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Bald Mountain Pond Landlocked Arctic Charr Radio Telemetry Study

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JOB NO. F-029
BALD MOUNTAIN POND LANDLOCKED ARCTIC CHARR RADIO TELEMETRY PROJECT
INTERIM SUMMARY REPORT NO. 1 (2014-2015)

SUMMARY

Bald Mountain Pond, located in Bald Mountain Township (Somerset County), is a headwater pond to the West Branch of the Piscataquis River. It contains a wild fishery for quality-sized brook trout and is one of Maine's 12 endemic landlocked Arctic charr populations. In May of 2014, the department received a report of rainbow smelts in Bald Mountain Pond. In July of 2014 an investigation of this potential illegal introduction quickly determined the report to be factual. In other situations like this statewide, charr populations have suffered greatly when smelt were introduced. It is feared that a similar scenario could occur at Bald Mountain Pond. For this reason, studies are being conducted to learn about the charr and smelt populations and their interactions in this water. Ideally, charr spawning sites will be identified and the question of whether or not this unique strain of charr could be relocated to a suitable donor water will be explored.

Various methods were utilized in the summer of 2014 to obtain charr for a telemetry study. The goal was to gain information related to the spawning behavior and locations in Bald Mountain Pond. While 23 charr were captured, only 4 fish were successfully released with radio tags. These charr were regularly followed throughout the fall and lead investigators to potential spawning locations near the east side and south end of the pond. The department's SCUBA team was used to evaluate these sites in early November, but no evidence of spawning was observed.

In the spring of 2015, evaluations of the rainbow smelt spawning run were conducted. Smelts were found to spawn in three of the five brooks assessed. One brook in particular, on the pond's east side, clearly showed more activity than the other two with a substantial deposition of smelt eggs over a 50 yard stretch of the brook. An attempt was made to destroy these eggs by electroshock treatments.

Again in 2015, efforts were made to collect charr for a radio telemetry project, as the 2014 goals were not reached. Methods used consisted mostly of late summer gillnetting and fall trapnetting. Gillnetting proved challenging due to water quality conditions, as there was insufficient dissolved oxygen below the thermocline resulting in no depth zone fully suitable for charr to inhabit. Seventeen charr were captured and only three successfully released with radio tags. Of the three successfully released all were caught in trapnets in mid-October. These charr were regularly followed throughout the fall and lead to potential spawning locations primarily along the shoreline of the southeastern cove of the pond. These sites will be evaluated for suitable spawning substrate in the future with SCUBA divers.

KEY WORDS: CHR, SLT, BKT, LAKE, OXYGEN, TEMPERATURE, RADIO TELEMETRY, TAGGING, MOVEMENT, SPAWNING, AGE & GROWTH, ELECTROFISHING, GILLNET, TRAPNET, SCUBA

INTRODUCTION

Bald Mountain Pond is a headwater pond to the West Branch of the Piscataquis River (Figure 1) and supports an important sport fishery for brook trout (*Salvelinus fontinalis*). Brook trout are a native fish to the drainage. A stocking program for this species was initiated in 1989 and discontinued in 2007. The pond has been managed with moderately restrictive fishing regulations (2-trout daily bag limit; minimum length 10 inches; only 1 may exceed 12 inches) since 1996. Other regulations include closed to ice fishing, artificial lures only, and the use of live fish as bait is prohibited in the tributaries.

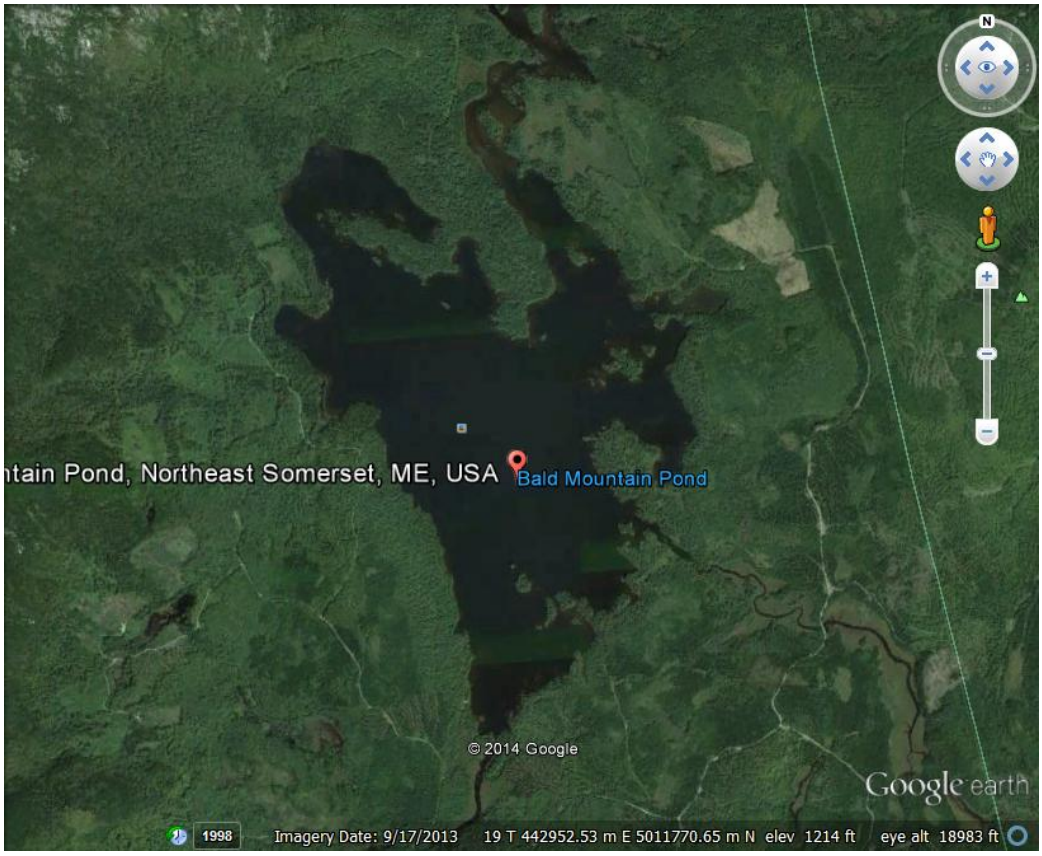


Figure 1. Aerial view of Bald Mountain Pond, Somerset County.

The pond's brook trout fishery has been monitored by periodic gill net surveys in 1965, 1971, 1986, 1989, 1997, and 2008. These surveys have consistently found the trout population to be in balance and healthy with individuals documented up to 5¼ pounds. This quality fishery is not well known, but is popular with local anglers.

A population of landlocked Arctic charr (*Salvelinus alpinus oquassa*) was confirmed in 1973. This population has since been monitored through trawling and gill net surveys in 1986, 1994, and 2008. Historically, there has been a healthy and robust population of charr ranging in length from 6 to 8 inches.

Other species of fish present in Bald Mountain Pond are redbreast sunfish (*Lepomis auritus*), white sucker (*Catestamers commersoni*), lake chub (*Couesius plumbeus*), golden shiner

(*Notemigonus crysoleucas*), common shiner (*Luxilus cornutus*), fallfish (*Semotilus corporalis*), creek chub (*Semotilus atromaculatus*), banded killifish (*Fundulus diaphenus*), and American eel (*Anguilla rostrata*).

In the spring of 2014, a report of an illegal rainbow smelt (*Osmerus mordax*) introduction was received by the department. A follow up investigation in July confirmed their presence with multiple age classes of smelts documented.

Radio telemetry studies of charr were initiated in 2014 and 2015. Fish were captured using short-duration gillnet sets in the summer and trapnet sets in the fall. Tagged fish lead investigators to potential spawning locations along the south and east shorelines. In 2014, SCUBA divers were deployed to identify spawning substrate and look for spawning activity.

STUDY AREA

Bald Mountain Pond has a surface area of 1,152 acres and mean and maximum depths of 18 feet and 65 feet, respectively. Summer water temperatures, dissolved oxygen concentrations, and the lake's physical habitat are ideal for coldwater fish species. The pond's shoreline is comprised of mostly ledge and boulders with many tributaries entering from all sides. The outlet, Bald Mountain Stream, flows east into the West Branch of the Piscataquis River.

Boat access to Bald Mountain Pond is available at an unimproved access site located on the southwest end of the pond. This is reached via a series of gravel logging roads north of Route 16 between the towns of Abbott and Bingham. The pond has three camps and a primitive camp site area.

METHODS

A variety of methods were used in attempt to capture charr for radio tagging and to further understand other complex issues at Bald Mountain Pond.

Confirmation of smelt introduction:

On July 8, 2014 an investigation of the illegal introduction of rainbow smelts into Bald Mountain Pond was undertaken. Four small mesh gillnets were set for a total of 2.5 hours in depths of 23 to 42 feet of water and collected 9 smelts. Brook trout were also targeted to examine their stomach contents for the presence of smelts. A number of smelts representing multiple age classes were found in these fish.

Smelt egg suppression by electroshocking:

On May 13, 2015 it was discovered that the smelt population at Bald Mountain Pond primarily utilized one brook for spawning, located on the pond's west side. Regional and administrative staff decided an effort to destroy these eggs was warranted.

A study to determine trout eggs susceptibility to backpack electrofishing units found intensity of voltage, duration of exposure to electricity, and egg stage development were positively correlated to mortality (Dwyer et al. 1993). In early stages of development, eggs are more susceptible to mortality from electricity using 550 to 700 volts over a span of 10 to 15 seconds. This method resulted in 100 percent mortality (Appendix A). Regional staff desired to employ these methods in hopes it would have the same results on smelt eggs.

On May, 19th an effort using backpack electrofishing was made targeting smelt eggs. For a total of 104 minutes, 700 volts of electricity coursed over an area estimated to be 1200 square feet in size. The smelt egg deposition was moderate to heavy with an estimated 50% eyed-up. The brook temperature was 52°F. To evaluate the effects of the shocking, this brook was checked three and eight days later, with water temperatures of 48°F and 56°F, respectively.

Water quality:

In 2014, complete temperature/dissolved oxygen profiles of Bald Mountain Pond were conducted 3 times. Before each sampling event, a quick determination of the thermocline was assessed, but not always documented. In 2015, it was decided to monitor the pond's water column more closely. During that summer, eight profiles were recorded between July 22nd and October 9th.

Large minnow traps:

Two large (~3½ ft long x ~1½ ft diameter) minnow trap style devices, specifically designed for charr sampling were one of several sampling techniques used to capture charr for radio tagging. These traps were deployed into deep water in late September of 2014 and were baited with canned tuna or shrimp and placed into depths ranging from 35 to 59 feet.

Gillnetting effort:

Efforts targeting charr for a radio telemetry project began on September 23, 2014. A total of 22 charr were caught in 51.1 gillnet hours (0.45 charr/gillnet hour). Several complications arose during the tagging/recovery procedure, such as issues associated with the rapid change in water temperature and the fish's inability to quickly adjust their swim bladders to remain stable. Therefore, only four fish were released equipped with radio tags. Of these four fish only two exhibited possible spawning behavior leading to meaningful data points for the study.

In 2015, with improved techniques on handling charr, a new plan was designed to accomplish the same goal as the previous year. Netting began on July 22nd; however, the water column profile was already notably different than in 2014 with very low dissolved oxygen at the depths where charr had been caught the previous year. Charr proved to be very difficult to collect with only 12 being captured in 41.1 gillnet hours (0.29 charr/gillnet hour). Three of these twelve charr were released with a radio tag. One other gillnetted charr was tagged and released on October 5th after a total of 18.6 gillnet hours (0.05 charr/gillnet hour) of effort.

Trapnetting effort:

In 2014 three trap nets were deployed in mid-September and early October, however only brook trout and non-target species were captured.

After failing to successfully release tagged charr with gillnets in 2015, a more significant attempt was made using trapnets. Beginning on October 14th, five trapnets were placed at various locations around Bald Mountain Pond and were fished for approximately 1066 total hours. In that time, 3 charr were captured, one on the 15th and two on the 21st. All three were successfully released with radio tags. Other fish caught included brook trout, rainbow smelt, redbreast sunfish, white sucker, fallfish, golden shiner, lake chub, and creek chub.

Radio Tagging and Tracking:

In both 2014 and 2015 Advanced Telemetry System (ATS) body implant transmitters with trailing whip antennas were used, refer to Appendix B for transmitter details. Tags were chosen based on weight, so not to exceed 3% of the fish's body weight, minimizing stress and decreasing the potential for mortality.

Charr captured alive were placed in a large cooler full of iced water to create a similar temperature as the water from which the fishes were taken. An aerator was used to maintain a suitable level of dissolved oxygen, which was monitored, and the charr were assessed for surgery potential. Fish were anaesthetized using a mixture of 0.05 ounces Aqui-S in approximately 3 gallons of water for 3 to 5 minutes until an appropriate level of sedation was attained for surgery. The transmitter was placed into the body cavity through a 0.5 inch incision between the pectoral and pelvic girdle and the trailing antenna was fed along the body wall through a 14 gauge needle. Absorbable 4-0 monofilament sutures were applied to close the incision. Ethanol was used to sterilize all instruments and transmitters in the field prior to all surgeries. After completion of surgery a length and weight were recorded and a scale sample was collected for aging. Charr recovered in a tank of cool, well-oxygenated water until exhibiting clear signs of recovery and then released.

Tagged charr were tracked with an ATS R2000 receiver and 3-element Yagi antenna. On most tracking efforts, a boat was utilized, but a fixed wing aircraft was required for three late season efforts due to ice cover. GPS coordinates were recorded for each charr's location on each tracking event. Time, depth, surface water temperature, and a general weather description were also recorded. Tagged charr were tracked several times over 24 hour periods, one to three times a week for a period of just over 6 weeks in both 2014 and 2015. Coordinates were mapped using Delorme's XMap7 mapping software.

SCUBA work:

Two shoals were targeted for IF&W's SCUBA team to examine based upon the current year's observations while tracking tagged charr. On November 4, 2014, two members of the team searched these areas for potential charr spawning substrate and activity.

SUMMARY OF FINDINGS

Smelt egg suppression and population status:

The nine rainbow smelt first documented in July of 2014 ranged in lengths from 5.0 to 7.6 inches. On this same date, smelt found in the contents of brook trout stomachs ranged from 2.4 to 5.4 inches in length. A total of 103 smelts were sampled with gillnets during 2014 and ranged in length from 3.0 to 8.3 inches. In 2015, 74 smelts were handled from gillnet and trapnet sets and ranged from 3.5 to 8.7 inches in length.

After electroshocking the brook on the west side of the pond on May 19, 2015, the appearance of the eggs had changed. It is unknown if they were dead or hatched, but visual observation indicated that there were more white-colored dead eggs than before the treatment. This technique will be used again in future years with greater emphasis on evaluating the success.

Smelt as a bycatch in charr gillnet sets decreased from 2014 to 2015 (103 and 37, respectively). Three age classes (ages 0+, I+, & II+) of smelts have been identified through scale

interpretation. It is clear they had been present in Bald Mountain Pond for some time and are well established.

Water quality:

In 2014, complete temperature/dissolved oxygen profiles of Bald Mountain Pond were conducted 3 times. Conditions stayed suitable for charr between 45 and 55 feet below the surface until early September, when the pond began to cool and the volume of suitable habitat increased.

In 2015, assessment of the pond's water quality profile was performed 8 times and results were very different than those from the previous year. Conditions deteriorated throughout the summer to a point where no suitable depths existed for charr (Table 1). This situation made collecting charr for radio tagging very difficult to impossible by mid-August. Only one charr was collected after August 7th during these conditions, while all 24 of the charr sampled in 2014 were taken during this time period.

Table 1. Water quality at Bald Mountain Pond in 2015.

Bald Mountain Pond - Summer Water Quality - 2015

Date:	22-Jul		7-Aug		19-Aug		31-Aug		18-Sep		23-Sep		5-Oct		9-Oct	
Depth (ft)	°F	DO	°F	DO	°F	DO	°F	DO	°F	DO	°F	DO	°F	DO	°F	DO
0	70	7.7	70	9.7	76	8.1	71	7.0	71	8.1	68	7.8	59	10.9	57	7.8
5	70	7.7	70	9.6	76	8.1	71	6.9	71	8.0	67	7.7	59	10.9	57	7.8
10	70	7.8	70	9.7	71	8.3	71	6.6	70	7.8	67	7.6	59	10.8	57	7.8
15	69	7.7	70	9.7	70	7.9	71	6.3	69	7.5	67	7.5	58	10.8	57	7.8
20	68	7.4	70	9.6	70	7.4	71	6.3	69	7.3	67	7.4	58	10.7	57	7.8
25	67	7.2	70	9.4	69	7.0	71	6.2	68	7.0	67	7.4	58	10.7	57	7.8
30	**64**	6.3	**66**	7.2	67	5.7	66	3.4	68	6.7	67	7.4	58	10.6	57	7.8
35	60	5.7	60	4.6	**62**	4.1	**62**	1.9	**65**	3.3	67	7.5	58	10.5	57	7.9
40	56	5.5	56	4.0	57	2.7	56	1.3	57	0.9	**60**	1.0	58	10.4	57	7.9
45	53	5.5	54	3.6	54	2.3	55	1.1	55	0.8	55	0.8	57	10.2	56	7.9
50	51	5.0	53	3.3	52	1.9	53	0.8	53	0.8	53	0.8	**56**	8.8	56	7.4
55	51	4.4	52	3.2	52	1.7	52	0.6	53	0.8	53	0.8	53	3.0	54	1.9
60	51	4.1	52	3.2	52	1.6	52	0.6	52	0.8	52	0.8	52	3.0	53	0.3
65			51	3.0	52	1.5	52	0.5	52	0.8	52	0.8	52	2.9	52	0.2
70			51	1.7			52	0.5								

> 68°F - too warm for CHR

Thermocline

< 4 ppm DO - too low for CHR

Brook trout:

While not the targeted species of this project, a number of brook trout were collected as bycatch from Bald Mountain Pond during the sampling. In 2014, 109 trout were collected. Thirty-four of these were measured and averaged 11.9 inches in length and 11.1 ounces in weight. These trout had a mean condition factor of 0.970.

In 2015, 169 brook trout were handled in efforts to capture charr. Lengths and weights were taken on 71 trout. These trout averaged 11.5 inches in length and 10.2 ounces in weight with a mean condition factor of 0.909. Of the 71 trout, there were a number of large individuals with lengths up to 19.2 inches. Fifty-one (39%) of the 132 trout were released alive from gillnet sets; all trout captured via trapnetting were released.

Landlocked Arctic charr:

Overnight gillnet sets were utilized in late July of 2008 to assess the status of Bald Mountain Pond's charr population. A 46 fish sample was obtained representing 4 age classes from age II+ through age V+. These fish averaged 6.6 inches in length and 1.3 ounces in weight with a mean condition factor of 0.866. These fish were considered robust and very healthy (Table 2).

Table 2. Bald Mountain Pond mean lengths (inches) and weights (ounces) of charr sampled by age and year.

		Age II+		Age III+		Age IV+		Age V+		Age VI+		Age VII+		Age VIII+	
Year	No. Fish	L	W	L	W	L	W	L	W	L	W	L	W	L	W
1997	10	-	-	6.8"	1.6	-	-	-	-	-	-	-	-	-	-
2008	46	4.8"	0.5	6.3"	1.2	7.1"	1.6	8.1"	2.2	-	-	-	-	-	-
2014	23	-	-	4.8"	0.4	5.9"	0.7	6.1"	0.7	7.1"	1.1	9.1"	2.6	10.0"	4.3
2015	18	-	-	5.2"	0.6	-	-	7.1"	1.5	8.2"	2.2	9.2"	3.4	10.4"	4.8

The two large minnow traps deployed in 2014 proved ineffective at capturing charr in Bald Mountain Pond. After a total of 714 hours in the water, only 33 white suckers, 1 redbreast sunfish, and 1 lake chub were collected.

Beginning on September 5, 2014 charr were targeted using multiple techniques in preparation for the radio telemetry project. In the following weeks, 24 charr were caught representing 6 age classes from age III+ through age VIII+. These fish averaged 7.2 inches in length and 1.4 ounces in weight. The charr appeared notably thin, which was confirmed by a mean condition factor of 0.556.

In 2015, a total of 18 charr were collected with a similar age class breakdown as the previous year. These fish averaged 8.2 inches in length and 2.5 ounces in weight. Many of the fish seemed more robust than those of the previous year and as a group exhibited a mean condition factor of 0.711.

Mean lengths, weights, and conditions of Bald Mountain Pond's charr population were plotted by age for year groups combining 1997 to 2008 and 2014 to 2015 (Tables 3, 4, & 5). All three factors show changes to each age class between periods. The declines in growth are likely a result of the smelt introduction.

Table 3. Comparison of length (in inches) of year groups of charr, Bald Mountain Pond, 1997 & 2008, and 2014 & 2015.

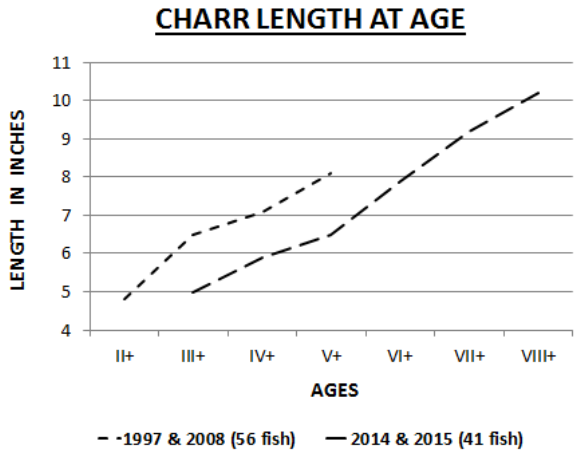


Table 4. Comparison of weight (in ounces) of year groups of charr, Bald Mountain Pond, 1997 & 2008 and 2014 & 2015.

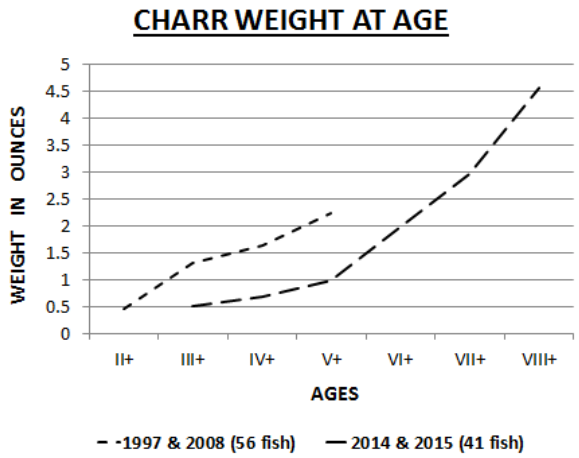
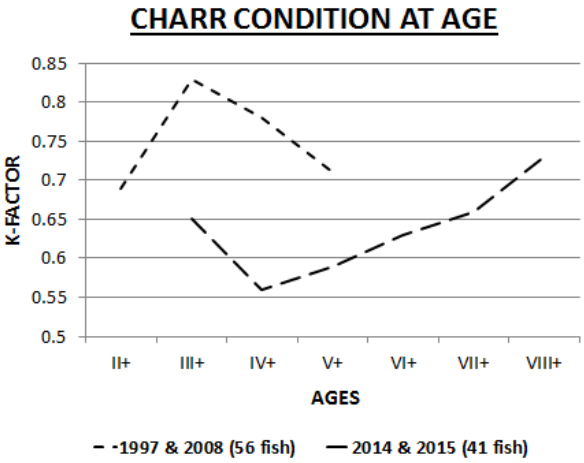


Table 5. Comparison of condition (K-factor) of year groups of charr, Bald Mountain Pond, 1997 & 2008 and 2014 & 2015.



The reason for the 1-year improvement in condition of the pond's charr is not known. There may be changes occurring in the populations of both the charr and smelts. Recruitment of young charr into the pond may be on a decline (Table 6). If numbers are dropping for either or both species, an improvement in the quality of charr growth and condition would be expected. This should be monitored in the future.

Table 6. Bald Mountain Pond number and percentage of charr sampled by age and year.

Year	Total No. of Fish	Age II+		Age III+		Age IV+		Age V+		Age VI+		Age VII+		Age VIII+	
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
1997	10	-	-	10	100	-	-	-	-	-	-	-	-	-	-
2008	46	5	11	20	43	17	37	4	9	-	-	-	-	-	-
2014	23	-	-	1	4	4	17	8	35	3	13	5	22	2	9
2015	18	-	-	1	6	-	-	5	28	6	33	4	22	2	11

Radio telemetry:

All charr tagged and released were given names. Refer to Table 7 for individual fish information.

Table 7. List of individual Bald Mountain Pond tagged charr caught and released, 2014 & 2015. Length in inches, weight in ounces.

Year	M/D	Freq.	Name	Length	Weight	K-factor	Age	Sex	Maturity
2014	9/24	8.841	Magnus	10.1	4.5	0.76	VIII+	Unk	Unk
2014	9/24	8.699	Rocky	5.6	0.6	0.64	IV+	Unk	Imm
2014	9/25	8.730	Misfit	6.4	0.8	0.54	V+	Unk	Unk
2014	9/30	8.762	Solomon	8.6	2.4	0.67	VII+	M	Mat
2015	7/24	9.791	Matador	7.2	1.6	0.71	VI+	Unk	Unk
2015	8/06	9.960	Mojo	10.8	5.4	0.73	VIII+	Unk	Unk
2015	8/07	9.931	Oakhurst	8.9	3.4	0.83	VII+	Unk	Unk
2015	10/5	9.991	Bernadette	8.5	2.2	0.62	VI+	F	Mat
2015	10/15	9.981	Wolowitz	6.5	1.1	0.68	V+	M	Mat
2015	10/21	9.950	Sheldon	7.6	1.7	0.67	V+	M	Mat
2015	10/21	9.882	Leonard	7.2	1.4	0.66	V+	M	Mat

In 2014, four charr were successfully tagged, released, and tracked. Two of the fish (Misfit & Rocky) were assumed to be immature and exhibited no spawning behavior at any point. The other two charr (Solomon & Magnus) exhibited potential spawning behavior leading to two separate shoals that were later investigated by SCUBA divers (Figures 2 & 3).

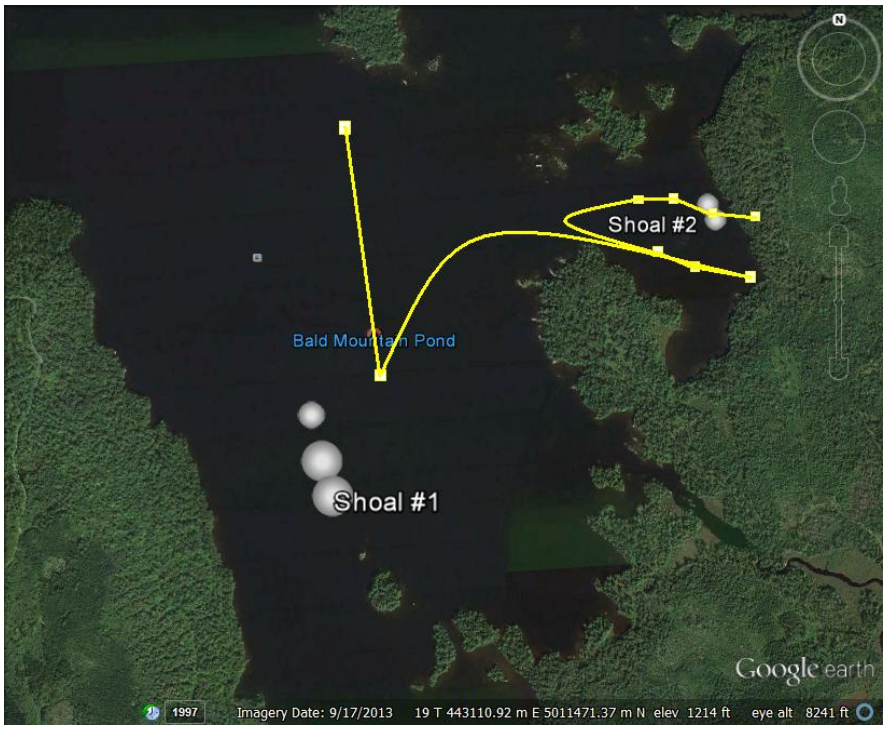


Figure 2. Tracking of Magnus 9/25-10/9, 2014. Magnus was released on 9/25/2014 at the northwestern point. He moved toward Shoal #1 before residing for 7 days in the northeast cove and near Shoal #2. His tag was located 50 feet into the woods under a large dead white pine tree on October 9th.

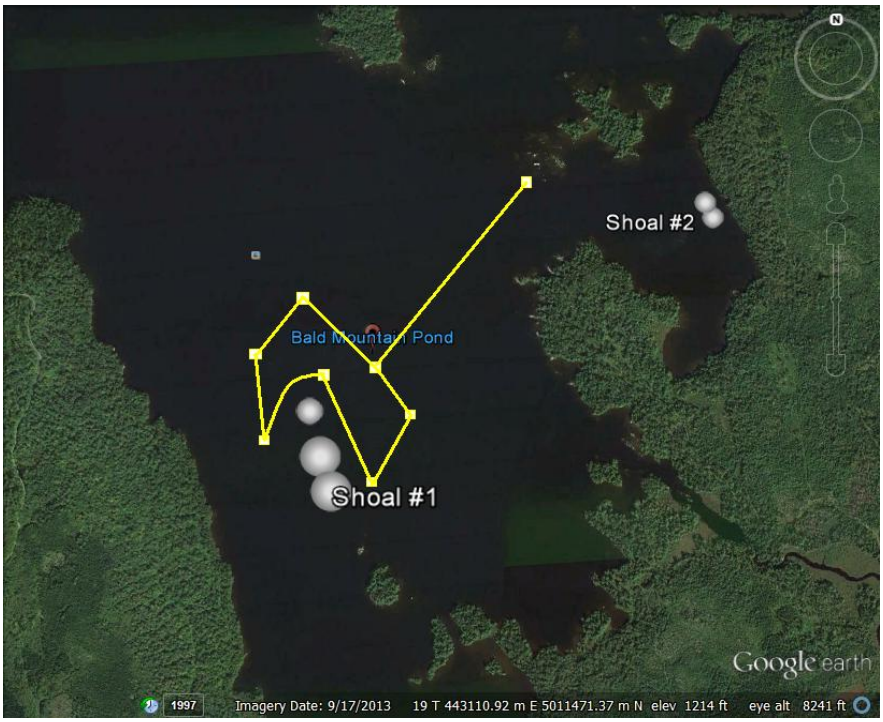


Figure 3. Tracking of Solomon 9/31-10/7, 2014. Solomon was released on 9/31/2014 at the edge of a shoal near where he was captured. He immediately moved toward Shoal #1 and seemed to stage in the middle of the southeast cove and around the large shoal for 7 days. He was last located on October 7th.

In 2015, all 4 charr that were gillnetted and released with radio tags failed to survive. It is believed that these fish drifted too deep during their recovery and expired in a zone of low dissolved oxygen. During fall trapnetting, three charr were captured and successfully released with radio tags. The stress from capture and tagging of these fish so late in the year is unknown and could potentially influence spawning behavior.

Wolowitz was caught in Trapnet 5 and tagged on October 15th (Figure 4). He was located 4 times before his tag was recovered on shore on the 22nd in the southeast cove near potential spawning sites. He may have expired post-spawning.

Figure 4. Tracking of Wolowitz: 10/15-10/22, 2015.Light points are daytime locations; dark points are nighttime locations. RIP is the location were tag was recovered on October 22nd.

Leonard was captured in Trapnet 1 and released with a radio tag on October 21st (Figure 5). He was regularly tracked over the next six weeks leading to multiple locations around the pond. Of interest, was his return to the site of his capture off the ledgy point along the east shore. This site will be evaluated for charr spawning activity and suitable substrate in the future.

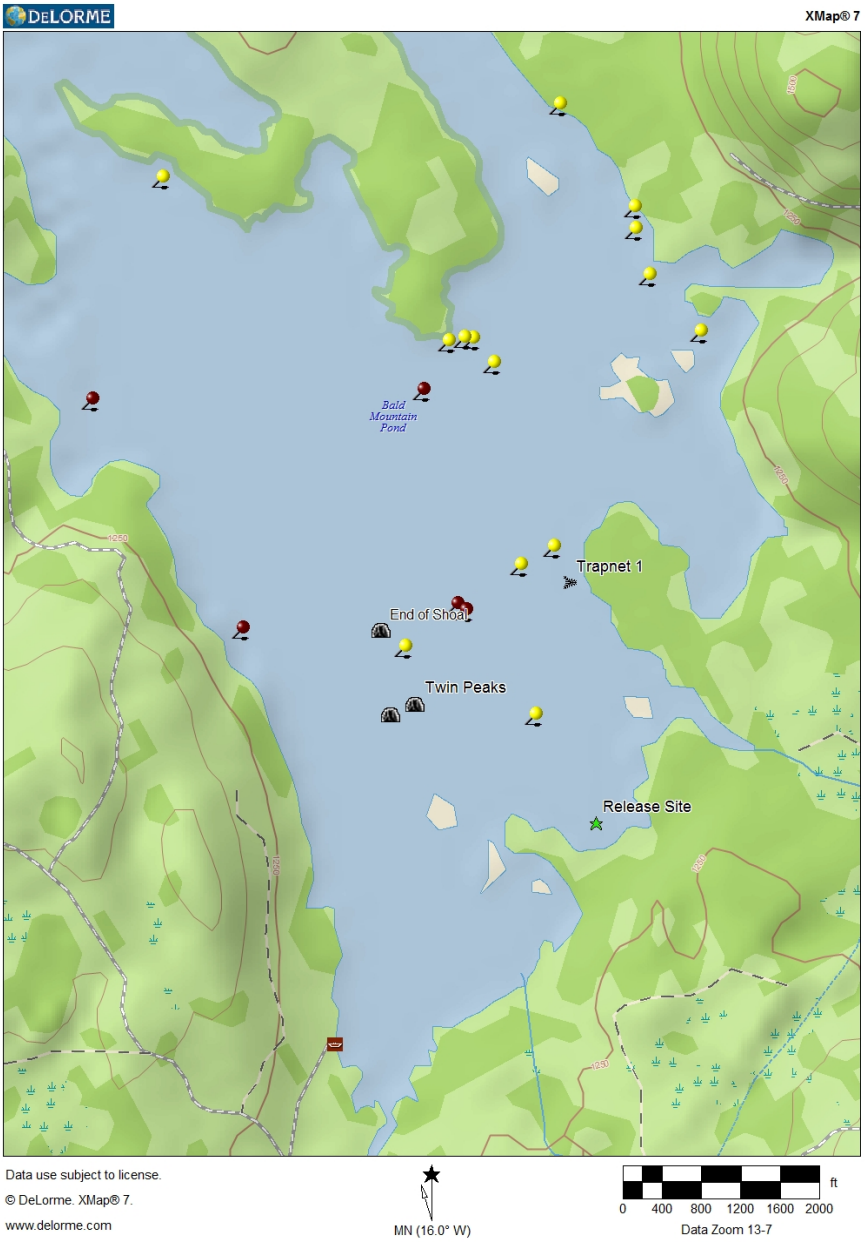


Figure 5. Tracking of Leonard : 10/21-11/20, 2015. Light points are daytime locations; dark points are nighttime locations. Some points represent multiple events.

Sheldon was captured in Trapnet 1 at the same time as Leonard (Figure 6) and was also tracked over the following six weeks. He spent a significant amount of time around an island off the mouth of the East Inlet. This area is located between the two successful trapnet sites and will be assessed in the future along with other nearby sites.

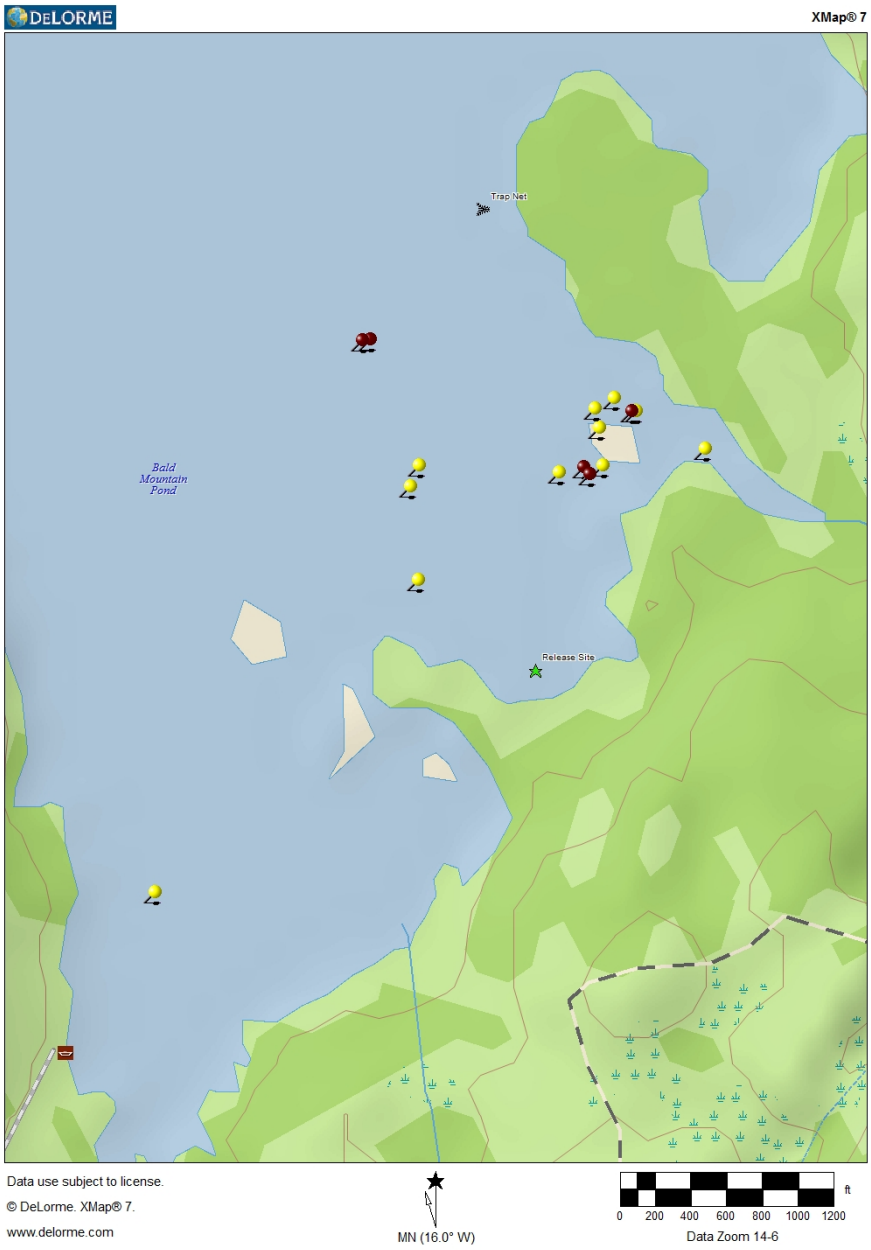


Figure 6. Tracking of Sheldon: 10/21-11/20, 2015. Light points are daytime locations; dark points are nighttime locations. Some points represent multiple events.

All successfully tracked charr were frequently observed moving into deeper water away from shore at night. During the day the tagged fish were often located near shore at potential spawning locations. A population of charr in the state of Maine was visually observed spawning during daylight hours and it is speculated that this population of charr also spawn during the day.

After tracking charr movement in Bald Mountain Pond for two years, indications were that most mature fish displayed spawning behavior from mid to late October. Sheldon lingered near a potential spawning location until November 11th, demonstrating that spawning activity may extend longer into the fall. During these times, surface water temperatures ranged from 40°F to 48°F.

By the 7th of December both Leonard and Sheldon were located near the northern shore of Bald Mountain Pond. These fish were tracked on the 19th and 26th of February 2016 and were still residing on the northern shore (Figure 7). This area is presumed to be where the charr overwinter.

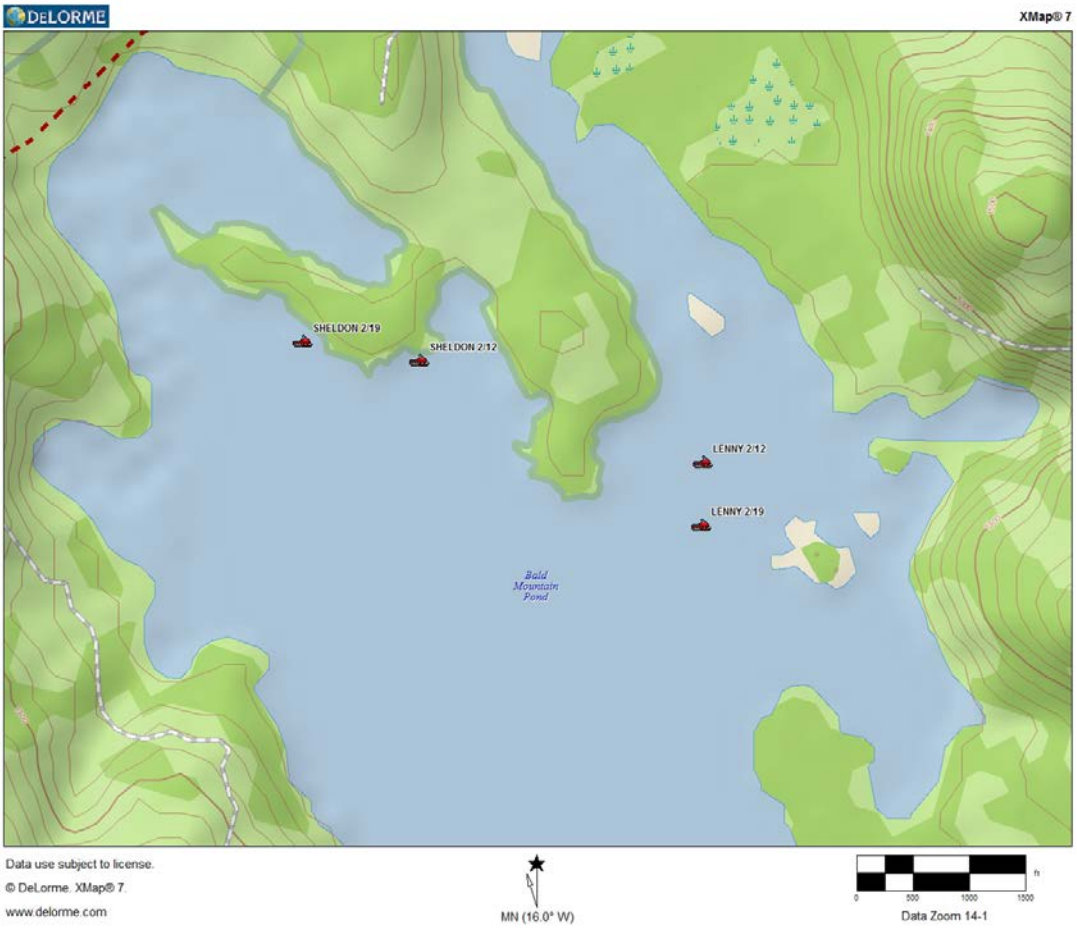


Figure 7. Locations of Leonard and Sheldon in February 2016.

SCUBA work:

SCUBA divers investigated the two shoals that had been selected based on information provided by the radio telemetry data in 2014.

Shoal number one was located in the middle of the pond toward the south end (Figure 2). This shoal is very large and made up of ledge and large boulders. Large cobble and small boulders were found in the crevices along with small patches of gravel. Historically, this shoal was the location where 53 charr were gillnetted in 1979 as an investigation to collect genetic samples.

Shoal number two, located near the shoreline of the northeastern cove (Figure 2), was found to be dominated by very large granite boulders. Many were over 5 feet in diameter and extended down to a depth of 12 feet. Again, there was some cobble and smaller boulders interspersed among the larger material.

No charr eggs or sign of spawning activity was observed by either diver. Suitable spawning habitat was not located, although only a small portion of the larger shoal was explored. Overall, it was determined that these sites were unlikely to be the principal spawning locations for charr in Bald Mountain Pond.

Fish Health Study:

A fish health study is currently underway to identify any potential diseases of regulatory concern within the pond. Samples of 20 brook trout and 46 smelts were collected for IF&W's pathology lab in 2015 for analysis. These fish were tested for 9 viruses and diseases, including furunculosis (*Aeromonas salmonicida*) and Whirling Disease (*Myxobolus cerecralis*). All test results came back negative. Glugea (*Glugea hertwigi*) was observed in 9 of the 46 smelts submitted.

RECOMMENDATIONS

Spring smelt run suppression:

In the spring of the next few years, attempts to disrupt the rainbow smelt spawning run will be made. This will be done by blocking the tributary entrance with a fyke net, by placing burlap on the spawning substrate, and by electroshocking the eggs during the smelt run activity. A control site will be set up to evaluate the effectiveness of the electroshocking technique. The eventual success or failure of these actions should become apparent by monitoring the status of the smelt spawning runs in the following years.

Landlocked Arctic charr:

While a lot has been learned about Bald Mountain Pond's charr population over the last two years, the goal of locating specific spawning areas has not been achieved. Therefore, a third year of telemetry work should be conducted using much of the information in this report to concentrate the efforts.

Gillnet efforts to implant radio tags should be strongly scrutinized due to lack of success after releasing tagged charr. Capturing charr in deep water has proven difficult and resulted in high fish mortality. Releasing charr back into a suitable environment is problematic due to warm upper level water temperatures, insufficient dissolved oxygen at the lower depths, and charr's inability to adjust their swim bladder.

Water quality should be conducted monthly throughout the summer (June through September) to better understand the environmental requirements of charr. The status of Bald Mountain Pond's charr population will need regular monitoring in future years. An every-other-year sampling schedule using gillnets to monitor the population status will be set up beginning after the telemetry study is completed. These samplings can correspond with water quality checks.

In 2016, an intensive trapnetting effort should take place in late September through mid-October in areas where charr have been located during previous years. Captured charr will be radio tagged, released, and monitored closely during the day as often as possible throughout the fall. Lengths, weights, and scale samples from each fish should be obtained at this time to monitor changes in the charr population size and robustness.

SCUBA divers will be directed to potential charr spawning sites to evaluate substrate and look for signs of charr spawning activity and eggs.

Search for suitable donor water:

If a decision is made to relocate the Bald Mountain Pond charr to a smelt-free waterbody, suitable candidates will need to be identified.

A list of Region D's waters based on species assemblage (lake trout & smelt being of greatest concern), acreage, depth, and water quality was created to determine if suitable donor waters existed nearby (Appendix C). Four waters are currently being considered, Big Island Pond (319 acres) in Seven Ponds Township, Franklin County, Blakeslee Lake (55 acres) in T05 R06 BKP WKR, Somerset County, and both Big and Mountain Dimmick Ponds (90 & 50 acres, respectively) in Caratunk, Somerset County. All of these waters are smaller than most charr waters statewide. Big Island and Big Dimmick Ponds have recently been inspected for potential as charr waters. Both ponds had prospective sites for spawning, but Big Island Pond only exhibited marginal summertime water quality. The issue of water quality will need further consideration, as Bald Mountain Pond only exhibited marginal water quality in the summer of 2015. Blakeslee Lake and Mountain Dimmick Pond have good water quality; however inspections of the spawning substrate on shoals and shorelines will need to be conducted. Waters in other Regions should also be considered and discussed.

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Sincere thanks to the Denise Leathers. Without the use of her family's camp, this project would be much more difficult to conduct. Assists were also made by IF&W biologists: Wes Ashe, Jeff Bagley, Dave Boucher, Bob Cordes, Scott Davis, Dana DeGraaf, Frank Frost, Tyler Grant, Jim Pellerin, Jason Seiders, and Bobby Van Riper. Kim Bates and Jarred Herrick of the Maine Warden Service also assisted. Contract worker Lucas Libby was a major contributor in 2014. Fishery Biologists Dave Boucher, Frank Frost, Joe Overlock and Robert Van Riper reviewed a draft of the report and offered helpful suggestions.

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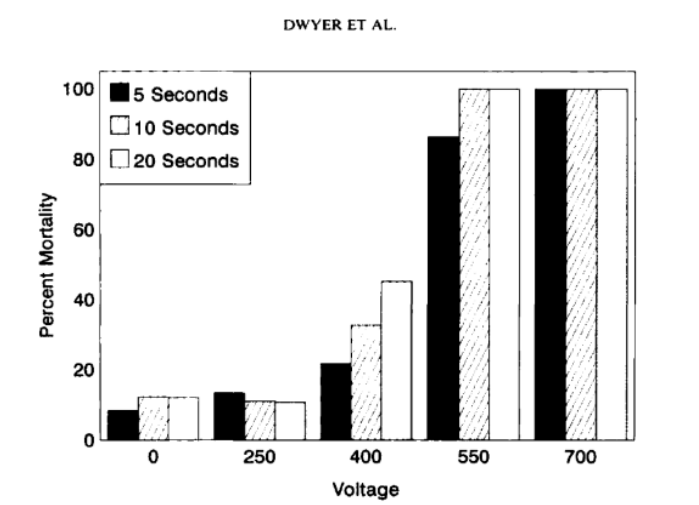
Appendix A. Percent mortality (mean) of cutthroat trout eggs exposed to electroshock in tanks at one of four voltages and three time durations on Day 8 post-fertilization. Mortality was determined 10 days after treatment. (Dwyer, Erdahl, & Fredenberg)



Appendix B. Advanced Telemetry System (ATS) body implant trailing whip antenna specs for years 2014 and 2015 transmitters.

Year	Model	Weight (Ounces)	Battery Life (Days)
2014	F1545	0.03	72
2015	F1555	0.04	116

Appendix C. List of Region D waters without confirmed lake trout populations with suitable acreage and depth for charr to exist. The list is separated into classes by water quality characteristics based on summer temperatures and dissolved oxygen.

Region D's CHR Donor Waters - 2015

Watcode	Water	Town	Acres	MaxDepth	Elevation	SLT	LKT	LLS	BSS	Other	WQ	Notes
0236	Big Dimmick P	Caratunk	90	39	1452						1	
0238	Mtn. Dimmick P	Caratunk	50	58	2010						1	
3350	Little Island P	Seven Ponds Twp	50	38	2032			?			1	LLS could travel up through fishway
3302	Mooselook L	Rangeley	16300	132	1467	X		X		YLP	1	
3290	Aziscohos L	Lincoln Plt	6700	60	1514	X		X			1	
3300	Rangeley L	Rangeley	6000	149	1518	X		X		YLP	1	
2374	Kennebago L	Davis Twp	1700	116	1779	X		X		BNT	1	
0086	Pierce P	Pierce P Twp.	1650	120	1142	X	?	X		PKL	1	
3966	Parmachenee L	Lynchtown Twp	912	93	1622	X		X			1	
5064	Chain of Ponds	Chain of Ponds Twp	700	106	1273	X	?	X		YLP	1	
3562	Beaver Mountain L	Sandy River Plt	543	52	1729	X		X			1	
3276	B Pond	Upton	471	110	1396	X	?	X		PKL	1	
3956	Johns P	Davis Twp	267	49	1748	?		X		YLP	1	No SLT found in stomach dataset
3528	Dodge P	Rangeley	230	51	1521	X		X		YLP	1	
0242	Baker P	Caratunk	186	74	1060	X		X			1	
3310	Beaver P	Magalloway Plt.	179	72	1486	X					1	
2384	Loon L	Dallis Plt	176	50	1713	X		X			1	
3524	Round P	Rangeley	166	57	1544	?		X		YLP	1	No SLT found in stomach dataset
3520	Howard P	Hanover	128	120	1084	X		X			1	
2614	Oaks P	Skowhegan	102	54	162	X			X	PKL	1	
3566	Sandy River P	Sandy River Plt	70	64	1700	X					1	
0062	Baker P	Solon	50	67	628				X		1	
5114	Blakeslee L	T5 R6	55	45	1728						2	
3352	Big Island P	Seven Ponds Twp	350	40	2147	?		?			2	No SLT found in stomach dataset
2362	Tim P	Tim Pond Twp	320	46	2012						2	
4086	Ellis P	Chase Stream Twp	85	38	1110						2	
0114	Otter P	Bowtown	77	44	1114	?					2	SLT found in BKT stomachs in 2006 but not in 2014
5124	Long P	King & Bartlett Twp	60	32	1620						2	
4050	Moxie P	East Moxie Twp	2370	51	970	X		X	X	WHP	2	
3104	Sturtevant P	Magalloway Plt.	518	58	1246	X		X	X	PKL/YLP	2	
3292	West Richardson P	Adamstown Twp	423	41	1505	X		X			2	
3502	Little Ellis P	Byron	297	41	1135	X		X			2	
3532	Gull P	Dallas Plt	281	44	1590	X		X		YLP	2	
5110	Baker P	T5 R6	270	33	1437			X			2	
0044	East Carry P	Carrying Place Twp.	267	40	1237	X					2	
2580	Wentworth P	Solon	213	48	579				X	WHP	2	
0202	Rowe P	Pleasant Ridge Plt	205	43	1203	X					2	
3958	Little Kennebago L	Stetsontown Twp	190	56	1782	X		X			2	
3278	C Pond	C Surplus	173	36	1291	X			X		2	
3332	Arnold P	Coburn Gore	148	62	1375	X		X			2	
2344	Mount Blue P	Avon	134	54	1171	X			X	WHP	2	
0104	Grass P	Pierce P Twp.	70	34	1156			?		PKL	2	
0028	Tufts P	Kingfield	53	43	1253	X					2	
3312	Little Beaver P	Magalloway Plt.	50	51	1490	X					2	
0046	Middle Carry P	Carrying Place Twp.	126	42	1229						3	
0042	Basin P	Pierce P Twp.	80	33	1254						3	
3684	Podunk P	Carthage	51	37	884						3	
2600	Barker P	Cornville	106	42	378				X	PKL/YLP	3	
0108	Kilgore P	Pierce P Twp.	96	37	1167	?				PKL	3	
4052	Mosquito P	The Forks Twp	71	47	1112			X	X		3	
5194	Staples P	Temple	64	46	704	?				BNT/PKL	3	

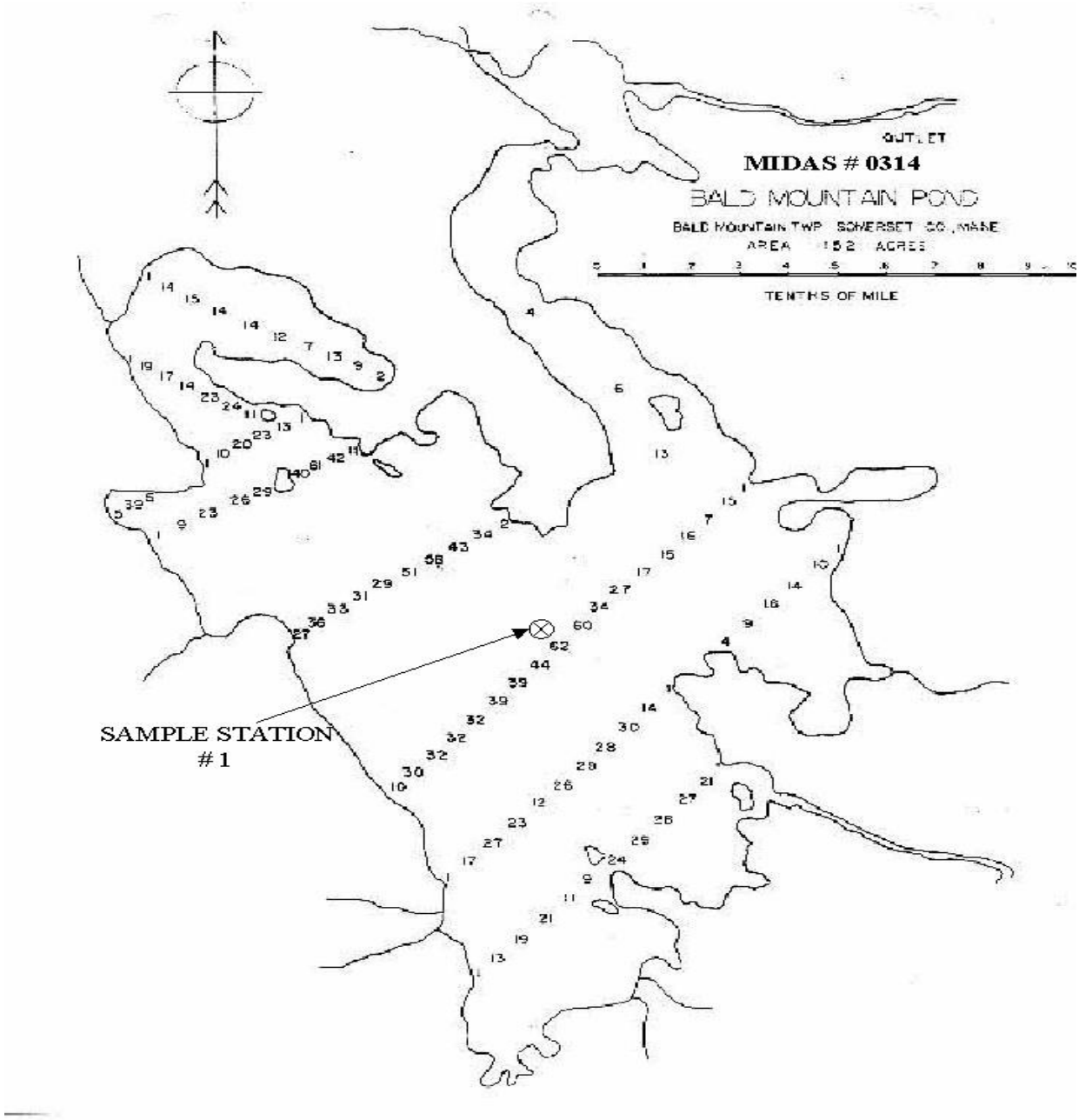
List comprised of all Region D water's over 50 acres, greater then 30 feet deep, and lacking confirmed self-sustaining LKT populations

List is sorted in order by: WQ, Species assemblage, Acres, Depth.

WQ 1 = Excellent 2 = Good 3 = Poor

Appendix D. A map of all 2015 Trapnet locations with dates. Nets #1 and #5 were successful in capturing charr and are bolded.

Appendix E. Depth map of Bald Mountain Pond, Somerset County.



COOPERATIVE

STATE FEDERAL

PROJECT

This report has been funded in part by the Federal Aid in Sport Fish Restoration Program. This is a cooperative effort involving federal and state government agencies. The program is designed to increase sport fishing and boating opportunities through the wise investment of angler's and boater's tax dollars in state sport fishery projects. This program which was founded in 1950 was named the Dingell-Johnson Act in recognition of the congressmen who spearheaded this effort. In 1984 this act was amended through the Wallop Breaux Amendment (also named for the congressional sponsors) and provided a threefold increase in Federal monies for sportfish restoration, aquatic education and motorboat access.

The program is an outstanding example of a "user pays-user benefits" or "user fee" program. In this case, anglers and boaters are the users. Briefly, anglers and boaters are responsible for payment of fishing tackle, excise taxes, motorboat fuel taxes, and import duties on tackle and boats. These monies are collected by the sport fishing industry, deposited in the Department of Treasury, and are allocated the year following collection to state fishery agencies for sport fisheries and boating access projects. Generally, each project must be evaluated and approved by the U.S. Fish and Wildlife Service (USFWS). The benefits provided by these projects to users complete the cycle between "user pays – user benefits."

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