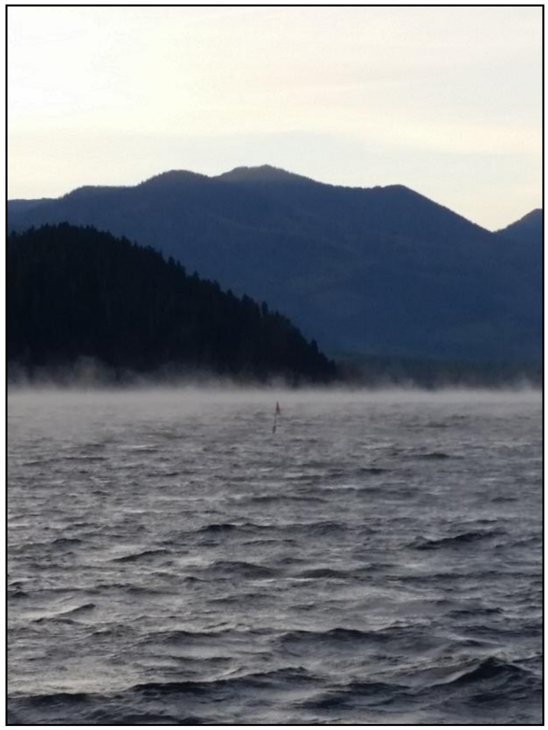
Experimental Removal of Lake Trout in Swan Lake, MT: 2015 Annual Report



Prepared for the Swan Valley Bull Trout Working Group

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Background

The Swan Valley has historically been one of Montana's strongest bull trout populations. However, in 1998, anglers began to occasionally catch adult sized (20-30 inch) lake trout from Swan Lake and the Swan River. This caused alarm because lake trout are not native and are notorious for rapidly expanding and dominating fish communities in lakes with *Mysis* shrimp, particularly at the expense of bull trout and kokanee salmon (Martinez et al. 2009). In 2003, the level of concern was compounded when biologists gillnetted juvenile lake trout from Swan Lake during standard low-intensity sampling efforts, indicating that wild reproduction was occurring. Since 2003, lake trout catch by anglers as well as during Montana Fish, Wildlife & Parks (FWP) biological sampling has continued to increase, another indication that the population was expanding. Research efforts from 2006-2008 focused on lake trout population demographics and exploring potential techniques to reduce lake trout numbers while minimizing bull trout bycatch. Based on case histories from nearby waters, managers determined that developing long-term management actions to control this increasing lake trout population was necessary in order to maintain the popular bull trout and kokanee fisheries.

In 2009, FWP released an environmental assessment (EA) for a three-year experimental removal of lake trout in Swan Lake. This removal experiment was a feasibility study to determine the effectiveness of using targeted gillnetting as a technique to reduce the number of lake trout and thus minimize threats to kokanee and bull trout. From 2009-2011, over 20,000 lake trout were removed from Swan Lake. Modeled total annual mortality rates for lake trout year classes vulnerable to the nets (Predominantly age-3 and 4) were higher than literature suggests are sustainable (50%). FWP released another EA in May 2012 for a five-year extension of the project to further evaluate the long-term effectiveness of the current lake trout suppression effort relative to measurable goals and specific success criteria outlined in the original 2009 EA. The project is scheduled to end in its current form and will be reassessed after the 2016 field season. Based on that assessment and other relevant considerations, FWP, with recommendations from the Swan Valley Bull Trout Working Group (SVBTWG), will consider whether changes are warranted in fisheries management of Swan Lake. Long-term sustainability of bull trout in Swan Lake, a threatened species under the ESA, is an additional and important consideration.

Previous annual reports can be found at:
http://montanatu.org/resources/swan-valley-bull-trout/

Methods

The five-year extension of the lake trout suppression project (2012-2016) closely mirrors the methods employed from 2009-2011. This consistency has allowed researchers to continue to remove lake trout from Swan Lake at a level that we believe should lead to long-term decline, while providing repeatable data for year-to-year comparisons and analysis.

Consistent with 2009-2011, the current project is composed of two distinct netting events. The first event (Juvenile Netting) is aimed at removing juvenile and some subadult lake trout throughout the two deep (>60 ft) basins of Swan Lake. This removal is carried out using small-mesh (1.5 – 2.75 inch stretch) gill nets, set by professional fisheries contractors over a three-week period in late August. This netting is conducted during a time in which most adult bull trout are upstream in the Swan River drainage in preparation for fall spawning and also occurs during the period in which Swan Lake is thermally stratified. Netting occurs only below the thermocline (>60 ft), in order to reduce incidental bycatch of bull trout and other fish species which occupy shallower depths.

Since 2009, netting for juvenile lake trout has been contracted to Hickey Brothers Research of Baileys Harbor, Wisconsin. Each year the boat has been cleaned and disinfected following a Hazard Analysis and Critical Control Point Plan (HACCP) to minimize the risk of spreading aquatic invasive species. The boat is inspected annually by FWP personnel prior to entering Swan Lake to ensure proper cleaning procedures have been followed.

Juvenile netting took place from August 10-28, 2015 consistent with the period fished since 2012. Prior to 2015 the contract with the Hickey Brothers always provided 30 lifts, with a lift being described as an event in which nets are set and retrieved. Insight gained over the past seven years revealed that the schedule of netting twice daily was exhausting crews and creating potentially dangerous working conditions. Therefore, in 2015, the schedule was adjusted to provide 22 lifts total, where every other day the nets would be set in the evening and retrieved the next morning. However, with those evening nets being left out for a longer duration, total soak time (net-hours) was similar to previous years despite the reduction in lifts. The number of net panels set has varied since the beginning, as more panels of small mesh net were set to increase the catch of juvenile lake trout (Table 1). Although the number of net panels has varied since inception of the project, the locations of the nets have remained constant.

Table 1: Dates and numbers of nets set for juvenile netting 2009-2015.

Year	Netting Dates	# Lifts	# 900' Nets	Net-hours
2009	Aug 24-Sept 11	30	248	1,946
2010	Aug 23-Sept 10	30	311	2,436
2011	Aug 22-Sept 9	30	399	3,173
2012	Aug 13-Aug 31	30	382	2,130
2013	Aug 11-Aug 30	30	347	2,059
2014	Aug 10-Aug 29	30	354	2,007
2015	Aug 10-Aug 28	22	255	1,965

The second netting event (Spawner Netting) is directed at removal of adult lake trout during spawning and thus is targeted to directly affect further recruitment. This portion of the project is carried out largely by SVBTWG members (with contractor assistance) and takes place during the month of October. Large-mesh gill nets (4.5 – 5 inch stretch) are set at night and during early morning hours, along spawning areas. Netting for spawning lake trout in 2015 was conducted from October 5-23, with nets being set and lifted twice daily, Monday-Friday. While netting did not occur twice every day (Friday afternoons, Saturdays, Sundays, and Monday mornings were not fished), the schedule and subsequent effort was similar to previous years of the project.

An acoustic telemetry study was initiated by FWP in 2014 and continued in 2015. Spawning behavior had been previously documented using acoustic telemetry in 2007-2008, identifying locations where adult lake trout could be targeted using gill nets (Cox 2010). After five years of gillnetting, adult lake trout movements were reevaluated to identify any changes in spawning location and behavior. Thirty-two adult lake trout captured using gill nets were tagged with two-year acoustic transmitters in August 2014. Tags recovered by anglers and netting were reused in 2015 to implant another 16 mature lake trout. Both years, fish were tracked by boat four to eight times per month prior to October and November. During lake trout spawning season (early October through mid November), fish were tracked four to five days per week. Crews concurrently gillnetting for spawning adults in October used fish locations to inform a subset of netting locations.

Results and Discussion

Juvenile Netting

A total of 5,733 lake trout ranging in total length from 6-22 inches were removed during the 2015 juvenile netting period (Figure 2). This represented a slight decrease from 2014 and a fourth year of continued decrease since 2012. The length frequency distribution of lake trout caught during the juvenile netting period continues to be heavily skewed toward smaller fish, a result of targeting areas containing high density juvenile lake trout and fishing smaller mesh nets (Figure 3). The majority of the juvenile lake trout catch is composed of age-3 and age-4 lake trout (Cox 2010). Incidental catch of other fish species during juvenile netting continues to be relatively low (Table 2).

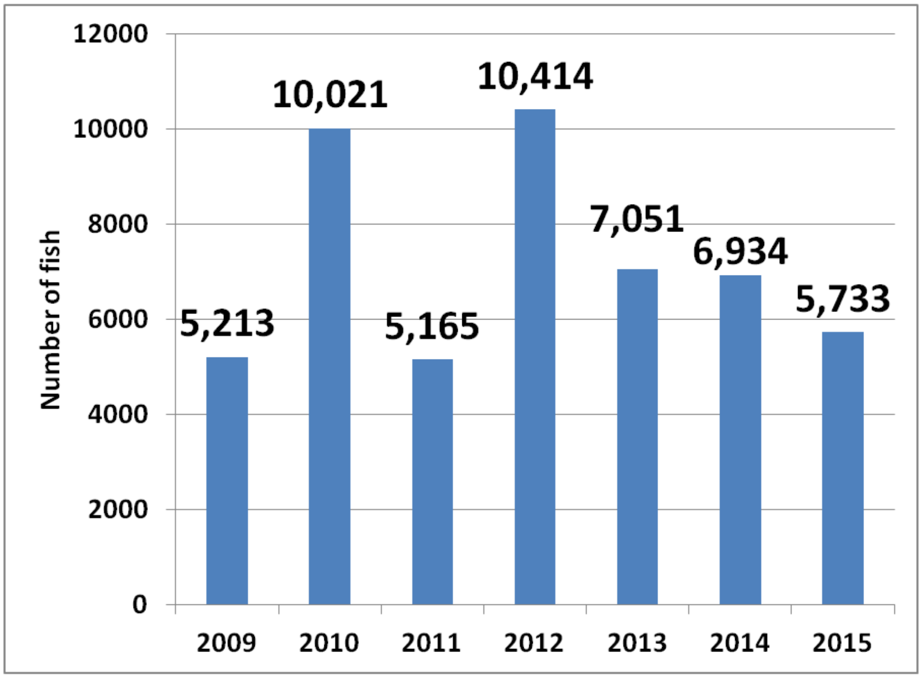

Figure 1: Total number of lake trout removed during juvenile netting 2009-2015.

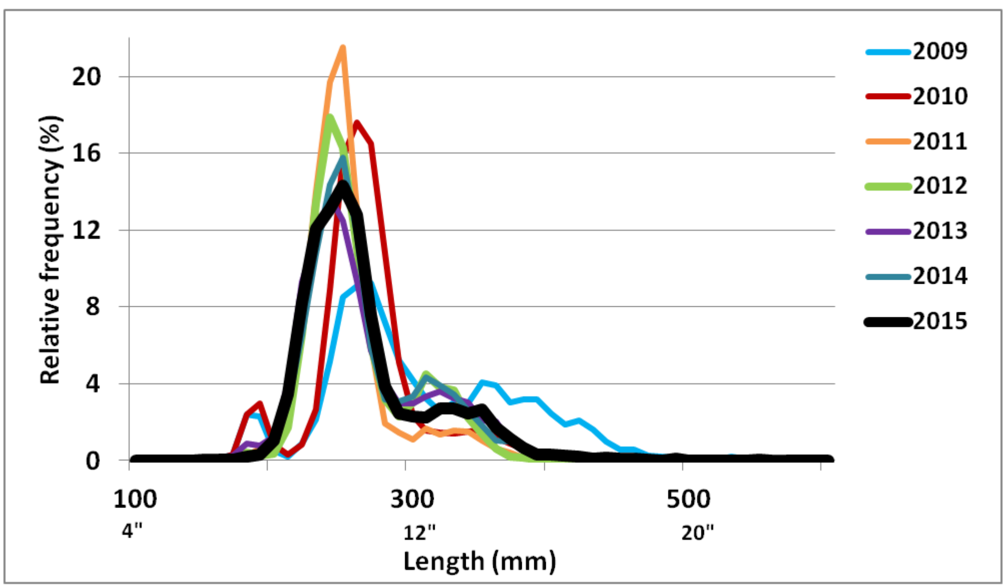

Figure 2: Relative length frequency of lake trout less than 500 mm (20 inches) total length caught during juvenile netting in Swan Lake 2009-2015.

Table 2: Bycatch of non-target fish species captured during juvenile and (spawner) netting events 2009-2015. Abbreviations are: BULL (bull trout), KOK (kokanee), MWF (mountain whitefish), PWF (pygmy whitefish), LNSU (longnose sucker), NPM (northern pikeminnow), CSU (largescale sucker), RBT (rainbow trout), PIKE (northern pike). Most fish were released alive.

Species	2009	2010	2011	2012	2013	2014	2015
BULL	238 (26)	212 (87)	237 (104)	334 (103)	168 (135)	146 (161)	74 (174)
KOK	205 (23)	414 (110)	159 (46)	521 (114)	388 (300)	138 (431)	166 (76)
MWF	107 (0)	28 (5)	31 (2)	67 (0)	104 (2)	93 (4)	15 (1)
PWF	139 (0)	63 (0)	9 (0)	79 (0)	27 (0)	11 (0)	28 (0)
LNSU	86 (50)	49 (306)	65 (145)	17 (207)	7 (157)	31 (213)	3 (234)
NPM	27 (36)	14 (136)	31 (131)	2 (68)	1 (132)	4 (147)	0 (141)
CSU	0 (58)	0 (109)	0 (111)	0 (54)	0 (96)	0 (147)	1 (134)
RBT	6 (3)	5 (10)	7 (11)	0 (11)	1 (11)	6 (16)	4 (19)
PIKE	0 (2)	0 (0)	0 (7)	0 (2)	1 (7)	0 (3)	0 (8)

Acoustic Telemetry

Thirty-two adult lake trout captured using gill nets were tagged with two-year acoustic transmitters in August 2014. By the end of the 2014 tracking season, 11 tagged fish remained alive in Swan Lake. Of the 21 tagged fish not remaining alive, 13 were caught in gill nets, 6 died during the tracking period, and 2 were not relocated after tagging. One additional fish was lost during winter between 2014 and September 2015, three were angled, leaving seven fish at the beginning of the 2015 tracking season. A total of 16 tags were redeployed in lake trout during August 2015, yielding a total of 23 tagged fish by September 2015. By the end of the 2015 tracking season, eight fish had been caught in gill nets, three had died, and one was not relocated after tagging.

Tracking results from both 2014 and 2015 indicate that although lake trout in Swan Lake continued using sites previously identified, locations less frequently used in the past attracted the majority of spawning adults in both years (Figure 3). Further, fish tagged in 2014 and 2015 were rarely relocated in the area predominantly used by tagged lake trout during 2007-2008, though differences exist between tracking methodologies of the two projects. Gillnetting on tagged fish aggregations in 2014 and 2015 also produced catch rates about twice that of the historically targeted location during those years. Of the four fish tracked during both 2014 and 2015, spawning site fidelity was observed (Figure 4). This study demonstrates the dynamic nature of lake trout behavior and underscores the broader importance of reevaluating assumptions through time in order to maximize conservation efforts and inform fisheries management.

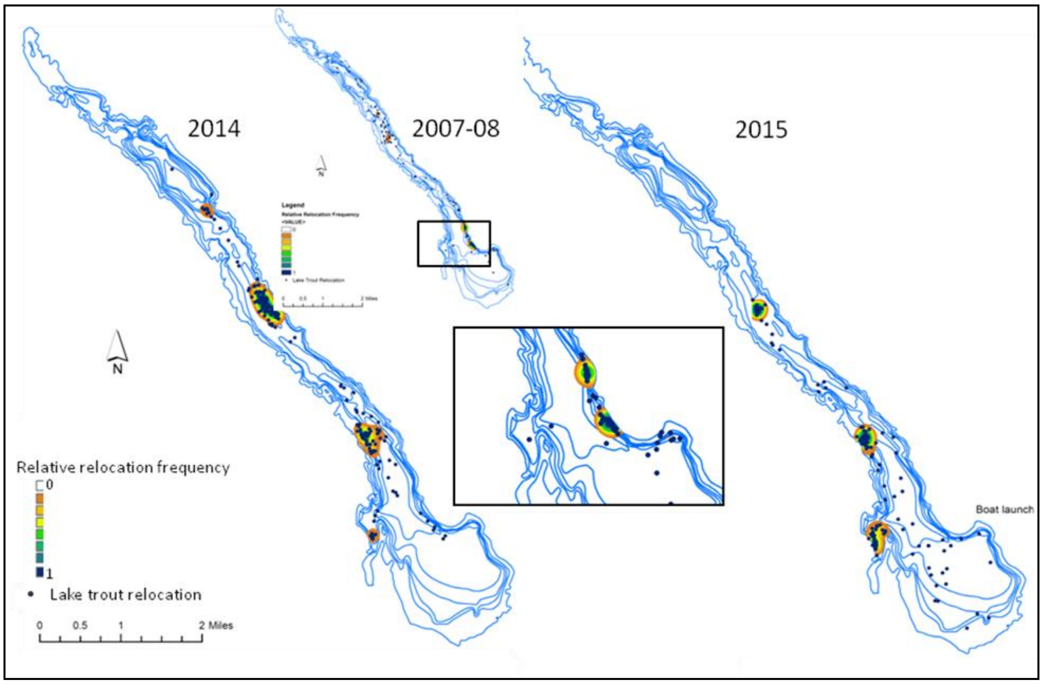

Figure 3: Location densities of adult lake trout implanted with acoustic telemetry tags during the 2007 and 2008 (adapted from Cox 2010), 2014, and 2015 spawning periods (October 20 through November 10) in Swan Lake. Relative relocation frequency describes the proportion of all fish locations throughout the spawning period.

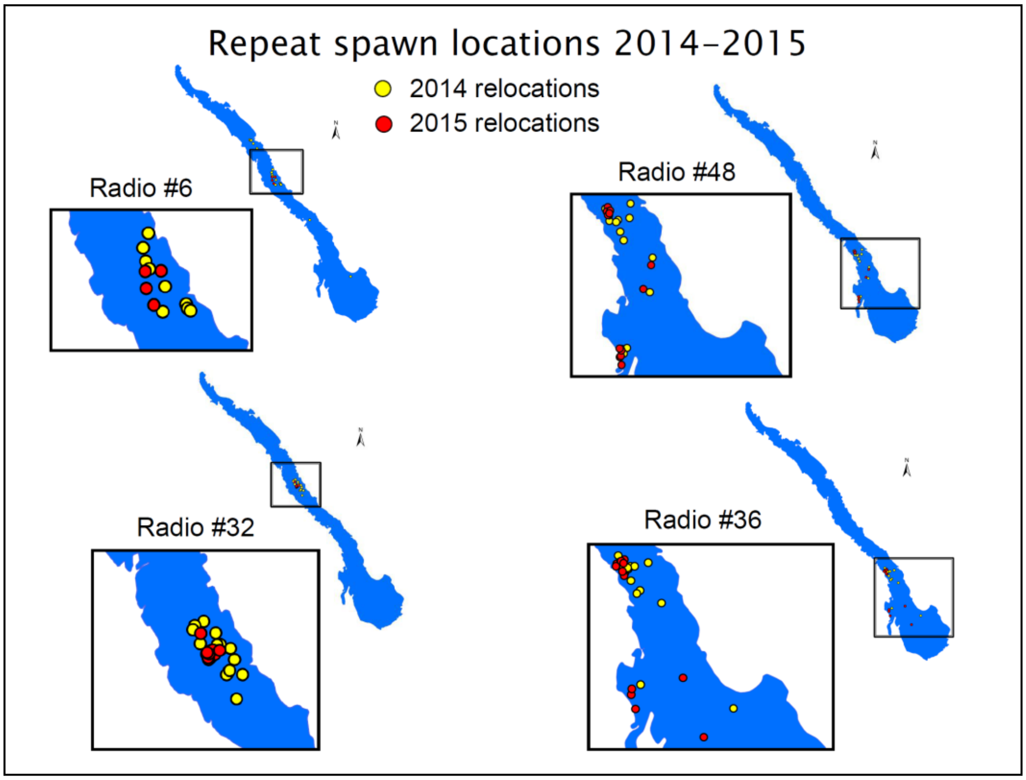

Figure 4: Locations of adult lake trout implanted with acoustic telemetry tags during the spawning period (October 20 through November 10) during both 2014 and 2015 in Swan Lake, Montana.

Spawner Netting

The removal of adult lake trout to directly reduce recruitment continues to be an important aspect of the project. Adult lake trout catch in 2015 was 467 fish, which represents the second year of increased catch (Figure 5). Similar to the 2014 spawner netting season, netting in 2015 was also accompanied by a second crew tracking tagged adult lake trout. In order to maintain netting effort on the traditional spawning area and maintain consistent data, the majority of nets (115) set for adult lake trout were placed along the same area fished from 2009-2013 (Highway 83 road cut). The remainder of the netting effort (42 nets) was placed in areas informed by acoustic telemetry. Consistent with 2014, gillnetting on exploratory locations in 2015 produced considerably higher catch rates than those of the historically targeted location, with 301 fish caught along the road cut and 166 fish caught along the newly identified areas.

Relative length frequency of lake trout captured along the Highway 83 road cut (Traditional) during spawner netting continues to be skewed to smaller individuals, suggesting that previous efforts effectively exploited larger, older fish from that area (Figure 6). Similarly, after netting over newly identified areas (Exploratory) in 2014, the 2015 relative length frequency in those areas is also shifting toward smaller individuals. This further reinforces the notion that targeted netting can affect the age distribution of adult fish in known spawning (Figure 7). Bycatch of fish species other than lake trout during spawner netting was similar to past years (Table 2).

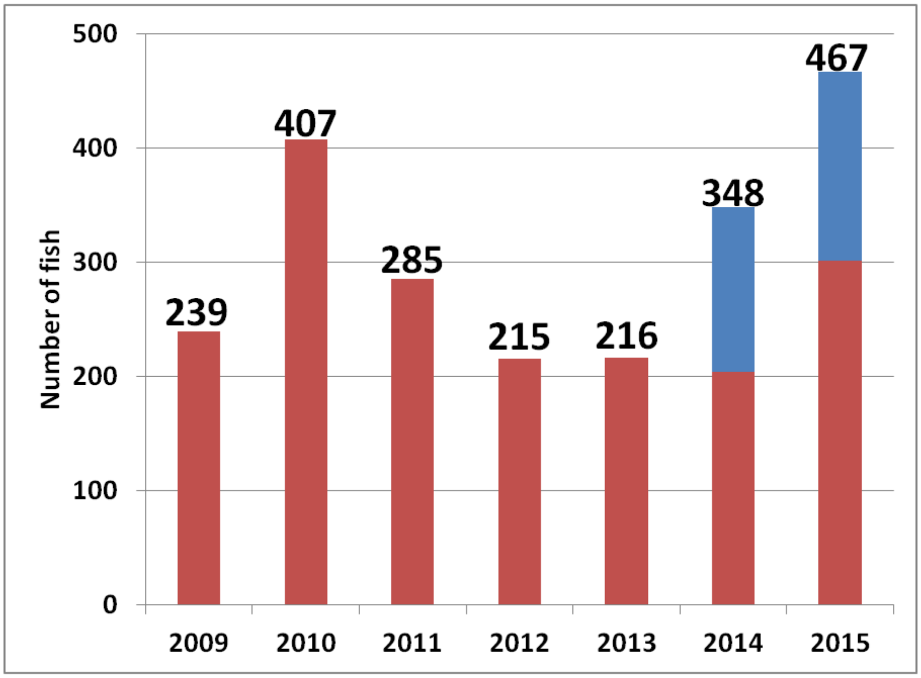

Figure 5: Total number of lake trout removed during spawner netting in Swan Lake 2009-2015. The red bars represent adult lake trout removed along the "traditional" spawning area and the blue bars represent adult lake trout removed over "exploratory" areas identified during 2014-2015 telemetry efforts.

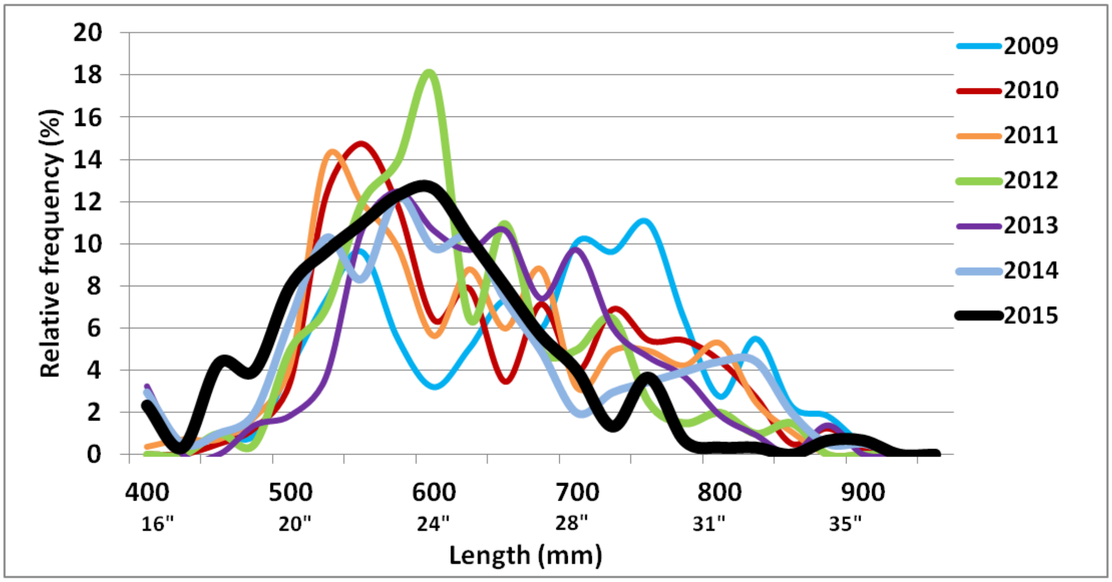

Figure 6: Relative length frequency of lake trout captured during spawner netting 2009-2015.

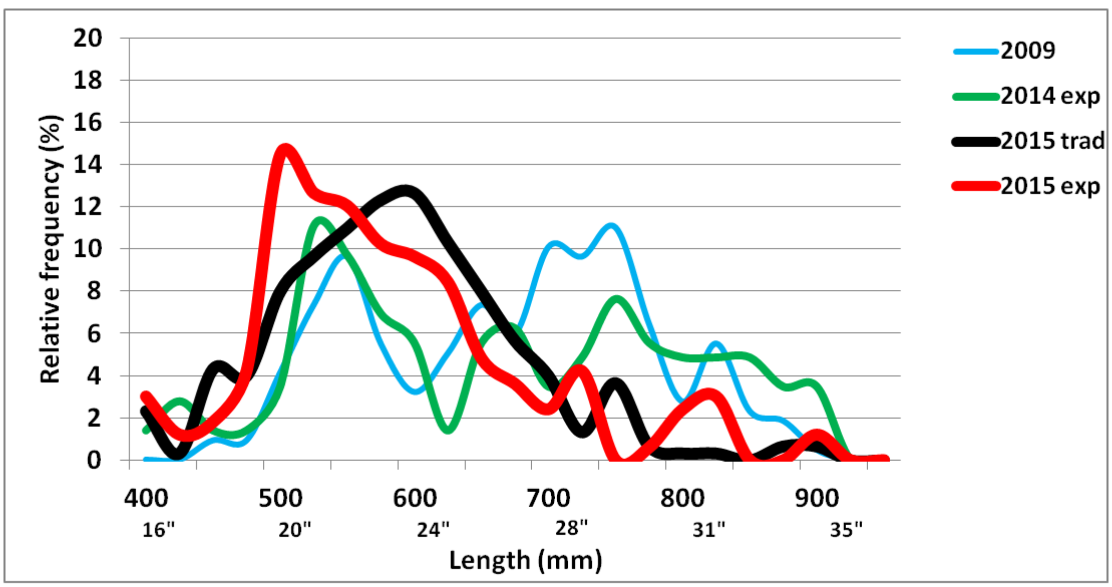

Figure 7: Relative length frequency of adult lake trout removed over "traditional" spawning areas in 2009 (blue) and 2015 (black), and "exploratory" spawning areas in 2014 (green) and 2015 (red).

Bycatch of Bull Trout

As in the past, bull trout bycatch continues to be closely monitored. Since the 2009 inception of the project, reducing the amount of bull trout bycatch and minimizing the mortality rates of inadvertently caught bull trout has been a priority.

A total of 260 bull trout were inadvertently captured as bycatch during netting activities in 2015 (blue bars - Figure 8). The juvenile netting period resulted in only 74 bull trout being captured with 33 direct mortalities (44.6%). This perpetuates a declining trend, since 2012, in numbers of bull trout captured (and killed) during juvenile netting. The favorable trend is no doubt partially a result of ongoing efforts to adjust mesh sizes and further refine methodology to avoid netting in depths and locations where bull trout bycatch was more concentrated. However, since numbers of bull trout caught during juvenile netting have declined by nearly 80% from the 2012 high, despite use of similar methods and consistent effort, additional examination as to the cause of the decline is warranted (see later in this report).

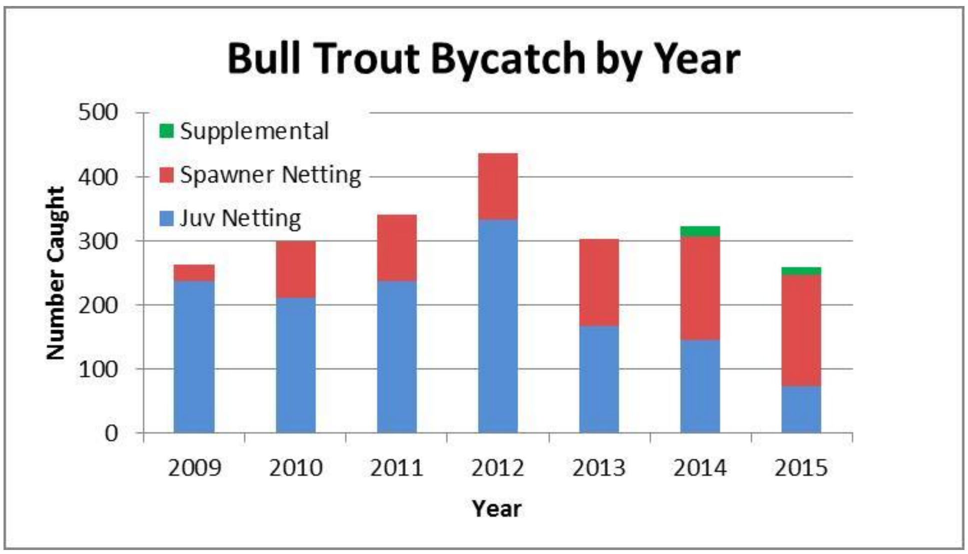

Figure 8: Bull Trout bycatch captured in juvenile and spawner netting programs on Swan Lake 2009-2015.

The traditional spawner netting period in October added another 174 bull trout to the bull trout bycatch total. While bycatch of bull trout during juvenile netting has been declining in recent years, the bycatch of bull trout during spawner netting in October has been increasing (red bars – Figure 8). This is partially a result of increasing effort (more nets and longer soak times) as well as additional targeting in 2014 and 2015 of a previously unexploited lake trout spawning ground on the north end of the lake. Diversifying the spawner net locations results in more net nights fished in previously unexploited waters and the bycatch of bull trout appears to have risen accordingly. Of the 174 bull trout captured during spawner netting, 74 were direct mortalities (42.5%).

During the 2014 and 2015 juvenile netting, we also set an additional group of large mesh nets in deep water near known kokanee concentrations to capture large adult lake trout for sonic tag implantation. This effort, termed “Supplemental Netting”, was outside the normal study protocol. During that expanded effort we caught an additional 17 bull trout in 2014 and an additional 12 bull trout in 2015 (depicted in green – Figure 8).

As indicated, distribution of mesh size and netting methodology has been continually updated, in part to further minimize bull trout bycatch, while maintaining or improving lake trout capture efficiency. In 2015, for the first time, we compiled and examined bull trout catch rates empirically, in order to assess whether past impressions derived anecdotally from our observations were accurate. Catch per unit effort (CPUE) was measured as the number of bull trout captured per 900’ of mesh panel (characterized as a “box”). While there was annual variation in mean CPUE (range in the mean is represented by limits of colored bars in Figure 9), there was surprising consistency from year to year. The total (7 year) bull trout CPUE in juvenile mesh sizes (1.50” – 3.00”) ranged from 0.54-0.70 fish per box (triangles – Figure 9). CPUE gradually increased with increasing mesh size for 1.5”-2.25” stretch and then gradually decreased for 2.5”-3.0” stretch. However, through the years 2009-2015, diminishing numbers and distribution of 2.5”-3.0” mesh nets were used, as low rates of lake trout capture increasingly failed to justify the amount of bull trout bycatch.

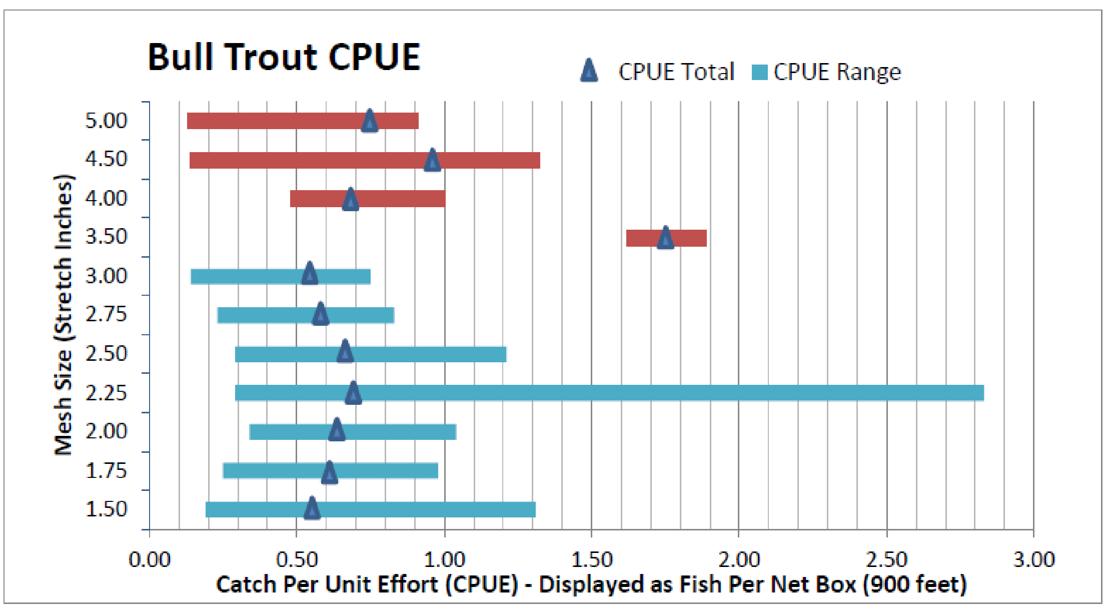

Figure 9: Comparison of bull trout CPUE (fish per 900 foot box) plotted against mesh size in Swan Lake in 2009-2015. Colored bars represent range of annual variability in mean CPUE during juvenile netting (blue) and spawner netting (red). Total CPUE by mesh size, for 2009-2015 combined data, is indicated by triangle markers.

Average CPUE (Figure 9) was higher for spawner netting (0.75-0.96 bull trout per box). This was attributed, at least in part, to the fact that spawner nets were set much later than juvenile nets (October vs. August) when most adult bull trout had returned to the lake from the upriver spawning grounds. The surface waters were also cooler in October, and nets were set much shallower, typically under 60 feet. For these reasons, the bull trout CPUE during spawner netting and juvenile netting are not directly comparable. The 3.5” and 4.0” stretch spawner nets were only used in 2009-2012, and then abandoned after it was determined that targeted adult lake trout (especially large females) were efficiently captured in 4.5” and 5” stretch mesh, while sustaining lower bycatch of non-target species, including bull trout. The 3.5” mesh showed particularly high bull trout bycatch rates in the two years (2011-2012) it was used (Figure 9).

As in the past, despite efforts to reduce mortality of accidentally netted bull trout, roughly 40% of these fish did not survive, in both types of netting. Research led by the USFWS (Rosenthal and Fredenberg 2014) suggests that total bycatch mortality is likely higher than what is directly observed, as some released bull trout may swim off but perish later from injuries sustained in the nets. Therefore, we empirically derived an estimated mortality rate of 53.6% and have applied that value to gillnetted bull trout estimates throughout this project. Applying this formula, the estimated bycatch mortality of bull trout in 2015 was calculated at 139 fish (74 + 174 + 12 = 260 X .536 = 139). Bull trout bycatch from 2009-2014 averaged 328 fish per year, resulting in estimated average annual mortality of 176 fish per year. Thus, in 2015, bull trout bycatch and calculated mortality was roughly 20% lower than the recent past. In fact, 2015 bull trout bycatch was the lowest to date during the seven years of this project.

At least 39 bull trout of the total 260 captured in 2015 (a minimum of 15.0%) had been previously caught during this project and implanted with PIT Tags. This proportion of marked fish was nearly identical to 2014 results. This information once again demonstrates that some long-term survival of gillnetted bull trout does occur. Valuable insight on growth and survival of PIT-tagged fish continues to be accumulated. We are investigating ways to use this recapture information to generate population demographic insights. Bull trout redd counts (i.e., spawning beds) in the Swan drainage in 2015 were down slightly (described elsewhere in this report), but largely consistent with 2014 results.
As mentioned, a consistent declining trend in juvenile bull trout gillnet bycatch occurred for the years 2012-2015. This was independently reflected in each of the four smallest mesh sizes (1.5”-2.25”). We are examining this data further, in an effort to determine whether population decline is strongly indicated. A declining bull trout population in Swan Lake should show up first in the smaller mesh sizes.

We examined the composite juvenile bull trout abundance index, compiled annually for four major Swan bull trout streams (Elk, Lion, Goat, and Squeezer). It is derived by conducting summer population estimates of age-1 and older juvenile bull trout in known high quality spawning and rearing habitat (primarily age-1+ and 2+ fish) and then averaging those results across the four sample sites. Since 2001, the index has shown, at worst, a slightly declining trend (Figure 10), and this does not portend the recent, much steeper drop we observed in Swan Lake juvenile gillnet catch, though effort during juvenile netting has also declined in recent years. In fact, the recent trend in the juvenile abundance index (since a low in 2011) shows more of a positive trend. This could provide support for the hypothesis that the juvenile and subadult bull trout population decline that we observed in Swan Lake in 2015 is due to negative interaction with nonnative species in the lake (competition or predation effects) and/or impacts from gillnetting bycatch rather than from a lack of recruitment. However, the known rates of gillnet bycatch do not equate to levels sufficient to cause a lakewide population decline. More analysis is warranted as the juvenile abundance index could also be misleading, as it is uncertain if this survey is truly reflecting the overall tributary densities.

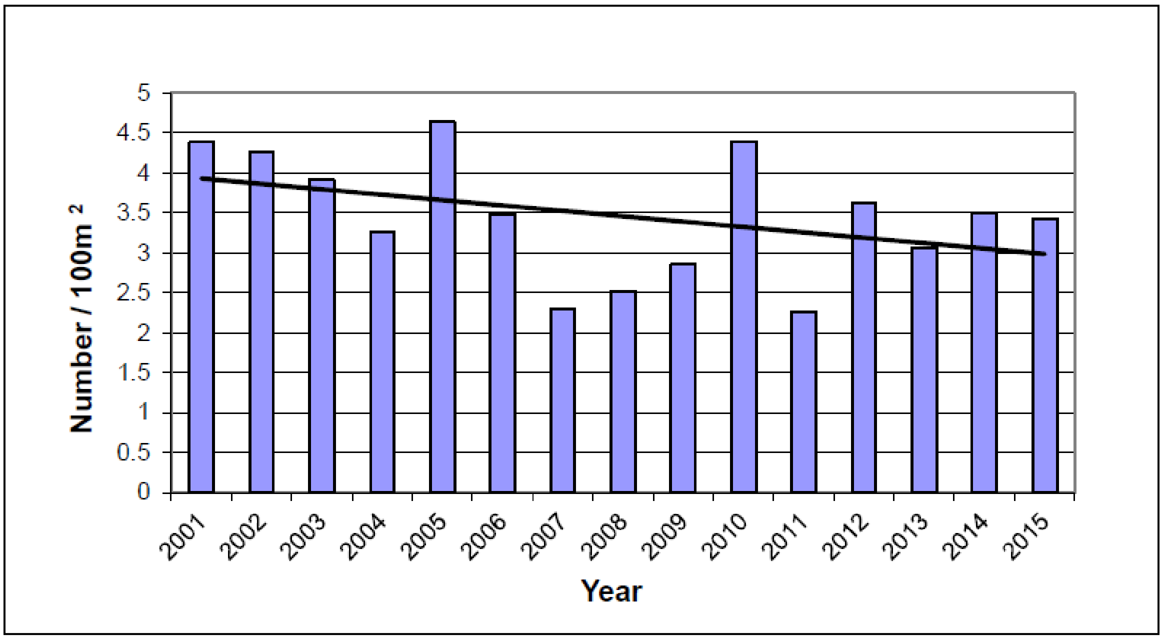

Figure 10: Composite juvenile bull trout abundance index (age 1 and older) for Swan Lake spawning and rearing tributaries 2001-2015.

Kokanee

Nonnative kokanee salmon are another important fish species in Swan Lake. Kokanee provide a popular angling opportunity in Swan Lake for both ice and open-water fishermen and represent an important food resource for adult bull trout and lake trout. Case histories from surrounding area lakes have demonstrated that the combination of *Mysis*, kokanee, bull trout, and lake trout typically results in decreased abundance of bull trout and elimination of kokanee. Therefore, kokanee represent a potentially sensitive indicator of lake trout abundance, as increases in kokanee abundance may suggest a reduction in predatory lake trout density.

Kokanee abundance in Swan Lake is monitored annually through redd counts along an index reach of Swan Lake shoreline. Kokanee spawner abundance had declined from 2005-2011 and then incrementally increased reaching 739 redds in 2014 (Figure 11). Kokanee were last stocked in Swan Lake in 2005, and at least some of the decline from 2005-2011 could partially be a result of the cessation of planting. The 2015 survey revealed a total of 323 redds. However, this decrease in redds should be viewed with caution, as weather conditions during the 2015 survey made counting difficult and some redds may not have been seen. Concomitant with the decrease in kokanee redd numbers, the total number of kokanee caught as bycatch in both netting periods also decreased in 2015 (Table 2). This observed decline may be reason for concern, as declines could indicate that netting efforts have been insufficient to reduce predation levels from lake trout.

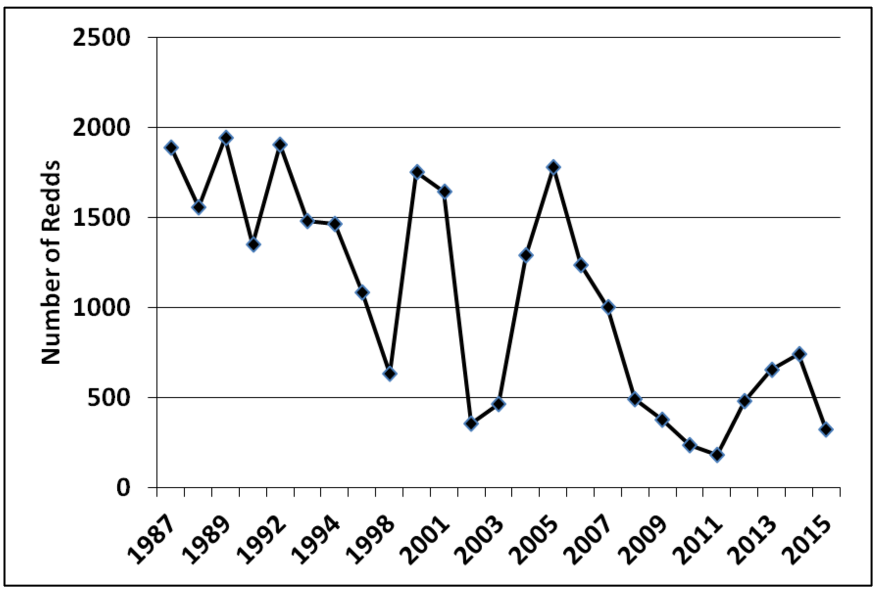

Figure 11: Kokanee redd count data from Swan Lake 1987-2015.

Length frequency analysis of kokanee inadvertently captured during the 2015 netting reveals no missing age classes in Swan Lake (Figure 12). Kokanee in the bycatch ranged from 6.5-18.2 inches (165-463 mm) with a strong peak of 225 mm (~9 in) probably representing ages 2+ kokanee. Kokanee smaller than 7 inches were likely not captured as a result of the mesh sizes used for the netting. While no missing age classes were observed, there is a noticeable reduction in the age 3+ kokanee when compared to the 2014 data (Figure 12). Previously we noted that in 2014 the age 2+ peak in the length frequency was less pronounced and could represent a weak year class coming through the population. Therefore the weak year class of age 3+ fish in 2015 could just be that cohort coming through. Changes in relative length frequency will be closely followed in upcoming years.

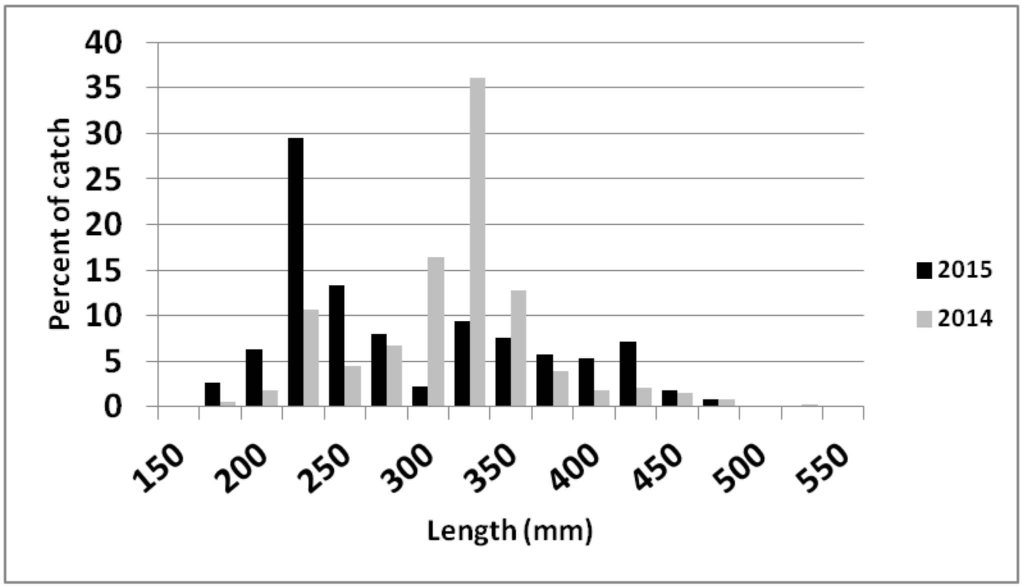

Figure 12: Length frequency of kokanee captured during both juvenile and spawner netting in 2014 and 2015.

Evaluation Criteria

This lake trout removal project in Swan Lake was initiated to evaluate the efficacy of using gill nets to control the expansion of the lake trout population and simultaneously benefit bull trout and kokanee. Criteria to evaluate this project were outlined in the original 2009 EA, and continue to be monitored throughout the study. A previous review of these criteria with regard to the 2009-2011 efforts can be found in the 3-year Summary Report (Rosenthal et al. 2012). A subsequent comprehensive review of the criteria will be discussed upon the completion of the project in 2016.

Netting mortality of lake trout during juvenile netting continues to be evaluated annually. Total annual lake trout mortality rates in excess of 50% have been shown to cause population declines in traditional lake trout fisheries (Healey 1978). In Swan Lake, conservative estimates of exploitation (mortality) of age-3 and age-4 lake trout have exceeded 50% in most years since 2009, typically approaching 60-70% (Figure 13). These modeled estimates are most accurate for age-3 and age-4 fish, as they are the most vulnerable to the nets being deployed and the locations being sampled. Unfortunately these modeled exploitation rates have not translated to a declining lake trout population, and the model result should therefore be viewed with some caution. Behavioral changes in the lake trout associated with the netting activity could potentially affect catchability and influence population estimates. This further reinforces the notion that model validation should be examined in future efforts.

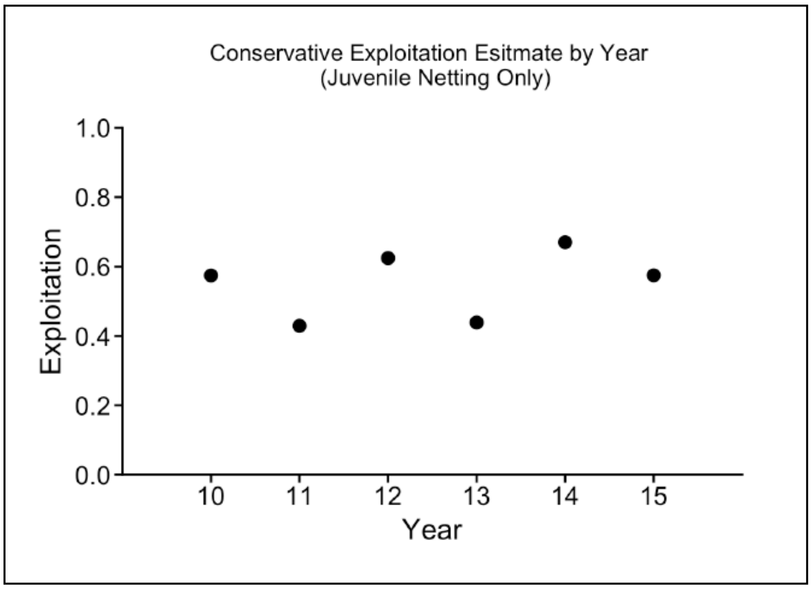

Figure 13: Modeled exploitation rates for Juvenile Netting 2010-2015.

Lake trout catch per unit effort during juvenile netting activities has been consistent since 2011 (Figure 14). This lack of trend in catch per effort suggests that spawner netting efforts have been insufficient to affect recruitment to a point in which the lake trout population is declining. Similarly, lake trout catch per effort in 4.5” and 5.0” mesh nets set along the traditional spawning area show no significant decline (Figures 15 and 16). This lack of a significant declining trend suggests that mortality rates from juvenile netting have not been sufficient to reduce recruitment of adult lake trout to the spawning grounds.

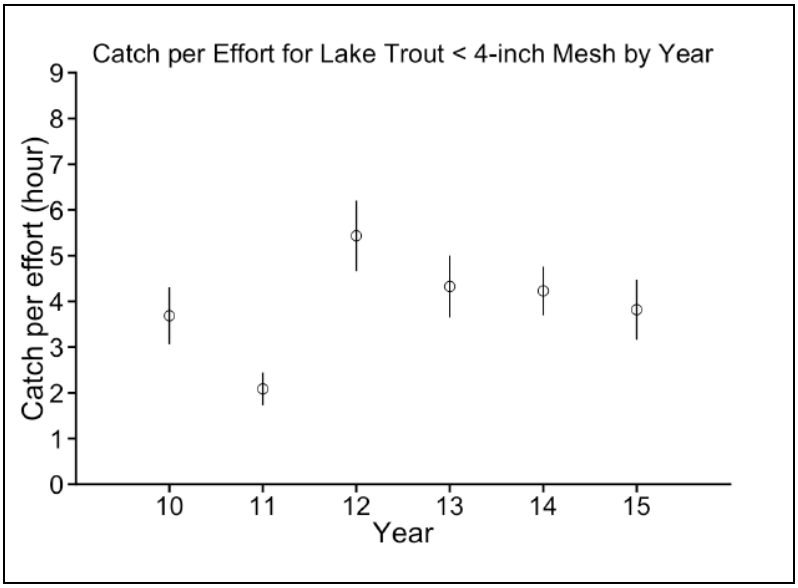

Figure 14: Lake trout catch per effort during juvenile netting 2010-2015.

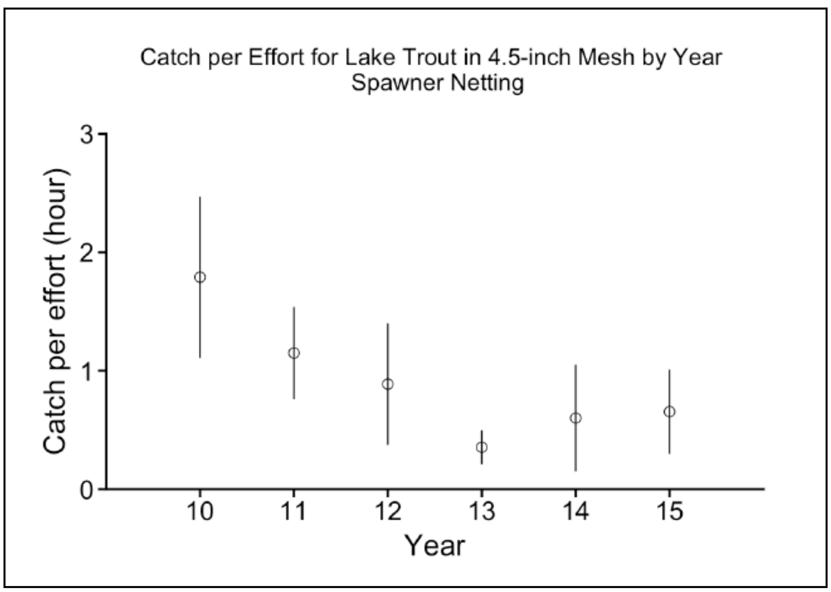

Figure 15: Lake trout catch per effort in 4.5" (stretch) mesh nets set along "traditional" spawning areas 2010-2015.

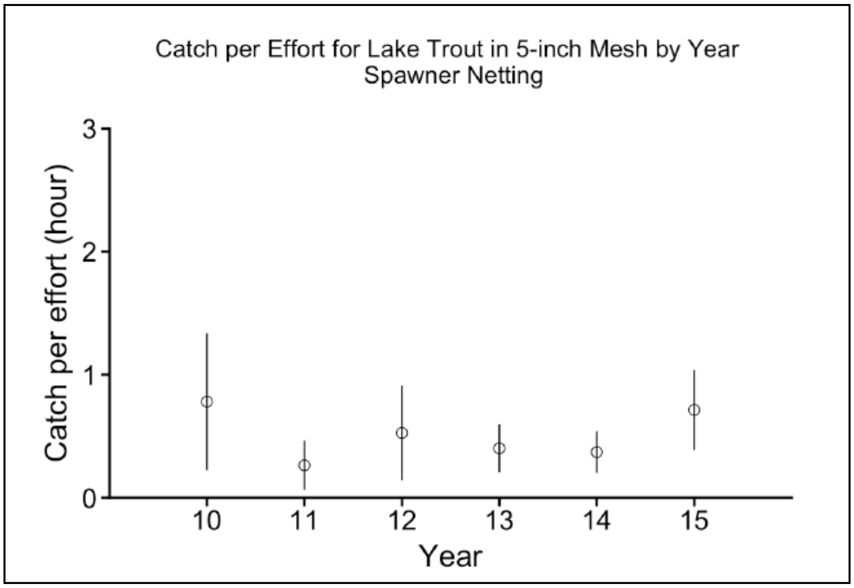

Figure 16: Lake trout catch per effort in 5.0” (stretch) mesh nets set along “traditional” spawning areas 2010-2015.

Trends associated with the bull trout population continue to be monitored as part of the success criteria. Maintaining or increasing the population of bull trout is something the SVBTWG has been working toward since their creation in 2005. Adult bull trout numbers are monitored annually through redd counts. Bull trout redd counts have been counted in four index tributaries (Elk, Lion, Goat, and Squeezer) since 1982 (Figure 17). The 2015 index count of 244 redds is 34% below the long term average of 370 redds. While being below the long term average is not the desired condition, this year’s results were consistent with those of the last six years (range 201-268). This lower, seemingly stable level will be evaluated in upcoming years to assist in determining the effectiveness of the netting project.

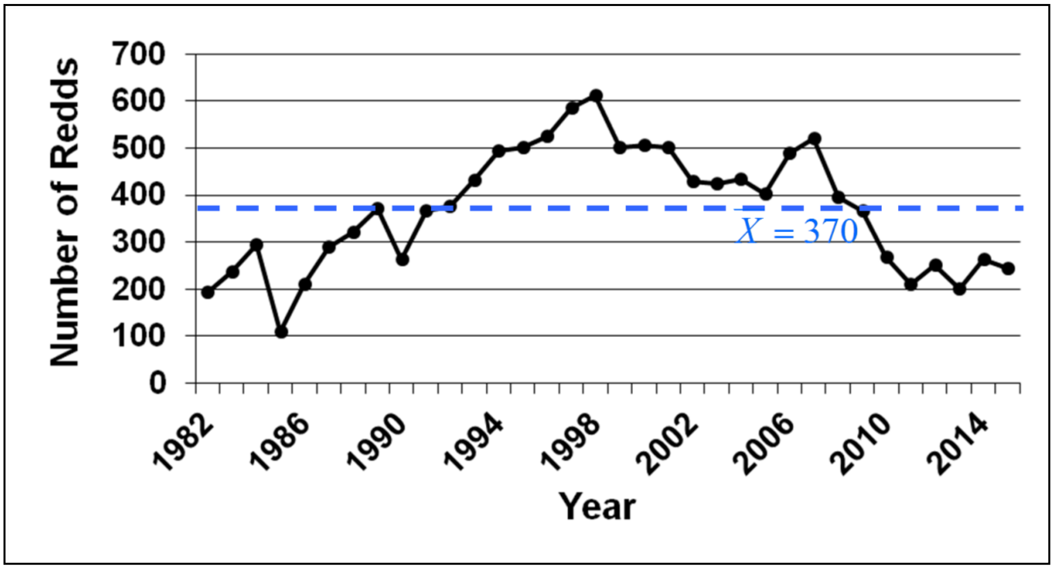

Figure 17: Bull trout redd counts in index streams of the Swan River drainage 1982-2015.

2016 Plans

Netting in 2016 will follow the same schedule as 2015. Juvenile netting will be conducted the last three weeks in August and will follow the modified schedule from 2014. This modified schedule reduced the number of lifts by 8 lifts, but provided a similar total soak time to previous efforts. Alternating this routine with the standardized past approach will provide enough consistency for data comparisons. Spawner Netting will continue to follow the same schedule as 2009-2015.

Monitoring of the other aquatic organisms will also continue in the Swan Lake system. Annual *Mysis* sampling occurs in early June, bull trout juvenile estimates in select spawning tributaries occurs in August, bull trout redd counts are conducted in October, and kokanee redd counts are completed in early December. Additionally, spring gill net monitoring will be conducted in Swan Lake, Lindbergh Lake, and Holland Lake to look at trends of all fish species.

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