PHILLIPS RESERVOIR PERCH REMOVAL PROJECT
2011 PROJECT REPORT
Summary of Actions 2009-2011

By

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INTRODUCTION

Shrader (2005) concluded that reducing or eliminating yellow perch from a western reservoir could be very difficult, but that any attempt at restoring fisheries should first focus on reducing perch densities, followed by actions to address specific management issues to maintain the fishery. While the outlook for improving the fishery at Phillips Reservoir is fraught with uncertainty regarding effectiveness and practicality of the various tools available to address the problem of overabundant yellow perch (Shrader and Bailey 2009), the ODFW Grande Ronde Watershed District and Baker County Commissioners are committed to moving forward in an experimental/adaptive approach to improve the fishery.

Mechanical removal of yellow perch has been successfully implemented to reduce perch density/biomass (Akroyd 1983; Riel 1965), albeit at a high cost in terms of effort required. It is also very likely that such an effort would need to continue indefinitely, although not necessarily on an annual basis, if it were the sole method chosen to achieve a more balanced and productive fishery at Phillips Reservoir.

The Phillips Reservoir Perch Removal Project is a joint effort between the Oregon Department of Fish and Wildlife, Grande Ronde Watershed District and Baker County with input and support from the Phillips Lake Fishery Improvement Committee appointed by the Baker County Commissioners. Project objectives are increased trout growth and survival and increased perch growth. The anticipated outcome is more trout of a larger size and larger perch available for anglers to catch. The objective **is not** to eliminate perch from the reservoir as this is not possible using the methodology chosen, and would preclude future fishery management opportunities.

Removal of yellow perch from Phillips Reservoir is an interim measure to address decline in the recreational fishery resulting from the illegal introduction of yellow perch into the reservoir in the early 1990's. Management actions have been taken in the past (changes in fish stocking) and interim measures are underway (yellow perch removal, tiger trout introduction) as ODFW develops a long-term fishery management plan to address issues with the current fishery and chart a course into the future. Yellow perch removal is considered interim until results of the on-going project show clearly the efficacy of the approach and/or a final management plan is adopted for the reservoir. The La Grande Fish District considers the experimental implementation of yellow perch removal from the reservoir a viable "interim measure" as it will not preclude future management options for the reservoir.

At this time, plans are to conduct annual removals in the spring through 2013. Funding has been secured from the ODFW Restoration and Enhancement Program and Baker County to continue the pilot project. Five years of project implementation should allow adequate time for fish community response and sufficient data to assess.

The purpose of this report is to document what has occurred and data collected to date. No attempt has been made to analyze these data or otherwise evaluate the effectiveness of perch removal in accomplishing project objectives. Data collected in 2011 would measure effect from only the 2010 removal as we do not believe the scope of the 2009 removal was large enough in scope to lead to fish community changes. More years of effort are needed to allow response time and provide further data for evaluation. Thus, analysis of data and evaluation of results are not planned until after completion of the planned 2013 removal effort. Data on growth and survival

of yellow perch and rainbow trout should be collected in spring 2014 to provide data for removals that occurred through 2013.

METHODS

The methodology used for this effort was modeled after a project implemented by Idaho Fish and Game (IDFG) in 2004 and 2005 to restock Lake Cascade with yellow perch collected from Phillips Reservoir. In 2004, IDFG utilized a combination of 6 small trap nets and 3 large Merwin traps to capture over 96,000 yellow perch. In 2005, IDFG utilized 6 Merwin traps to capture approximately 200,000 yellow perch with relatively little by-catch of non-target species. Considering the effort expended, the yield of the effort implemented in 2005 is what prompted ODFW and Baker County to try mechanical removal of yellow perch to accomplish fishery objectives at Phillips Reservoir.

Merwin trap nets are a passive capture technique, that in the case of this project, rely on spawning behavior of yellow perch to maximize capture of them. Although there are a wide range of temperatures (41° to 57°F) reported for initiation of yellow perch spawning (Coots 1956, Collete et al. 1977, Nelson 1977, Herman et al. 1982, and Krieger et al. 1983), it is generally thought to be related to ice breakup in those lakes that freeze (Weber and Les 1982). Larger, older perch are the first to migrate into shallow bays and shoreline areas, preferring those areas with moderate amounts of vegetation (Nelson 1977; Krieger et al. 1983). Experience from implementing the project over the past three years supports that spawning of yellow perch at Phillips Reservoir occurs during and immediately after ice out.

Semi-demersal eggs are emitted in gelatinous ribbons around plants or debris (Collette et al. 1977, Nelson 1977; Krieger et al. 1983) or rocks, sand, or gravel if submerged vegetation is not available (Herman et al. 1982; Krieger et al. 1983) in water generally less than 10 feet deep (Coots 1956; Herman et al. 1982), although spawning has been reported as deep as 25 feet (Thorpe 1977). This relatively unspecialized requirement for spawning strata and depth allows perch to utilize a wide variety of habitats and must partially account for their success in Phillips Reservoir.

Yellow perch move from deeper water where they have spent the winter, into shallow embayments where they spawn. The trap nets are placed strategically to capitalize on this behavior. The most productive deployment sites have been on the leeward side of points leading to shallow embayments. The other general deployment locale that has worked well is within relatively shallow areas at the upper end of the reservoir where spawning occurs. There is apparently significant movement of the fish within the spawning areas to facilitate capture.

Two trap configurations have been used, one with 12 foot depth and another with 16 foot depth (Figure 1). The 12 foot traps had pot, spiller and leads that were 12 feet high, when suspended, and the 16 foot trap, likewise. Dimensions of the pot and spiller portions of the traps are generally 9' x 9' and the leads 100' long.

In 2009, four of the traps deployed had 16' deep pots and two 12' deep. It was discovered after installation that some of the equipment got mixed when assembled so that one of the 16' deep traps was paired with a 12' deep lead and one 12' deep trap was paired with a 16' deep lead. In 2010 records were not kept on the number of the different trap configurations used, but 6 traps were deployed, likely three 12' and three 16'. In 2011, three 12' and three 16' traps were used.

Timing of trap deployment has proved to be critical to maximize catch. The sooner after ice out deployment has occurred, the more effective the capture. However, the traps cannot be deployed until all of the ice is melted off the reservoir to prevent damage to the equipment.

Beginning in early to mid March, ice conditions on the reservoir are checked on a weekly basis, by either on-site observation by ODFW personnel and/or reports from local observers. Based on these observations, weather patterns and the volume of runoff into the reservoir, a projected trap deployment date is estimated and equipment staged at the reservoir as appropriate. Once there is sufficient open water at the Union Creek Boat Launch, project base of operations, the traps are assembled and made ready for deployment.

In 2009, complete ice-out of the reservoir occurred on April 13th. However, due to logistical considerations of a first time project of this scale, project operations did not commence until April 20th. In 2010, ice-out occurred on April 8th and the traps were deployed on April 12th. In 2011 traps were deployed on April 11th, the day complete ice-out occurred Table 1.

With the uncertainty of project start date, logistics and effectiveness in 2009, ODFW and Baker County agreed that a ten day operation would be a good test of the project logistics from which to build in future years. Thus, a ten day personnel schedule was developed including ODFW personnel, Baker County temporary workers and Marine Deputies, and volunteers. In 2010 and 2011, the project was planned for an approximate three week duration, but dependent on daily catch. In 2010, traps were removed from the reservoir on April 29th for deployment duration of 17 days. In 2011, traps were removed on April 29th for deployment duration of 19 days.

For all three years of implementation, six Merwin traps were loaned to ODFW by IDFG through a memorandum of understanding (MOU). ODFW personnel traveled to McCall, Idaho December through March and transported the nets and associated equipment to Baker City or La Grande where the equipment was kept until moved to the reservoir for deployment.

In 2009, assembly and deployment of the traps occurred on April 20th. Two IDFG biologists assisted with the installation in 2009. In 2010 and 2011 trap assembly occurred on April 8th.

The trap floats were assembled and nets attached at the Union Creek Boat Launch (project base of operation) (Figures 2 and 3). The assembled traps (with nets wrapped and secured on top of the floats) were then towed by jet boat to their installation location (Figure 4). In 2009, the trap deployment sites were selected by one of the IDFG biologists based on trapping success in 2004 and 2005 and water depth (Figure 5). In 2010 and 2011, trap deployment sites were chosen by ODFW based on prior experience, water depth, and with higher reservoir pools levels than in 2009, more into the upper part of the reservoir (Figures 6 and 7). To be effective, the water depth at the location where the trap is installed (100' off shore) must not exceed height of the lead net height to prevent fish from swimming under the lead and evading the trap. Traps were secured to three steel fence posts driven along the shore line with polypropylene rope, the lead line attached to the center post and ropes secured to the others posts and shoreward corners of the trap (Figures 8 and 9). Traps were secured on the lake-ward side by two anchors secured to the trap with polypropylene rope. In order for the anchors to make good purchase with the reservoir bottom, the ropes must be fairly long (approx 150'). Two jet boats were used for transport and set-up.

Fish were removed from the nets daily, except Sundays, until daily yield began decreasing. As daily catch decreased, the traps were processed generally every other day. Two boats with 3-5 person crews removed fish from nets for generally the first week when catch was highest, then as catch reduced, operations were reduced to one boat and a reduced crew. The crews consisted of a boat operator (Baker County Sherriff's Department Marine Deputy) two temp workers and the project coordinator. During the first week of operation, ODFW La Grande Fish District personnel were onsite daily to oversee and assist.

Fish were removed from the nets by first gathering up the spiller net so that fish were brought to the surface and then held in place with bungy cords (Figure 10). Fish targeted for removal (yellow perch and northern pikeminnow) were then dip netted into buckets and placed on the boats for transport to the boat launch for sampling and disposal. Thirty to fifty buckets of fish were hauled per load. Non-target fish (bass, crappie, and suckers) were enumerated and released directly from the trap into the reservoir. Trout captured were placed in aerated livewells and transported back to the boat launch for data collection and then release back into the reservoir.

The number of target fish removed from the reservoir was estimated by obtaining the net weight of fish in each bucket to get the total pounds of fish removed. One bucket of fish from each net set each day was both weighed and the fish in the bucket enumerated in order to calculate the fish per pound. The total number of fish was then calculated by multiplying poundage removed by the fish per pound for each net set, each day of the operation.

In 2009, target fish were disposed of at a rendering facility (Darling-Delaware, Inc.) in Kuna, Idaho. Darling-Delaware parked a semi-trailer at the Union Creek boat launch for transport of the fish to their facility. As fish were removed from the boats and all sampling activities complete, fish were loaded into a backhoe bucket and then into the transport trailer. The trailer remained at the site until the operation was complete. In 2010 and 2011, target fish were disposed of by hauling them to a local agricultural producer to use as organic fertilizer. Baker County provided a backhoe and dump truck for loading and hauling the fish.

Lengths and weights were collected from a sub-sample of approximately 100 yellow perch each trapping day. The trap for which the sample was to be taken was randomly selected for each sampling day and then one bucket of fish was randomly selected from the fish collected. These fish were measured for total length to the nearest millimeter and weighed to the nearest gram. Scales were collected from perch on April 27, 2009. Scales were collected from ten fish for each 10 mm size group starting at 150 mm. The scales were archived for future reading.

All rainbow trout captured were transported to the sampling station at the Union Creek boat launch for weighing and measuring. These fish were measured for fork length to the nearest millimeter and weighed to the nearest gram. Trout with an adipose fin-clip were noted. Once weighed and measured, all trout were released back into the reservoir at the boat launch.

The Fulton Condition Factor (C) was calculated for both rainbow trout and yellow perch using the following formula:

$$C = (W/L^3) \times 10{,}000$$

where W is the weight in grams and L is the length in millimeters. Condition factor for yellow perch was calculated using total length and for rainbow trout using fork length.

In 2011, yellow perch were marked with a double, yellow floy tag to conduct a mark recapture experiment in order to develop an abundance estimate for perch in the reservoir and the proportion of the population removed. During daylight hours on April 8th, The eastside warmwater biologist with assistance from fish district and project personnel attempted to capture yellow perch using the eastside electrofishing boat. While numerous fish were present in bays according the fish finder on-board, no perch were collected as they were holding too deep to be stunned by the electrical current. Electrofishing was resumed after dark on the same date and several hundred yellow perch were collected and held for tagging in an empty Merwin trap. A total of 203 yellow perch were tagged and released back into the reservoir on April 9th. Two floy tags were inserted into each fish, one on each side of the body immediately ventral to the dorsal fin. Only fish over approximately 165 mm were tagged to avoid potentially higher post-release mortality on smaller fish. The tagged fish were then transported in aerated buckets by boat and released back into the reservoir.

On April 12, an additional 212 yellow perch were tagged and released back into the reservoir. These fish were removed from the Merwin Trap at deployment location 1 (Figure 7).
To avoid biasing the mark recapture estimate, the following release method was used to equally disperse the fish across the expanse of the reservoir. First the reservoir was divided into five release zones (Figure 11). Then approximately equal numbers of perch were released in each zone, at the midline of the reservoir.

The abundance of yellow perch in the reservoir at the time of the removal project in 2011 was estimated using the adjusted Peterson estimate (Ricker 1975):

$N=(M+1)(C+1)/R+1$

Where;

N is the size of the population at time or marking
M is the number of fish marked
C is the catch or sample taken for census
R is the number of recaptured marks in the sample

Large scale sampling variance was estimated using the following equation.

$$V(N) = \frac{N^2(C-R)}{(C+1)(R+2)}$$

The 95% confidence bound on N was calculated as +/- $2\sqrt{V(N)}$

RESULTS

An estimated 766,671 yellow perch have been removed from Phillips Reservoir as a result of the project; 51,574 in 2009, 360,629 in 2010, and 354,468 in 2011 (Table 2). Estimated average daily catch of yellow perch in 2009 was 5813 (range 976 – 10, 907), in 2010 was 30,052 (range 405-49,951) and in 2011 was 29,539 (range 3,197-55,820). Total weight of yellow perch removed to date is 118,536 pounds; 7,542 pounds in 2009, 50,213 pounds in 2010 and 60,871pounds in 2011.

Rainbow trout, bull trout, sucker (largescale and bridgelip), largemouth bass, smallmouth bass and black crappie were captured and released back to the reservoir (Table 2). Following are total number of these species captured 2009-2011: 624 rainbow trout, 2 bull trout, 698 suckers 30 bass (undetermined species), 52 largemouth bass, 15 smallmouth bass, and 384 black crappie. In addition to yellow perch, 1,013 northern pikeminnow were captured and removed from the reservoir.

Catch of yellow perch per day was highest at the onset of the project and rapidly decreased after the first week of operation (Figure 12 and tables 3, 4 and 5). In 2010 and 2011, when the traps were deployed shortly after ice out, over 90 % of the total number captured for that year occurred by day 10. Comparison of capture totals and the timing of trap deployment relative to ice-out, indicate that delaying deployment after ice-out decreases total catch.

Yield by net deployment site varied considerably between years and deployment sites. The aggregation of all deployment sites 2009-2011 is shown in Figure 13, with the most productive deployment locations highlighted.

The average length and condition factor of rainbow trout stocked as fingerlings in the fall and in their first year of residency in the lake was 212 mm and 1.03, respectively Table 6. No fall fingerlings were released in 2010, thus none were found in the 2011 sample in their first year of residency. The average length and condition factor of rainbow trout stocked as fingerlings in the fall and in their second year of residency in the lake was 310 mm and 0.98, respectively Table 6. The average length and condition factor of rainbow trout stocked at legal size was 306 mm and 0.95 (Table 6).

The length frequency distribution of rainbow trout stocked as fingerlings in the fall is shown in Figure 14. The length frequency distribution of rainbow trout stocked at legal size is shown in Figure 15.

The average length of yellow perch was 182 mm, 186 mm, and 189 mm in 2009, 2010 and 2011, respectively. The length frequency distribution of yellow perch captured is shown in Figure 16. The average weight of yellow perch was 59 g, 63 g, and 69 g in 2009, 2010 and 2011, respectively. The average condition factor of yellow perch was 0.86, 0.94, and 0.99 in 2009, 2010 and 2011, respectively.

The estimated yellow perch abundance in the reservoir at the time of the 2011 removal effort is 1,636,575 (95% CI: 1,236,748- 2,036,403). The 354,466 fish that were removed equates to a 21.7 % removal rate 2011.

The average water storage volume of the reservoir during the removal efforts was 55,115 acre-feet, 49,677 acre-feet and 58,356 acre-feet in 2009, 2010 and 2011, respectively (Figure 17). Average daily surface water temperature during April averaged 41.7, 41.9 and 41.8 in 2009, 2010 and 2011, respectively (Figure 18).

DISCUSSION

With the number of perch caught in 2010 and 2011 being similar, it appears the personnel, equipment and logistical needs are well understood or being applied consistently. The project is being implemented in an effective and efficient manner. The following are key components to a successful removal effort using the methods prescribed:

- On-site Project Coordinator responsible for day to day operations
- Four temporary workers to carry out much of the needed labor
- Two jet boats with qualified operators
- Six Merwin traps loaned by Idaho Fish and Game; two owned by ODFW
- Loader to handle perch
- Dump truck to store (temporarily) yellow perch and transport to disposal destination
- Low-cost convenient location for yellow perch disposal
- Authorization by USFS to use Union Creek boat launch as base of operations
- Reservoir storage level equal to or greater than 35,000 acre feet to use the Union Creek launch.
- 100-150 five gallon buckets
- Array of sampling and fish handling equipment

It is apparent from our experience over the past three years that the timing of deploying the traps after ice-out is critical. In 2009, the traps were deployed seven days after ice-out and good catches of yellow perch were achieved for only three days after deployment (Tables 1 and 3; Figure 10). In comparison, deployment in 2010 and 2011 occurred four and zero days after ice out and good catches of perch continued for approximately 10 days (Tables 1, 4 and 5; Figure 10). Interestingly, IDFG's experience in 2005 was different. Their operation began on March 18 and ended on April 11th, approximately three weeks. The cumulative catch per day is shown in Figure 19, displaying that at day ten only approximately 62 % of the catch had been achieved and over 90% was not achieved until day 18. Thus, catch efficiency maintained over a longer period of time at a steadier rate than what was experienced 2009-2011. The highest daily catches by ODFW in 2010 and 2011 include eleven days over 5,000 pounds. The most caught in one day in 2005 by IDFG was 3,278 pounds. The trapping equipment and methods were the same.

There were several differences in conditions in 2005 that could have led to the differing results. Reservoir conditions were very different than 2009-2011. The average storage volume during the 2005 project was 20, 572 acre-feet compared to 55,115 acre-feet, 49,677 acre-feet and 58,356 acre-feet in 2009, 2010 and 2011, respectively (Figures 17 and 20). Therefore, the quantity of available spawning habitat (shoreline) was likely much less in 2005. Surface water temperatures appear to have been more consistent in 2005 (Figures 18 and 21), although the data collection methods are different; 2009-2011 data are from the BOR Hydromet system collected by electronic probes and the 2005 data are grab samples with handheld thermometers. Finally, ice-out occurred much earlier in 2005, sometime shortly before March 19th compared to April 13, 12 and 11 in 2009, 2010, and 2011, respectively.

While the mechanism is not necessarily clear, it is obvious that yellow perch behavior in 2005 was different than 2009-11, leading to differences in passive capture by Merwin trap nets. Thus, project implementers need to be ready to adapt if reservoir conditions should be different than

those experienced 2009-11. A longer period of trapping may be required under differing conditions.

Based on the IDFG data, we believed when the project was initiated that a relatively small number of traps (6) over a period of three to four weeks would be the "shape" of the operation, the key factor, having the nets in the water over an extended spawning period. Based on our results to date, it appears that the number of traps in the water may be a limiting factor.

Deploying more trap nets during the high catch rate period immediately after ice-out shows potential to significantly increase catch, given that the effective trapping period is so short, at least in recent years. However, there could also be a limit to the number of high catch deployment sites, areas of high spawning density. There is also a limit on the number of ideal set locations relative to how the traps "fish". The last two years, nets were deployed in the upper reservoir, set locations G and H in Figure 13, where there is little protection from prevailing winds that come out of the west. While catches have been good at these locations, the nets have been difficult to maintain in ideal "fishing" condition. Strong winds cause the anchors to be dislodged thus the trap being displaced, requiring a significant amount of time to reset the trap to fish properly. In addition, consistent winds and wave action perpendicular to the lead line causes the bottom of the lead to be swept up, allowing fish to move underneath the lead rather than being funneled toward the trap. This same situation occurs with the pot and spiller boxes of the traps. In this case the trap funnels get partially or completely closed blocking passage for fish into the trap.

However, in an attempt to increase catch, ODFW has purchased two Merwin traps to be deployed in 2012 and 2013 in addition to IDFG's six nets.

While the purpose of this report is not to evaluate the efficacy of the project to accomplish objectives, there are a few data findings that warrant some discussion. First, length frequency of rainbow trout captured appears to be shifting somewhat and yellow perch length frequency has shown some minor change as well.

The length of rainbow trout released as both legals and sublegals appears to have been greater in 2011 than in 2009 and 2010 (Figures 14 and 15). This is a promising trend indicating the possibility that trout growth rate could have increased. However, at this time data are insufficient to infer to that this is actually occurring and even more important, what the mechanism could be.

There appears also to have been a shift in the length distribution of yellow perch sampled in 2011 (Figure 16). From the length frequency histogram it appears that there has been a decrease in the relative abundance of yellow perch less than 180 mm and increase in relative abundance of yellow perch over 180 mm. Again, additional data are needed to determine that this is, in fact happening, and what the mechanism may be.

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Table 1. Dates of reservoir ice-out, trap deployment, and removal, 2009-2011.

Year	Ice-Out Date	Trap Deployment Date	Trap Removal Date
2009	April 13	April 20	April 30
2010	April 8	April 12	April 29
2011	April 11	April 11	April 29

Table 2. Total capture of fish resulting from the perch removal project, 2009-2011.

Species	**Year**		
	2009	**2010**	**2011**
Yellow Perch*	51,754	360,629	354,468
Bull Trout	0	0	2
Rainbow Trout	220	140	264
Rainbow (clipped)	44	68	34
Smallmouth Bass	3	10	2
Largemouth Bass	2	44	6
Bass	25		
Crappie	223	144	17
Sucker	144	305	249
Northern Pikeminnow	376	358	279

*Number estimated by total weight captured and fish per pound

Table 3. The number and pounds of yellow perch harvested by day in 2009.

Date	Number Perch	Pounds Perch
April 21	13,394	1,786
April 22	18,150	2,605
April 23	11,539	2,001
April 24	3,554	440
April 25	2,077	218
April 27	1,401	185
April 28	598	85
April 30	1,041	224
Average	**6,469**	**943**

Table 4. The number and pounds of yellow perch harvested by day in 2010.

Date	Number Perch	Pounds Perch
April 13	49,251	6,741
April 14	70,218	10,503
April 15	83,971	10,758
April 16	38,773	5,106
April 17	24,769	3,603
April 19	43,356	6,241
April 20	12,262	1,868
April 21	8,309	1,188
April 23	20,799	2,781
April 26	5,861	965
April 28	2,655	392
April 29	405	67
Average	**30,052**	**4,,184**

Table 5. The number and pounds of yellow perch harvested by day in 2011.

Date	Number Perch	Pounds Perch
April 12	43,295	8,624
April 13	55,820	9,982
April 14	50,724	8,445
April 15	33,777	6,526
April 16	48,437	8,053
April 18	64,769	9,784
April 19	15,487	2,563
April 20	11,838	1,764
April 22	15,147	2,343
April 25	8,102	1,513
April 27	3,875	678
April 29	3,197	594
Average	**29,539**	**5,073**

Table 6. Length and condition factor of rainbow trout stocked in Phillips Reservoir and sampled during the yellow perch removal project, 2009 – 2011.

	Fingerlings				**Legals**	
	Year 1		**Year 2**			
Year	**Len. (mm)**	**C Factor**	**Len. (mm)**	**C Factor**	**Len. (mm)**	**C Factor**
2009	217	1.00	297	0.99	302	0.96
2010	207	1.06	305	0.94	304	0.93
2011	NA	NA	327	1.02	312	0.95

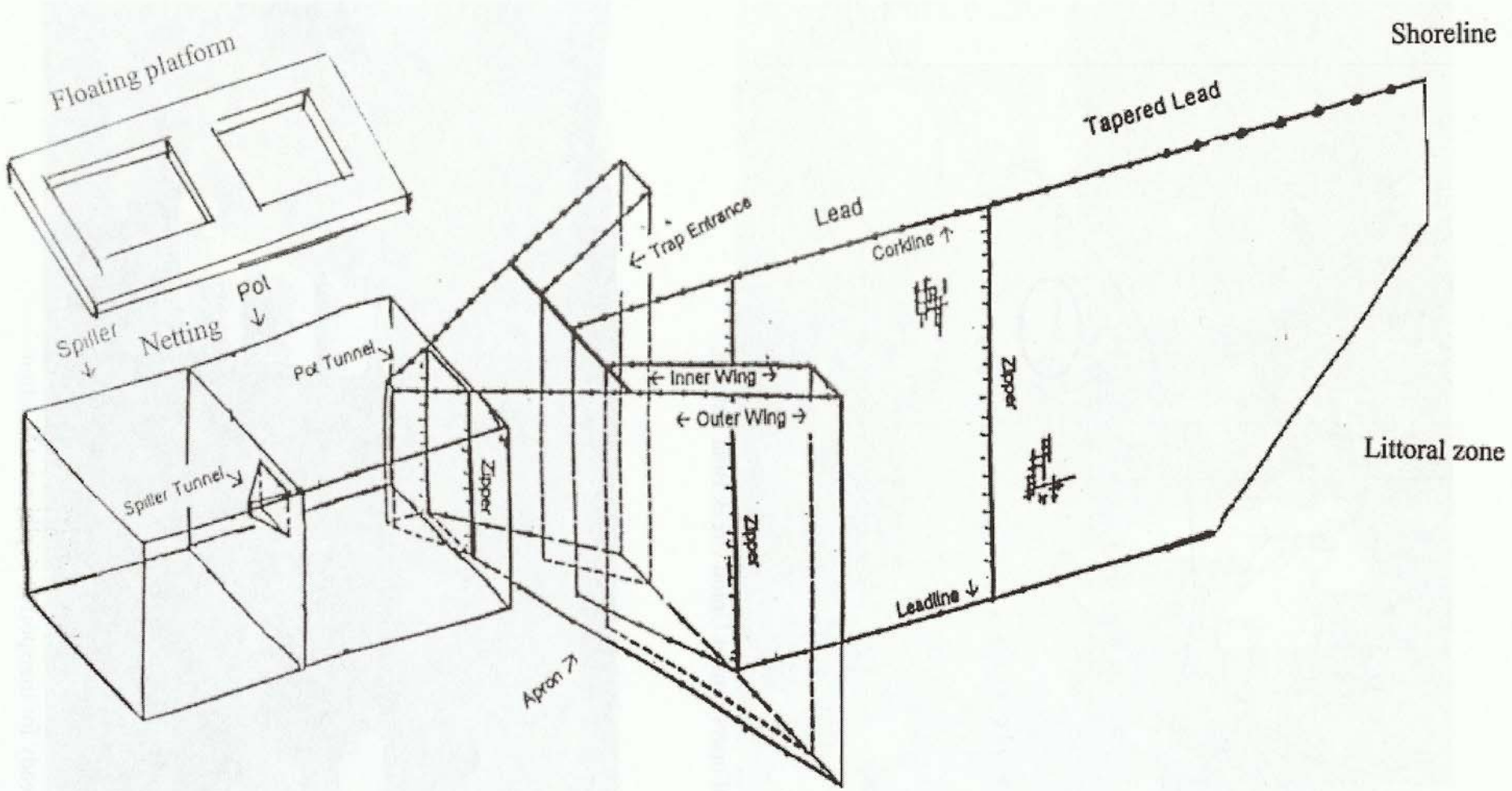

Figure 1. Schematic of Merwin trap.

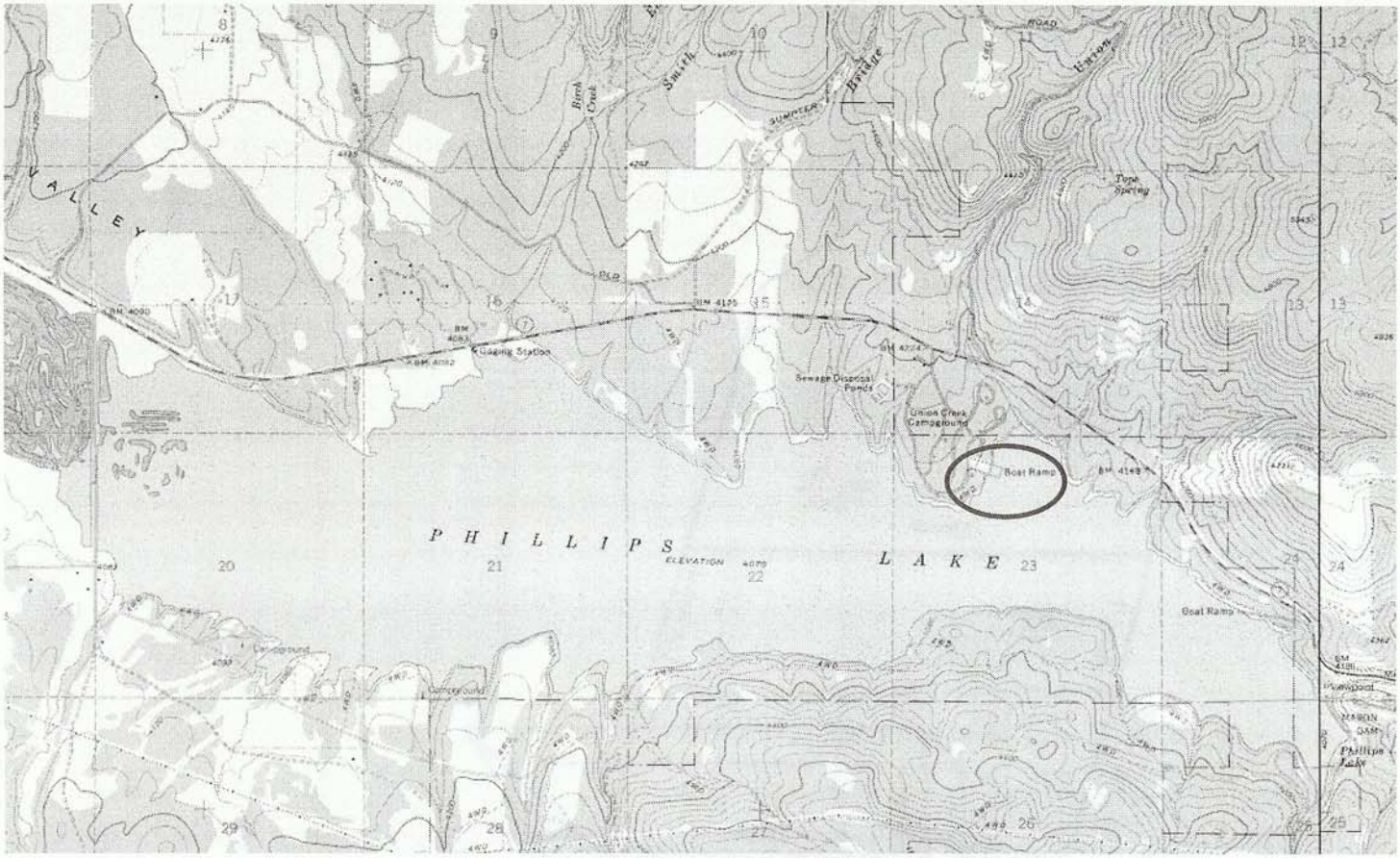

Figure 2. Location of project base of operations at Union Creek Boat Launch.


Figure 3. Assembled Merwin trap ready for transport to deployment location.

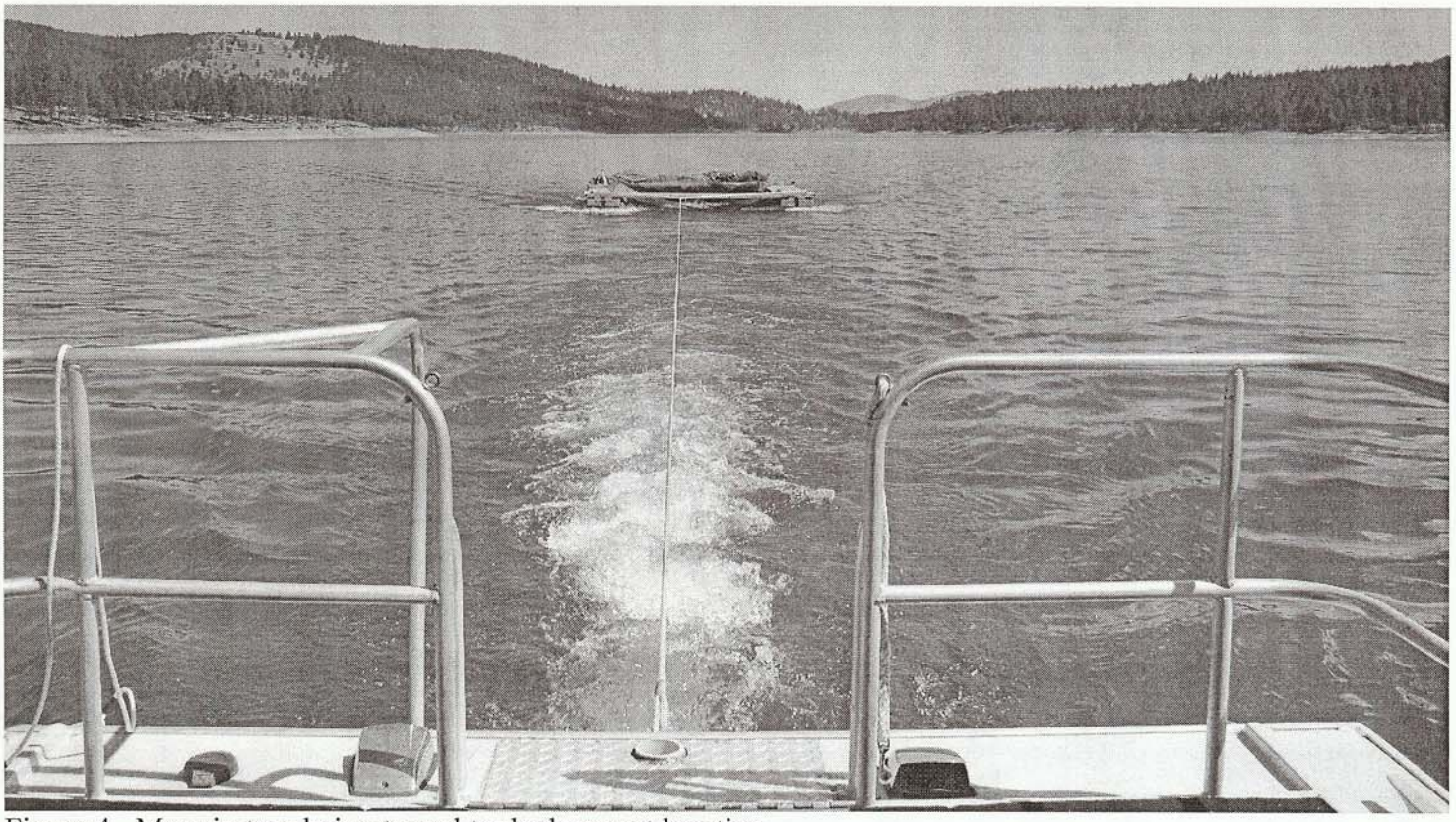

Figure 4. Merwin trap being towed to deployment location.

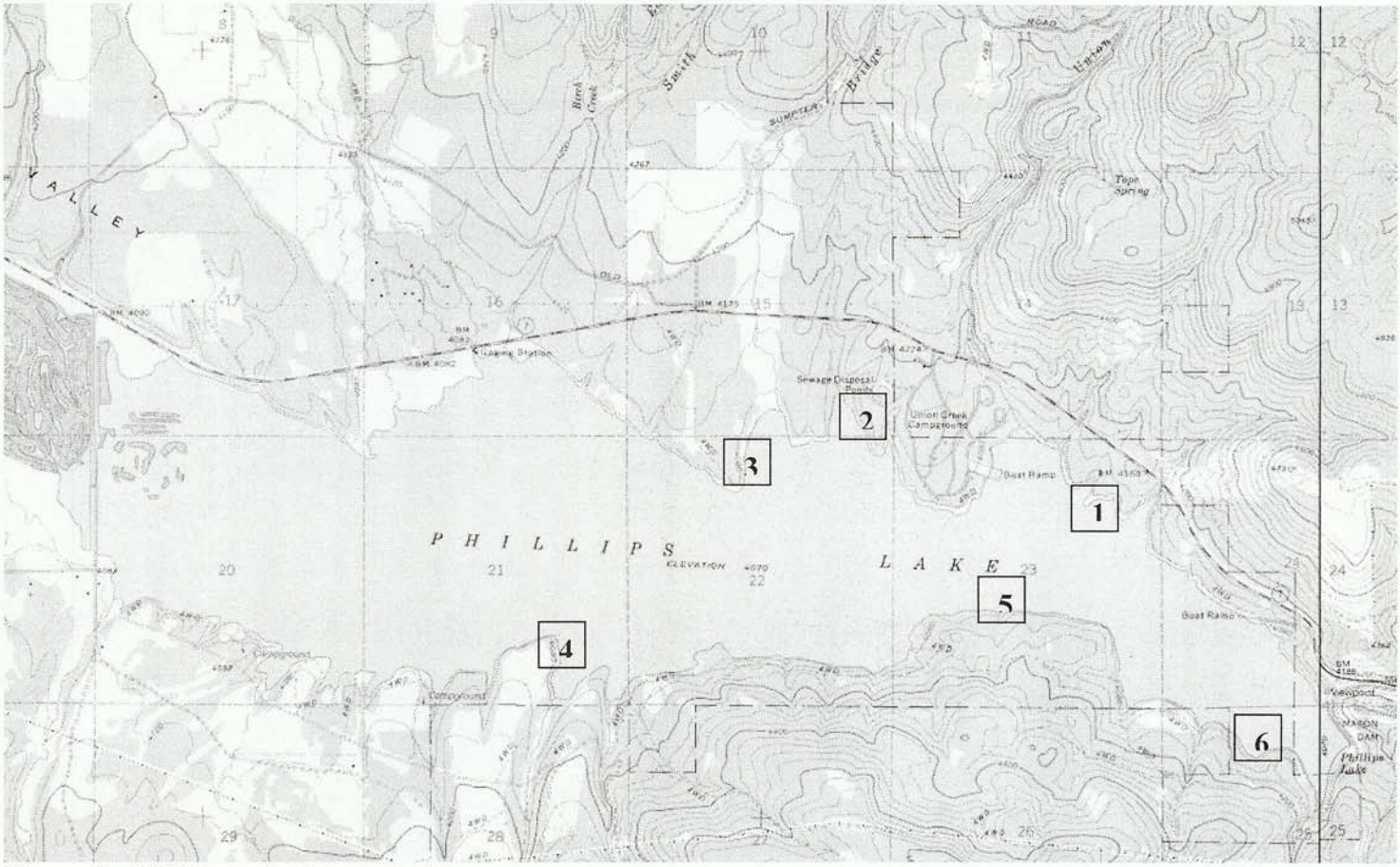

Figure 5. 2009 trap deployment sites.

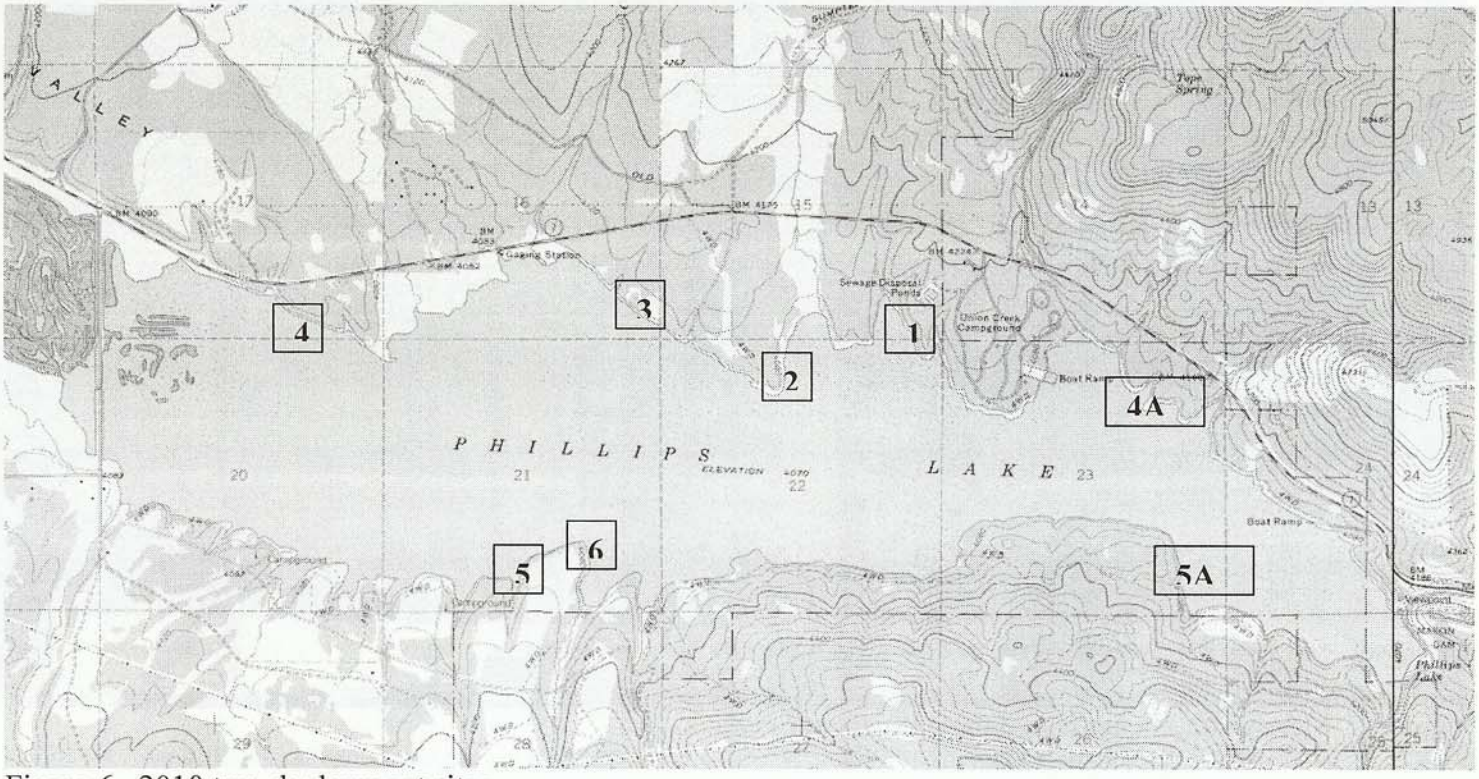

Figure 6. 2010 trap deployment sites.

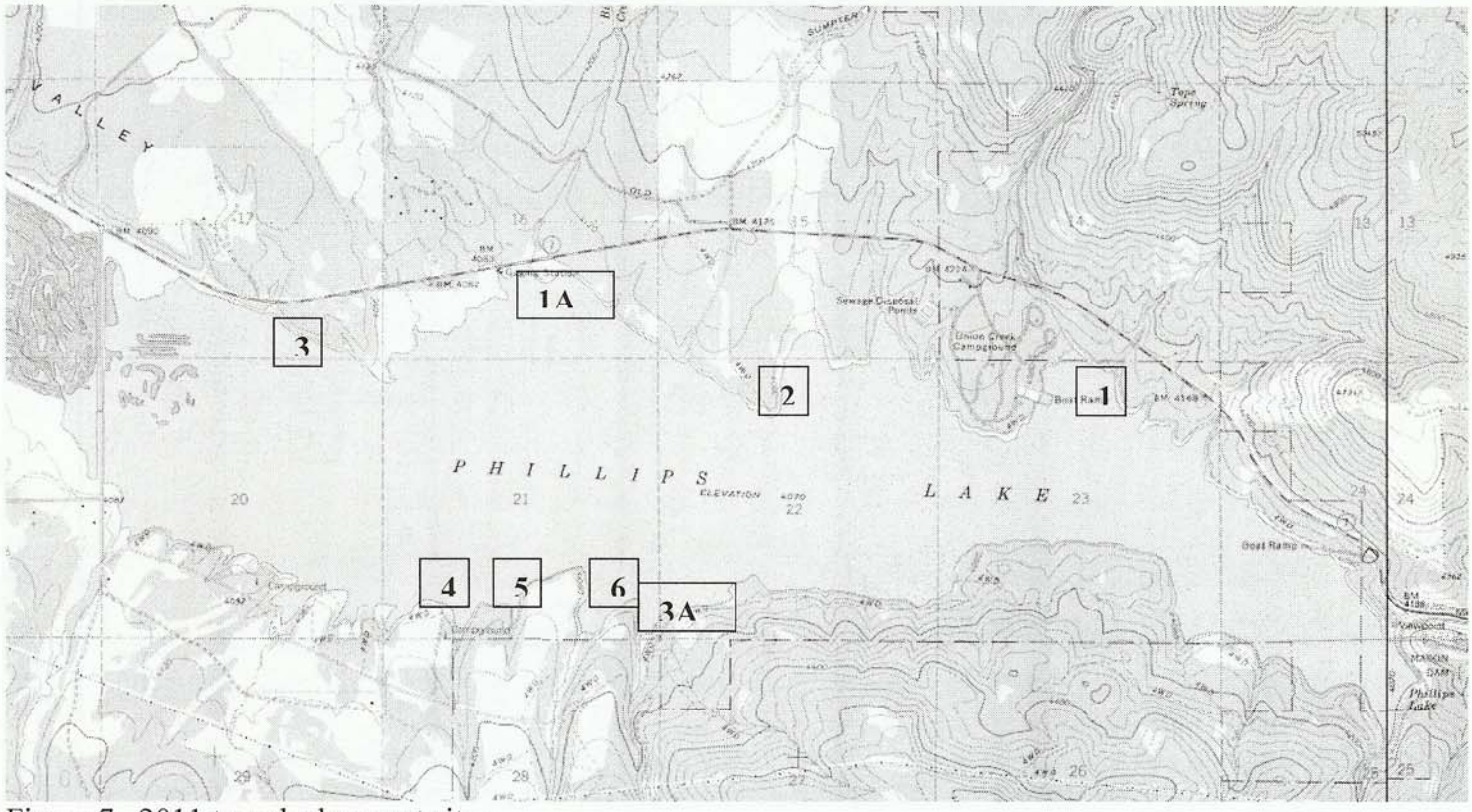

Figure 7. 2011 trap deployment sites.

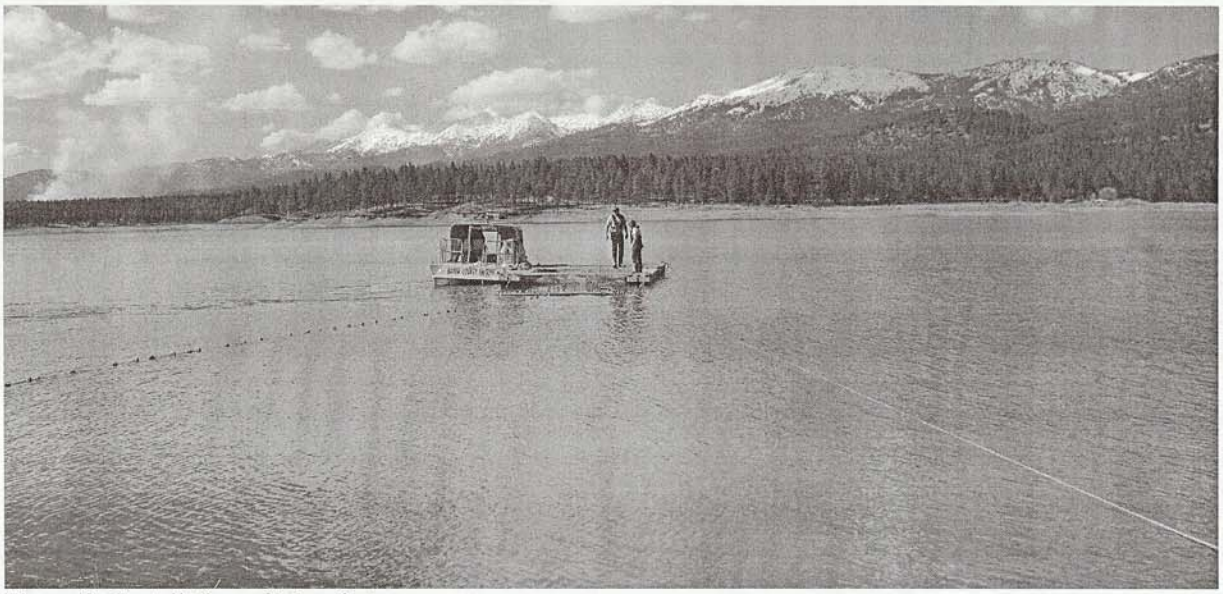

Figure 8. Installation of Merwin trap.

Figure 9. Installed Merwin trap.

Figure 10. Fish collection from Merwin trap.

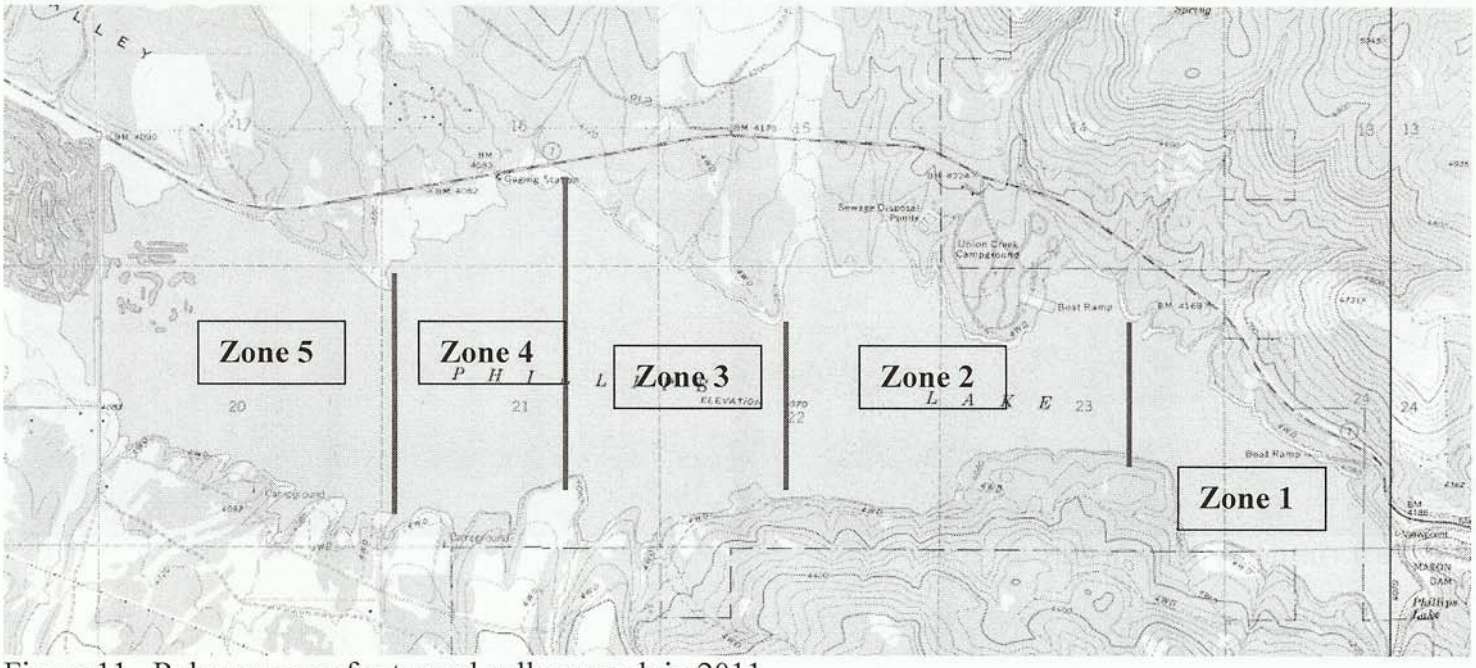

Figure 11. Release zones for tagged yellow perch in 2011.

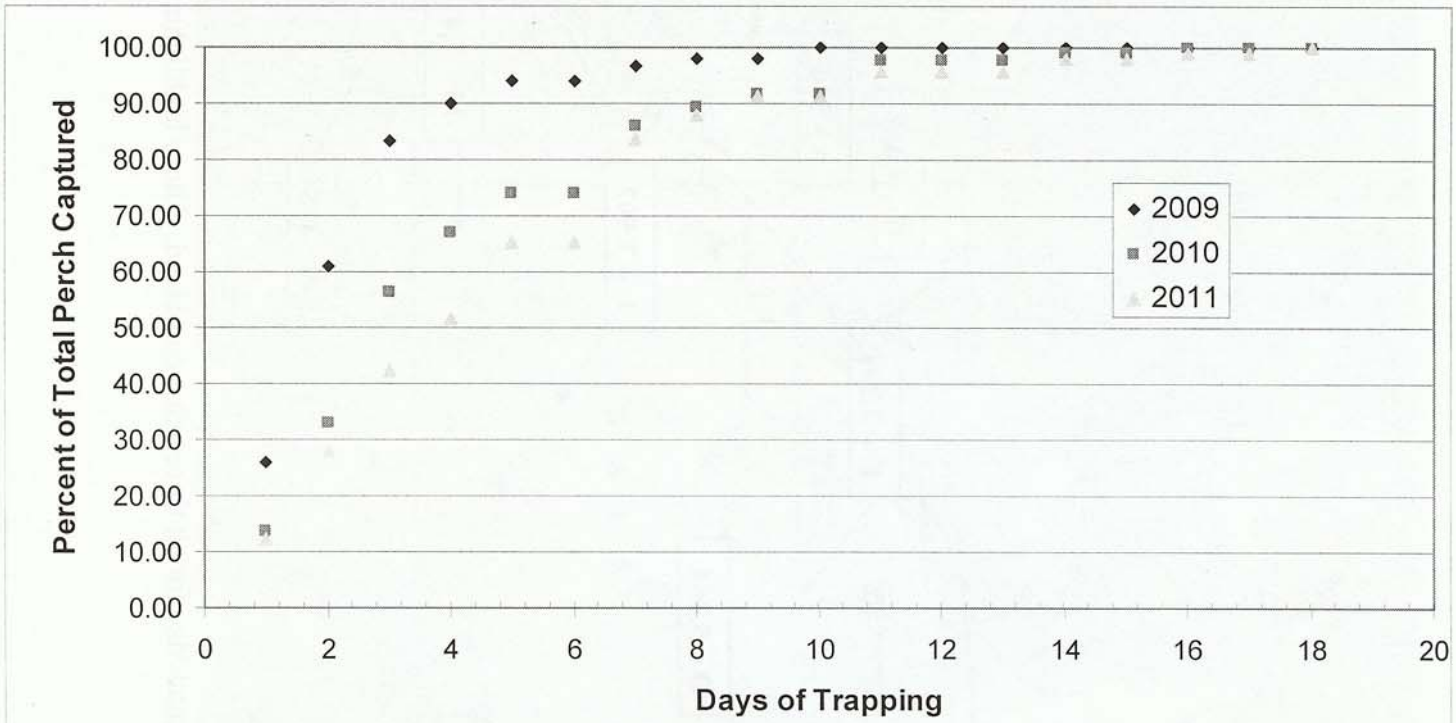

Figure 12. Cumulatve catch of yellow perch from Phillips Reservoir with Merwin trap nets, 2009-11.

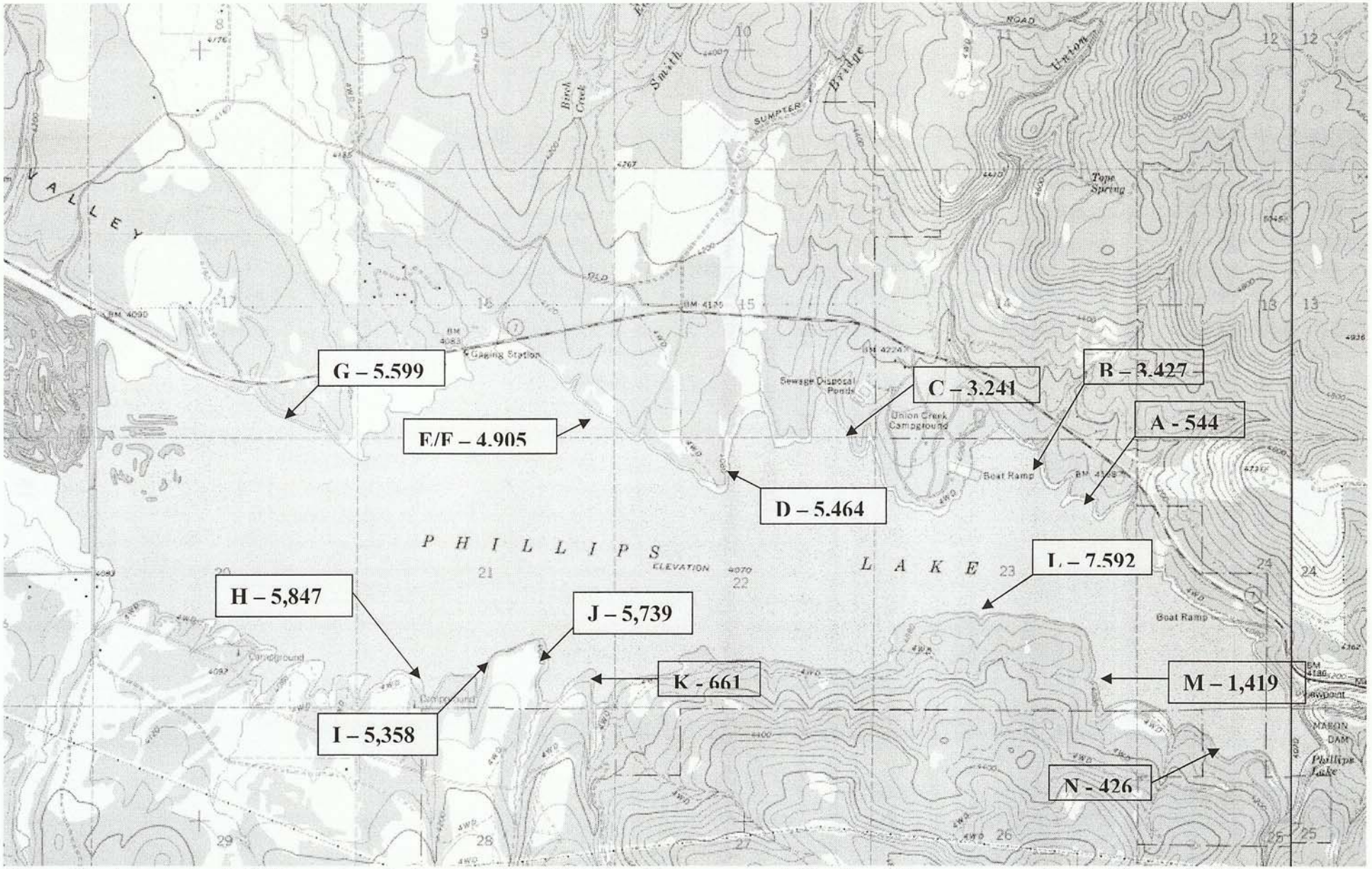

Figure 13. Aggregate of all Merwin trap deployment sites 2009-11, with average catch/day for all three years combined. Those highlighted in yellow were the most productive.

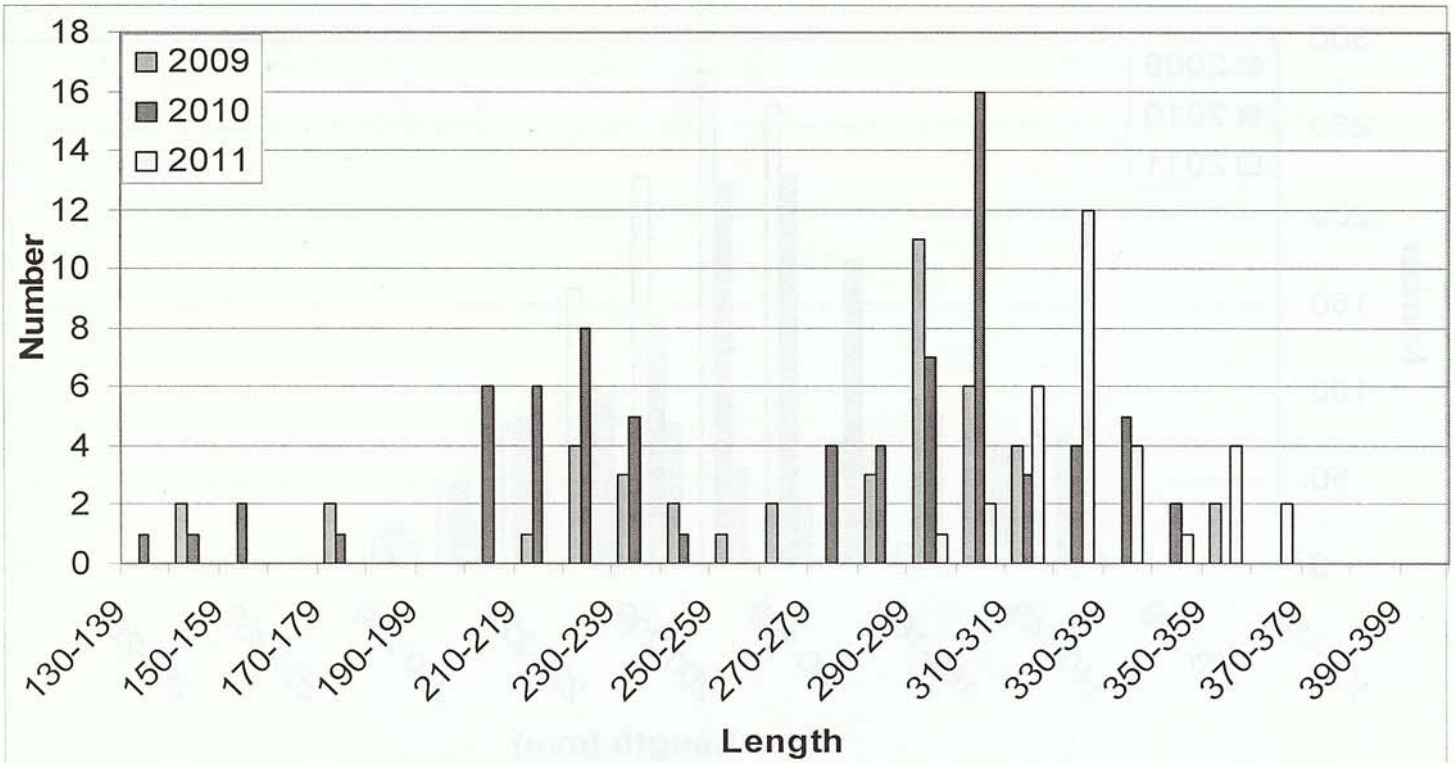

Figure 14. Length frequency distribution of rainbow trout stocked as fingerlings and captured in Merwin trap nets, 2009 - 2011.

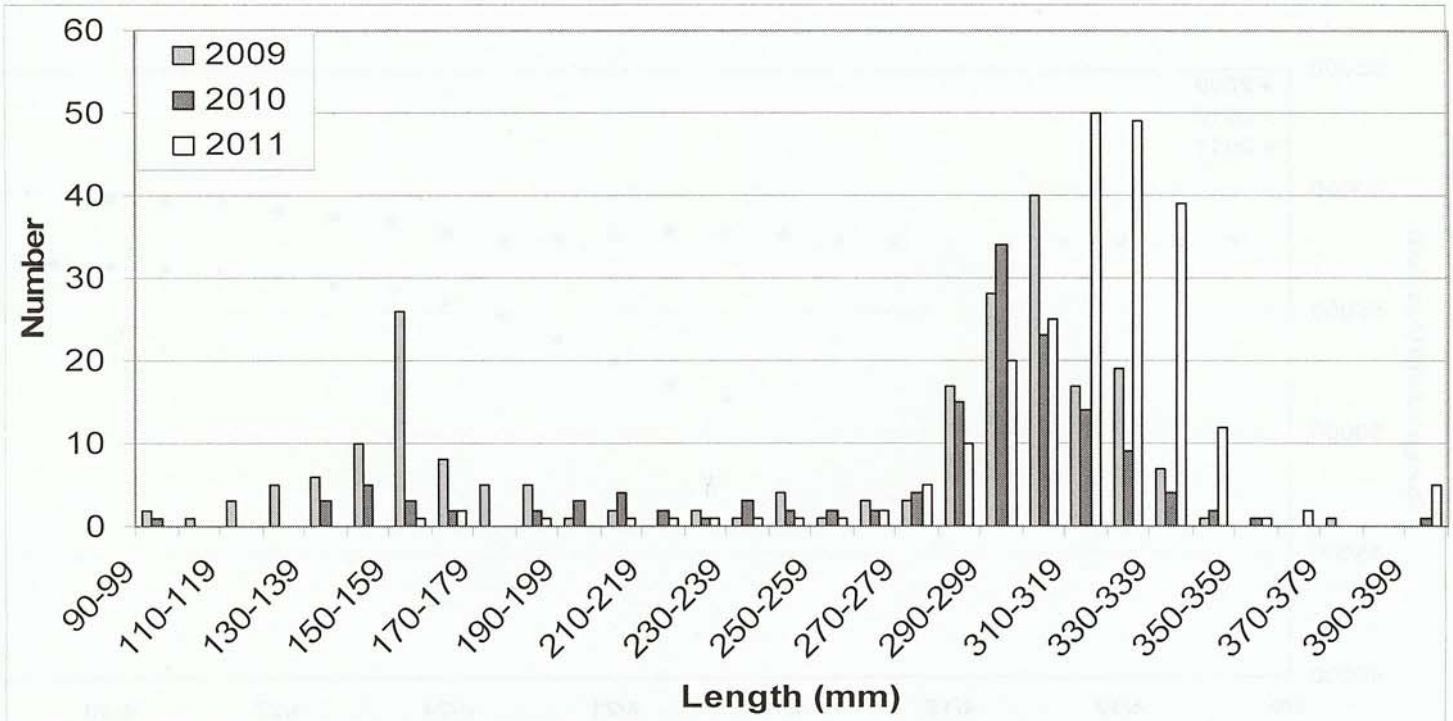

Figure 15. Length frequency distribution of rainbow trout stocked at legal size and captured in Merwin trap nets, 2009 - 2011.

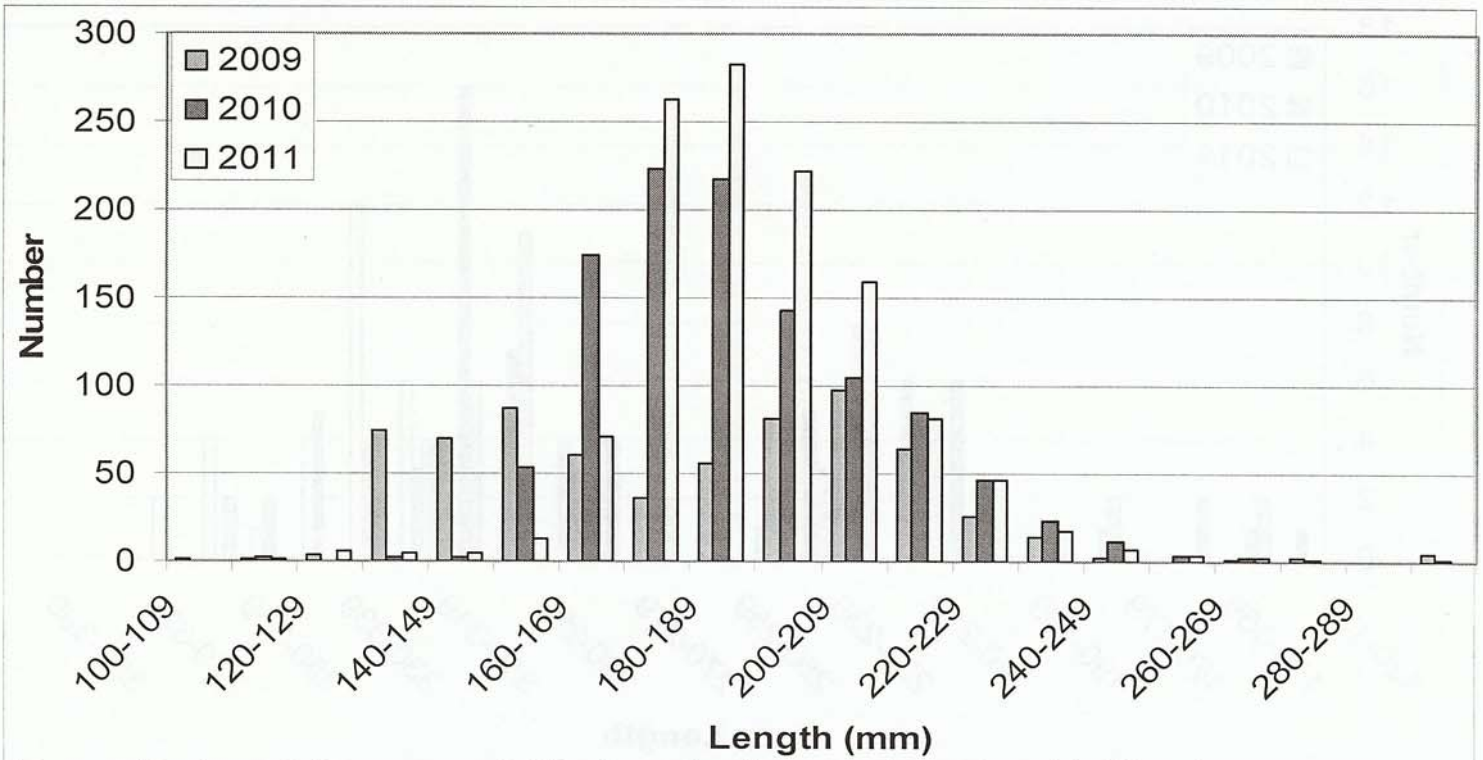

Figure 16. Length frequency distribution of yellow perch captured in Merwin trap nets, 2009 - 2011.

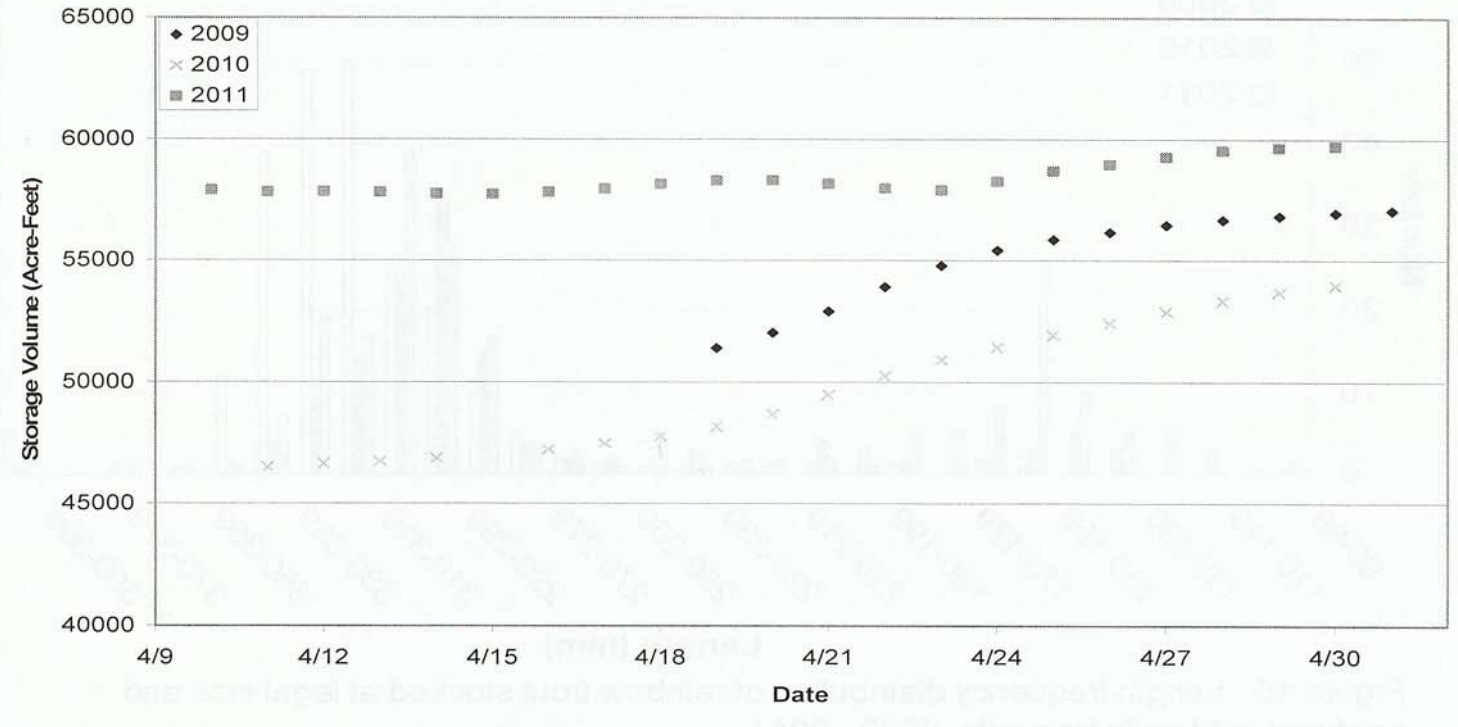

Figure 17. Water storage volume (Acre-Feet) in Phillips Reservoir during perch removal project operations, 2009 - 2011.

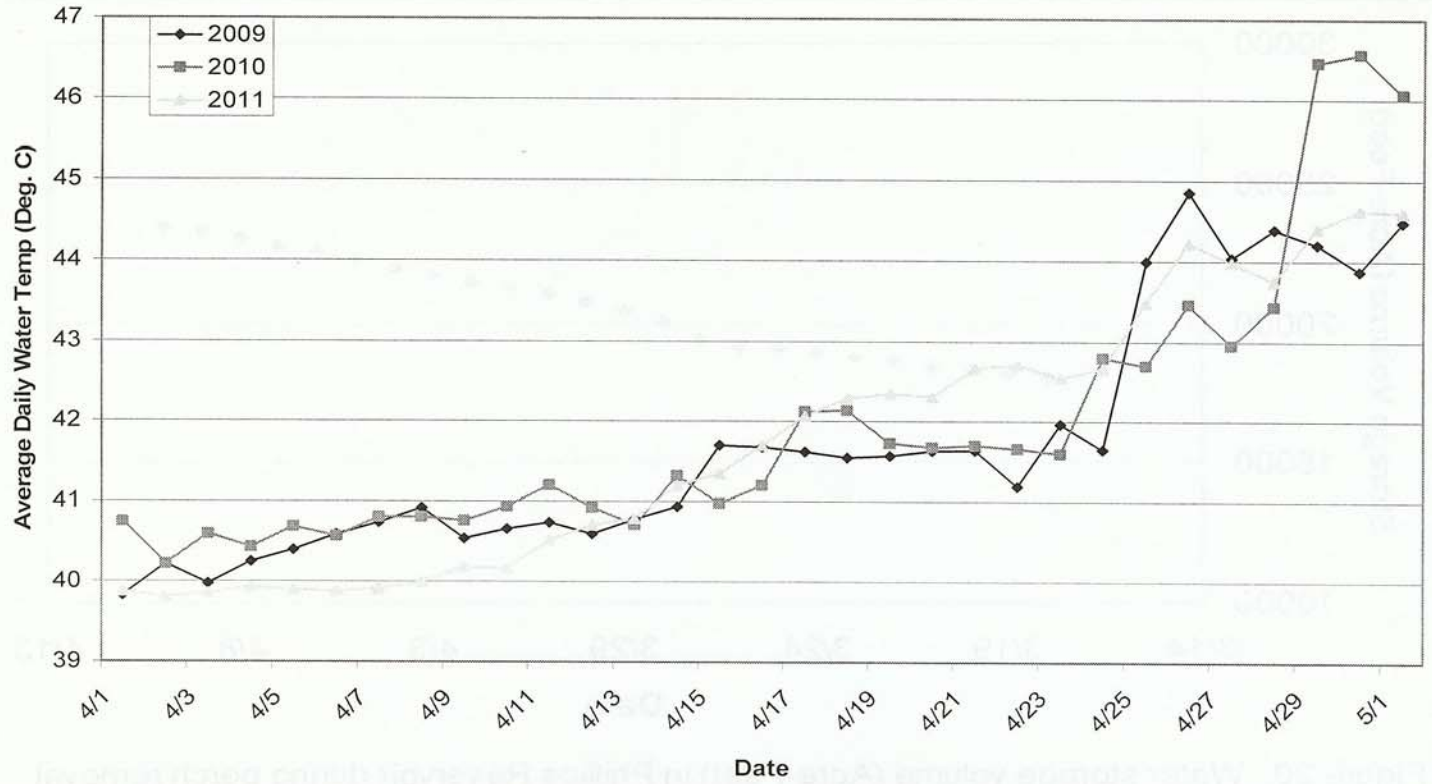

Figure 18. Water temperature in Phillips Reservoir during perch removal project operations, 2009 - 2011. Data source, U.S Bureau of Reclamation Hydromet at www.usbr.gov/pn/hydromet/.

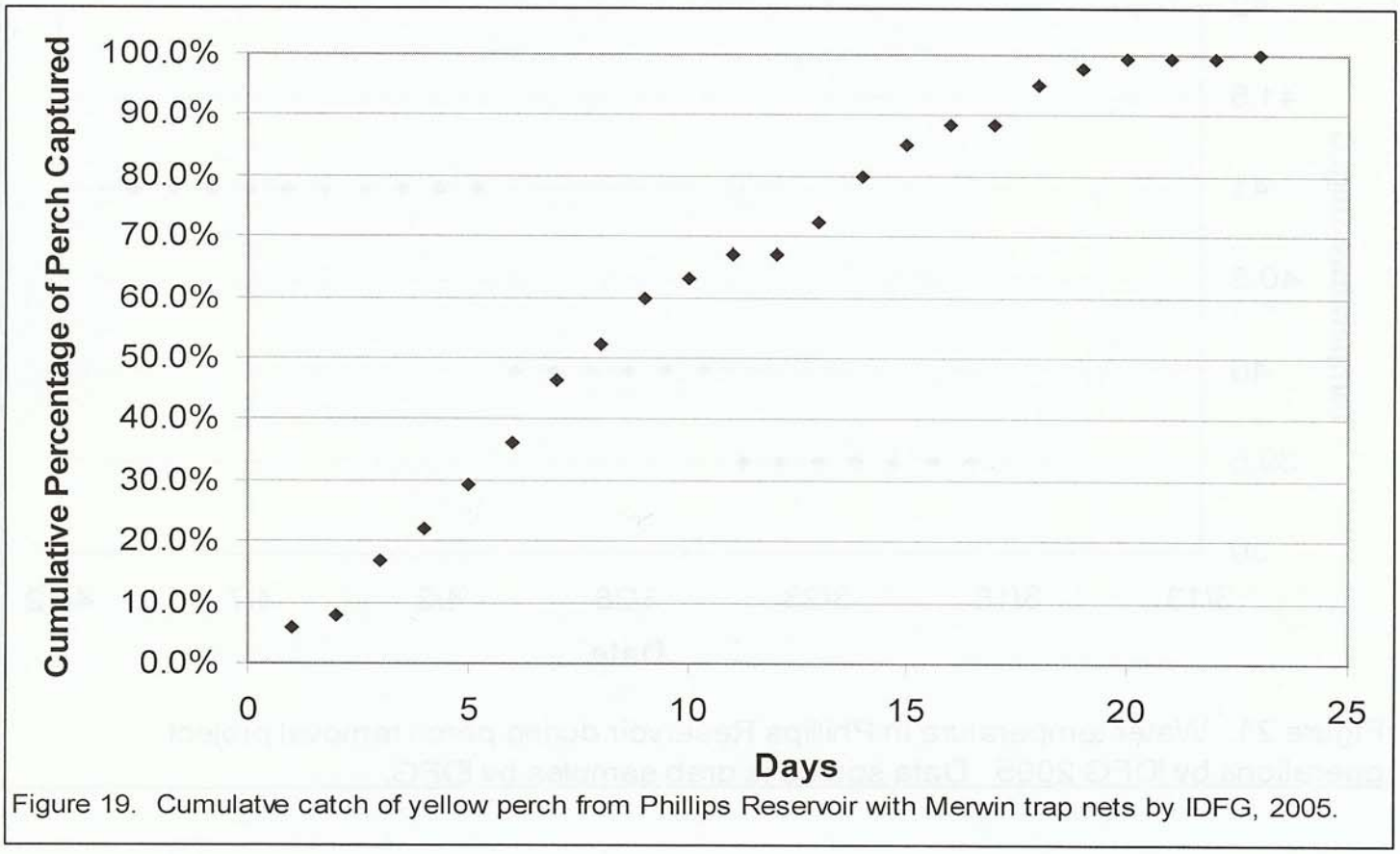

Figure 19. Cumulatve catch of yellow perch from Phillips Reservoir with Merwin trap nets by IDFG, 2005.

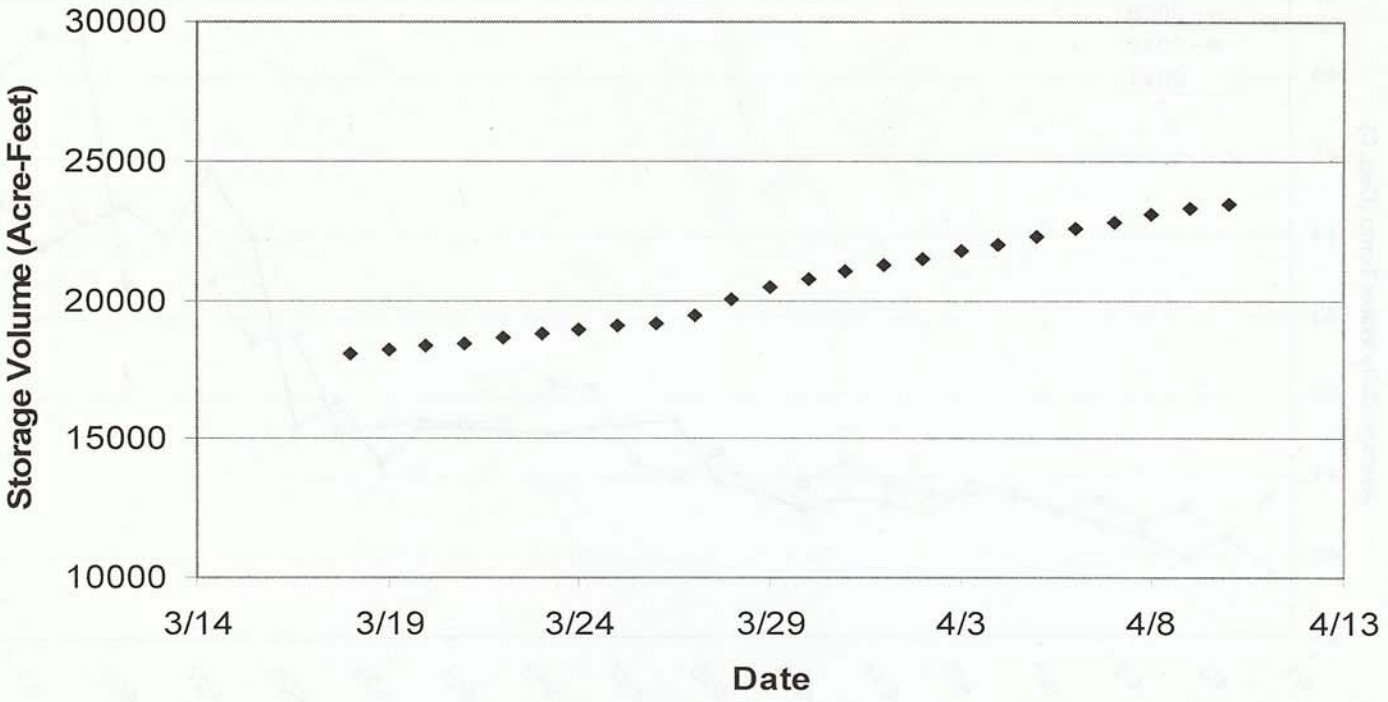

Figure 20. Water storage volume (Acre-Feet) in Phillips Reservoir during perch removal project operations by IDFG in 2005.

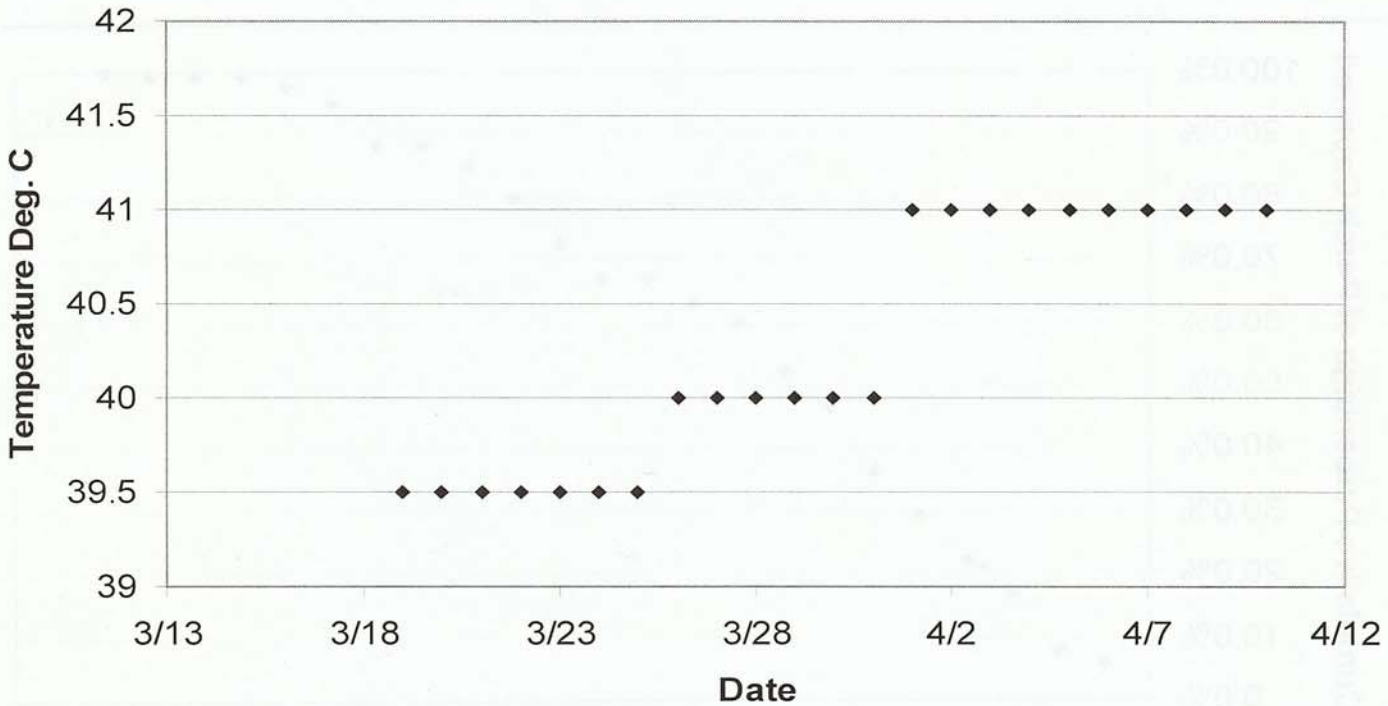

Figure 21. Water temperature in Phillips Reservoir during perch removal project operations by IDFG 2005. Data source is grab samples by IDFG.