FISHERY MANAGEMENT INVESTIGATIONS

IDAHO DEPARTMENT OF FISH AND GAME

FISHERY MANAGEMENT ANNUAL REPORT

Virgil Moore, Director

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2011 Southwest Region – McCall Fishery Management Report

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MOUNTAIN LAKES SURVEY

ABSTRACT

We collected fin clips from Loon Lake kokanee *Oncorhynchus nerka kennerlyi* spawners for genetic analysis to help determine origin of these fish. There were no recorded kokanee introductions into Loon Lake. These fish were early (August, September) stream spawners. Early results indicate that this kokanee population is unique genetically and is most likely endemic.

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INTRODUCTION

Loon Lake in the Secesh River drainage has a viable kokanee population of unknown origin. There are no recorded kokanee *Oncorhynchus nerka kennerlyi* introductions or stockings into Loon Lake. To help determine the origin of these fish we collected kokanee spawners and fin clips for genetic analysis in 2011.

METHODS

Kokanee spawners were located in Loon Creek, upstream of Loon Lake. Fish were dip netted out of the stream and measured to the nearest 1 mm. We then collected a 6mm by 6mm pelvic fin clip from each fish. Fin clips were preserved in a 100% ethanol preservative. Samples were sent to Eric Iwamoto with the National Marine Fisheries Service (NMFS) genetics lab in Seattle Washington for sequencing.

RESULTS

We collected fin clips from 22 spawning kokanee in Loon Creek on September 9, 2011. The furthest upstream fish were found approximately 200 m below a large water slide barrier at the GPS coordinates: 45.14222 degrees N, 115.86742 degrees W (WGS84). This was approximately 3,000 meters direct line from the Loon Creek mouth on Loon Lake. Spawning kokanee were located downstream of this site for some distance but the extent of downstream distribution was not determined. No fish were observed in the first 1500 m above Loon Lake. Kokanee spawners averaged 190 mm total length. Results of the genetics evaluation are presented here as an excerpt from an e-mail from Eric Iwamoto received after completing the initial analysis.

> “I'm no expert but my best guess is that they are probably endemic. I just ran the FST's and they are consistently large (0.19 to .43) with most of them in the 0.3 range. This would indicate that they aren't really related to anybody as far as frequencies go but they don't have any unique alleles so they aren't a "novel" population but one that was likely derived from Columbia River stocks some time ago. When I do a neighbor-joining tree, they tend to stick with the other Snake River populations which is good. I don't recall much stocking from within the Snake River Basin so their relationship is probably what you would expect from a natural population that was there for a long time. The heterozygosity for Loon Lake is 0.39 which is even below that of Warm Lake and Redfish Lake (0.5, 0.48) so it is probably a small, isolated population which would be expected given the size and location of Loon Lake.”

The neighbor-joining tree is presented in Figure 1.

MANAGEMENT RECOMMENDATION

Continue current Loon Lake management strategy as a general regulations mountain lake.

2011 Southwest Region – McCall Fishery Management Report

LOWLAND LAKES

ABSTRACT

We completed gill net surveys on Lost Valley Reservoir, Upper Payette Lake, Goose Lake and Granite Lake in September 2011. All these lakes have a long history of catchable size rainbow trout *Oncorhynchus mykiss* stockings.

Little Payette Lake has always been a fairly poor fishery, due to its low productivity and relatively large populations of largescale suckers *Catostomus macrocheilus* and northern pikeminnow *Ptychocheilus oregonensis*. We investigated the feasibility of removing largescale sucker and northern pikeminnow from the lake utilizing merwin traps in 2010, and continued the investigations again in 2011. We collected a total of 142 northern pikeminnow greater than 250 mm and 238 largescale suckers greater than 250 mm. We completed a gillnetting survey as well and collected a total of seven kokanee, 71 largescale suckers, 100 northern pikeminnow, two rainbow trout, and seven smallmouth bass *Micropterus dolomieu*. Gillnetted northern pikeminnow averaged 185 mm and the majority of largescale suckers were greater than 450 mm

The Payette Lake kokanee *Oncorhynchus nerka kennerlyi* population was surveyed using hydroacoustic gear and techniques. The total kokanee estimate was 131,100. Kokanee observed in Payette Lake originate from both wild and hatchery origins, as such they overlap in size and age, making age class determinations difficult. Therefore, we estimated kokanee numbers by size class. Estimates were 79,400 natural fry, 34,700 size 2, 13,500 size 3, and 3,500 size 4.

We completed a lake trout creel survey on Payette Lake in May and June 2011. We estimated a catch of 1,345 lake trout with no reported harvest.

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OBJECTIVES

To conduct investigations and implement management strategies on lowland lakes and reservoirs to enhance, maintain, and protect McCall area fisheries. Monitor effectiveness of catchable-sized rainbow trout *Oncorhynchus mykiss* stockings in area lakes.

Catchable Rainbow Trout Stocked Lakes (Lost Valley Reservoir, Granite Lake, Goose Lake, Payette Lake, and Upper Payette Lake)

Introduction

Lost Valley Reservoir, Granite Lake, Goose Lake and Upper Payette Lake all have a long history of being stocked with catchable size rainbow trout to maintain their fisheries. Granite, Goose, and Upper Payette Lakes have a management goal of maintaining minimum catch rates of 0.5 rainbow trout per hour utilizing hatchery reared catchable size trout (IDFG 2007). The Lost Valley Reservoir management goal is to maintain catch rates greater than 0.5 rainbow trout per hour for fish 254 mm to 406 mm in length. Because it had been several years since these lakes had been surveyed, we completed gill net surveys in 2011 to evaluate current status of these important fisheries.

Methods

Upper Payette, Granite, and Goose lakes were sampled using two sinking and two floating standard IDFG survey nets. Lost Valley Reservoir was sampled using only one sinking IDFG standard survey net due to the presence of large numbers of small yellow perch. Yellow perch *Perca flavescens* length frequencies were used determine age classes. Nets were set in the afternoon, fished all night, and then pulled the next morning. All fish collected were identified to species and measured to the nearest 1 mm.

Results

Lost Valley Reservoir was sampled on September 14, 2011 and was found to contain a large number of yellow perch in addition to stocked catchable size rainbow trout, wild rainbow trout and wild brook trout *Salvelinus fontinalis*. Stocked catchable size rainbow trout averaged 275 mm and no holdover stocked rainbow trout were observed. Length frequencies of all fish collected are presented in Table 1. We collected three age classes of yellow perch that averaged 160 mm, 215 mm, and 255 mm respectively.

We collected one redside shiner, *Richardsonius balteatus* 56 stocked catchable size rainbow trout averaging 265 mm, and one 650 mm westslope cutthroat trout or rainbow trout x cutthroat trout *Oncorhynchus clarki lewisi* hybrid from Granite Lake on September 15, 2011 (Table 1). Of the 56 rainbow trout, 15 (27%) appeared to be holdovers from the 2010 stocking, and averaged 309 mm.

We collected 74 brook trout and 69 rainbow trout (both stocked and wild) from Goose Lake (Table 1). Stocked catchable size rainbow trout averaged 270 mm and holdover rainbow trout averaged 340 mm. Brook trout ranged in size from 155 mm to 330 mm.

Upper Payette Lake was sampled on September 13, 2011 and we collected 88 largescale suckers *Catostomus macrocheilus*, three brook trout, one mountain whitefish *Prosopium williamsoni*, and 49 stocked catchable size rainbow trout. Catchable rainbow trout averaged 255 mm, and five holdover rainbows averaged 305 mm.

Discussion

Upper Payette, Granite and Goose Lakes probably met management goals in 2011. While no catch rate data was available, late season gill netting surveys indicated good numbers of catchable rainbow trout. Upper Payette Lake continued to have a significant largescale sucker population which has no obvious impacts to the put and take catchable rainbow trout fishery. Due to current funding reductions, we could reduce the number of fish stocked in these lakes and probably still meet management objectives.

Lost Valley Reservoir was partially meeting the size management objective, as we collected no rainbow trout greater than 309 mm total length. This would indicate that either fish greater than 309 mm were all harvested, or growth rates are slow. However, we know from past surveys that the size management objective is met in years immediately following yellow perch removal (Janssen et al. 2006).

The large numbers of yellow perch collected indicate a large and growing yellow perch population. The reservoir has a long history of stunted yellow perch populations and rotenone treatment cycles. The last treatment was completed in 2007 and is described by Janssen et al. (2009). Over the next one to two years the overabundance of yellow perch will result in poor survival and catch rates of stocked catchable size rainbow trout. Yellow perch growth will also decline rapidly as has happened historically. The reservoir should be treated with rotenone in the next two years to remove the unwanted yellow perch.

Management Recommendations

1. Complete rotenone treatment on Lost Valley in 2012 or 2013 to remove the unwanted, and soon to be stunted, yellow perch population. This will maximize rainbow trout growth.
2. Decrease stocking rates in Upper Payette, Granite and Goose Lakes due to funding issues, the cost of catchable size rainbow trout, and the abundance of stocked rainbow trout late in the year;
3. Continue monitoring and evaluation of Upper Payette, Granite and Goose Lakes with surveys again in five years.
4. Survey Lost Valley one to two years post rotenone treatment to determine if 254 mm to 406 mm fish are being produced.

Little Payette Lake Northern Pikeminnow and Largescale Sucker Removal

Introduction

Little Payette Lake has a long history as a "put and take" rainbow trout fishery. Historical data indicate that, with the exception of a couple periods following chemical renovation and fish stocking treatments, the lake has always been a fairly poor fishery due to its low productivity and relatively large populations of largescale suckers (LSS) and northern pikeminnow (NPM).

The lake was chemically treated with rotenone in 1987 to remove NPM and LSS populations with intent to produce a trophy rainbow trout fishery. A trophy trout fishery had been established by 1989 and in 1990 angler use was estimated to be 9,360 angler hours or 2,674 angler days (3.5 hours per day) from Memorial Day weekend through Labor Day weekend (Janssen and Anderson 1992). Using the mean value for angler spending at Little Payette Lake in 2003 ($180/day; (IDFG 2003)) the estimated value of the 1990 fishery was $481,371. However, by 1993, NPM and LSS biomass exceeded game fish biomass in gill net surveys (Janssen et al. 1997). As a result, rainbow trout survival and growth rates, as well as angler use, declined rapidly over the next couple of years.

Currently, angler use on the lake is much lower than it could potentially be. Because the lake sits within a mile of the City of McCall, the potential as a family fishery is huge. A rainbow trout fishery developed and maintained on this lake would result in a dramatic increase in angler use and provide another quality fishery in the McCall area similar to Horsethief Reservoir.

In 2010 we completed a population estimate of NPM and LSS >250 mm, and began a LSS and NPM removal feasibility study utilizing Merwin traps (Janssen et al. 2011). We continued the removal study in 2011. Specifically, we evaluated catch efficiency with Merwin traps. We calculated a second Peterson single mark /recapture population estimate of NPM and LSS >250 mm in 2011, using fish marked in 2010 and encountered in 2011 in the merwin traps, to help evaluate the precision of the 2010 population estimate. The 2010 population estimates were 1,556+/-442 NPM and 5,841+/-2,818 LSS.

We completed a fall gillnetting survey in 2011 to evaluate overall species composition and population age structure of the NPM and LSS populations.

Little Payette Lake is a natural lake with a 5 m high dam placed on top of the original outlet area in 1926. Land inundated by water backed up by the dam was never logged and therefore there have been thousands of fir and pine logs drifting around the lake for the last 85 years. These logs piled up along the shoreline making shoreline angling virtually impossible. The logs continually blocked the boat ramp and had to be removed multiple times a year.

We began an experimental, shoreline log removal project in 2011 in an attempt to open up fishing areas to shoreline anglers. Potential success of the project was an unknown as many of these logs are liberated from the shoreline each year during high water months and free to be blown around by the wind, possibly inundating the areas just cleared of logs.

Methods

We utilized three Merwin traps (3.7 m deep with 30.5 m leads) to collect all fish for this investigation. Merwin traps were placed in water at least 3.7 m in depth, and leads were attached to the shoreline. The traps were fishing 7 days a week, 24 hours a day, and were checked twice a week. All fish collected were removed, identified, and counted. All NPM and LSS were killed and disposed of in the lake. All other species were released back into the lake. The total catch of 2010 marked versus unmarked NPM and LSS were used to calculate a Peterson single mark/recapture population estimate. We assumed zero mortality of fish marked in 2010.

We surveyed the fish population in 2011 using four sinking IDFG standard survey gill nets. Nets were set in the afternoon, fished all night, and then pulled the next morning. All fish collected were identified to species and measured to the nearest 1 mm. We collected opercles from both northern pikeminnow and largescale suckers for aging. Opercles were boiled in water to allow the skin to be removed, and then aged with the aid of a dissecting microscope.

We obtained the necessary permit from the Idaho Department of Lands to conduct the log removal project for five years. The Southern Idaho Timber Protective Association was contracted to use their track hoe, equipped with a grabbing thumb, to remove logs along prescribed treatment areas above and below the lake's high water mark. All logs collected were piled above the high water mark to be burned at a later date.

Results

A total of three merwin traps were placed in the lake on June 2 and 7 and pulled August 8, 2011, fishing a total of 189 trap days. We placed traps in close proximity to the 2010 trap locations which included the west shoreline, the south shoreline approximately 350 m west of the dam, and approximately 350 m northeast of the dam on the east shoreline. Traps were fished 24 hours a day, seven days a week for a total of 189 trap days. The traps were checked twice a week. The traps were pulled August 8, 2011.

We collected and removed a total of 142 NPM greater than 250 mm, and 238 LSS greater than 250 mm from the Merwin traps (Table 2). The overall catch rate was 0.75 NPM and 1.26 LSS per trap day. Of these, we encountered 62 and 19 fin clipped NPM and LSS, respectively. We also collected 15 adult smallmouth bass *Micropterus dolomieu*, and 115 tiger muskie *Esox lucius x E. Masquinongy.* Total catch by species and month is given in Table 2. The 2011 Peterson single mark/recapture population estimates were 1,135+/-208 NPM and 6,345+/-2,598 LSS.

We set four sinking gill nets on September 16, 2011. The gill nets collected a total of 7 kokanee, 71 LSS, 100 NPM, 2 rainbow trout, and 7 smallmouth bass. The majority of NPM averaged 185 mm, and the majority of LSS were greater than 450 mm. Length frequencies of fish collected are given in Table 3.

We aged a total of 10 LSS and 31 NPM collected from gill nets. Maximum age observed for both LSS and NPM was 18 years. It took five to seven years for NPM to reach 400 mm and four to five years for LSS (Figures 2 and 3).

We cleared logs from approximately 780 m of lakeshore in both the spring and fall of 2011. The prescribed areas included approximately 100 m of shoreline west of the boat ramp and 180 m east of the boat ramp, and another 500 m section of shoreline just west of Duston Creek. The 780 m treatment area length was approximately 5.4% of the total lake shore length of 14,400 m, all of which is covered with logs. Log removal took place before the water levels reached the high water mark in the spring and then after the water had receded well below the high water mark in the fall. An estimated 20,000 to 25,000 board feet of logs were removed from the shoreline in 2011 at a cost of $4,000.00. Around ½ of the log volume removed in the spring had to be removed again in the fall from the same areas.

Discussion

Merwin trap efficiencies dropped significantly from the 2010 season (Janssen et al. 2011). In 2010 we captured 564 NPM (2.2/ trap day) and 1,777 LSS (7.1/trap day) in 252 trap days compared with 142 NPM (0.75/trap day) and 238 LSS (1.26/trap day) in 189 trap days in 2011. Changes in water clarity are thought to have impacted catch rates of the traps. Browns Pond dam, approximately 2 miles upstream, failed during spring runoff of 2010 exporting large volumes of mud, sand, and debris into Little Payette Lake. This event created turbid water conditions for most of the summer 2010. By the spring of 2011 the water had cleared and water clarity returned to normal.

The catch in 2011 hardly justified the effort to operate the traps. However, with the large difference in catch between the two years it would be useful to evaluate the traps one additional year.

The log removal went well, however, the treatments may need to be repeated for two to three years to determine if the removal is a long term solution or just temporary. Unknown is the percentage of logs permanently locked in place by sediment and other logs versus moving around from year to year. Shoreline campers indicated it was the first time they'd ever been able to park a boat and fish in front of their campsite. Log removal efforts should continue if cleared areas remain so and funding is available.

Management Recommendation

1. Operate Merwin traps one additional year (2012) to evaluate their effectiveness at removing northern pikeminnow and largescale suckers.
2. Monitor effects of Little Payette Lake log removal efforts and continue if warranted and funded.

Payette Lake - Kokanee Investigations

Introduction

Fishery management on Payette Lake was focused on maintaining the kokanee, rainbow trout, and trophy lake trout *Salvelinus namaycush* fisheries (IDFG 2007). Rainbow trout were managed as a put-and-take fishery. Lake trout and kokanee management has been a dynamic balancing act between special lake trout rules and kokanee stocking with fairly extensive monitoring to evaluate the effects of each. The fact that kokanee were the primary forage fish for lake trout in Payette Lake makes the methods to achieving this goal all the more confounding. Lake trout and kokanee have co-existed in Payette Lake since the early 1940's and management of the trophy lake trout fishery began in 1996. We surveyed Payette Lake kokanee densities in 2011 to help identify needs for future management changes to achieve fishery goals of maintaining both kokanee and trophy lake trout fisheries.

Methods

We monitored the kokanee population in 2011 by conducting a lake-wide, hydroacoustic survey of Payette Lake. The mobile survey was conducted using Southwest Region (McCall) Fish Management's 6.4 m Koeffler boat. Kokanee abundance was estimated using a Simrad EK60 scientific echosounder with a split-beam 120 kHz transducer. The echosounder was set to ping at 3.3 ping/s, and the transducer was mounted to a pole off the port side of the boat. The transducer when lowered was about 0.5 m below the surface. Prior to the survey, we calibrated the echo sounder using a 23 mm copper calibration sphere with a target strength (TS) of -40.4 decibels (dB), to set the gain and adjust for signal attenuation to the sides of the acoustic axis. We used Simrad's ER60 software to determine, and input, the calibration settings.

Three previously established lake sections (Janssen et al. 2011) were used again in the 2011 survey in order to maintain consistency in methods; southwest – 844 ha, east – 680 ha, and narrows – 82 ha. We also used transects previously established by Janssen et al. (2011) which followed a uniformly spaced, zigzag pattern traveling from shoreline to shoreline (MacLennan and Simmons 1992) (Figure 4). We maintained a boat speed of approximately 1.56 m/s.

Echo integration techniques were used to estimate kokanee abundance from hydroacoustic files (echograms). Echogram data was viewed and analyzed using SonarData's Echoview software, version 4.90.64. Within the echogram, a box was drawn around the kokanee layer of each transect (on average, 2 m to 35 m deep), integrated to obtain the nautical area scattering coefficient (NASC), and analyzed to obtain the mean target strength (TS) of all returned echoes (Hardy et.al. 2010). This integration accounted for fish that were too close together to detect as a single target (MacLennan and Simmonds 1992). Densities were then calculated by the equation:

$$\text{Density (fish/ha)} = (\text{NASC}/4\pi 10^{TS/10})0.00292$$

Where: NASC = total backscattering (m^2/nautical mile)
TS = mean target strength in dB for the area sampled

Hatchery origin kokanee were stocked into Payette Lake from 2007 through 2011 and, since hatchery and natural origin age classes overlap, kokanee targets were separated by fish target strength frequency distribution (size class).The target strength data from all returned echoes that qualified as single fish targets were binned into 1 dB intervals (adjusted target strength) for each transect. Single fish targets were categorized into kokanee or non-kokanee groups based upon their TS. All single targets less than -60.0 dB were considered too small to be kokanee fry. Targets greater than -34.0 dB were thought to be too large to be kokanee but some other species such as lake trout or northern pikeminnow.

We graphed a frequency distribution of fish target strengths from all survey transects. Observed size breaks were subsequently used to generate size-specific abundance and density estimates. Love's equation (1971) was used to calculate fish lengths at each break between size classes. All kokanee targets between -60.0 dB [approximately 16 mm total length (Love 1971) and -46.0 dB (86 mm), were defined as naturally produced kokanee fry. Fish targets between -45.9 and - 34.0 dB were defined as age 1 – 3 kokanee. In previous surveys, we separated kokanee age classes based on their percentage within the trawl catch. However, due to the presence of both hatchery and wild origin fish of overlapping ages, fish target strengths were assigned the following size classes; natural fry from -60.0 to -46.0 dB, size 2 from -45.9 to –42.0 dB, size 3 from -41.9 to -38.0 dB, and size 4 kokanee from -37.9 to -34.0 db.

Mean density of each size class of kokanee, in each lake section, was calculated and multiplied by the area of that section to obtain size class abundance estimates per section. Abundance estimates for each section were totaled to obtain total size class population estimates and the size class estimates totaled to obtain total kokanee abundance in the entire lake.

We completed mid-water trawl sampling in Payette Lake to help identify wild and hatchery age class lengths observed in the hydroacoustic studies. We used the mid-water trawl sampling technique as described by Peterson et al. (2011).

Results

The hydroacoustic survey was completed on August 10, 2011. A total of 323 echo returns were recorded from fish within all hydroacoustic transects. Fish target strengths from returned echoes ranged between -60 and -30 dB (Figure 5). Approximately 60% of fish targets had target strengths within the kokanee fry range. Across all transects collected on Payette Lake in 2011, kokanee densities ranged from 17 to 285 fish/ha (Table 4). The highest densities of all size classes were found in the eastern basin of the lake.

We estimated a total of 79,397 natural fry (90% CI +/- 22,125), 34,670 size 2 (90% CI +/- 18,936), 13,495 size 3 (90% CI +/- 4,274), and 3,545 size 4 kokanee (90% CI +/- 3,242) in Payette Lake (Table 5). The abundance of all kokanee was estimated at 131,107 fish (90% CI +/- 41,318).

We completed trawl sampling at four different locations on August 1, 2011. One sample site was located in each of the South East, East, North and West basins of the lake. We collected a total of 11 kokanee in all the trawling effort. We collected two kokanee in the South East basin of 119 and 106mm total length, four in the East basin of 120, 58, 45, and 47mm total length, three in the North basin of 57, 60, and 133mm total length, and two in the West basin of 105 and 126mm total length. Two age classes appeared to be represented in the sample with age 0 fish ranging in size from 45 to 58mm and age 1 fish ranges from 105 to 133mm. However, the presence of wild fish and hatchery origin fish confused the ageing of these fish. When stocked, age 0 hatchery fish are approximately the same size as wild age 1 fish and stocked age 1 fish would be approximately the same size as age 2 wild fish. Attempts to age these fish using otoliths were inconclusive.

Discussion

The total population estimate for kokanee in Payette Lake decreased about 40%, from 218,758 (136 kokanee/ha); (Jansen et al. 2011) in 2010 to 131,107 (82 kokanee/ha) in 2011. Most of the decrease was attributed to a large decrease in natural fry abundance. From previous work we know that natural kokanee alone cannot maintain this population (Table 9). Therefore, numbers of kokanee fry are probably not that significant as we rely on kokanee fingerling stockings to maintain this population. Interpreting the trawling data is confounded by the presence of both wild and hatchery fish of overlapping lengths and ages as mentioned in the results. The important conclusion is that the numbers of size 2 and greater kokanee over the last three years have continued to increase with the reinstatement of annual kokanee stockings (Table 6).

Hydroacoustics provide a quick and reliable method to estimate kokanee abundance and densities in lakes and reservoirs, but like any method, still has limitations. During our survey we defined all fish targets within the acoustic target strengths of -60 dB to -33 dB (16 to 410 mm) as kokanee. Thus, it should be noted that other species may have been detected, thereby potentially inflating kokanee estimates. Species present that could have been incorporated include suckers *Catostomus spp.*, mountain whitefish *Prosopium williamsoni*, northern pikeminnow *Ptychocheilus oregonensis*, and Rainbow trout *Oncorhynchus mykiss*. Although all of these species could overlap with kokanee in size (TS), none of these fish are known to be pelagic, especially at night. In addition, all shallow near shore targets of all sizes were excluded from analyses. And larger fish targets (greater than -33.0 dB) within pelagic areas were not counted as kokanee. Therefore, we are confident that few non-target species were incorporated into these estimates.

The equipment, software, and analyses used to conduct this survey and analyze the data remained the same as in 2009 and 2010; therefore we feel data are directly comparable to results from those years. This year we maintained a minimum ping rate of 0.3 sec/ping (3.3 pings/sec), which should have increased the precision of adjusted fish target strengths, thereby reducing the likelihood of including fish outside of the kokanee TS range.

During 2011, fry survival was low, but it is not clear what sources of mortality caused this decline. Lake trout are not likely selectively feeding on fry, thus it is more likely that natural mortality of fry was high due to environmental conditions and or other predators during 2011.

Management Recommendation

Continue Payette Lake hydroacoustic survey kokanee population estimate work to help evaluate annual kokanee stocking success.

Payette Lake - Lake Trout Harvest Investigations

Introduction

A new lake trout harvest regulation went into effect for Payette Lake on January 1, 2011. This new regulation allowed the harvest of one lake trout less than 762 mm. The regulation was enacted to reduce predation on the severely depressed kokanee population (Janssen et al. 2011)(North Fork Payette River Section, this report). We completed a creel survey during the first month post ice-off (typically one of the most heavily fished periods of the year for lake trout) to monitor harvest rates resulting from this new harvest regulation.

Methods

We randomly selected 10 days and the beginning daily count time to conduct the survey. The creel clerk made one count at the prescribed time and made a second count four hours later. Anglers were questioned to determine the amount of time angling that day, how many lake trout they had harvested and how many they had released. The survey was completed using a boat to make counts and contact boat anglers.

Results

We surveyed a total of four weekend days and six weekday days from May 18 through June 12. During the 28 day survey period we estimated 537 angler hours were spent pursueing lake trout. Anglers caught an estimated 1,345 lake trout, none of which were harvested.

Discussion

The potential effects of the new lake trout harvest regulation appear to be minimal as anglers are reluctant to kill small lake trout. If recently reinstated kokanee fingerling stockings fail to increase overall kokanee numbers over the next few years, more direct lake trout reduction measures such as gillnetting might need to be employed. However, historical Payette Lake kokanee and lake trout fisheries have been successfully supported with hatchery origin kokanee stockings.

Management Recommendations

1. Continue the stocking of kokanee fingerling annually.
2. Continue to monitor kokanee population status with hydroacoustics and kokanee spawner counts in the NFPR.

3. Complete a lake trout population survey in 2015 to evaluate impacts of new lake trout regulation.

LAKE CASCADE YELLOW PERCH FISHERY RESTORATION MONITORING AND INVESTIGATIONS

ABSTRACT

We continued monitoring the yellow perch and northern pikeminnow populations in Lake Cascade following the yellow perch restoration work from 2004 through 2006. We collected an average of 331 yellow perch per bottom trawl sample in 2011. We also completed an intensive gillnetting survey on Lake Cascade in 2011 to examine relative fish species abundance and length frequencies of all species and ages of yellow perch, northern pikeminnow, and largescale suckers. We collected eleven species of fish in total. Yellow perch were the most abundant species, followed by black bullhead *Ameiurus melas*, northern pikeminnow, largescale suckers, smallmouth bass, and rainbow trout. Gillnetted yellow perch ages averaged 3 years at 250 mm, and ranged from 3 to 5 years at 300 mm. Northern pikeminnow ranged in length from 175 mm to 485 mm and ranged in age from 2 to 6 years. It had been seven years since the initial northern pikeminnow eradication was made in 2004. In May 2009 we tagged 499 yellow perch with floy tags. Through December 2011, we had 112 tags returned by anglers for a corrected catch of 32% and a harvest exploitation rate of 30%. Harvest exploitation in 2009, 2010 and 2011 was 14%, 9% and 7% respectively.

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INTRODUCTION

Since the mid 1990's, survival of juvenile yellow perch in Lake Cascade had been poor, resulting in the collapse of this fishery. Northern pikeminnow numbers and subsequent predation on juvenile yellow perch were determined to be preventing yellow perch recovery and were probably the direct cause of the population collapse.

The two-treatment restoration plan included stocking large numbers of yellow perch adults to overwhelm predators (northern pikeminnow) and physically reducing predator (northern pikeminnow) numbers. We transplanted over 860,000 adult yellow perch and removed an estimated 75% of the northern pikeminnow population in the lake from 2004 through 2006 (Janssen et al. 2008). Since 2006 we have annually monitored the response of fish populations to the treatments and we continued this monitoring in 2011.

Yellow Perch Population Trend Monitoring

A bottom trawl has been utilized since 1998 to monitor changes in yellow perch population structure and abundance. The trawl sampling effort was competed again in 2011. We collected and aged otoliths from yellow perch to determine age and growth rates and to help us interpret trawl sampling results.

Methods

We continued to use the same lake area divisions (east, west, north, and south), effort and transect sites that were developed in 1998 and 1999 and described by Janssen et al. (2003). Trawl transect locations were as close as possible to the established sites. Exact sites change due to water levels and macrophyte bed development. Trawl sites are moved into deeper water to avoid dense macrophyte beds that foul the trawl. We have abandoned trawl sampling in the north area due to the large numbers of submerged stumps that snag the trawl. We counted all yellow perch collected and inventoried a representative sample of yellow perch from each sample area. Collected fish were measured for total length to the nearest 1 mm and weighed to the nearest 0.1 g.

Results

We completed 63 trawl transects in 2011, trawling a total of 330 minutes, collecting 20,869 yellow perch. We averaged 1.2, 758, and 235 yellow perch per five minute transect in June, August, and October, respectively, which equals 331 perch per trawl sample (Table 7). Length frequencies and ages of fish collected in June, August, and October are presented in Table 8.

Length frequency data and otolith ageing indicate the majority of yellow perch collected in the June trawl samples were age-1. Age-0 fish dominated the catches in the August and October samples. The strong 2008 year class observed over the last two years was not found this year.

Discussion

While sampling with the trawl seemed to be efficient at monitoring young-of-year and yearling age class strengths, it did not appear to be effective at monitoring recruitment of the juvenile age classes into catchable size fish. We are unsure if this was a result of too small a sampling effort/area compared to the overall size of the lake or trawl avoidance by larger age class fish. However, the trawl does catch yellow perch of all sizes and age classes. When comparing the trawl result for yellow perch with those of the gill nets (See “Intensive Gill Netting Survey” section, next page) we noted a significant difference in numbers of age classes represented. While the trawl catches mostly young-of-year and yearling yellow perch, the gill nets caught fish greater than 140 mm. The smallest gill net mesh size of ¾ inches allowed most yellow perch less than 140 mm to swim through the net.

Management Recommendation

1. Abandon the trawl as a yellow perch sampling tool as they fail to show recruitment rates of perch to catchable size when compared with gill net catches.

Intensive Gill Netting Survey

Introduction

We continued to monitor effects of the yellow perch restoration project of which treatments were completed in 2006 (Janssen et al. 2008). Lake Cascade relative fish population abundance and length frequency structure by species was examined with an intensive gill net survey in 2011. Abundance and population age structure of the northern pikeminnow and yellow perch populations were of particular interest with respect to the yellow perch restoration project.

Methods

We systematically selected gill net sites around the perimeter and mid lake. At each site we set one sinking and one floating, standard IDFG lake survey gill net. Sinking gill nets at shoreline netting sites were attached to the shore. The beginning of floating net was set at the deep end of the sinking net, and was placed as an extension of the sinking net. Mid lake sets were simply set within proximity of each other. Nets were fished overnight and pulled the next day. All fish were identified, measured to total length, and a sub sample weighed to the nearest gram. Otoliths were collected from 30 randomly chosen yellow perch. Opercles were collected from a random sample of northern pikeminnow and largescale suckers.

Results

We sampled a total of 23 sites from June 23 through July 21, 2011. We collected 1,642 fish of 11 species (Table 10). Yellow perch were the most abundant species with 578 collected followed by 356 black bullheads *Ameiurus melas*, 268 northern pikeminnow, and 199 largescale suckers. Length frequencies of all fish collected are presented in Table 11.

Yellow perch from 147 to 365 mm were aged at 2 to 5 years old (Figure 6). It took an average of two years to reach 200 mm and three to five years to reach 300 mm total length. Yellow perch aging results revealed a strong 2008 year class. These fish varied greatly in size and ranged from 195 to 305 mm total length. Northern pikeminnow from 200 to 466 mm were aged at two to six years old, and largescale suckers from 365 to 530 mm were aged at four to seven years old (Figures 7 and 8).

Discussion

A shift in age class structure and growth rates of northern pikeminnow was noted since the northern pikeminnow trapping and rotenone removal efforts in 2004, 2005, and 2006. Northern pikeminnow were found to be three to twenty years old in 2003, with the majority of fish being greater than 11 years old (Janssen et al. 2006). Conversely, as noted above, northern pikeminnow were two to six years old in 2011 (Figure 9). While not investigated in 2003, we suspect that the same age structure shift occurred with suckers as well.

Growth rates of northern pikeminnow have increased as well. Age and growth studies in 2011 indicated it took six years for northern pikeminnow to reach 400 mm compared to 9 to 11 years in 2003. The cause of the shift from an old growth slow growing population to a much younger, fast growing, population is attributed to the northern pikeminnow population and largescale sucker reduction efforts (Janssen et al. 2008). Relative densities of northern pikeminnow are much lower now than in 2003, this young and fast growing population should be monitored closely to determine the need for additional rotenone treatments to protect the yellow perch and other Lake Cascade fisheries. Predation on young northern pikeminnow by the large yellow perch population should help keep northern pikeminnow numbers in check as well. Specific Lake Cascade fish community concerns are discussed in Allen et. al. (2009).

Management Recommendations

1. Continue monitoring Lake Cascade fish community with annual gillnetting.
2. Protect the yellow perch and other fisheries in Lake Cascade by removing northern pikeminnow spawners from the North Fork Payette River when the lake population of northern pikeminnow is dominated by fish > 350 mm (Allen 2009).

Yellow Perch Exploitation Study

Introduction

As the yellow perch population continued to increase from its low in the mid 2000's, so has the number of anglers pursuing yellow perch. To examine the level of harvest of this new and fledging yellow perch population, we initiated an angler harvest exploitation study in 2009 and continued to monitor tag returns through 2011.

Methods

Standard IDFG lake survey trap nets were used to collect yellow perch from multiple locations around the lake. We utilized the statewide IDFG fish exploitation tag return program "Tag you're It" operated out of the Nampa Fishery Research to collect and summarize tag return data. Fish collected were measured to the nearest mm and all fish less than 200 mm were released. Fish greater than 200 mm were tagged with a bright orange Floy tag anterior to the dorsal fin. Methods utilized to determine exploitation rates of tagged fish are presented in Meyer et al. (2010).

Results

We collected and tagged 499 yellow perch between April 28 and May 29, 2009. Tagged fish ranged in size from 203 to 312 mm and averaged 252 g. Between April 28, 2009 and December 21, 2011 we had tags returned from 78 fish, 73 harvested and 5 released. Tag loss, determined from double tagged yellow perch was estimated at 1.2%. However, with over half the fish double tagged and only a 1.2% tag loss rate, we assumed that virtually all fish caught had retained at least one of the tags and therefore we used a tag loss of zero in the final exploitation calculations.

The reporting rate for non-reward tags was calculated to be 62%. Catch and harvest exploitation rates were estimated to be 16% and 14% respectively in 2009, 9% and 0% respectively in 2010, and 7% and 6.6% respectively in 2011. From 2009 thru 2011 the total catch exploitation estimates for reward tagged fish was 35% compared to 32% with non-reward tags. Natural mortality rates were unknown during this time period, therefore exploitation rates were minimums.

Discussion

Yellow perch exploitation rates appeared to be high over the last three years (35%) given the size of Lake Cascade (28,000 acres) and the relatively light fishing pressure (70,589 hours) and yellow perch harvest (38,055) reported in 2009 (Janssen et al. 2011). High exploitation was probably indicative of a relatively small population of two or three age classes of large, harvestable size fish. As the yellow perch population continues its recovery and the lake is filled to its potential with numerous age classes of fish, numbers of harvestable size fish of several age classes will increase as well and annual exploitation rates should fall accordingly. We did not see a need to protect adult yellow perch from harvest at this time.

During the intensive creel survey completed from May 15, 2009 through May 30, 2010 we estimated a total harvest of 38,055 yellow perch (Janssen et al. 2011). The tag return data from the same time period indicated a harvest exploitation rate of 17.4%. We used these data to calculate a population estimate, of yellow perch greater than 200 mm, of 218,700 or 18.5 per ha (harvest estimate divided by exploitation estimate for same time period). Average yellow perch harvest rate during this time period was 0.35 fish/hour.

Management Recommendation

1. Repeat the exploitation study in 2015 or 2016 when the yellow perch population should be at or near maximum capacity for Lake Cascade. This would allow us to document changes in exploitation rates and allow us to address public comments suggesting creel limits on large yellow perch.

RIVERS AND STREAMS INVESTIGATIONS

ABSTRACT

The 2011 kokanee *Oncorhynchus nerka kennerlyi* spawning run in the North Fork Payette River (NFPR) above Payette Lake was estimated to be 735 fish, the lowest estimate since counts began in 1988.

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North Fork Payette River above Payette Lake - Kokanee Spawner Counts

Introduction

The spawning run of kokanee *Oncorhynchus nerka kennerlyi* in the NFPR from Payette Lake has been enumerated since 1988 to assess spawning escapement and to serve as a method of validating kokanee population/density estimates and survival estimates from in-lake population work. This estimate was completed again in 2011.

Methods

We completed kokanee spawner counts by walking the entire stretch of river utilized by spawning kokanee and counting all live spawners. Three counts were completed during the spawning run. Counts were made weekly until a peak count was established. The total run estimate was made by multiplying the largest daily count by 1.73 (Frost and Bennett 1994).

Results

We made our highest live kokanee spawner count of 435 fish on September 12th. The total spawning run estimate was 753(435*1.73) fish (Table 12). Average total length of spawners was 390 mm.

Discussion

Kokanee spawner counts continued to decline to the lowest number documented. Reasons for the decline are probably due to the lack of kokanee stocking from the mid 1990’s through the mid 2000’s. A stock recruitment curve generated from kokanee spawner counts versus number of spawners four years later, in years where no stocking occurred, indicate that wild fish alone would not maintain the kokanee population (Figure 10). Average size of kokanee spawners decreased slightly in 2011 from the largest size recorded in 2010, hopefully in response to larger numbers of fish in the lake from kokanee stocking over the last four years.

Although lake trout predation is probably the reason that a wild produced kokanee population cannot maintain itself, we know from past experience that kokanee numbers have been increased significantly with stocking (Figure 11). The lake trout population has remained relatively constant and a 2010 gillnetting survey indicated no obvious increases in lake trout numbers or changes in length frequencies from prior surveys in the 1990’s and 2000’s (Janssen et al. 2011).

We stocked 87,500, 460,000, 263,265, 383,500, and 400,000 kokanee fingerlings from 2007 through 2011 in response to the drop in kokanee numbers in recent years. Janssen et al. (2010) noted that stocked kokanee do not show up as spawners until the fourth year following the year stocked (Figure 11). Therefore, 2011 was the first year we expect stocked kokanee to contribute to the spawning run. However, the small number of fish stocked in 2007 recruited few if any spawning fish in 2011. Kokanee population estimates should be completed in each of the next several years to monitor the effectiveness of the kokanee stockings.

Management Recommendations

1. Continue hydroacoustic surveys to estimate kokanee population size in Payette Lake.
2. Continue annual kokanee spawner counts as this is the most accurate method of monitoring kokanee numbers and stocking success in Payette Lake.
3. Consider stocking large numbers of adult kokanee spawners captured from Deadwood Reservoir tributaries to further enhance kokanee recruitment to the lake.

TABLES

Table 1. Length frequencies of fish collected with gill nets in September 2011from Lost Valley Reservoir, Granite Lake, Goose Lake, and Upper Payette Lake.

	Lost Valley Reservoir			Granite	Goose Lake		Upper Payette Lake			
Total Length (mm)	Brook Trout	Rainbow Trout Wild and Catchables	Yellow Perch	Rainbow Trout Catchables	Brook Trout	Rainbow Trout Wild and Catchables	Rainbow Trout Catchables	Brook Trout	LSS	MWF
120-129	0	0	0	0	0	0	0	0	0	0
130-139	0	0	2	0	0	0	0	0	0	0
140-149	0	0	5	0	0	0	0	0	0	0
150-159	0	1	15	0	2	0	0	0	0	0
160-169	1	1	15	0	5	2	0	0	2	0
170-179	0	0	13	0	4	0	0	1	4	0
180-189	2	2	0	0	4	2	0	0	7	1
190-199	1	0	2	0	1	2	0	1	4	0
200-209	0	0	4	0	1	0	0	0	1	0
210-219	1	1	13	0	2	1	1	0	1	0
220-229	0	1	8	0	5	2	3	0	1	0
230-239	0	2	2	1	4	1	5	1	8	0
240-249	0	4	0	2	12	2	10	0	9	0
250-259	0	6	1	7	6	7	11	0	7	0
260-269	0	6	0	5	6	6	7	0	2	0
270-279	0	5	0	7	7	13	4	0	2	0
280-289	0	6	0	5	4	12	2	0	2	0
290-299	0	6	0	2	3	7	3	0	1	0
300-309	0	3	0	8	2	6	1	0	1	0
310-319	0	0	0	3	4	1	2	0	1	0
320-329	0	0	0	1	2	1	0	0	8	0
330-339	0	0	0	0	0	1	0	0	1	0
340-349	0	0	0	0	0	2	0	0	2	0
350-359	0	0	0	0	0	1	0	0	1	0
360-369	0	0	0	0	0	0	0	0	3	0
370-379	0	0	0	0	0	0	0	0	3	0
380-389	0	0	0	0	0	0	0	0	2	0
390-399	0	0	0	0	0	0	0	0	3	0
400-409	0	0	0	0	0	0	0	0	3	0
410-419	0	0	0	0	0	0	0	0	3	0
420-429	0	0	0	0	0	0	0	0	1	0
430-439	0	0	0	0	0	0	0	0	0	0
440-449	0	0	0	0	0	0	0	0	1	0
450-459	0	0	0	0	0	0	0	0	0	0

Total Length (mm)	Lost Valley Reservoir Brook Trout	Lost Valley Reservoir Rainbow Trout Wild and Catchables	Lost Valley Reservoir Yellow Perch	Granite Rainbow Trout Catchables	Goose Lake Brook Trout	Goose Lake Rainbow Trout Wild and Catchables	Upper Payette Lake Rainbow Trout Catchables	Upper Payette Lake Brook Trout	Upper Payette Lake LSS	Upper Payette Lake MWF
460-469	0	0	0	0	0	0	0	0	0	0
470-479	0	0	0	0	0	0	0	0	1	0
480-489	0	0	0	0	0	0	0	0	0	0
490-499	0	0	0	0	0	0	0	0	0	0
500-509	0	0	0	0	0	0	0	0	3	0
650				1 ctt x rbt?						
Total	5	44	80	42	74	69	49	3	88	1

Table 2. Merwin trap catch by species, size, and mark by month in summer 2011 in Little Payette Lake.

Species/Size/Mark	June	July	August	Grand Total
Largescale suckers (marked, > 250 mm)	16	2	1	19
Largescale suckers (>250 mm, unmarked)	175	21	23	219
Largescale suckers (< 250 mm, unmarked)	3	1	0	4
N. pikeminnow (< 250 mm, unmarked)	40	5	0	45
N. pikeminnow (> 250 mm, unmarked)	35	26	19	80
N. pikeminnow (>250, marked)	33	25	4	62
Tiger muskie	69	37	9	115
Smallmouth bass	2	7	2	11
Kokanee	27	2	0	29
Rainbow trout	8	2	0	10

Table 3. Length frequencies of fish collected with gill nets on September 17, 2011from Little Payette Lake.

Total Length	Kokanee	Largescale Sucker	Northern Pikeminnow	Rainbow Trout	Smallmouth Bass
30-39	0	0	0	0	0
40-49	0	0	0	0	0
50-59	0	0	0	0	0
60-69	0	0	0	0	0
70-79	0	0	0	0	0
80-89	0	0	0	0	0
90-99	0	0	0	0	0
100-109	0	0	0	0	0
110-119	0	0	0	0	0
120-129	0	0	0	0	0
130-139	0	0	0	0	0
140-149	0	0	0	0	0
150-159	0	0	0	0	0
160-169	0	0	0	0	0
170-179	0	0	13	0	0
180-189	0	2	50	0	0
190-199	0	0	11	0	0
200-209	0	0	0	0	0
210-219	0	1	0	0	0
220-229	1	7	0	0	0
230-239	0	7	0	0	0
240-249	1	1	0	0	0
250-259	0	0	1	0	0
260-269	2	0	1	0	0
270-279	2	0	3	0	0
280-289	0	0	2	0	0
290-299	0	0	2	0	0
300-309	1	0	4	0	0
310-319	0	1	1	0	0
320-329	0	0	0	0	0
330-339	0	0	4	0	0
340-349	0	0	0	0	3
350-359	0	1	1	0	1
360-369	0	0	1	0	0
370-379	0	1	1	0	0
380-389	0	0	1	0	0
390-399	0	0	1	0	0
400-409	0	0	0	0	0
410-419	0	0	0	0	1

Total Length	Kokanee	Largescale Sucker	Northern Pikeminnow	Rainbow Trout	Smallmouth Bass
420-429	0	0	0	0	0
430-439	0	0	0	0	1
440-449	0	0	1	0	0
450-459	0	2	0	0	2
460-469	0	2	0	0	1
470-479	0	4	0	0	0
480-489	0	2	0	0	0
440-499	0	6	0	0	0
500-509	0	10	0	0	0
510-519	0	5	0	0	0
520-529	0	8	0	0	0
530-539	0	5	1	1	0
540-549	0	3	0	0	0
550-559	0	1	0	1	0
560-569	0	2	0	0	0
570-579	0	0	0	0	0
580-589	0	0	0	0	0
590-599	0	0	0	0	0
600-609	0	0	0	0	0
Total	7	71	100	2	9

Table 4. Hydroacoustic survey transect data including number of pings analyzed, nautical area scattering coefficient (NASC), mean target strength (dB), and density estimates (no./ha) of kokanee by size class in each transect on August 1, 2011 in Payette Lake,. (Size 2 thru 4 estimates include both hatchery and natural origin fish which overlap in both size and age.)

Transect Number	Number of Pings Analyzed	NASC	Mean Target Strength (dB)	Kokanee Density (number/ha) Fry	Size 2	Size 3	Size 4	TOTAL
1	1718	27.77	-46.5	178	89	18	0	285
2	1038	14.11	-46.1	76	38	19	0	133
3	1144	8.93	-42.1	15	5	13	0	33
4	2653	1.43	-50.0	27	6	0	0	33
5	2301	9.88	-44.7	47	11	10	0	68
6	2590	8.94	-47.3	97	5	10	0	112
7	3629	44.12	-42.0	75	48	16	22	162
8	3373	8.39	-44.0	33	7	7	1	49
9	1577	12.28	-46.9	103	24	12	0	139
10	1136	0.94	-49.0	12	5	0	0	17
11	1206	8.37	-41.5	17	6	0	6	28
12	1555	15.39	-39.9	21	0	7	7	35
13	1688	13.29	-43.9	45	22	7	0	75
14	2183	3.81	-48.6	48	16	0	0	64
15	2942	25.48	-44.6	64	86	21	0	172
16	2830	4.89	-42.4	13	0	7	0	20
17	3294	7.44	-43.4	26	7	2	2	38
18	3077	14.24	-40.1	22	6	2	4	34

Table 5. Kokanee density and abundance estimates from a hydroacoustic survey on August 1, 2011 in Payette Lake. (Size 2 through 4 estimates include both hatchery and natural origin fish which overlap in both size and age.)

		Density (fish/ha)		Abundance	
Section (area)	**Kokanee Age**	**Estimate**	**90% CI (+/-)**	**Estimate**	**90% CI (+/-)**
East (680 ha)	Natural Fry	72	-	49,265	-
	Size 2	26	-	17,698	-
	Size 3	12	-	7,862	-
	Size 4	3	-	1,741	-
	Total	113	-	76,566	-
Narrows (82 ha)	Natural Fry	15	-	1,192	-
	Size 2	5	-	431	-
	Size 3	0	-	-	-
	Size 4	3	-	227	-
	Total	23	-	1,850	-
Southwest (844 ha)	Natural Fry	34	-	28,940	-
	Size 2	20	-	16,541	-
	Size 3	7	-	5,634	-
	Size 4	2	-	1,577	-
	Total	62	-	52,692	-
TOTAL (1,606 ha)	Natural Fry	49	14	79,397	22,125
	Size 2	22	12	34,670	18,936
	Size 3	8	3	13,495	4,274
	Size 4	2	2	3,545	3,242
	TOTAL	82	26	131,107	41,318

Table 6. Kokanee abundance and density estimates by size class from hydroacoustic surveys from 2009 through 2011 in Payette Lake. (Size 2 thru 4 estimates include both hatchery and natural origin fish which overlap in size and age).

Kokanee Abundance (x 1,000)						
Year	**Natural Fry**	**Size 2**	**Size 3**	**Size 4**	**Total**	**# spawners (*1000)**
2009	104.5	17.2 (not separated in estimate)		4.8	22.0	2.2
2010	179.7	27.3	9.4	2.4	39.1	1.0
2011	79.4	34.7	13.5	3.5	51.7	0.75
	Density[a] (kokanee/ha)					
2009	65	11 (both sizes)		3	14	1.4
2010	112	17	6	1.5	24	0.62
2011	49.4	22	8	2.2	32	.047

a. 1,606 ha usable kokanee habitat (Area with depth greater than 40 feet).

Table 7. Total and mean catch of yellow perch by area collected in June, August and October 2011 with a bottom trawl from Lake Cascade with 95% confidence intervals (+/-).

	June			August			October		
AREA	**Number of Transects**	**Total Number Perch**	**Average Catch per Transect**	**Number of Transects**	**Total Number Perch**	**Average Catch per Transect**	**Number of Transects**	**Total Number Perch**	**Average Catch per Transect**
South	7	4	0.6	7	2,750	393 (+/725)	7	734	211 (+/-28)
West	7	16	2.3	7	148	21 (+/-21)	7	681	97(+/-232)
East	7	5	0.7	7	13,012	1,942 (+/-2,298)	7	3,519	503(+/-784)
Totals/Averages	21	25	1.2	21	15,910	758	21	4,934	235

Table 8. Average yellow perch catch per trawl transect for all transects and areas from 1998 through 2011 in Lake Cascade.

YEAR	Average Yellow Perch Catch per 5 Minute Trawl	Dominant October Age Class
1998	2	0
1999	21	0
2000	10	0
2001	18	0
2002	7	0
2003	1.6	0
2004*	93	0
2005*	220	0
2006*	436	0
2007	651	0
2008	1,140	0
2009	1,029	1
2010	59	1
2011	331	0

* Years with adult yellow perch introductions and northern pikeminnow removal

Table 9. Length frequencies and October ages of yellow perch collected with a bottom trawl in June, August, and October 2011 from Lake Cascade.

Total length	June	August	October	October ages
10	0	0	0	
20	0	124	0	
30	0	1863	0	
40	1	9438	126	0
50	4	4222	1551	0
60	9	248	1928	0
70	1	0	1006	0
80	0	0	252	0
90	0	1	53	0
100	0	0	10	0
110	1	2	2	0
120	1	0	1	0
130	1	1	1	0,1
140	1	3	1	0,1
150	0	3	0	1
160	1	0	1	1,2
170	0	2	0	1,2
180	0	1	0	
190	0	0	0	
200	2	0	1	
210	1	0	0	
220	0	0	0	
230	1	0	0	
240	0	0	0	
250	0	0	1	
260	0	0	0	
270	0	0	0	
280	0	1	0	
290	0	0	0	
300	0	0	0	
310	0	0	0	
320	0	0	0	
330	0	0	0	
340	1	1	0	-
350	0	0	0	
360	0	0	0	
370	0	0	0	
380	0	0	0	
TOTALS	25	2332	584	

Table 10. Gill net catch by species, number, and weight collected in June and July 2011 from Lake Cascade.

Species	Number	Percent	Total Weight	Percent of Total Weight
Yellow Perch	578	34.9	170.2	21.3
Black Bullhead	356	21.5	81.2	10.4
Northern Pikeminnow	269	16.3	125.6	15.7
Largescale Sucker	212	12.8	307.0	38.4
Smallmouth Bass	94	5.7	45.4	5.7
Rainbow Trout	88	5.3	38.9	4.8
Mountain Whitefish	26	1.6	7.1	1.0
Coho Salmon	18	1.1	6.4	0.8
Kokanee (Early)	11	0.7	10.1	1.3
Pumpkinseed	3	0.2	0.2	0.04
Black Crappie	1	0.1	0.3	0.06
Tiger Muskie	1	0.1	3.6	0.5
Total	1657	100	796	100

Table 11. Length frequencies of all fish and yellow perch ages collected with gill nets in June and July 2011 from Lake Cascade.

Total Length (mm)	Black Bullhead	Black Crappie	Coho Salmon	Kokanee	Largescale Sucker	Mountain Whitefish	Northern Pikeminnow	Pumpkinseed	Rainbow Trout	Smallmouth Bass	Yellow Perch	Yellow Perch Ages (Otoliths)
110-119	1	0	0	0	0	0	0	0	0	0	0	
120-129	0	0	0	0	0	0	0	1	0	0	0	
130-139	0	0	0	0	0	0	0	0	0	1	1	
140-149	0	0	0	0	0	0	0	0	1	1	9	1
150-159	0	0	0	0	0	0	0	0	0	1	4	
160-169	0	0	0	0	0	0	0	0	0	1	3	1
170-179	0	0	0	0	0	0	1	0	0	0	3	1
180-189	6	0	1	0	0	1	2	0	0	2	7	
190-199	7	0	2	0	0	1	3	0	0	2	10	1,2,3
200-209	22	0	1	0	1	0	8	0	0	1	13	2,3
210-229	15	0	0	0	0	0	7	0	1	2	16	2,3
220-229	41	0	0	0	0	0	1	0	2	3	14	2
230-239	60	0	3	0	0	1	3	0	0	2	14	2,3
240-249	46	0	0	0	0	1	6	0	3	3	13	
250-259	47	0	0	0	1	1	8	0	9	4	24	4
260-269	34	1	0	0	1	1	15	0	6	5	30	3
270-279	25	0	1	0	3	2	11	0	9	4	26	3,4
280-289	20	0	0	0	1	6	13	0	9	2	55	
290-299	8	0	0	0	4	1	12	0	14	5	62	3,4,5
300-309	9	0	0	0	0	1	11	0	3	4	93	3
310-319	2	0	0	0	0	0	13	0	2	4	77	4,5
320-329	2	0	0	0	1	3	10	0	3	1	56	5,6
330-339	1	0	0	0	1	0	8	0	0	2	28	
340-349	2	0	2	0	2	1	10	0	0	3	6	
350-359	1	0	4	0	5	3	3	0	1	5	5	
360-369	2	0	2	0	3	1	4	0	0	4	6	5,6
370-379	1	0	0	0	5	1	11	0	0	3	2	

Total Length (mm)	Black Bullhead	Black Crappie	Coho Salmon	Kokanee	Largescale Sucker	Mountain Whitefish	Northern Pikeminnow	Pumpkinseed	Rainbow Trout	Smallmouth Bass	Yellow Perch	Yellow Perch Ages (Otoliths)
380-389	1	0	0	0	4	0	9	0	0	5	1	
390-399	0	0	0	0	7	1	14	0	1	6	0	
400-409	1	0	1	1	2	0	27	0	3	6	0	
410-419	0	0	1	0	4	0	5	0	3	4	0	
420-429	0	0	0	2	13	0	10	0	5	3	0	
430-439	0	0	0	3	5	0	9	0	2	3	0	
440-449	0	0	0	4	8	0	13	0	1	1	0	
450-459	0	0	0	0	10	0	9	0	4	0	0	
460-469	2	0	0	1	10	0	8	0	0	1	0	
470-479	0	0	0	0	14	0	2	0	0	0	0	
480-489	0	0	0	0	13	0	2	0	1	0	0	
490-499	0	0	0	0	12	0	0	0	1	0	0	
500-509	0	0	0	0	15	0	0	0	1	0	0	
510-519	0	0	0	0	6	0	0	0	1	0	0	
520-529	0	0	0	0	13	0	0	0	1	0	0	
530-539	0	0	0	0	6	0	0	0	1	0	0	
540-549	0	0	0	0	2	0	0	0	0	0	0	
550-559	0	0	0	0	5	0	0	0	0	0	0	
560-569	0	0	0	0	6	0	0	0	0	0	0	
570-579	0	0	0	0	3	0	0	0	0	0	0	
580-589	0	0	0	0	1	0	0	0	0	0	0	
590-599	0	0	0	0	7	0	0	0	0	0	0	
600-609	0	0	0	0	0	0	0	0	0	0	0	
610-619	0	0	0	0	0	0	0	0	0	0	0	
620-629	0	0	0	0	0	0	0	0	0	0	0	
630-639	0	0	0	0	0	0	0	0	0	0	0	
Total	356	1	18	11	199	26	268	3	88	94	578	

Table 12. Payette Lake kokanee spawner counts and estimated spawning run size and biomass from 1988 through 2011 in the North Fork Payette River.

Year	Peak Count	Estimated Number of Spawners	KG/Lake HA_1	Number/Lake HA_1	Average Spawner Weight (g)	Average Spawner Total Length (mm)
1988	13,200	22,800	4.6	13.3	346	--
1989	8,400	14,500	2.9	8.4	349	--
1990	9,642	16,700	3.5	9.7	358	--
1991	10,400	18,000	5.3	10.5	505	365
1992	16,945	29,300	6.4	17.1	377	
1993	34,994	59,310[a]	8.5	34.6	245	--
1994	25,550	44,200	5.5	25.8	214	--
1995	32,050	55,450	4.8	32.3	147	260
1996	35,090	60,707	5.7	35.4	162 [c]	--
1997	36,300[e]	64,891[d]	5.6	37.8	148	265
1998	14,585	25,232	2.1	14.7	143	254
1999	15,590	26,971	2.9	15.7	184	276
2000	15,520	26,850	2.9	15.6	188	286
2001	15,690[g]	30,144[f]	4.4	17.6	250[b]	--
2002	9,430	16,314	--	9.5	--	--
2003	5,430	9,394	1.5	5.5	279	--
2004	11,290	19,532	--	11.4	--	--
2005	11,780	20,780	--	12.1	--	--
2006	5,580	9,650	--	5.6	--	317
2007	3,925	6,790	1.6	4.0	401	340
2008	2,425	4,195	--	2.4	--	336
2009	1,290	2,232	--	1.3	--	405
2010	610	1,055	--	0.6	--	416
2011	435	753	--	0.4	--	390

$_1$ 1,717 ha usable kokanee habitat in Payette Lake (Area with depth greater than 40 feet).
[a] Estimate made from stream and weir counts (Frost and Bennett, 1994)
[b] From gill net data of captured spawners in Payette Lake during lake survey.
[c] From trawling collections made in September 1996.
[d] Includes 2,092 fish spawned and removed by Nampa Fish Hatchery.
[e] Does not include 2,092 fish spawned and removed by Nampa Fish Hatchery.
[f] Includes 3,000 fish spawned and removed by Nampa Fish Hatchery.
[g] Does not include 3,000 fish spawned and removed by Nampa Fish Hatchery.

FIGURES

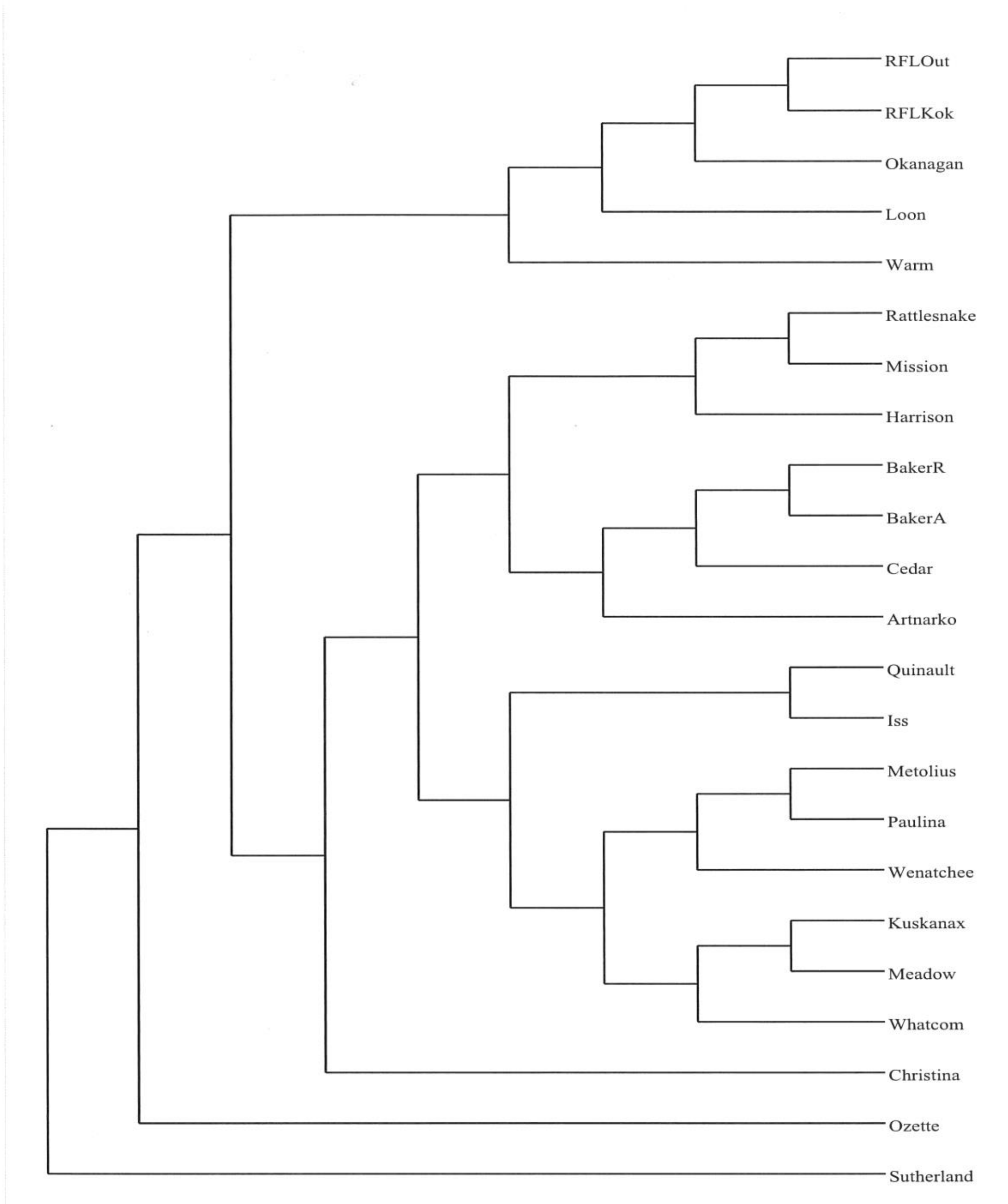


Figure 1. Neighbor Joining Tree of Loon Lake and other North American, *Oncorhynchus nerka kennerlyi* populations developed by Eric Iwamoto (National Marine Fisheries Service, genetics lab, Seattle, Washington)

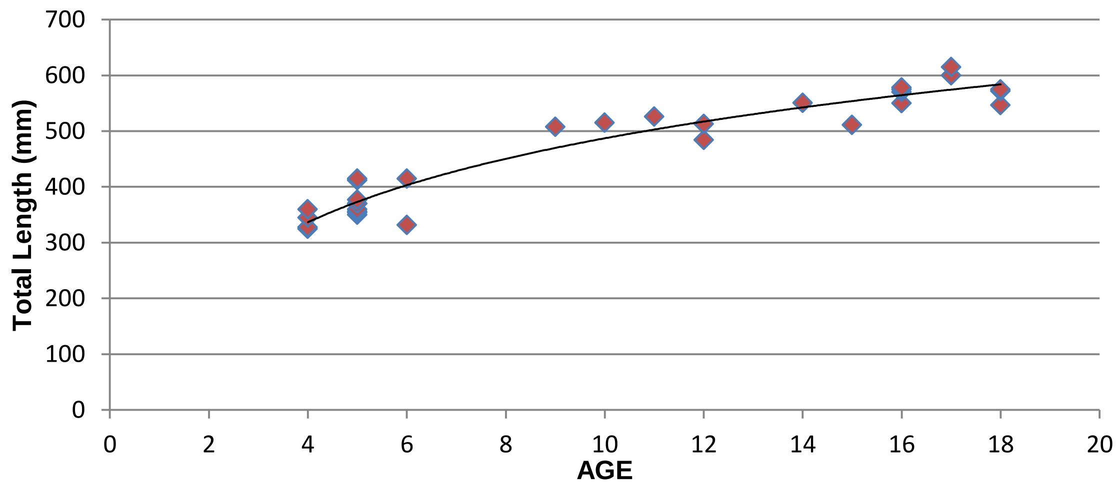


Figure 2. Ages at total length of northern pikeminnow collected in September, 2011 from Little Payette Lake.

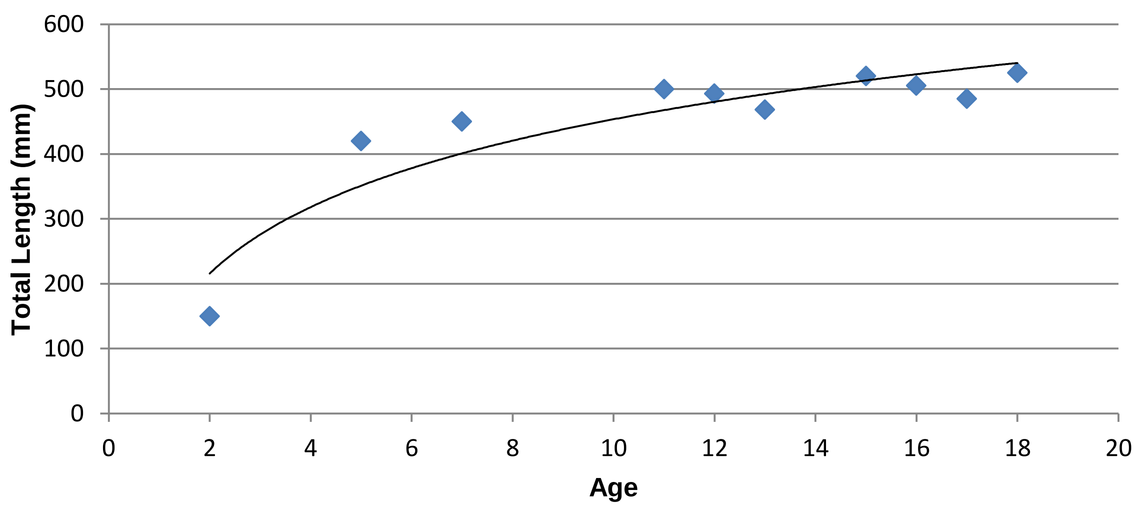
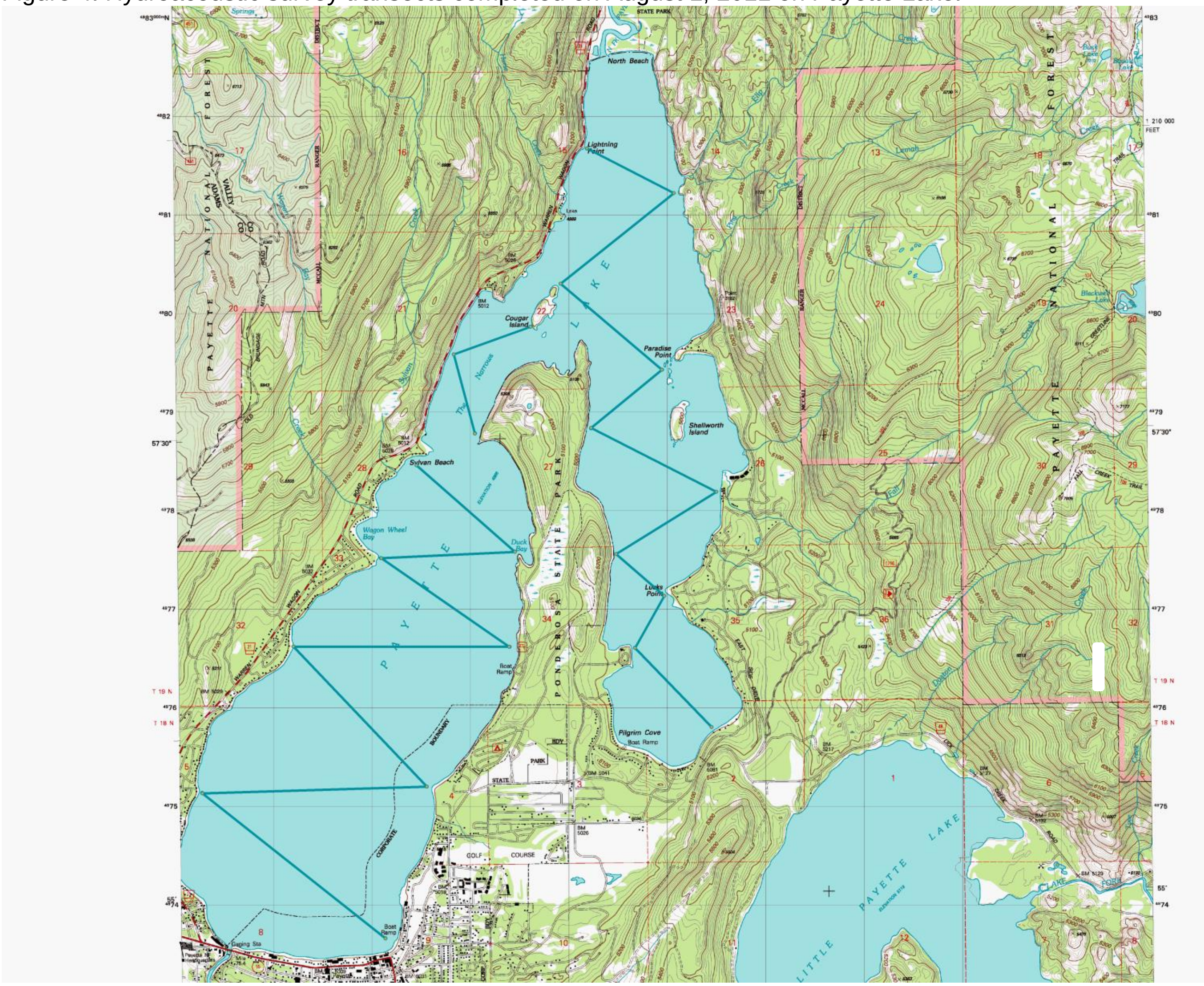


Figure 3. Ages at total length of largescale sucker collected in September, 2011 from Little Payette Lake.

Figure 4. Hydroacoustic survey transects completed on August 1, 2011 on Payette Lake.



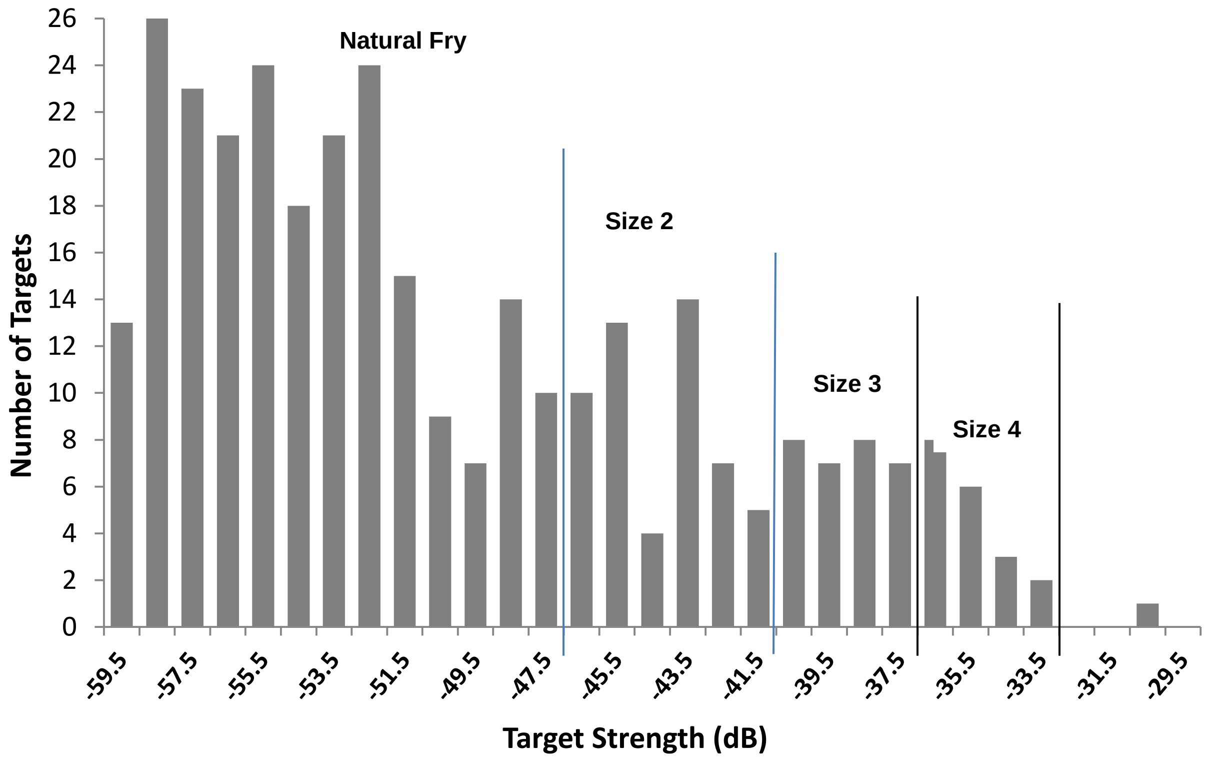


Figure 5. Frequency distribution of all fish target strengths recorded in hydroacoustic transects in August 2011 from the pelagic area in Payette Lake.

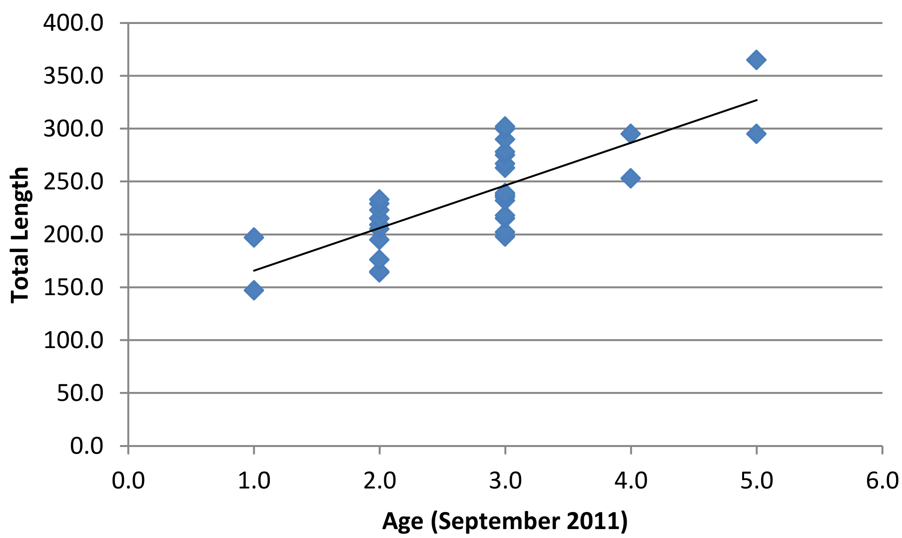


Figure 6. Yellow perch lengths at age collected with gill nets in June and July 2011 from Lake Cascade.

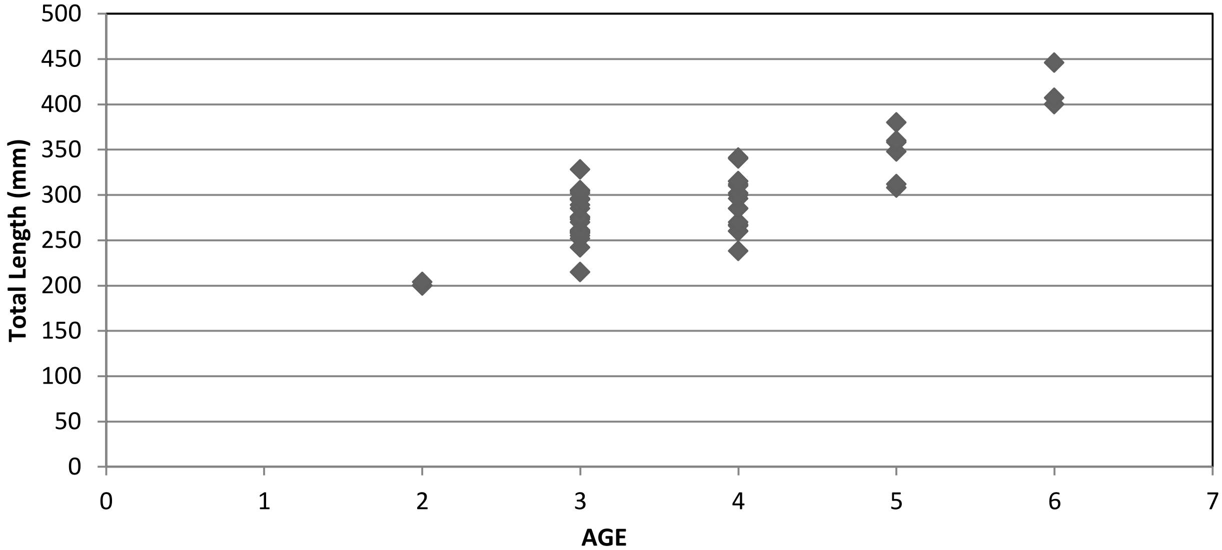


Figure 7. Northern pikeminnow lengths at age collected with gill nets in September 2011 from Lake Cascade.

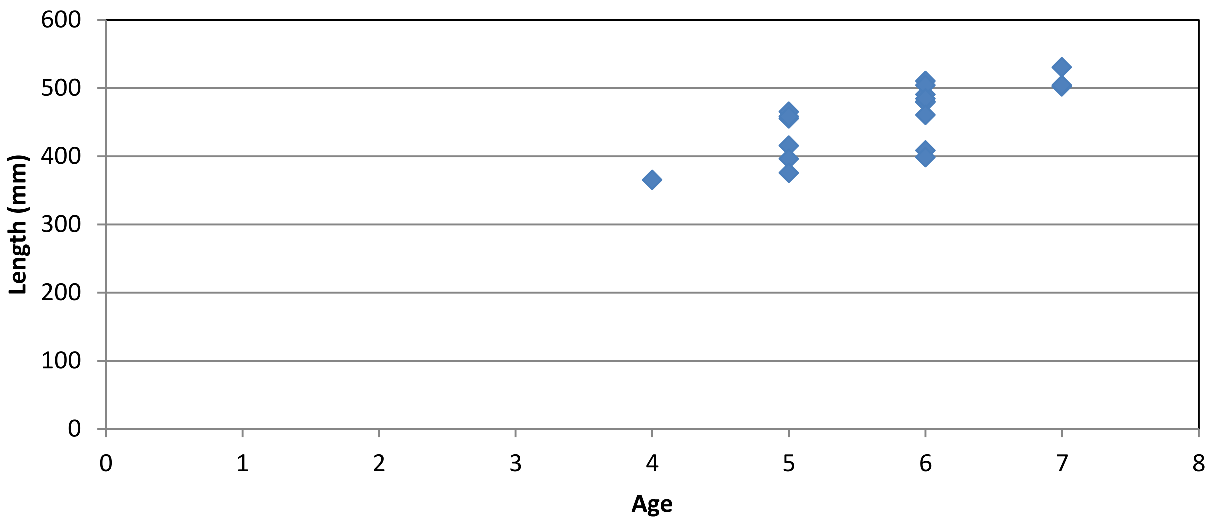


Figure 8. Largescale sucker lengths at age collected with gill nets in September 2011 from Lake Cascade.

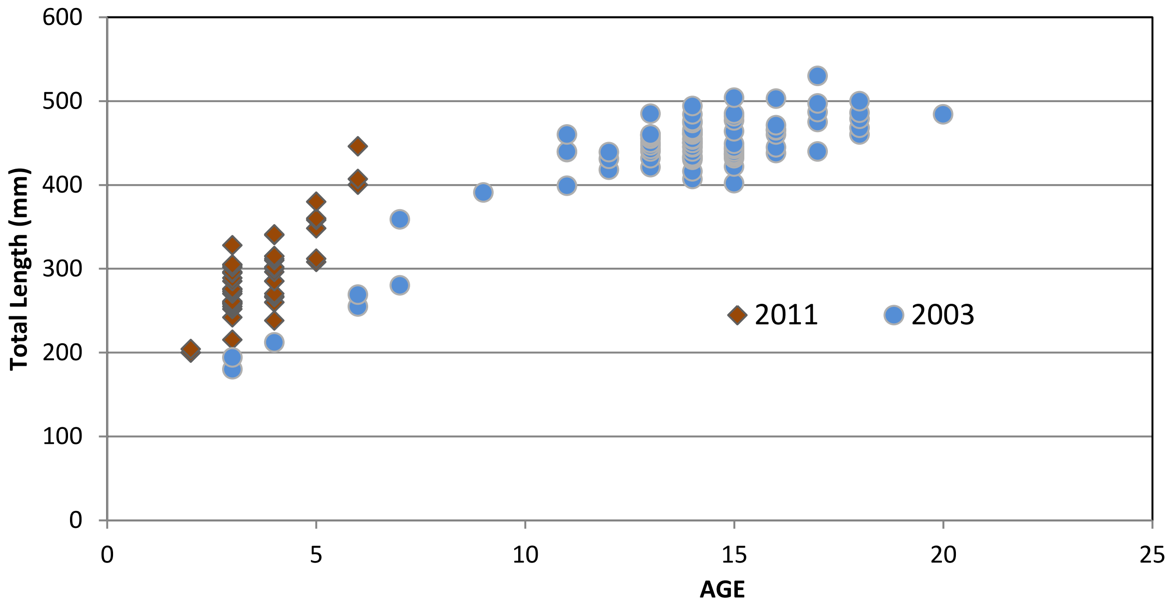


Figure 9. Northern pikeminnow lengths at ages collected in 2003 and 2011 from Lake Cascade.

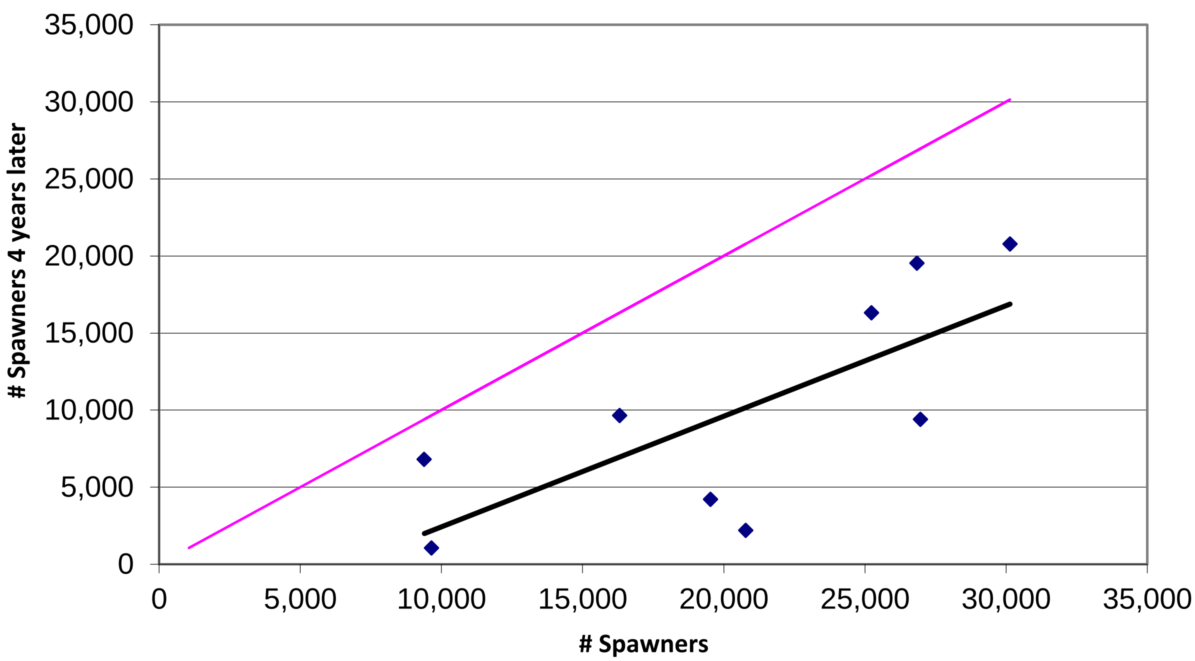


Figure 10. Kokanee stock recruitment curve for years when no kokanee were stocked in Payette Lake.

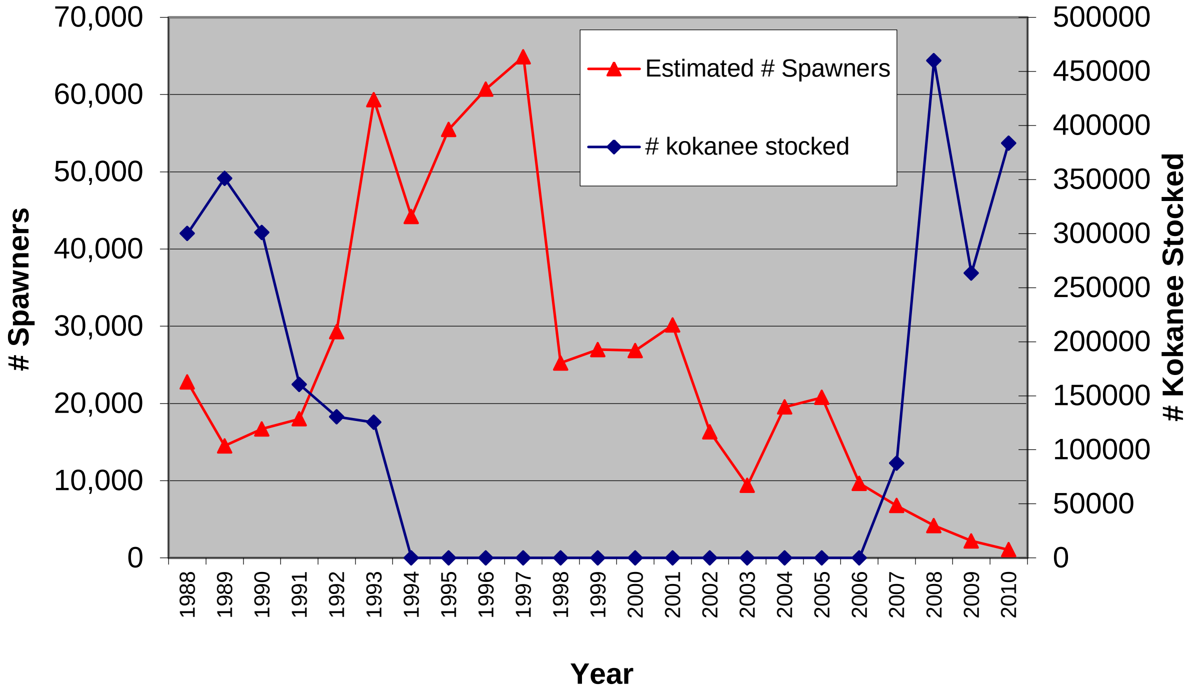


Figure 11. Number of kokanee stocked since 1988 in Payette Lake vs. number of kokanee spawners in the North Fork Payette River.

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