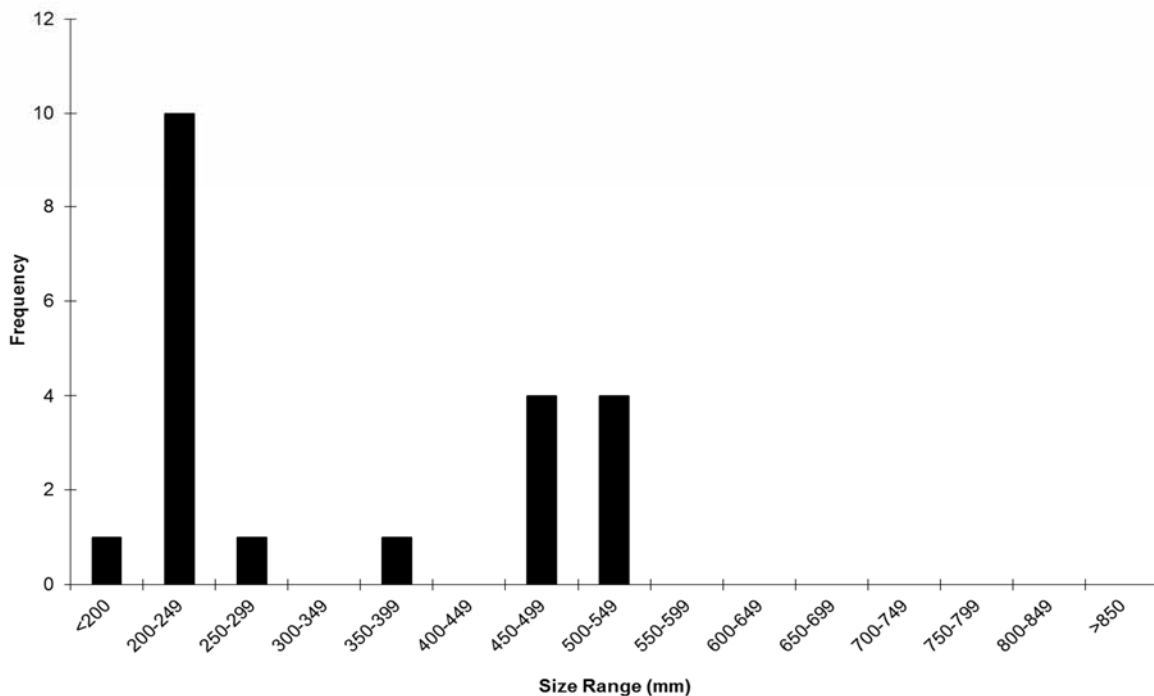| Species	Range (mm)	Number	Avg W_r	95% CI (+/-)	SE	Range (mm)	
						Min	Max
Largemouth Bass	ALL $\geq$ 200	10	97	5	2.314392	83	109
	200-299	5	96	-	-	-	-
	300-379	0	-	-	-	-	-
	380-509	5	97	-	-	-	-
	$\geq$ 510	0	-	-	-	-	-
Smallmouth Bass	ALL > 180	50	88	4	1.863907	40	150
	180-279	24	91	-	-	-	-
	280-349	15	86	-	-	-	-
	350-429	5	92	-	-	-	-
	$\geq$ 430	6	80	-	-	-	-
Walleye	ALL $\geq$ 250	10	93	5	2.36985	79	105
	250-379	2	100	-	-	-	-
	380-509	5	96	-	-	-	-
	510-629	3	83	-	-	-	-
	$\geq$ 630	0	-	-	-	-	-

Figure 13. Length- frequency histogram of Walleye from fall nighttime electrofishing Canistear Reservoir (2015).

4

FURNACE LAKE

Location: Warren County, Oxford Twp.   Acres: 53
Drainage: Pequest River   Avg Depth: 18 ft.
Target Species: Muskellunge, Tiger Muskellunge   Max Depth: 37 Ft.

Methods
A total of nine South Dakota trap nets were set on Furnace Lake April 21 - 24. Three trap nets were set daily in water depths ranging from 3.5 to 6 Ft. deep and allowed to fish for 24 hours. Sample sites were selected based on historical sites and diversity of habitat. Muskellunge were measured for total length and weight, and scales were collected for growth analysis and age. Other fish species were measured for total length and weight, and/or counted for presence.

Biological Data
A total of 4,337 fish were captured in trap nets. Bluegill Sunfish were by far the most common fish species present, composing 92.3% of the catch (Table 5). A total of twelve species of fish were collected during the 2015 trap net survey. Catch of the target species, Muskellunge and Tiger Muskellunge, was good, with an average of one individual captured for two nets set (CPUE of 0.44 fish/net). The Muskellunge were large at 1010 - 1061 mm (39.8 – 41.8 in) and weighed 9.8 – 11.5 kg (21.6 – 25.4 lb), as were the Tiger Muskellunge at 836 – 846 mm (32.9 – 33.3 in) and weighed 3.63 – 4.12 kg (8.0 – 9.1 lb). Furnace Lake is a small waterbody but is popular among Muskellunge anglers, which is not surprising since our catch rate here exceeds any other waterbody that we have sampled since the Coolwater Assessment was initiated in 2015.

The sunfish population was very abundant and should provide adequate forage for higher trophic level fish species. The CPUE for Bluegill was 445 fish/net and Pumpkinseed CPUE was 21.8 fish/net. PSD for both Bluegill and Pumpkinseed was 5, which is low and indicates a population composed of smaller individuals. Relative weight (W_r) is low for Bluegill (86) and Pumpkinseed (88) further indicating that there is a potential that the high abundance of both species are creating stress and competition for resources (Table 6). It would be interesting to investigate the bass population here via boat electrofishing to determine if stocking is necessary to help control and balance the sunfish population.

Management Recommendations
1. Recommendation for Muskellunge will be made at project completion.
2. Assess status of the bass population via boat electrofishing.

Coolwater Assessment 2015

Table 5. Catch per unit effort (CPUE) and stock density indices for spring trap netting on Furnace Lake in 2015.

Species	Total Number Caught	% of Captured	Nets Set	CPUE (Fish / Net)	PSD	95% CI (+/-)	RSD$_p$	RSD$_m$
Largemouth Bass	3	0.1	9	0.3	-	-	-	-
Bluegill	4005	92.4	9	445.0	5	6	0	0
Pumpkinseed	196	4.5	9	21.8	5	7	0	0
Yellow Perch	39	0.9	9	4.3	95	10	64	21
Black Crappie	10	0.2	9	1.1	100	10	100	90
Brown Bullhead	40	0.9	9	4.4	97	8	-	-
Rock Bass	2	0.0	9	0.2	-	-	-	-
Muskellunge	2	0.0	9	0.2	-	-	-	-
Tiger Muskellunge	2	0.0	9	0.2	-	-	-	-
Channel Catfish	4	0.1	9	0.4	-	-	-	-
Alewife	28	0.6	9	3.1	-	-	-	-
Rainbow Trout	5	0.1	9	0.6	-	-	-	-
Total	**4336**	100.0						
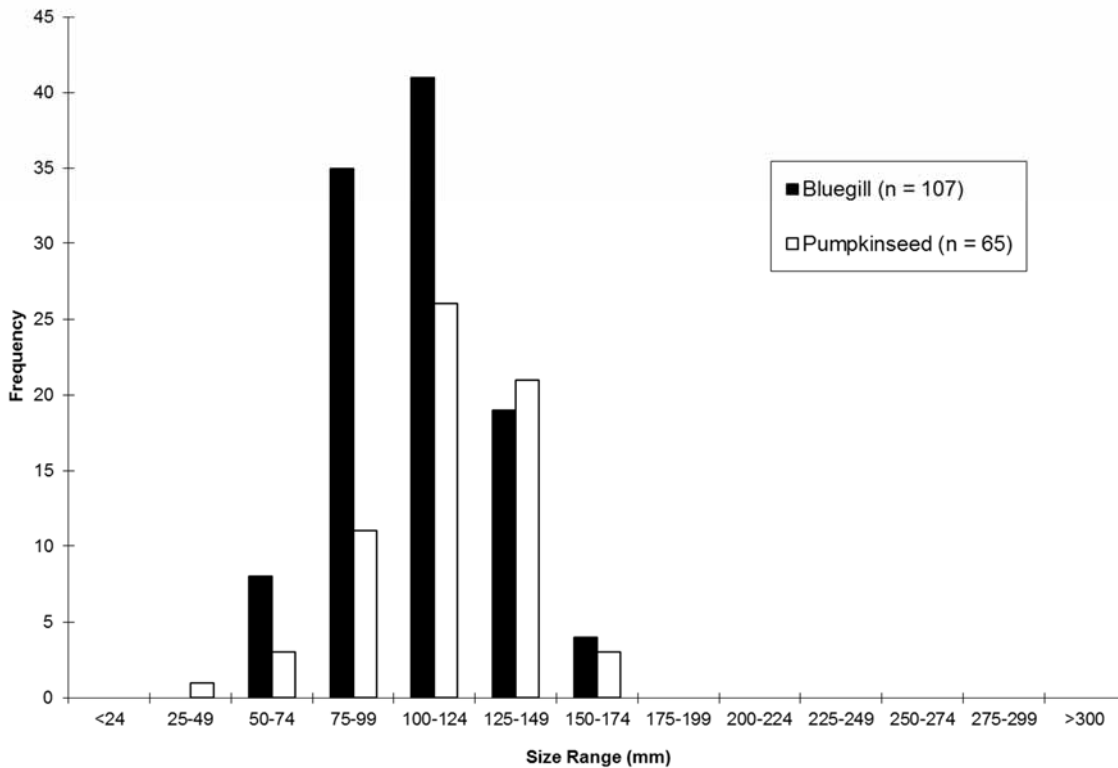
Figure 7. Length- frequency histogram of Bluegill and Pumpkinseed from spring trap netting Furnace Lake (2015).

Coolwater Assessment 2015

Table 6. Condition of fish species captured on Furnace Lake in 2015 indicated by Relative Weight (W_r) index. Relative Weight quantifies fish condition based on how much a fish weighs for its length. A W_r of 95-105 is a typical objective for most species. Values well below 100 for a size group may be indicative of a problem in food and feeding relationships, and values well above 100 for a size group may be indicative of fish not making the best use of available prey.

Species	Range (mm)	Number	Avg W_r	95% CI (+/-)	SE	Range (mm)	
						Min	Max
Bluegill Sunfish	ALL $\geq$ 80	87	86	4	1.897717	36	142
	80-149	83	86	-	-	-	-
	150-199	4	88	-	-	-	-
	200-249	0	-	-	-	-	-
	$\geq$ 250	0	-	-	-	-	-
Pumpkinseed Sunfish	ALL $\geq$ 80	61	88	3	1.693956	58	122
	80-149	58	87	-	-	-	-
	150-199	3	100	-	-	-	-
	200-249	0	-	-	-	-	-
	$\geq$ 250	0	-	-	-	-	-
Yellow Perch	ALL $\geq$ 130	39	79	2	1.155973	65	96
	130-199	2	82	-	-	-	-
	200-249	12	84	-	-	-	-
	250-299	17	77	-	-	-	-
	$\geq$ 300	8	75	-	-	-	-
Brown Bullhead	ALL $\geq$ 150	38	109	12	6.155255	84	324
	150-229	1	172	-	-	-	-
	$\geq$ 230	37	102	-	-	-	-
Muskellunge	ALL $\geq$ 510	2	116	-	0	116	116
	510-759	0	-	-	-	-	-
	760-969	0	-	-	-	-	-
	970-1069	2	116	-	-	-	-
	$\geq$ 1070	0	-	-	-	-	-
Tiger Muskellunge	ALL $\geq$ 510	2	90	7	3.5	86	93
	510-759	0	-	-	-	-	-
	760-969	2	90	-	-	-	-
	970-1069	0	-	-	-	-	-
	$\geq$ 1070	0	-	-	-	-	-

Coolwater Assessment 2015

MANASQUAN RESERVOIR

Location: Monmouth County, Howell Twp.   Acres: 720
Drainage: Manasquan River   Avg Depth: 16 ft.
Target Species: Muskellunge   Max Depth: 32 ft.

Methods
A total of sixteen South Dakota trap nets were set on Manasquan Reservoir between April 6 and April 10. Four trap nets were set daily in water depths ranging from 3.5 to 8 ft. deep and allowed to fish for 24 hours. Sample sites were selected based on historical sites and diversity of habitat. Muskellunge were measured for total length and weight, and scales were collected for growth analysis and age. Other fish species were measured for total length and weight, and/or counted for presence.

Biological Data
A total of 3,815 fish were captured in trap nets. White Perch and Bluegill cumulatively composed 94% of the catch (Table 3). A total of 13 species of fish were collected, but catch of the target species, Muskellunge, was low, with only one individual captured (CPUE of 0.1fish/net). The Muskellunge was large at 963 mm (38 in) and weighed 8 kg (17.6 lb). Manasquan Reservoir proved to be a difficult waterbody to sample as it lacks a variety of points and inlets that trap nets are usually set and have proven to be effective places to capture Muskellunge. Anglers and Monmouth County Park employees provided anecdotal evidence of anglers catching Muskellunge but this species does not seem to be specifically targeted by many anglers. Another method of sampling or more trap netting may be needed to better understand the Muskellunge fishery in this reservoir.

Trap netting revealed an abundant population of White Perch with a CPUE of 106.1 fish/net (Table 3). The White Perch population is dominated by larger individuals with a PSD of 100, RSD_p of 58, and RSD_m of 22. Manasquan Reservoir offers great habitat and water quality for White Perch and is a reason why they thrive there.   White Perch tend to form very large populations that can dominate the waters they inhabit because of their large reproductive potential in places that have favorable conditions (Smith 2002). This population should be closely monitored as White Perch populations have a tendency to achieve high abundances of individuals with small size structure. Currently, they provide great fishing opportunities.

A good number of Black Crappie were captured (CPUE of 7.6 fish/net). Many large individuals composed the population (PSD of 96, RSD_p of 94, and RSD_m of 65), with 45 of 83 measured individuals exceeding 12 inches in length! Despite there being a trap net bias to capture larger Black Crappie, the abundance and sizes are large relative to other New Jersey lakes sampled that have Black Crappie populations. Not many smaller Black Crappie were captured as shown by the length-frequency graph (Figure 5), but this is not a concern as smaller individuals typically are not captured in trap nets.

Bluegill were also abundant with a CPUE of 117.1 fish/net but their condition was below average, indicated by an average relative weight (W_r) of 80 (Table 4). The reservoir's forage base is abundant. Chain Pickerel were commonly captured in trap nets as well (CPUE of 2.6

Coolwater Assessment 2015

fish/net), and most were larger individuals with a PSD of 76 (Figure 6). This species should provide a lot of action for anglers fishing here. In addition, three Hybrid Striped Bass were captured in one of the trap nets. Trap nets are typically ineffective at capturing Hybrid Striped Bass and therefore were sampled in the fall of 2015 with gill nets. On October 21 - 22 a total of four 120 ft. experimental gill nets (6 ft. deep, with 4 panels of 2 – 5 in mesh sizes) were set. A total of 3 Hybrid Striped Bass were captured during this gill netting event. With this low catch rate more sampling is needed next fall to determine the status of this fishery.

Management Recommendations
1. Determine an effective method to sample the Muskellunge population as trap nets were not successful for this species.
2. Set gill nets in the fall of 2016 to assess the Hybrid Striped Bass population.

Table 3. Catch per unit effort (CPUE) and stock density indices for spring trap netting on Manasquan Reservoir in 2015.

Species	Total Number Caught	% of Captured	Nets Set	CPUE (Fish / Net)	PSD	95% CI (+/-)	RSD$_p$	RSD$_m$
Largemouth Bass	8	0.2	16	0.5	88	39	75	0
Chain Pickerel	41	1.1	16	2.6	76	17	17	5
Bluegill	1883	49.4	16	117.7	92	6	53	0
Pumpkinseed	5	0.1	16	0.3	-	-	-	-
Yellow Perch	36	0.9	16	2.3	93	21	7	0
Black Crappie	121	3.2	16	7.6	96	6	94	65
White Perch	1698	44.5	16	106.1	100	1	59	22
Brown Bullhead	10	0.3	16	0.6	100	26	-	-
Muskellunge	1	0.0	16	0.1	-	-	-	-
Hybrid Striped Bass	3	0.1	16	0.2	-	-	-	-
Channel Catfish	1	0.0	16	0.1	-	-	-	-
Golden Shiner	1	0.0	16	0.1	-	-	-	-
American Eel	6	0.2	16	0.4	-	-	-	-
Total	**3814**	100.0						

Table 4. Condition of fish species captured on Manasquan Reservoir in 2015 indicated by Relative Weight (W_r) index. Relative Weight quantifies fish condition based on how much a fish weighs for its length. A W_r of 95-105 is a typical objective for most species. Values well below 100 for a size group may be indicative of a problem in food and feeding relationships, and values well above 100 for a size group may be indicative of fish not making the best use of available prey.

| Species	Range (mm)	Number	Avg W_r	95% CI (+/-)	SE	Range (mm)	
						Min	**Max**
Largemouth Bass	ALL ≥ 200	8	110	11	5.71964	77	130
	200-299	1	77	-	-	-	-
	300-379	1	127	-	-	-	-
	380-509	5	113	-	-	-	-
	≥ 510	1	105	-	-	-	-
Chain Pickerel	ALL ≥ 250	41	94	3	1.571042	75	118
	250-379	10	98	-	-	-	-
	380-509	24	94	-	-	-	-
	510-629	5	90	-	-	-	-
	≥ 630	2	86	-	-	-	-
Bluegill Sunfish	ALL ≥ 80	109	80	2	1.204315	36	133
	80-149	9	85	-	-	-	-
	150-199	42	79	-	-	-	-
	200-249	58	81	-	-	-	-
	≥ 250	0	-	-	-	-	-
Yellow Perch	ALL ≥ 130	15	69	6	3.089871	48	94
	130-199	1	94	-	-	-	-
	200-249	13	69	-	-	-	-
	250-299	1	54	-	-	-	-
	≥ 300	0	-	-	-	-	-
Black Crappie	ALL ≥ 130	82	100	2	0.894555	80	116
	130-199	3	94	-	-	-	-
	200-249	2	101	-	-	-	-
	250-299	24	103	-	-	-	-
	≥ 300	53	99	-	-	-	-
White Perch	ALL ≥ 130	100	90	2	0.808413	64	110
	130-199	0	-	-	-	-	-
	200-249	41	89	-	-	-	-
	250-299	37	89	-	-	-	-
	≥ 300	22	95	-	-	-	-
Muskellunge	ALL ≥ 510	1	111	-	-	111	111
	510-759	0	-	-	-	-	-
	760-969	1	111	-	-	-	-
	970-1069	0	-	-	-	-	-
	≥ 1070	0	-	-	-	-	-
Hybrid Striped Bass	ALL ≥ 200	3	89	3	1.527525	87	92
	200-299	0	-	-	-	-	-
	300-379	0	88	-	-	-	-
	380-509	0	-	-	-	-	-
	≥ 510	2	90	-	-	-	-

Coolwater Assessment 2015
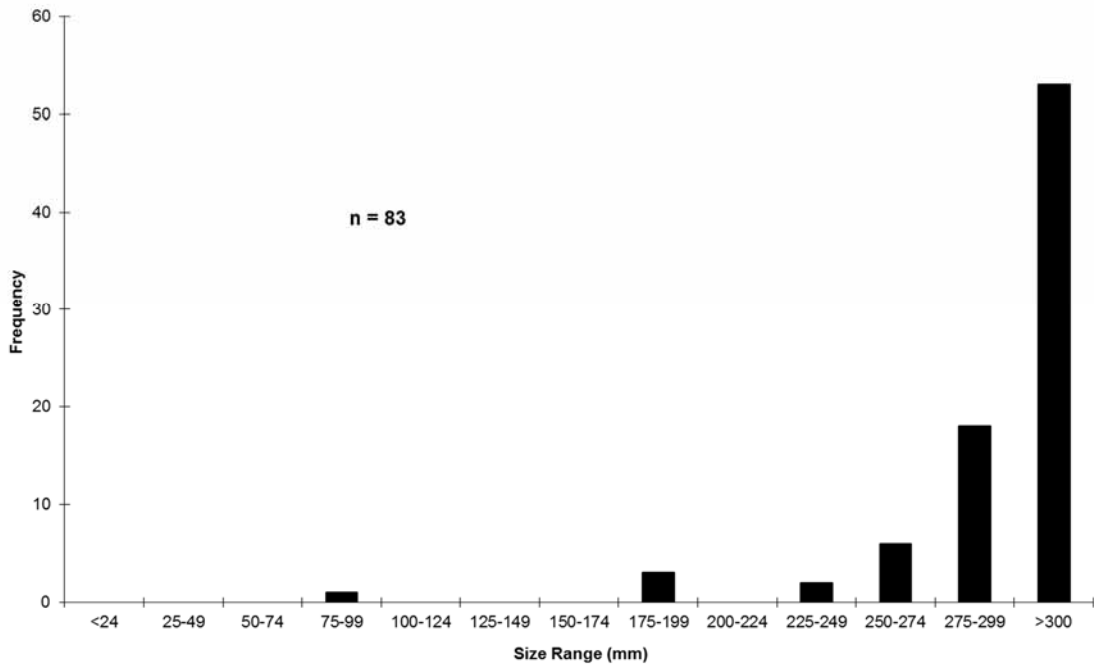
Figure 5. Length-frequency histogram of Black Crappie from spring trap netting Manasquan Reservoir (2015).
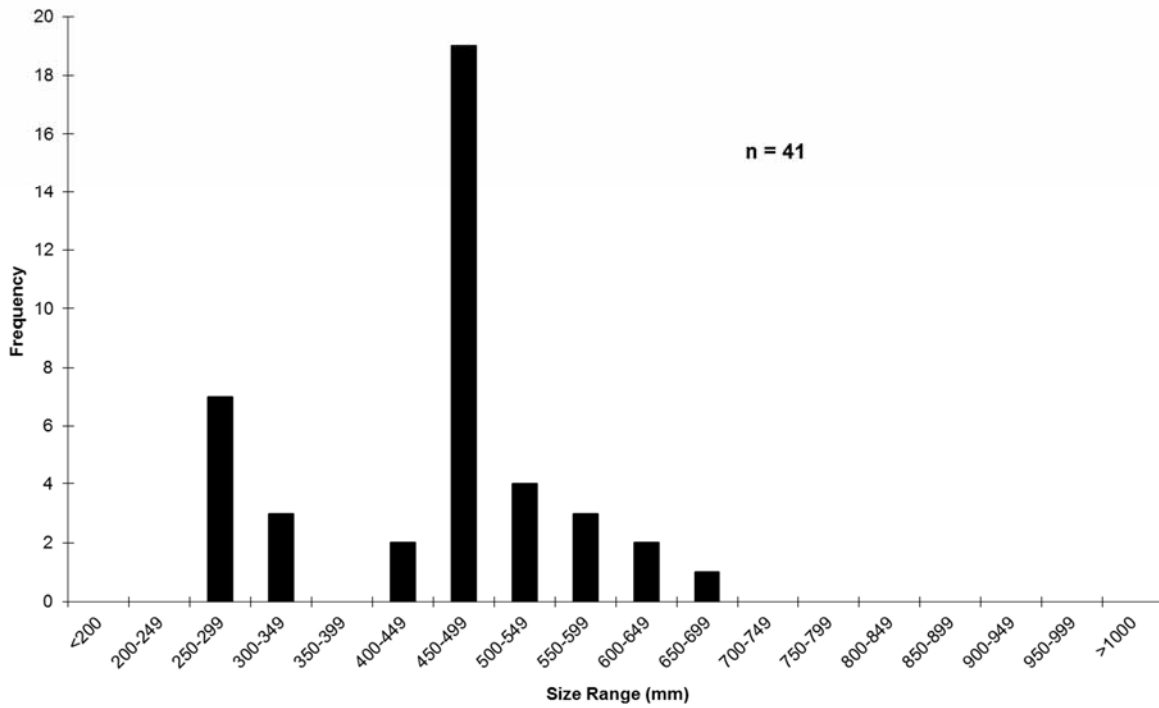

Figure 6. Length- frequency histogram of Chain Pickerel from spring trap netting Manasquan Reservoir (2015).

11

MERCER LAKE

Location: Mercer County, West Windsor Twp.   Acres: 275
Drainage: Assunpink Creek   Avg Depth: 8 ft.
Target Species: Muskellunge   Max Depth: 20 ft.

Methods
A total of fifteen South Dakota trap nets were set on Mercer Lake between April 27 and May 1. Three to four trap nets were set daily in water depths ranging from 3.5 to 8 ft. deep and allowed to fish for 24 hours. Sample sites were selected based on historical sites and diversity of habitat. If Muskellunge were captured, they would be measured for total length and weight, and scales collected for growth analysis and age. Other fish species were measured for total length and weight, and/or counted for presence.

Biological Data
A total of 6,247 fish were captured in the trap nets. White Perch were, by far, the most common fish species present, composing 91.2% of the catch (Table 7). A total of twelve species of fish were collected during this trap net survey. The target species, Muskellunge, was not captured during the survey. This is an indication that population abundance is low.

Trap netting revealed an abundant population of White Perch with a CPUE of 380 fish/net (Table 7). Similar to Manasquan Reservoir, which was also surveyed with trap nets in 2014, the White Perch population was very abundant. However, the White Perch population at Mercer Lake is dominated by smaller individuals indicated by a PSD of 5 and an RSD_p of 0 (Table 7, Figure 8). White Perch tend to form very large populations that can dominate the waters they inhabit because of their large reproductive potential in places that have favorable conditions (Smith 2002). White Perch populations have a tendency to achieve high abundances of individuals with small size structure and can become a nuisance. They're very aggressive feeders and a large portion of their diet can be fish eggs or smaller fish which can lead them to dominate waters they inhabit.

White Crappie and Black Crappie were both captured during this survey. Black Crappies were more abundant but the White Crappies seem to be reaching larger sizes with the largest at 393 mm (15.4 in) in length and 1.0 kg (2.2 lb).

Management Recommendations
1. Continue to investigate Muskellunge population via new sampling techniques or additional trap netting.
2. Determine appropriate action to control White Perch population that may be reaching nuisance levels.

Table 7. Catch per unit effort (CPUE) and stock density indices for spring trap netting on Mercer Lake in 2015.

Species	Total Number Caught	% of Captured	Nets Set	CPUE (Fish / Net)	PSD	95% CI (+/-)	RSD$_p$	RSD$_m$
Largemouth Bass	5	0.1	15	0.3	-	-	-	-
Yellow Perch	134	2.1	15	8.9	18	15	3	0
Black Crappie	52	0.8	15	3.5	-	-	-	-
White Crappie	15	0.2	15	1.0	100	8	62	62
White Perch	5700	91.2	15	380.0	5	6	0	0
Yellow Bullhead	48	0.8	15	3.2	-	-	-	-
Brown Bullhead	159	2.5	15	10.6	100	3	-	-
Channel Catfish	3	0.0	15	0.2	-	-	-	-
Gizzard Shad	123	2.0	15	8.2	-	-	-	-
Golden Shiner	1	0.0	15	0.1	-	-	-	-
Alewife	4	0.1	15	0.3	-	-	-	-
American Eel	3	0.0	15	0.2	-	-	-	-
Total	**6247**	100.0						
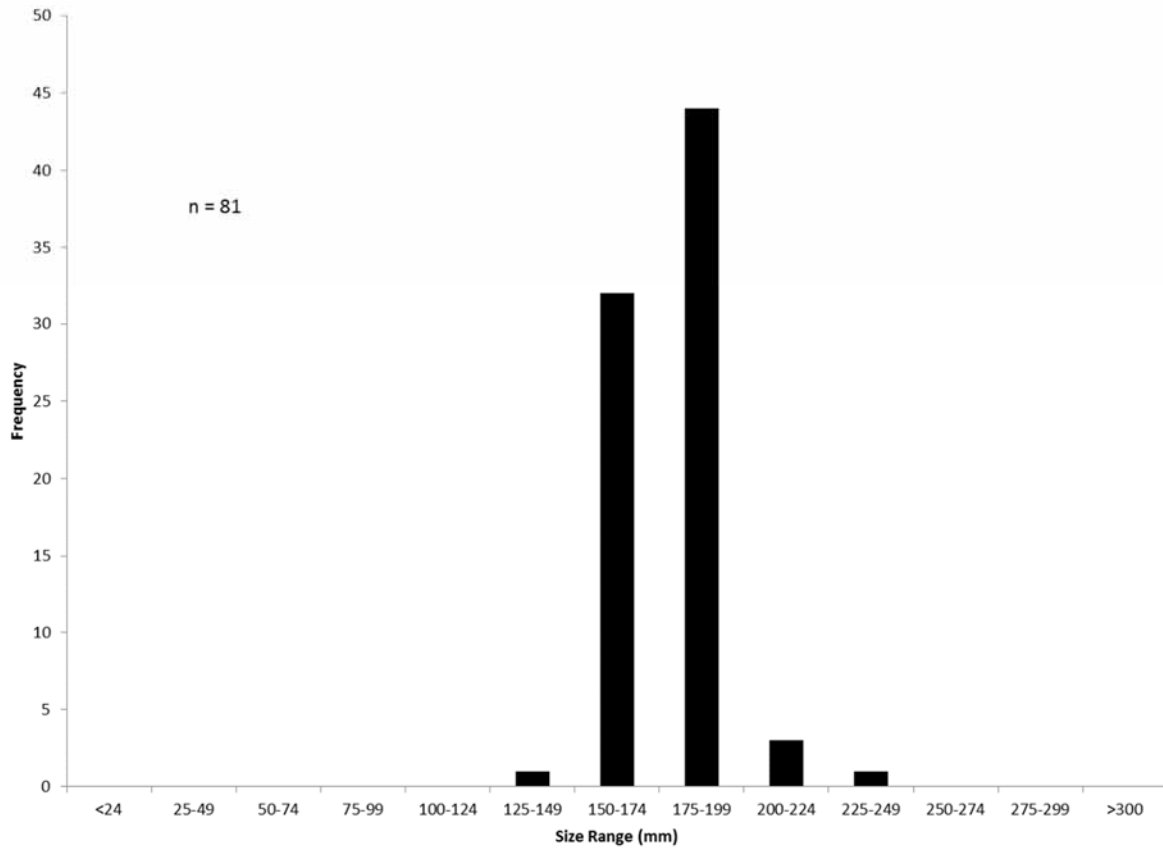
Figure 8. Length- frequency histogram of White Perch from spring trap netting Mercer Lake (2015).

Coolwater Assessment 2015
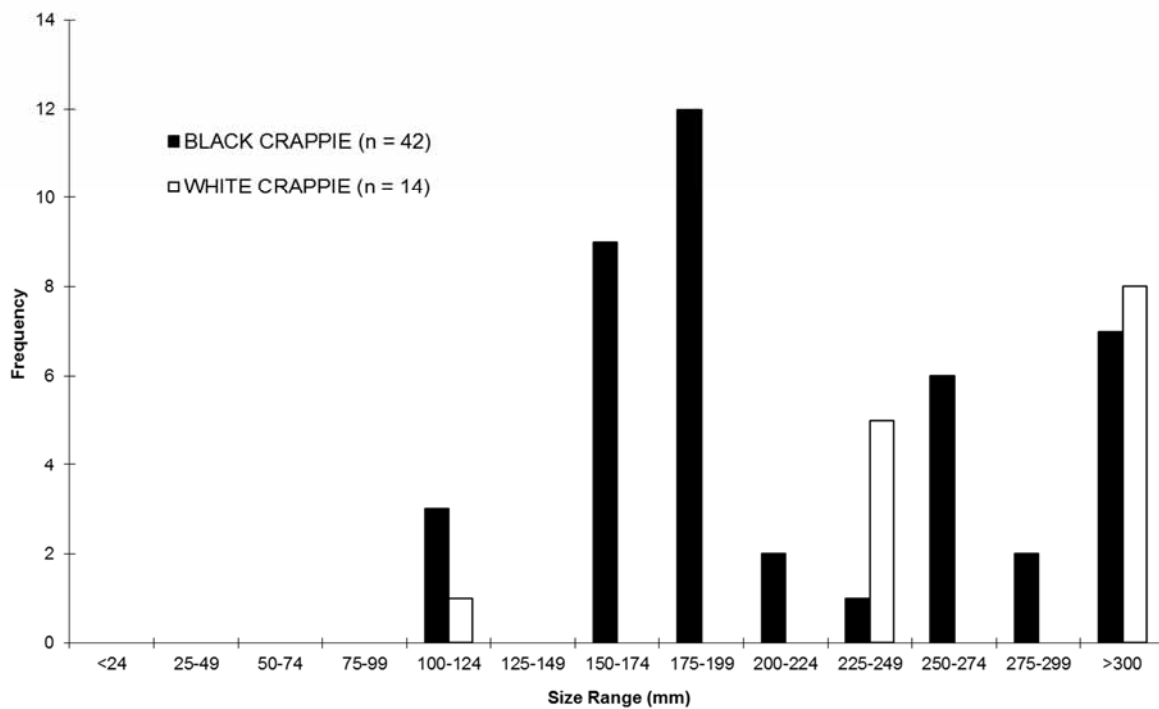
Figure 9. Length- frequency histogram of Black Crappie and White Crappie from spring trap netting Mercer Lake (2015).

Coolwater Assessment 2015

Table 8. Condition of fish species captured on Mercer Lake in 2015 indicated by Relative Weight (W_r) index. Relative Weight quantifies fish condition based on how much a fish weighs for its length. A W_r of 95-105 is a typical objective for most species. Values well below 100 for a size group may be indicative of a problem in food and feeding relationships, and values well above 100 for a size group may be indicative of fish not making the best use of available prey.

Species	Range	Number	Avg W_r	95% CI (+/-)	SE	Range W_r Min	Range W_r Max
Yellow Perch	ALL $\geq$ 130	40	86	4	2.110623	60	123
	130-199	33	87	-	-	-	-
	200-249	6	78	-	-	-	-
	250-299	1	82	-	-	-	-
	$\geq$ 300	0	-	-	-	-	-
Black Crappie	ALL $\geq$ 130	39	89	8	3.995083	0	185
	130-199	21	91	-	-	-	-
	200-249	3	97	-	-	-	-
	250-299	8	93	-	-	-	-
	$\geq$ 300	7	78	-	-	-	-
White Crappie	ALL $\geq$ 130	13	97	3	1.408824	92	108
	130-199	0	-	-	-	-	-
	200-249	5	94	-	-	-	-
	250-299	0	-	-	-	-	-
	$\geq$ 300	8	99	-	-	-	-
White Perch	ALL $\geq$ 130	81	86	2	1.268458	48	112
	130-199	77	87	-	-	-	-
	200-249	4	81	-	-	-	-
	250-299	0	-	-	-	-	-
	$\geq$ 300	0	-	-	-	-	-
Yellow Bullhead	ALL $\geq$ 150	30	99	3	1.299292	81	114
	150-229	5	97	-	-	-	-
	$\geq$ 230	25	99	-	-	-	-
Brown Bullhead	ALL $\geq$ 150	39	103	4	2.287802	87	175
	150-229	0	-	-	-	-	-
	$\geq$ 230	39	101	-	-	-	-

Coolwater Assessment 2015

MONKSVILLE RESERVOIR

Location: Passaic County, Ringwood Twp.   Acres: 505
Drainage: Wanaque River   Avg Depth: 43 ft.
Target Species: Muskellunge and Walleye   Max Depth: 90 ft.

Methods
Monksville Reservoir was surveyed in 2014 using trap nets for Walleye and Muskellunge but it was determined that because sampling was done in the Fall, it was not indicative or comparable of their populations' actual abundance or size structure. Therefore, a total of 16 South Dakota trap nets were set on in the reservoir from May 4 to May 8 in 2015. Three to four trap nets were set daily in water depths ranging from 3.5 to 8 ft. deep and allowed to fish for 24 hours. Sample sites were selected based on historical sites and diversity of habitat. Muskellunge and Walleye were measured for total length and weight, and scales collected for growth analysis and age. Other fish species were identified and counted. Biometric data (length and weights) was collected on other species in 2014, therefore it was not necessary to assess this again. In addition to setting trap nets, nighttime electrofishing was conducted on October 6 to further assess the Walleye population.

Biological Data
A total of 1,740 fish were captured in trap nets. Bluegill, White Perch, and Black Crappie were the most common fish species present respectively (Table 9). A total of 16 species of fish were collected during the 2015 trap net survey at Monksville Reservoir. One of the target species, Walleye, was found to be fairly abundant (41 total) with a CPUE of 2.6 fish/net. Pennsylvania Fish and Boat Commission developed trap net standards for medium sized reservoirs (50-500 acres) which are 4.8 Walleye/net during the early spring and 1.8 Walleye/net post spawn. The timing of the trap netting in Monksville Reservoir coincided with the tail end of the Walleye spawning period and thus the catch rate was reduced. The Walleye captured were composed of most larger individuals indicated by a PSD of 85, RSD_p of 75, and RSD_m of 50, but there were a good number of individuals representing a variety of age classes (Table 9, Figure 10). The relative weight (W_r) index indicated Walleye were in below average condition (average W_r of 90 $\pm$ 3), but this condition is expected for fish that just completed the spawning process (Table 10). The Walleye population in this reservoir appears to be in good condition, well balanced, and stable.

The other target species, Muskellunge, was found to be fairly abundant (4 total) with a CPUE of 0.3 fish/net. Pennsylvania Fish and Boat Commission developed trap net standards for capturing Muskellunge via trap nets in which a quality Muskellunge fishery will encounter 0.25 Muskellunge/trap net (1 Muskellunge for every 4 nets set). Applying this standard to our catch rate, Monksville Reservoir has a good Muskellunge fishery. The sizes of Muskellunge captured were composed of larger individuals indicated by a PSD of 75, RSD_p of 75, and RSD_m of 50 (Table 9). The relative weight (W_r) index indicates the Muskellunge were in slightly below average condition (mean W_r of 94 $\pm$ 7) as well (Table 10). Furthermore, in 2014 and 2015 as Bureau of Freshwater Fisheries crews set and tended trap nets, multiple anglers commented on the great Muskellunge fishery here and this anecdotal evidence corroborates the empirical data collected these two years.

Nighttime electrofishing on October 6 for Walleye was unsuccessful. No Walleye were captured during this survey, which lasted 1.76 hrs. Historically, sampling at Monksville Reservoir has shown that timing of sampling can play a large role in the success of catching the target species, with more success for Walleye later in October. Catching no Walleye during this sampling event was not a concern as the trap net results produced evidence of a good Walleye fishery and the timing of our electrofishing effort may have been early. Electrofishing did show an abundant population of Largemouth Bass (CPUE of 28 fish/hr) that is well balanced as indicated by a PSD of 47, RSD_p of 12, with many size ranges represented. Chain Pickerel were even more abundant (CPUE of 44 fish/hr) and well balanced as indicated by a PSD of 40 and RSD_p of 4. The abundance of Largemouth Bass and Chain Pickerel is good news in terms of the added benefit in angling opportunities at this reservoir.

Management Recommendations
1. Recommendations for Walleye and Muskellunge will be made at the time of project completion.

Table 9. Catch per unit effort (CPUE) and stock density indices for spring trap netting on Monksville Reservoir in 2015.

Species	Total Number Caught	% of Captured	Nets Set	CPUE (Fish / Net)	PSD	95% CI (+/-)	RSD_p	RSD_m
Largemouth Bass	2	0.1	15	0.1	-	-	-	-
Chain Pickerel	23	1.3	15	1.5	-	-	-	-
Bluegill	881	50.6	15	58.7	-	-	-	-
Pumpkinseed	58	3.3	15	3.9	-	-	-	-
Yellow Perch	11	0.6	15	0.7	-	-	-	-
Black Crappie	107	6.1	15	7.1	-	-	-	-
White Perch	571	32.8	15	38.1	-	-	-	-
Yellow Bullhead	1	0.1	15	0.1	-	-	-	-
Brown Bullhead	1	0.1	15	0.1	-	-	-	-
Smallmouth Bass	6	0.3	15	0.4	-	-	-	-
Rock Bass	6	0.3	15	0.4	-	-	-	-
Walleye	41	2.4	16	2.6	85	14	75	50
Muskellunge	4	0.2	16	0.3	75	77	75	50
Channel Catfish	1	0.1	15	0.1	-	-	-	-
Golden Shiner	6	0.3	15	0.4	-	-	-	-
Alewife	21	1.2	15	1.4	-	-	-	-
Total	**1740**	100.0						

Coolwater Assessment 2015

Table 10. Condition of fish species captured on Monksville Reservoir in 2015 indicated by Relative Weight (W_r) index. Relative Weight quantifies fish condition based on how much a fish weighs for its length. A W_r of 95-105 is a typical objective for most species. Values well below 100 for a size group may be indicative of a problem in food and feeding relationships, and values well above 100 for a size group may be indicative of fish not making the best use of available prey.

Species	Range (mm)	Number	Avg W_r	95% CI (+/-)	SE	Range (mm) Min	Max
Walleye	ALL $\geq$ 250	40	90	3	1.609821	74	136
	250-379	6	95	-	-	-	-
	380-509	4	88	-	-	-	-
	510-629	10	92	-	-	-	-
	$\geq$ 630	20	88	-	-	-	-
Muskellunge	ALL $\geq$ 510	4	94	7	3.75	86	102
	510-759	1	86	-	-	-	-
	760-969	0	-	-	-	-	-
	970-1069	1	102	-	-	-	-
	$\geq$ 1070	0	95	-	-	-	-
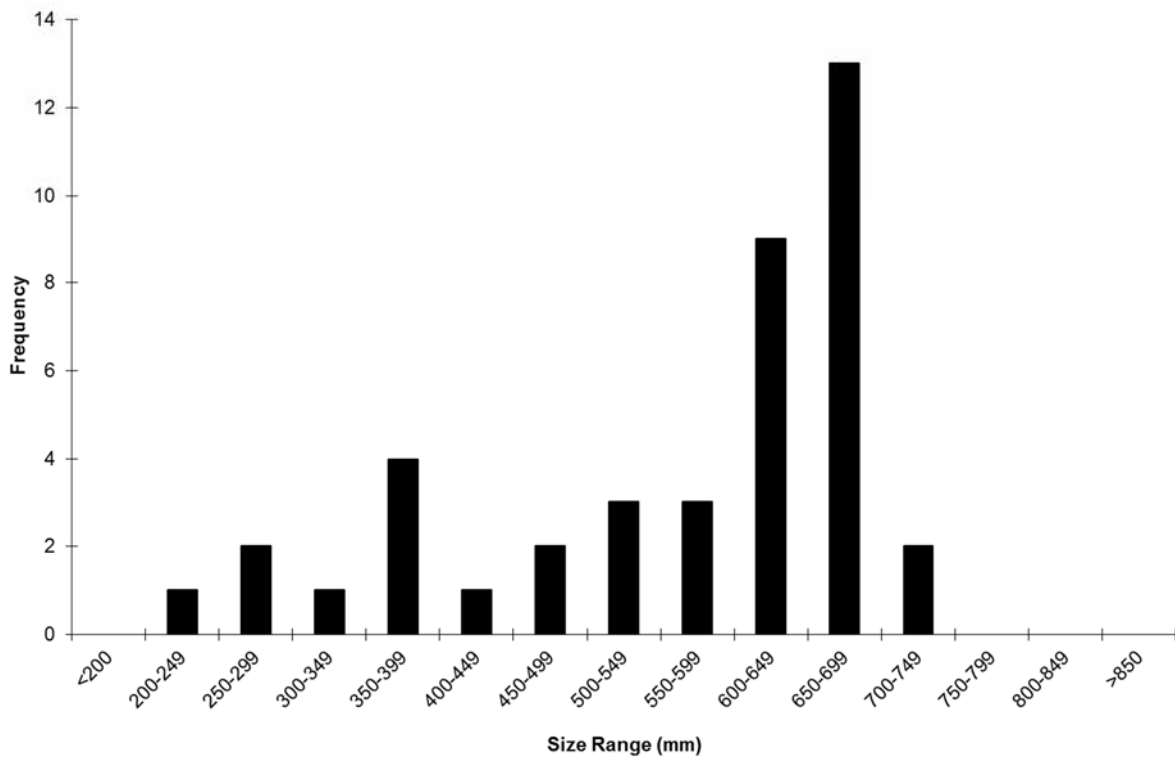
Figure 10. Length- frequency histogram of Walleye from spring trap netting Monksville Reservoir (2015).

Coolwater Assessment 2015
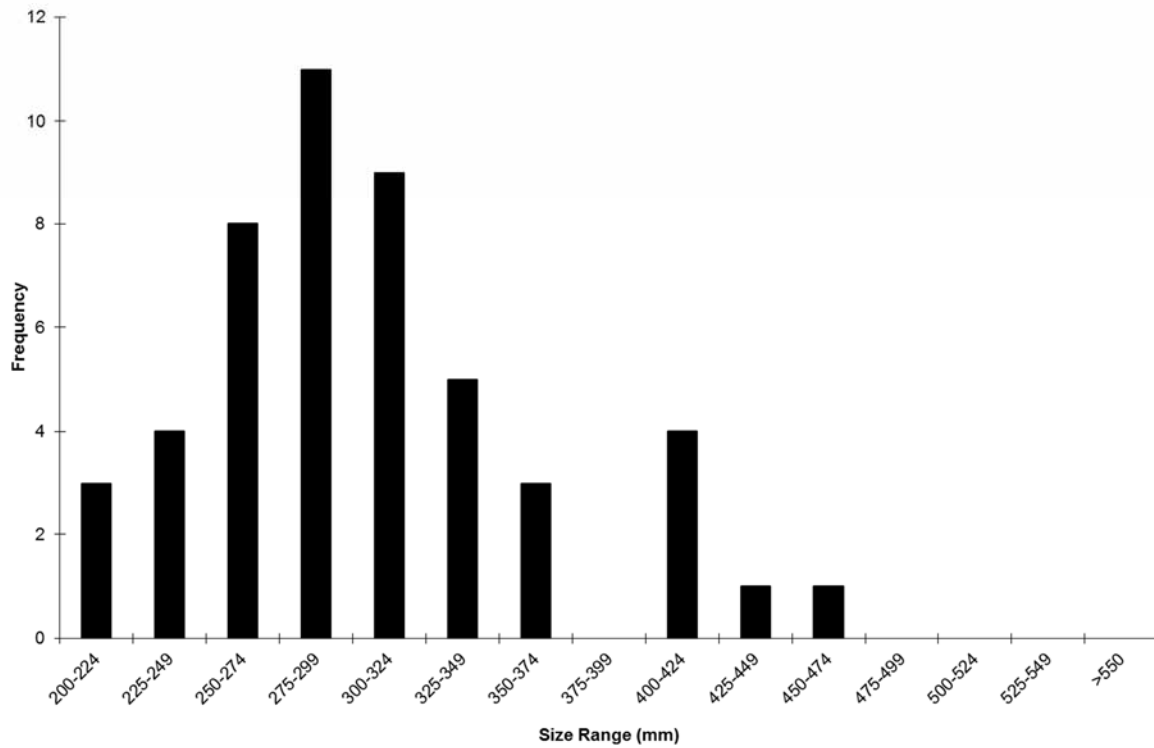
Figure 11. Length- frequency histogram of Largemouth Bass from fall nighttime electrofishing Monksville Reservoir (2015).

Coolwater Assessment 2015

SPRUCE RUN RESERVOIR

Location: Hunterdon County, Clinton Twp.   Acres: 1,290
Drainage: Raritan River, South Branch   Avg Depth: 26 ft.
Target Species: Northern Pike   Max Depth: 73 ft.

Methods
A total of sixteen South Dakota trap nets were set on Spruce Run Reservoir April 6 – 10 to capture Northern Pike. Four trap nets were set daily in water depths ranging from 3.5 to 6 ft. and allowed to fish for 24 hours. Sample sites were selected based on historical sites and diversity of habitat. Northern Pike were measured for total length and weight, and scales were collected for growth analysis and age. Other fish species were measured for total length and weight, and/or counted for presence.

Biological Data
A total of 1,197 fish were captured in trap nets (Table 1). Yellow Perch, Bluegill, Alewife, and Black Crappie were the four most abundant species sampled in the trap nets (Table 1). A total of 14 species of fish were collected during the 2015 trap net survey at Spruce Run Reservoir. Catch of Northern Pike was good (CPUE of 5.1 fish/net), with a total of 82 Northern Pike captured, ranging in size from 390 – 926 mm (15.4 – 36.5 in) long and 0.37 – 6.58 kg (0.82 – 14.5 lb). Of the Northern Pike captured, the majority were larger individuals (indicated by a PSD of 96 and RSD_p of 26), with 59 fish exceeding the keeper size of 24 in and 27 fish exceeding a quality size of 30 inches (Table 1). The condition of Northern Pike was measured using the relative weight metric (W_r). The overall mean W_r for Northern Pike collected was 93 ± 3 and ranged from 67 – 122 which indicates slightly below average conditions (Table 2). The reason for below average condition is indicative of sampling the population in the middle of spawn. The Northern Pike population here appears abundant, healthy, and well balanced (Figure 1).

Trap netting is typically not a successful sampling technique for Largemouth Bass populations (Largemouth Bass have "net fear"). The CPUE for bass was 0.3 fish/net, and when compared to past sampling yields of 1-2 bass/net on other waterbodies in New Jersey, the Largemouth Bass population in this reservoir appears to be below average (Table 1).

Trap netting revealed a good population of Black Crappie (CPUE of 7.2 fish/net). Many large individuals composed the sample (PSD 95, RSD_p 92, and RSD_m 65) with 62 of the 104 measured individuals exceeding 12 inches in length! Despite the gear bias to capture larger Black Crappie, the abundance and sizes are considered large relative to other lakes sampled with Black Crappie populations in New Jersey. Not many smaller Black Crappie were captured as shown by the length-frequency graph (Figure 2), but this is not a concern as smaller individuals are not typically captured in trap nets.

The Yellow Perch and Bluegill populations here are abundant with a CPUE of 29 fish/net and 21.4 fish/net respectively (Table 1). However, PSD was low for both species and indicates populations stunted and out of balance (Table 1). The length-frequency graph for Yellow Perch shows most individuals are between 125-149 mm (5 – 5.9 in) in length (Figure 3). To gain more insight into what management strategies need to be taken to balance the Yellow Perch and

Coolwater Assessment 2015

Bluegill populations it is recommended their populations be investigated further by boat electrofishing.

Proportional Stock Density (PSD) of all species captured was on the higher end of their accepted ranges (Table 1) and part of this may be due to trap net bias. For instance, Laarman and Ryckman (1982) showed that trap nets were selective for larger sizes of Rock Bass, Walleye, Black Crappie, Bluegill, Yellow Perch, and Pumpkinseed. Being aware of these biases and interpreting them based upon the knowledge of these biases is appropriate. All gear used in collection of fisheries data can have their own bias. Even the method of collection can create a bias to alter what we perceive is the current condition of a fishery, verses what's actually present.

Spruce Run Reservoir also has a Hybrid Striped Bass fishery. To collect information and determine the status of this fishery, five 120 ft. experimental gill nets were set October 14 - 15. A total of 47 Hybrid Striped Bass were captured representing all size ranges (Figure 4), but most were larger individuals as indicated by the PSD 93, RSD_p 64, and RSD_m 18. The Hybrid Striped Bass fishery in this reservoir appears to be healthy and stable.

Management Recommendations
1. Management recommendation for Northern Pike and Hybrid Striped Bass will be made at project completion.
2. Assess status of Largemouth Bass population via a boat electrofishing unit.

Table 1. Catch per unit effort (CPUE) and stock density indices for Spring Trap Netting on Spruce Run Reservoir in 2015.

Species	Total Number Caught	% of Captured	Nets Set	CPUE (Fish/ Net)	PSD	95% CI (+/-)	RSD_p	RSD_m
Largemouth Bass	5	0.4	16	0.3	100	21	80	0
Bluegill	342	28.6	16	21.4	8	6	0	0
Yellow Perch	464	38.8	16	29.0	0	1	0	0
Black Crappie	115	9.6	16	7.2	95	5	92	65
White Perch	26	2.2	16	1.6	88	17	27	8
Northern Pike	82	6.9	16	5.1	96	6	26	2
Yellow Bullhead	3	0.3	16	0.2	-	-	-	-
White Catfish	6	0.5	16	0.4	-	-	-	-
Golden Shiner	3	0.3	16	0.2	-	-	-	-
Alewife	127	10.6	16	7.9	-	-	-	-
Spottail Shiner	7	0.6	16	0.4	-	-	-	-
White Sucker	1	0.1	16	0.1	-	-	-	-
Common Carp	3	0.3	16	0.2	-	-	-	-
American Eel	13	1.1	16	0.8	-	-	-	-
Total	**1197**	100						

Coolwater Assessment 2015

Table 2. Condition of fish species captured on Spruce Run Reservoir in 2015 indicated by Relative Weight (W_r) index. Relative Weight quantifies fish condition based on how much a fish weighs for its length. A W_r of 95-105 is a typical objective for most species. Values well below 100 for a size group may be indicative of a problem in food and feeding relationships, and values well above 100 for a size group may be indicative of fish not making the best use of available prey.

| Species	Range (mm)	Number	Avg W_r	95% CI (+/-)	SE	Range (mm)	
						Min	Max
Largemouth Bass	ALL ≥ 200	5	100	7	3.72827	91	111
	200-299	0	-	-	-	-	-
	300-379	1	94	-	-	-	-
	380-509	4	102	-	-	-	-
	≥ 510	0	-	-	-	-	-
Bluegill Sunfish	ALL ≥ 80	110	99	5	2.58084	57	200
	80-149	101	101	-	-	-	-
	150-199	9	79	-	-	-	-
	200-249	0	-	-	-	-	-
	≥ 250	0	-	-	-	-	-
Yellow Perch	ALL ≥ 130	90	76	4	1.898829	38	164
	130-199	90	76	-	-	-	-
	200-249	0	-	-	-	-	-
	250-299	0	-	-	-	-	-
	≥ 300	0	-	-	-	-	-
Black Crappie	ALL ≥ 130	103	98	2	0.820568	73	128
	130-199	5	105	-	-	-	-
	200-249	3	99	-	-	-	-
	250-299	28	98	-	-	-	-
	≥ 300	67	97	-	-	-	-
White Perch	ALL ≥ 130	26	88	5	2.609643	61	119
	130-199	3	66	-	-	-	-
	200-249	16	93	-	-	-	-
	250-299	5	83	-	-	-	-
	≥ 300	2	98	-	-	-	-
Northern Pike	ALL ≥ 350	81	93	3	1.311911	67	122
	350-529	3	93	-	-	-	-
	530-709	57	91	-	-	-	-
	710-859	19	97	-	-	-	-
	≥ 860	2	117	-	-	-	-

Coolwater Assessment 2015
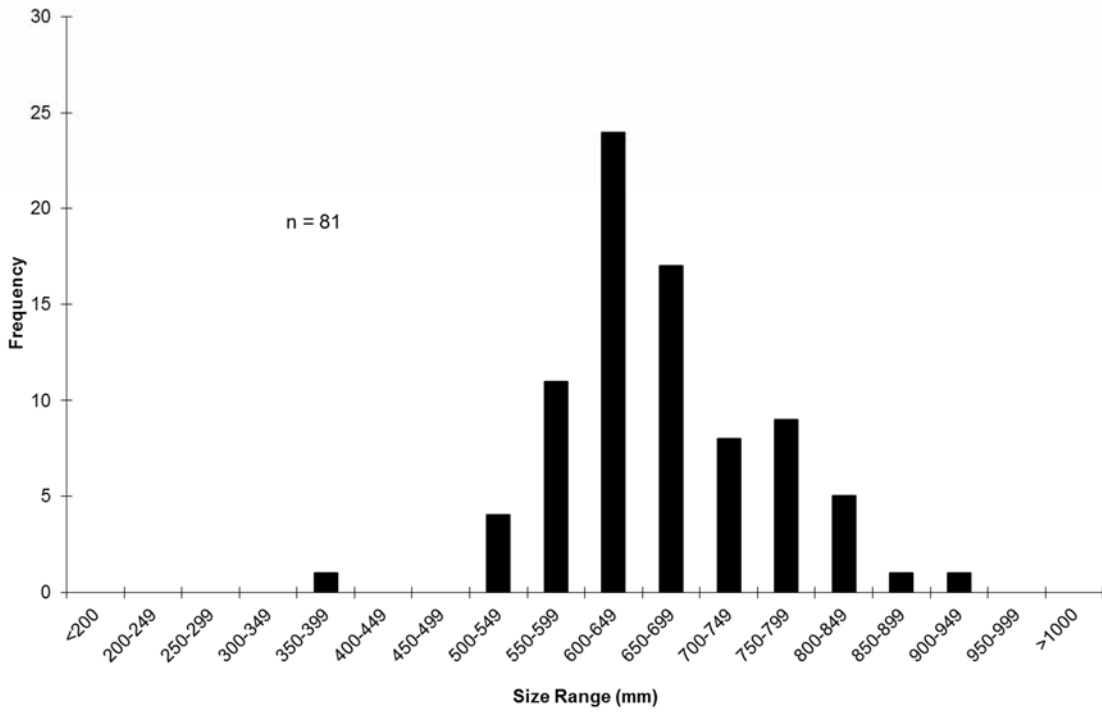
Figure 1. Length-frequency histogram of Northern Pike from spring trap netting Spruce Run Reservoir (2015).
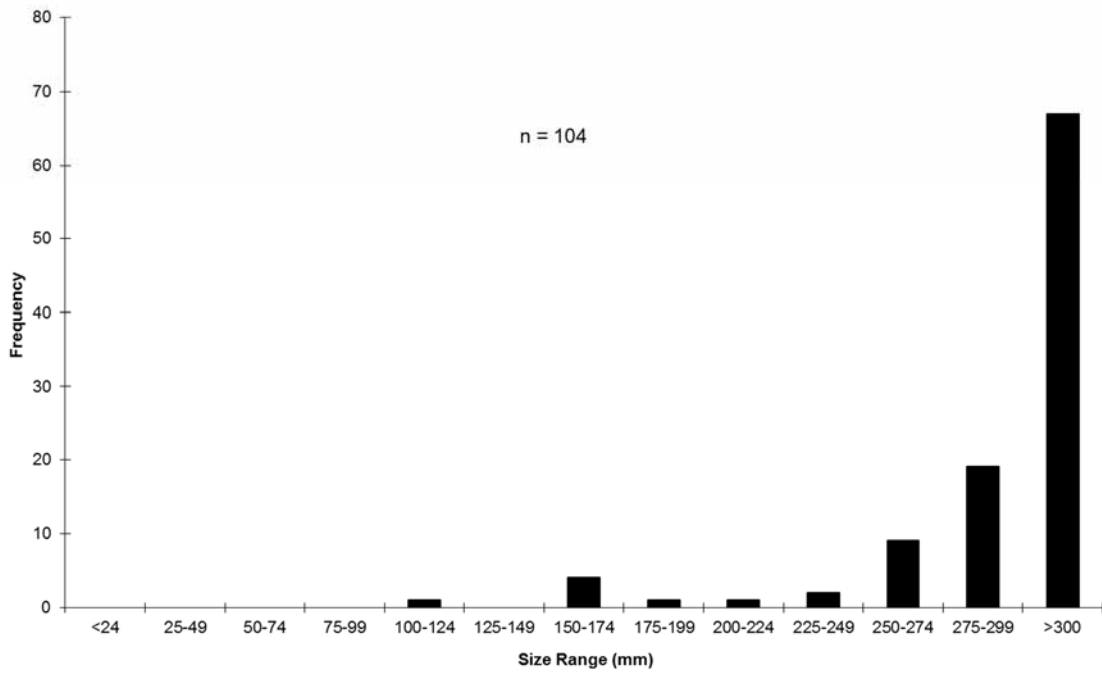
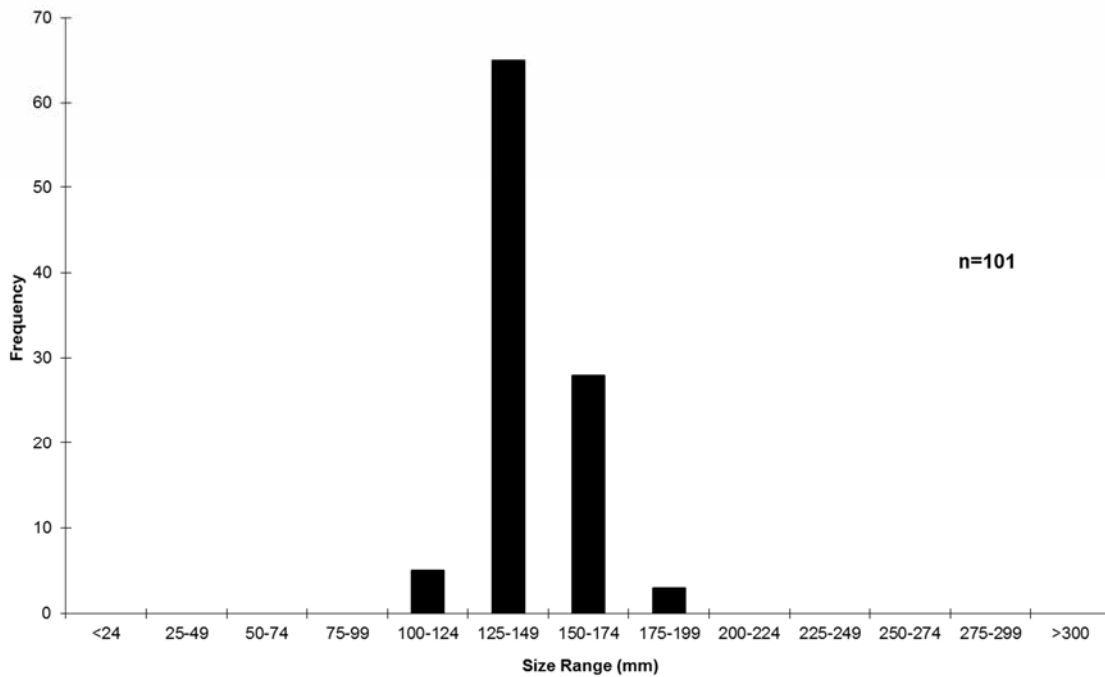**Figure 2.** Length-frequency histogram of Black Crappie from spring trap netting Spruce Run Reservoir (2015).
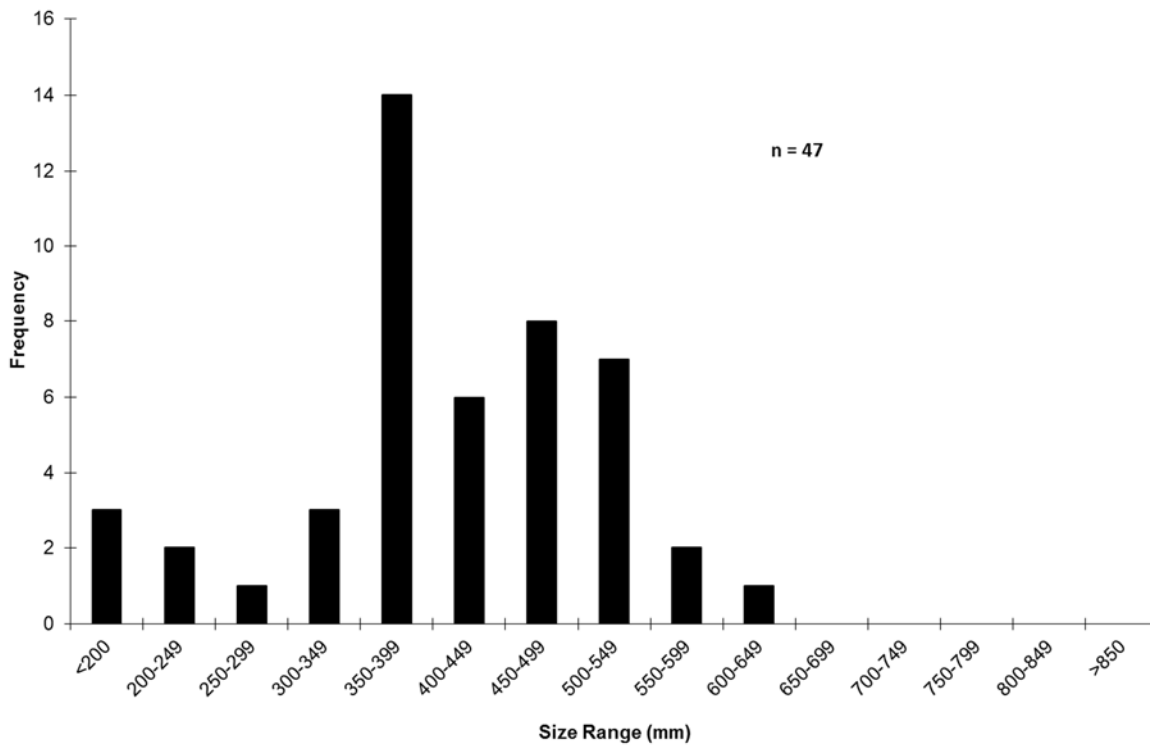
Coolwater Assessment 2015

Figure 3. Length-frequency histogram of Yellow Perch from spring trap netting Spruce Run Reservoir (2015).

Figure 4. Length-frequency histogram of Hybrid Striped Bass from fall gill netting Spruce Run Reservoir (2015).

24

Coolwater Assessment 2015

SWARTSWOOD LAKE

Location: Sussex County, Stillwater Twp.   Acres: 519
Drainage: Paulins Kill   Avg Depth: 25 ft.
Target Species: Walleye   Max Depth: 54 ft.

Methods
To assess the Walleye fishery at Swartswood Lake nighttime electrofishing was conducted on three nights in 2015, May 21, June 2, and October 20. At least one hour and a half of electrofishing was conducted each night. Largemouth Bass, Smallmouth Bass and Walleye, were measured for total length and weight, and scales collected for growth analysis and age.

Biological Data
During the spring (May 21 and June 2) a total of 53 Walleye, 36 Smallmouth Bass, and 16 Largemouth Bass were captured during nighttime electrofishing. A total of 3 hours of electrofishing was conducted between these two nights and Walleye were found to be most abundant (CPUE of 15 fish/hr, Table 11). Compared to Pennsylvania Fish and Boat Commission's standard for early spring night electrofishing catch rate of 18 legal Walleye/hr, our catch rate was good considering it was late spring after the spawning period when Walleye congregate. The Walleye population was represented by mostly larger individuals indicated by a PSD of 85 and RSD_p of 43. The relative weight (W_r) index indicated Walleye were in good condition (average W_r of 100 ± 3, Table 13). Smallmouth Bass were also found to be abundant and dominated by larger individuals, with a CPUE of 10, PSD of 66, and RSD_m of 31. Six Smallmouth Bass exceeded 18 in in length and the largest was 495 mm (19.4 in) and 1.6 kg (3.5 lb).

In the fall a total of 11 Walleye, 17 Smallmouth Bass, and 28 Largemouth Bass were captured during 1.8 hours of nighttime electrofishing on October 20. As opposed to the spring when Walleye were the most abundant catch, followed by Smallmouth Bass, in the fall Largemouth Bass were found to be most abundant (CPUE of 10 fish/hr, Table 13).

In addition to electrofishing efforts in the spring and fall by the Bureau of Freshwater Fisheries, Hackettstown Hatchery sets trap nets annually on Swartswood Lake to collect Walleye broodstock and regularly captures Walleyes numbering in the hundreds. With spring night electrofishing success and the Hatchery's continued annual success in trap netting broodstock in the spring, the Walleye fishery appears to be doing well.

Management Recommendations
   1. Recommendations for Walleye will be made at the time of project completion.

Coolwater Assessment 2015

Table 11. Catch per unit effort (CPUE) and stock density indices for spring nighttime electrofishing on Swartswood Lake in 2015.

Species	Total Number Caught	Number > Stock Size Caught	% of Captured	Hours sampling	CPUE (stock size)	PSD	95% CI (+/-)	RSD$_p$	RSD$_m$
Largemouth Bass	16	16	15.2	3	5	69	31	31	0
Smallmouth Bass	36	29	34.3	3	10	66	22	55	0
Walleye	53	46	50.5	3	15	85	13	43	2
Total	**105**								

Table 12. Condition of fish species captured on Swartswood Lake in the spring of 2015 indicated by Relative Weight (W_r) index. Relative Weight quantifies fish condition based on how much a fish weighs for its length. A W_r of 95-105 is a typical objective for most species. Values well below 100 for a size group may be indicative of a problem in food and feeding relationships, and values well above 100 for a size group may be indicative of fish not making the best use of available prey.

Species	Range (mm)	Number	Avg W$_r$	95% CI (+/-)	SE	Range (mm)	
						Min	Max
Largemouth Bass	ALL $\geq$ 200	16	99	5	2.367257	85	115
	200-299	5	100	-	-	-	-
	300-379	6	99	-	-	-	-
	380-509	5	98	-	-	-	-
	$\geq$ 510	0	#DIV/0!	-	-	-	-
Smallmouth Bass	ALL > 180	29	83	4	1.855361	66	108
	180-279	10	89	-	-	-	-
	280-349	3	84	-	-	-	-
	350-429	7	83	-	-	-	-
	$\geq$ 430	9	76	-	-	-	-
Walleye	ALL $\geq$ 250	46	100	3	1.469232	61	120
	250-379	7	105	-	-	-	-
	380-509	19	102	-	-	-	-
	510-629	19	96	-	-	-	-
	$\geq$ 630	1	92	-	-	-	-

Table 13. Catch per unit effort (CPUE) and stock density indices for fall nighttime electrofishing on Swartswood Lake in 2015.

Species	Total Number Caught	Number > Stock Size Caught	% of Captured	Hours sampling	CPUE (stock size)	PSD	95% CI (+/-)	RSD$_p$	RSD$_m$
Largemouth Bass	28	18	50.0	1.8	10	78	27	56	0
Smallmouth Bass	17	16	30.4	1.8	9	38	32	6	0
Walleye	11	8	19.6	1.8	4	100	13	50	0
Total	**56**								

Coolwater Assessment 2015

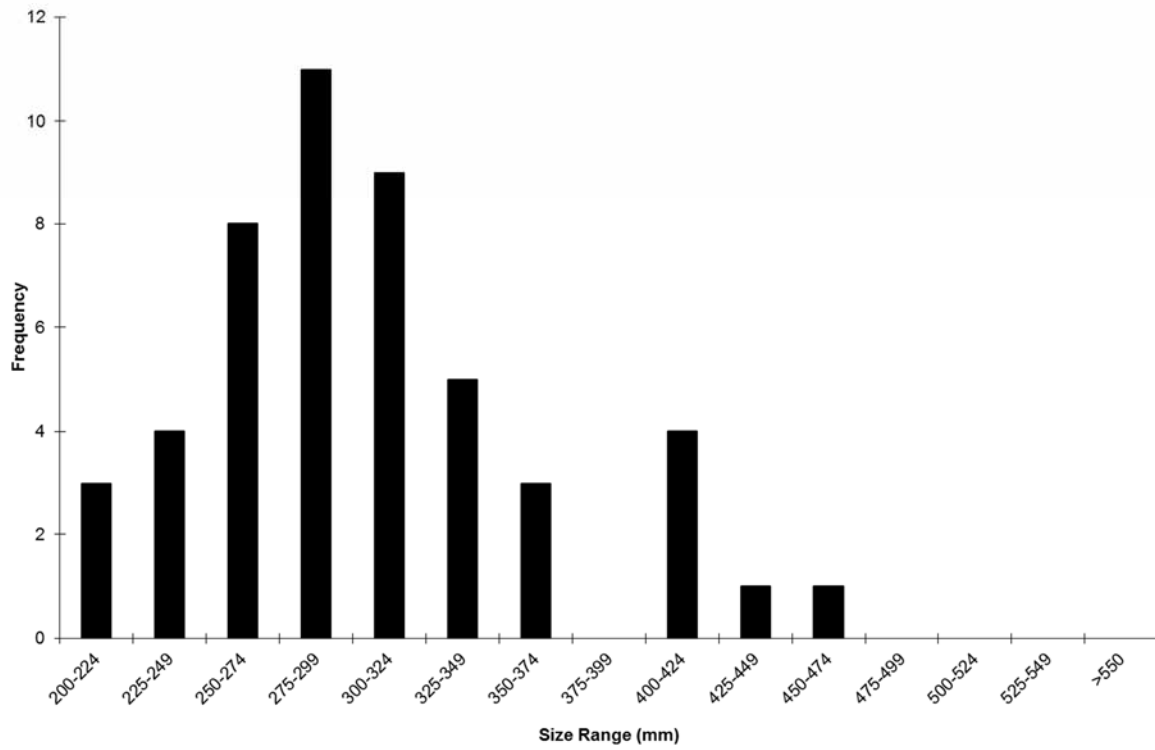**Figure 12.** Length- frequency histogram of Walleye from spring nighttime electrofishing Swartswood Lake (2015).

Coolwater Assessment 2015

References

Laarman, P. W., and J. R. Ryckman. 1982. Relative size selectivity of trap nets for eight species of fish. North American Journal of Fisheries Management 2: 33-37.

McInerny, M. C. and T. K. Cross. 2006. Trap-net catchability of Black Crappies. North American Journal of Fisheries Management 26(3): 652-654.

Smith, M. 2002. White Perch Management Plan. Maine.