Big Hole Mountain Lakes Report

2008-2010

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MONTANA STATEWIDE FISHERIES MANAGEMENT

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Project Title: Montana Statewide Fisheries Management

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Abstract: A total of 45 mountain lakes in the Big Hole River drainage were surveyed from 2008-20101. The goal of this survey was to update existing information or survey lakes that have previously not been inventoried. The emphasis for much of the research covered in this report was to survey lakes that are actively managed through stocking. Most actively managed lakes are stocked with westslope cutthroat trout but rainbow trout are stocked in 1 lake and golden trout in 1 lake. The results of these lake survey are covered in this report.

Waters Referred To:

Ajax Lake
Albino Lake
Baldy Lake
Bear Lake
Berry Lake
Brownes Lake
Cherry Lake
Cowbone Lake
Elbow Lake
Englejard Lake
Fish Lake
Granite Lake
Green Lake
Hamby Lake
Hidden Lake
Highup Lake
Johanna Lake
Lake Agnes
Lake Geneva
Lena Lake
Lily Lake
Lower Seymour Lake
Mudd Lake
Oreamnos Lake
Ovis Lake
Peterson Lake
Phlox Lake
South Fork Reservoir
Sand Lake
Sawed Cabin Lake
Schultz Reservoir
Skytop Lake
Stone (lower) Lake
Stone (upper) Lake
Surprise Lake
Tenmile (lower) Lake
Tenmile (middle) Lake
Tenmile (upper) Lake
Timberline Lake
Trapper Lake
Unnamed Lake
Unnamed Lake
Unnamed Lake
Upper Lena Lake
Van Houten Lake
Violet Lake

Introduction

The Big Hole is home to 137 named lakes and at least as many unnamed lakes and smaller ponds. Most are natural lakes formed by glacial processes, some are manmade lakes, while others are water storage reservoirs. Nearly all of these lakes are located on public lands on the Beaverhead-Deerlodge National Forest. Given their pristine setting and open access to the public, these mountain lakes often provide unique and highly sought after recreational sport fishing opportunities. Angling for native and non-native fishes in lakes located within the Beaverhead-Deerlodge National Forest accounts for a substantial portion of recreational activities undertaken in the forest (Oswald 1983).

Many of the backcountry lakes were likely historically fishless because of the lack of connectivity between the lakes and the streams. However, stocking efforts, likely beginning in the early 1900's, began to introduce a variety of primarily salmonid species to the lakes including brook trout, cutthroat trout, rainbow trout, golden trout and Arctic grayling. The fisheries in lakes with suitable spawning habitat became self-sustaining whereas those where such habitat was not present require periodic stocking to maintain the fishery. Currently, 29 backcountry lakes are stocked with fish whereas the other 99 that are believed to contain fish populations are self-sustaining. Beginning in 1976, Montana Fish Wildlife and Parks primarily stocked McBride strain Yellowstone cutthroat trout into alpine lakes due to their longevity and their ability to effectively utilize the dominant food base which consequently resulted in accelerated growth. However, because westslope cutthroat trout is the native trout to the Big Hole and because preliminary studies indicated westslope would perform equally as well as Yellowstone cutthroat trout in high elevation lakes (Hochhalter and Oswald 2007), stocking of cutthroat trout in alpine lakes was switched from Yellowstone cutthroat to westslope cutthroat in 2006. Only two lakes in the Big Hole drainage are stocked with anything other than westslope cutthroat trout and they are Tahepia Lake, which is stocked with rainbow trout and Skytop Lake, which is stocked with golden trout.

Previous research described the status of the fisheries and potential for future enhancement of recreational fishing opportunities in many alpine lakes located within the Beaverhead-Deerlodge National Forest (Wells 1982, McMullin 1983, Oswald 1983, Shephard 1990; Brammer et al. 1992). To effectively manage the existing backcountry lake fisheries, promote native species conservation and assess the potential to develop new angling opportunities, more recent population data is needed; therefore, surveys were initiated in 2008. The information collected during these surveys will be used to develop lake specific management recommendation to improve or maintain the quality of existing fisheries, enhance angling opportunities and conserve native fish populations.

Methods

Fish populations in alpine lakes were sampled using sinking monofilament 125x6 ft experimental gill nets with 25 ft panels. Net mesh size ranged from 0.75 -2.0 inches. Nets were generally set perpendicular to the shore across the lake outlet or inlet or a bay. Nets were set by either walking a rope around the shore line or by attaching the rope to a dog and having him swim the rope to the other side then attaching the rope to the net and pulling the net across the lake into position. Generally nets were set over night; however, in a few cases overnight sets were not possible or were not warranted (many fish

were captured in a short net set) and only day sets were used. Angling was also used to sample fish in lakes and in some cases a combination of angling and nets were used. Generally only one net was deployed per lake.

All fish captured were identified to species, measured (0.1 inch) and weighed (0.01 lb). Condition Factor (K) was calculated according to Shepherd (1990) and comparisons were made to previously collected data when available. Water quality measurements were taken at each lake including surface temperature, pH and conductivity. Spawning habitat was quantified in the inlet, outlet and shore line. Inlet, outlet and shoreline spawning habitat was classified as either: excellent, good, fair or poor and assigned at least 1 qualifier according to the information in Box 1. For example, at Upper Tenmile Lake the spawning habitat in the inlet was scored P5 (Poor habitat because inlet was all boulders), the outlet was scored P5 and the shore line was scored P3 (Poor because of less than 10 yards of suitable habitat). Lake habitat was qualitatively assessed (i.e., shallow silt bottom, or deep with rocky shores). In some cases bathymetric measurements were made by using a float tube, hand-held Garmin GPS and a hand-held Vexilar digital depth finder (accuracy to 0.01 ft). Bathymetric maps were generated using ARC GIS software and the 3-D Analyst tool. In addition to fisheries and water quality measurements, lakes were surveyed for the presence of all life stages of amphibians. The amount of use at the lakes was qualitatively assessed (light, moderate, heavy) and camping area and fire rings were noted. For the purposes of this report the lakes of the Big Hole were divided into 5 categories according to the following geography: West Big Hole Lakes (Beaverhead Mountains north to Highway 43, Pintler Lakes (Northeast of Highway 43 to Deep Creek, Fleecer Lakes (east of Deep Creek to I-15), West Pioneer Lakes (West Pioneer Mountains west of Wise River) and East Pioneer Lakes (east of Wise River in East Pioneer Mountains).

Box 1. Spawning habitat classification for mountain lakes in the Big Hole drainage.

Excellent (E) = (1) large stream (will not go dry), (2) abundant clean gravels (< 2 in), (3)> 50 yards of suitable habitat.
Good (G) = (1) moderate stream (could go dry in drought), (2) moderate gravels (<2 in), (3) 20-49 yards of suitable habitat.
Fair (F) = (1) small stream (likely dry in drought), (2) limited or silted gravels, (3) 10-20 yards of suitable habitat.
Poor (P) = (1) Intermittent stream (dry in most years), (2) no gravel mostly sand, (3) < 10 yards of suitable habitat, (4) no inlet or no outlet, (5) boulders.

Results

West Big Hole Lakes

Berry Creek Lakes

Berry Lake

Berry Lake is located at the headwaters of Berry Creek at 8789 ft in elevation. It is one of the most unproductive lakes in the west Big Hole (Wells 1981). The lake is 14.8 acres and has a maximum depth of 32 ft (Wells 1981). The lake is situated at the head of a cirque basin with tallus/bedrock slopes extending down to the waters edge on the north, south and western shore. The lake has limited littoral habitat as the water depth along the shoreline increases rapidly. There is no inlet to the lake and the outlet is low gradient and flows through boulders for only a short distance before dropping down a very steep cascade to Moose Meadows below. Berry Lake has historically been stocked with Yellowstone cutthroat trout beginning in 1966. From 1986 until the present day the lake has been stocked at a low density on a 4-year rotation with approximately 500 fish (42 fish/ acre). In 2006, the species stocked in the lake was changed from Yellowstone to westslope cutthroat trout. The lake has been sampled twice before in 1973 and 1981 (Wells 1981). Access to the lake is gained by traveling by ATV on the Berry Creek Road then hiking approximately 2.5 miles on Trail 161 to Moose Meadows. At the head of Moose Meadows the trail ends at a large boulder talus slope that must be carefully traversed following Berry Creek to reach Berry Lake.

Berry Lake was sampled on July 30th, 2009. A single gill net was set across the outlet stream and allowed to fish overnight. A total of 37 cutthroat trout were captured, but the distinction between age-3 westslope cutthroat trout and age 7 Yellowstone cutthroat trout was not made at the time of sampling so the two subspecies were analyzed together (Table 1). The condition of the fish was slightly above average, suggesting that the current stocking schedule and rate are resulting in a quality fishery given the low productivity of the lake. Historically no natural reproduction has occurred at Berry Lake (Wells 1981), however, a length frequency plot of fish captured in 2009 indicates some reproduction may be occurring because of the lack of a clear size class division between the 3 year old westslope cutthroat and the 7 year old Yellowstone cutthroat trout (Figure 1), as observed in nearby Timberline Lake (Figure 2). A possible alternative explanation is that fish growth rates in the lake are very slow and disparate, yielding a wide distribution of sizes within each age class, but this is unlikely given the condition of the fish. Fish were observed attempting to spawn during late July over the limited sandy/gravely areas along the shoreline. Use at the lake was light. Only 2 camping areas were identified on the north shore near the lake outlet and no amphibians were observed.

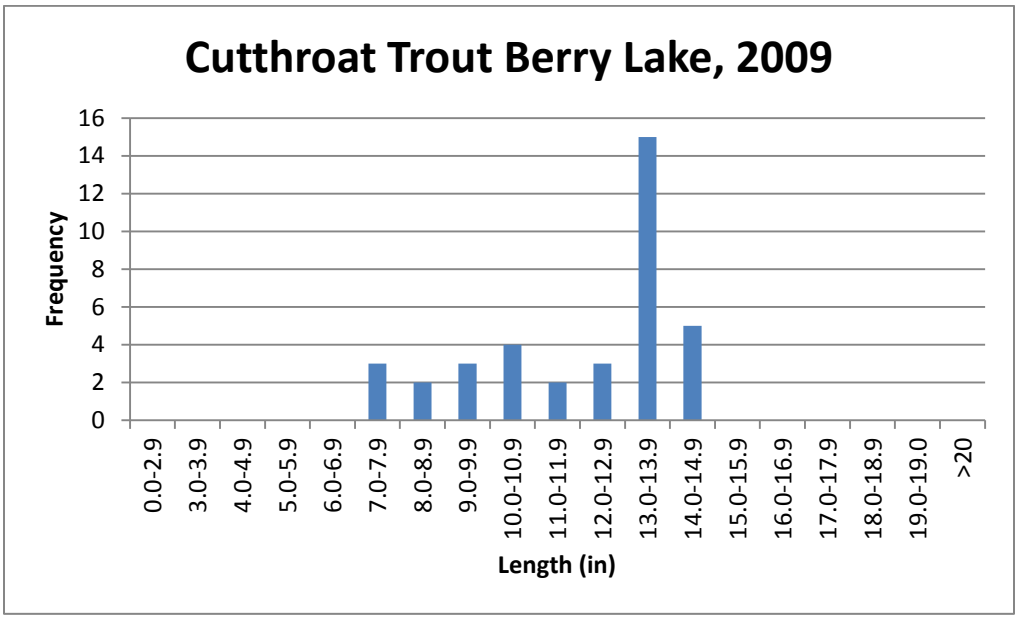

Figure 1. Length frequency of cutthroat trout captured in a single gill net in Berry Lake, July 2009.

Timberline Lake

Timberline Lake is a 7.5 acre lake located at an elevation of 9130 ft. The long narrow lake is located in a steep cirque basin at the headwaters of an unnamed tributary to Berry Creek. The maximum depth of the lake is 26 ft (Wells 1981) and the shoreline consists of steep talus slopes and bedrock cliffs. There is no inlet to the lake, but large snowfields above the lake likely supply ground water through the summer months. The outlet of the lake consists of medium sized boulders with little gravel or other spawning substrate. Timberline has been sampled twice in the past in 1973 when the lake was fishless and 1981. The lake was initially stocked in 1976 with Yellowstone cutthroat trout. From 1984 to the present the lake has been stocked every 4 years with 400 fish for a stocking rate of 67 fish/acre. In 2006 the species of cutthroat trout stocked was changed from Yellowstone cutthroat to the native westslope cutthroat trout. Wells (1981) recommended stocking the lake every 6 years with 50 fish/acre to increase fish size and still provide a quality fishery.

Timberline Lake was surveyed on August 8th, 2009. A single gill net was set overnight near the outlet of the lake and captured 34 cutthroat trout (Table 1). Although westslope and Yellowstone cutthroat trout were not distinguished at the time of the survey, the length frequency and photographic evidence suggest that fish from 7-11 inches were westslope cutthroat trout (age 3) and fish > 11 inches were Yellowstone cutthroat trout (age 7). The condition of the fish was slightly below average for Big Hole lakes and less than that of Berry Lake. There does not appear to be any reproduction occurring at the lake and there is very limited suitable spawning habitat. Use of the lake was light and there were no established camping areas. No amphibians were observed.

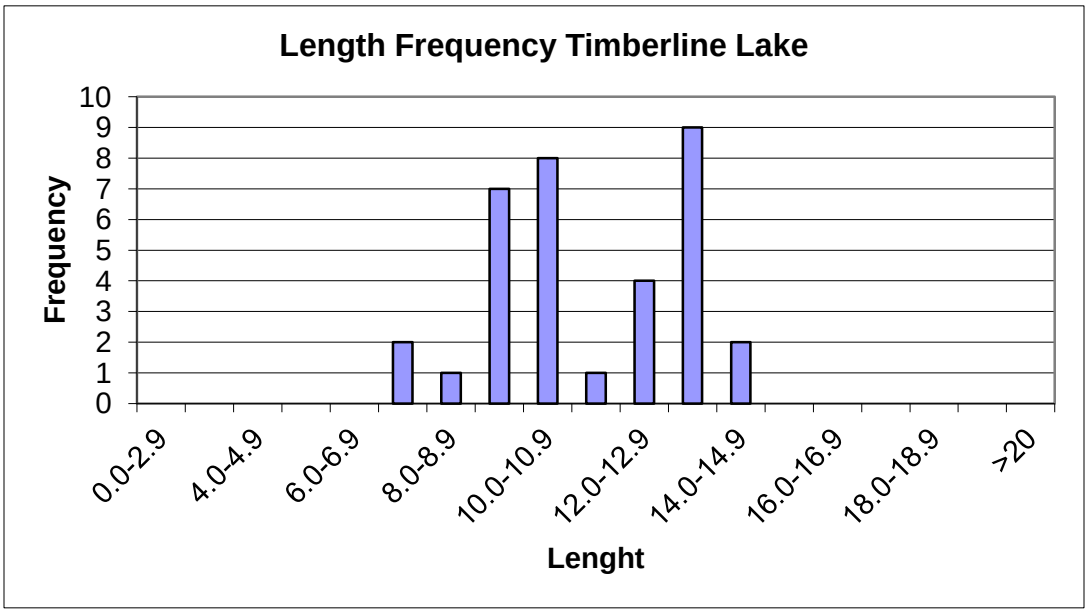

Figure 2. Length frequency of cutthroat trout captured in Timberline Lake, July 2009.

Management Recommendations for Berry Creek Lakes

Berry Lake should be monitored in the future to determine if reproduction is occurring and if future stocking should be adjusted or terminated. Stocking rates and frequency should be adjusted at Timberline Lake to 50 fish/acre every 6 year to improve the quality of the fishery.

Cowbone Lake

Cowbone Lake is the southernmost lake in the Big Hole drainage and is located on an unnamed tributary to Darkhorse Creek approximately 0.3 miles southeast of Darkhorse Lake. The elevation of the lake is 8565 ft and it is 8.0 surface acres and has a maximum depth of at least 35 ft (Peterson 1971). The lake is deep with much of the lake being greater than 8 ft deep (based on visual estimation). It has a boulder and silt bottom and appears to be relatively productive. Cowbone Lake was originally stocked with undesignated cutthroat trout from 1934 to 1960 with one rainbow trout plant in 1941. Beginning in 1968, the lake was stocked with Yellowstone cutthroat trout at 3-6 year intervals until 1984 when the lake was stocked every 4 years with 1000 fish. In 2008, Cowbone Lake was stocked with westslope cutthroat trout as part of the move from the non-native Yellowstone cutthroat trout to the native cutthroat species. Cowbone Lake was surveyed in 1971 when a floating gill net was set overnight and only caught 1 cutthroat trout (Peterson 1971). Access to the lake is gained via the Darkhorse Lake Road, which Is a four wheel drive/ATV trail.

Cowbone Lake was sampled on August 7th, 2009 when a single gill net was fished off the northern shore of the lake. Both Yellowstone (8) and westslope (1) cutthroat trout were captured in the gill net (Table 1). The Yellowstone cutthroat trout were from the 2004 plant and were 5 years old. There was no evidence of natural reproduction and the condition of the 5-year-old Yellowstone cutthroat was low relative to other stocked lakes, suggesting either the stocking rate or frequency is too high for the food supply. Interestingly, upon inspection of fish stomach contents one cutthroat trout had consumed a

mottled sculpin indicating that this species is also present in the lake. Use at Cowbone Lake is high because it can be accessed by motorized vehicles.

Management Recommendations

The stocking rate at Cowbone Lake should be monitored between 2012 and 2013 to determine if the condition of the recently stocked westslope cutthroat trout is similar to that of the Yellowstone cutthroat trout at maturity. If the condition is still poor, the stocking rate should be lessened from approximately 125 fish/acre (1000 fish) to 75 fish/acre (600 fish) to improve fish condition. Depending on the longevity of the westslope cutthroat trout, an alternative management practice that may also yield increased condition would be to stock the lake on a 6 year rather than a 4 year cycle at 100 fish/acre. Additional data are necessary before management changes are made at this lake.

Englejard Lake

Englejard Lake is a small (1.2 acre), lower elevation (7150 ft) lake located adjacent to Englejard Creek. Based upon maps and field surveys it appears that Engeljard Lake at one time was nearly 4 times (6.0 acres) its present size. It appears that either a natural or manmade dam was present on Englejard Creek that resulted in a much larger and deeper lake. The breaching of this dam has dried up the upper lobe of the lake leaving the lower, deeper lobe isolated from the stream and filled by groundwater. Based on the lack of vegetation on the shores of the lower lobe, water elevations in this part of the lake appear to fluctuate significantly (5 ft) with increasing and decreasing groundwater elevation. Currently there is no surface water connection between Englejard Creek and the remnants of Englejard Lake. There is no stocking record for Englejard Lake and the lake has never been surveyed previously. The Beaverhead National Forest Lake and Fish Inventory (1992) lists Englejard Lake as containing cutthroat trout. Access to the lake is achieved by 4x4 or ATV from Pioneer Creek Trailhead (Road 71267) across Berry and Hamby creeks. After crossing Hamby Creek, the lake is accessed by traveling the west fork onto Road 7322 for 0.5 miles then take Road 71272 to the lake.

Englejard Lake was surveyed on July 30th, 2009 when a single gillnet was fished for 2 hours. Only longnose suckers (12) were caught in the net (Table 1). All suckers captured were in the smallest mesh of the net, suggesting that no larger individuals are present in the lake. Large schools of juvenile suckers were observed from the bank. The lake had abundant aquatic life with many caddis flies, mayflies and leeches. Spotted frog adults and tadpoles were abundant and western toad tadpoles were also present. At the time of the survey, the lake appeared to be between 6 and 8 ft deep, but evidence on the shoreline suggest the lake at times fills to roughly 6 ft higher than the elevation when it was surveyed.

Management Recommendations

No management changes are recommended for Englejard Lake unless the dam can be reconstructed and the lake size enhanced. Given its small size there is little fisheries potential above what is present and the lake in its current state is providing important amphibian habitat.

Hamby Creek Lakes

Hamby Lake

Hamby Lake is a large (35.5 acre) lake located near the headwaters of Hamby Creek (elevation 8098 ft). The lake has a maximum depth of 33 ft (Wells 1981). The majority of the shoreline of Hamby Lake is forested with boulder lake margins. The lake habitat consists of a mix of rocky shore line along the eastern edge of the lake and gravely shoreline flanking a large single talus slope on the southern shore. The western and northern shores are forested with grassy/cobble-boulder margins. The lake substrate is primarily large boulders and silt. Hamby Lake shore line is generally not as steep as other cirque basin mountain lakes creating a more extensive littoral zone. Prior sampling indicated the lake is of average productivity relative to other Big Hole Lakes (Wells 1981). The outlet is primarily small boulders and the outlet stream flows into a smaller pond before the gradient increases. The lake has 3 inlet streams: one from Lake Geneva on the northern shore, one from an unnamed lake to the west of Hamby and one on the southwest corner of the lake. There is no stocking history for Hamby Lake, but it has been surveyed three times before in 1973, 1981 (Wells 1981) and in 1992 (Brammer et al. 1992). In 1971 brook, cutthroat and rainbow-cutthroat hybrid trout and Arctic grayling were captured. No grayling have been captured in subsequent sampling and no cutthroat trout were captured in 1992. Access to the lake was gained by ATV on the Hamby Creek Trail until the Trail Closed sign approximately 2 miles downstream of the lake. From this point, the lake can only be reached by foot or horseback on Trail 112. Trail 112 crosses several wet meadows and the trail is not well marked through these areas. To stay on the trail, at the end of the ATV road stay right through the first meadow and look for a trail blaze as you enter into the trees. At the second meadow, veer left and cross Hamby Creek watching for blazes on trees.

Hamby Lake was sampled again on August 4th, 2009 and a single gillnet was set overnight near the stream outlet. Both brook trout and Yellowstone cutthroat trout were captured in the lake (Table 1), but no grayling were captured. The condition of brook trout was average while the condition of the cutthroat trout was slightly below average. The brook trout fishery in Hamby Lake historically has been very consistent (average size and size range was nearly identical in 1973, 1981 and 1992). The condition of brook trout appears to have declined from 38.4 in 1992 to 33.0 in 2009 suggesting there may be too many fish for the available food supply. High quality spawning habitat is located in the inlet stream on the north side of the lake (outlet of Lake Geneva). This stream near the lake spreads out in a large delta with abundant clean gravels. Farther upstream, additional gravely spawning habitat is also present in this stream. There are potential spawning areas at the inlet on the western side of the lake coming from the unnamed lake upstream. The abundance and high quality of spawning areas at Hamby Lake suggests the lake is very likely to continue to be self-sustaining into the future. Use at the lake was moderate with two well used campsites near the outlet. One spotted frog was noted at the outlet.

Lake Geneva

Lake Geneva is a small (8 acres), but relatively deep lake (47 ft) located only 0.5 miles northwest of Hamby Lake. The lake elevation is 8451 ft and it is considered a moderately productive relative to other Big Hole Lakes (Wells 1981). The immediate shores of the lake are mostly grassy with intermixed boulders and cobbles and the adjacent banks are forested. The lake inlet on the southwestern side of the lake is low to moderate gradient. The lake outlet is also low-moderate gradient but with more coarse substrate and limited pockets of gravel. The lake bottom primarily silt and boulders with some areas of bedrock. The lake has historically been stocked only one time in 1966 with 1000 undesignated cutthroat trout. The lake has been surveyed two other times in 1973 and 1981 (Wells 1981). Lake

Geneva is a very scenic lake and the grassy shores allow good angler access around most of the lake. Access to the lake is achieved by following a primitive trail from the outlet of Hamby Lake around the northern shore of the lake to near the outlet stream of Lake Geneva. The trail crosses the stream and climbs toward Lake Geneva.

Lake Geneva was sampled with a single gillnet on August 4th, 2009 near the lake inlet. Only cutthroat trout were caught which phenotypically appeared to be Yellowstone cutthroat trout (Table 1). The average size of fish captured in 2009 was identical to that observed in 1973 (10.3), but length distribution was smaller than recorded in 1981 (12.5, Wells1981). It was also noted by Wells (1981) that the cutthroat trout caught were in excellent condition (no weights taken) but the cutthroat captured in 2009 were showed condition slightly below average. It appears that the weight of fish relative to their length in Lake Geneva may fluctuate through time but the lake consistently produces an average fishery for cutthroat trout. Spawning habitat was ranked good in the inlet stream because of abundant gravels, but the inlet stream was small and may go dry in drought years. No other spawning areas were identified in the lake; however, it is clear that spawning habitat in the lake is adequate to maintain the fishery. Use at the lake was light and only one campsite was identified near the lake inlet. No amphibians were observed at the lake.

Management Recommendations for Hamby Creek Lakes

No management recommendations are warranted at Hamby Lake or Lake Geneva. Both lakes are self-sustaining and provide good fisheries for average sized fish in a scenic setting. Fish harvest at both lakes should be encouraged to maintain and potentially improve the quality of the fisheries.

Holland Creek Lakes

Ovis Lake

Ovis Lake is located at the headwaters of Holland Creek, a tributary to Moose Creek. The lake is 4.5 acres and is approximately 8450 ft in elevation. The lake and shoreline habitat is rocky with a preponderance of small boulders. The north shore is a steep talus slope that extends directly down into the lake whereas the west, south and north shore slopes are very gradual and forested. The lake habitat along the north shore drops off very quickly and is > 10 ft deep within 20 ft of the bank. The eastern and western shore consists of large reefs that extend from 50-200 ft from the shore before the water deepens. The outlet of the lake on the south is a large boulder field and there is no defined stream channel. However, a stream appears from the boulder field approximately 0.25 miles downstream of the lake. Ovis Lake has never been sampled. It was stocked with Yellowstone cutthroat trout in 1980, but was never stocked again or monitored thereafter. There is no established or primitive trail to Ovis Lake. Access to the lake is gained by driving to Shultz Reservoir then paralleling Holland Creek through the timber for approximately 3 miles to Ovis Lake. Holland Creek contains a conservation population of westslope cutthroat trout, so it became imperative to determine if Ovis Lake still contained Yellowstone cutthroat trout.

Ovis Lake was surveyed on August 5th, 2009 with a single gillnet fished overnight across the northeast corner of the lake. No fish were captured in the net and no evidence of fish was observed during the

survey 2 days at the lake. Spawning habitat was very limited due to the lack of an inlet or defined outlet. Minimal spawning gravels were identified in the lake on the eastern shore. Spotted frog tadpoles were observed on the northwest bay of the lake. Use at the lake was light and only one camp spot was identified at the west side of the lake.

Schultz Reservoir

Schultz Reservoir is an impoundment created by water diverted from Holland Creek to an adjacent dammed basin. It is located on the Beaverhead-Deerlodge National Forest and is accessed by taking Forest Road 994 from Highway 43 west of the Big Hole Battlefield to Road 7364. Approximately 2 mile up this road turn onto 7362 to the reservoir. The reservoir when full is approximately 14 acres and between 20 and 25 ft deep based on the height of the dam, which is located at the north end of the reservoir. The reservoir drains into Yank Swamp and forms the headwaters of Swamp Creek. The reservoir inlet enters in the south west corner of the lake. The spillway is in the southeast corner of the lake only a short distance from the inlet. The outlet structure has been fitted with a fish barrier to prevent brook trout from reaching the reservoir and stream above. The diversion structure on Holland Creek is also fitted with a fish barrier structure. There is no stocking record for Schultz Reservoir.

Schultz Reservoir was netted with an overnight set on June 23rd, 2009. The net was set across the north end of the reservoir. Westslope cutthroat trout and brook trout were captured in the net (Table 1). The cutthroat trout appeared to be in very good condition and were abundant with all size classes of fish well represented. Fish were observed actively spawning in the inlet channel to the reservoir. Only 2 larger brook trout were captured. The lack of other age classes of brook trout suggest that reproduction may be limited or not occurring. It is possible that the fish barrier is not a complete barrier and allows limited fish passage. The cutthroat trout in Holland Creek are considered a conservation population that is slightly hybridized (97.7%) with Yellowstone cutthroat trout. The fish captured in the reservoir did not appear to be hybridized and were assumed to be a population founded from Holland Creek. Genetic samples were collected the cutthroat trout captured but have not yet been analyzed. Because the reservoir is use for irrigation purposes, its level fluctuates and it is drawn down substantially in dry years. However, it appears this draw down does not significantly impact the fishery. Multiple age classes of fish were present and fish were all in excellent condition. The stream flow into the reservoir during drawdown likely mitigates the impacts on the fishery. In 2010 the reservoir was drained in order to replace the outlet structure. It is unclear if this drawdown affected the fishery and the reservoir should be resampled in the near future to determine the impact of this drawdown and to monitor the brook trout population.

Management Recommendations

Ovis Lake should be stocked with westslope cutthroat trout on a 6 year basis at a stocking rate of 100 fish/acre to reestablish a fishery. It does not appear likely the fish population will become self-sustaining given the lack of suitable spawning habitat and the lake will require stocking to maintain the fishery. The moderate stocking density and longer frequency should result in larger fish. No management changes are recommended for Schultz Reservoir except for continued monitoring.

<u>Peterson Lake</u>

Peterson Lake is small (8.5 acres), lower elevation lake (7,806 ft) located on the Big Hole divide between the Big Hole and the Beaverhead drainages. The lake is 26 ft deep with approximaltey 50% of the lake being deeper than 14 ft deep (Lloyd 1983). It forms the headwaters of Peterson Creek (also called Short Creek), which is in the upper Governor Creek watershed. There is no inlet to the lake and the south and west shore line is made of large boulders. The outlet area of the lake is shallow with abundant boulders and a small island. The eastern shoreline is forested. With the exception of the outlet area, the lake shore drops off quickly and much of the lake appears to be > 8ft deep with a maximum depth of 26 ft (Brammer et al. 1992). Peterson Lake is one of the most productive lakes in the Big Hole drainage (Brammer et al. 1992). Access to the lake is gained by a primitive 0.65 mile trail that follows Peterson Creek from the end of a primitive forest service road. There is no stocking record for Peterson Lake, but previous sampling in 1992 (Brammer et al. 1992) indicated that the lake contains a self-sustaining population of rainbow trout (possibly hybridized with cutthroat trout). In 2006, westslope cutthroat trout intended for Peterson Lakes in the Beaverhead drainage were errantly stocked into Peterson Lake in the Big Hole.

Peterson Lake was sampled on July 1st, 2009 via angling. Two anglers fished the lake for a total of 2.5 hours and caught 14 westslope cutthroat trout and 6 rainbow trout (Table 1). Angling can be an effective means of sampling fish populations in lakes, but can be biased toward larger fish, similar to gillnets. The westslope cutthroat captured were age-3 and were in very good condition. Average condition factor for westslope cutthroat trout was greater than that observed for rainbow trout. At the time of sampling, fish were observed spawning the outlet stream. The lake outlet stream flows through dense alders with large boulders intermixed with coarse granitic sand. The outlet stream is relatively low gradient for approximately 200 yards downstream of the lake before the gradient increases. No other spawning was observed in the lake. Use at the lake was moderate and 2 established campsites were present on the east and west sides of the outlet.

Management Recommendations

Given the success of the errant westslope cutthroat plant in Peterson Lake and the fact that Peterson Lake is a potential source of rainbow trout in the Governor Creek drainage, which contains several conservation populations of westslope cutthroat trout, it is recommended that westslope cutthroat trout continue to be stocked into Peterson Lake. Studies have shown that frequent stocking of non-hybridized cutthroat trout into waters with rainbow trout can result in the conversion of those fisheries to cutthroat trout. The lake should be stocked biennially with 400 fish in an attempt to replace the rainbow trout fishery with westslope cutthroat trout.

<u>Pioneer Creek Lakes</u>

Highup Lake

Highup Lake is actually two small connected lake basins separated by a rock outcrop. There is no defined inlet to the upper basin, but is it has steep rocky shores that drop off sharply to depths < 8 ft (Shephard 1990) and the maximum depth is 14 ft. The lower basin is connected to the upper basin by a small channel. The lower basin is also fed by Pioneer Creek flowing down from Skytop Lake. The lower basin is also rocky with a maximum depth of 15 ft. There is no record of fish being stocked in Highup

Lake and previous fisheries inventories captured no fish (Shephard 1990). Access to the lake is described below for Skytop Lake.

Highup Lake was visually surveyed on September 3rd, 2009 by sitting at high vantage points and looking for fish for approximately 1 hour. No fish or evidence of fish was observed. It appears that Highup Lake continues to be fishless. The inlet stream appears to have habitat adequate to support spawning and there is some gravel along the shore line. The lake is isolated from Pioneer Lake downstream, which reportedly has a remnant cutthroat trout population among abundant brook trout, by large cascades and it appears that no golden trout from Skytop Lake have yet migrated downstream.

Skytop Lake

Skytop Lake is a 5 acre lake that is the highest elevation lake (9370 ft) in the Big Hole drainage that contains a viable fishery. The lake is located at the headwaters of the Pioneer Creek drainage. Highup Lake is located less than 0.2 miles to the south of Skytop Lake and Pioneer Lake is located 0.5 miles southeast from Highup Lake. All lakes are located on Pioneer Creek. Skytop Lake is a relatively deep lake (maximum depth of 36 ft, Wells 1981) with rocky shores around nearly all of the lake. The lake has no defined inlet, but a large snow field at the western edged of the lake supplies water to the lake during the summer months. A shallow, rocky reef extends into the lake at the western shore, but the rest of the shore is steep. The outlet of the lake is small and flows only a short distance before cascading steeply downhill to Highup Lake. Skytop is the only lake in the Big Hole drainage that supports a stocked golden trout population. Golden trout were initially stocked in 1984 and have been periodically stocked thereafter (1990, 2007, 2009). The sporadic stocking of golden trout is due to the inconsistent availability of golden trout eggs collected from Sylvan Lake in the Beartooth Mountains. Golden trout are packed into Skytop Lake by backpack. Skytop Lake was surveyed in 1981 (Wells 1981) and found to be fishless. Access to the lake is gained by taking trail 442 toward Pioneer Lake. Approximately 0.2 miles before reaching the lake, head cross country northwest toward the inlet of Highup Lake. One must traverse a steep rocky chute to reach the inlet of Highup Lake, but this route is better than following Pioneer Creek from Pioneer Lake to Highup Lake. Once at Highup Lake, follow the stream to Skytop Lake.

Skytop Lake was surveyed on September 3rd, 2009 as fry were being transported to the lake for stocking. A single gillnet was set on the western side of the lake for 2.5 hr and caught 6 golden trout. All fish captured appeared to be 2 year olds from the 2007 plant and there was no evidence of natural reproduction at the lake from previous plants. Prior sampling in 1989 indicated that 5 year old fish were 11.3-15.4 inches (Shephard 1990). Fish growth at Skytop Lake is slow likely because of the high elevation of the lake and the short growing season. Large copepods were abundant at the lake and were present in the stomachs of fish along with fingernail clams and terrestrial ants. Use of the lake was light likely owing to the difficulty of access and inconsistent stocking of fish.

Management Recommendations for Pioneer Creek Lakes

Highup Lake was recommended for stocking of westslope cutthroat trout in 1990, but no stocking has occurred. Prior to the stocking of Highup Lake, the status of Pioneer Lake should be determined. The presence of a remnant cutthroat trout population in in Pioneer Lake and its potential genetic status has

not been tested and it is possible that non-hybridized westslope cutthroat trout are present in the lake. Because of the high likelihood of fish introduced into Highup Lake becoming self-sustaining, it is possible that fish from Highup could migrate downstream to Pioneer Lake. If a conservation population of cutthroat trout is present Pioneer Lake, Highup Lake should only be stocked with westslope cutthroat trout or left fishless.

No management changes are recommended for Skytop Lake with the exception of a more consistent golden trout stocking regime. Because of its high altitude and low productivity, it is recommended that Skytop Lake be stocked on a 6 year cycle. If a conservation population of westslope cutthroat trout is found in Pioneer Lake, the stocking of golden trout will have to be more closely evaluated to determine if it poses a threat to the native cutthroat trout.

Big Swamp Creek Lakes

Ajax Lake

Ajax is a moderate sized (19 acres), very deep lake (93 ft, Wells 1981) located at an elevation of 8522 ft. Ajax Lake is located at the headwaters of Big Swamp Creek in a steep cirque basin. Ajax is one of the few alpine lakes that is accessible by a 4x4 vehicle. The lake shore is composed of large rocks and some bedrock along the southwest portion of the lake. The shoreline around the entire lake drops off quickly and there is very limited littoral area. Ajax Lake was stocked with undesignated cutthroat in 1948 and 1958 and with a single plant of rainbow trout in 1959. The lake was sampled in 1970 and 1973 and found to contain a self-sustaining population of rainbow trout (Wells 1981). Access to the lake is gained by traveling the Big Swamp Creek Road (Road 625) to the end of the road. It should be noted that due to the elevation, and steep rugged nature of the road, it is sometimes not passable until later in July.

Ajax Lake was sampled on July 15th, 2010 when a single gillnet was set in the lake and left to fish overnight. Only rainbow trout (23) were captured in the gill net (Table 1). The average size of fish captured in 2010 was greater than that observed in 1970 (11.4 in) and in 1973 (11.5 in) and maximum fish size was nearly 4 inches greater than previously documented (Wells 1981). Ajax Lake appears to continue to be a self-sustaining fishery for rainbow trout and is currently producing quality sized fish. Good spawning habitat is present in the outlet stream within 100 yards of the lake after which the stream cascades down a very high gradient reach. Use at the lake is high because of the good access. No amphibians were found at the lake. It should be noted that an attempt was made to reach the lake the first week in July 2010 and a walk of more than 1.75 miles was required to reach the lake due to snow drifts and the lake was completely frozen. At one point near the lake, the road was under more than 15 ft of snow.

Albino Lake

Albino Lake is a 4.6-acre lake located 0.5 miles to the northwest of Ajax Lake at an elevation of 8817 ft. The lake substrate and shoreline is primarily boulders. There is no defined inlet stream, but an outlet stream drains to the east. The eastern lobe of the lake is shallow with boulder substrate while the western part of the lake is much deeper (appears > 8 ft) with steep shores. Albino Lake was stocked

with brook trout in 1940 but there is no record of the lake being sampled any time thereafter. The Beaverhead National Forest Lake and Fish Inventory (1992) lists the lake as fishless.

A single gillnet was fished in Albino Lake overnight on July 15th, 2010 and no fish were captured. It appears that the brook trout stocked into Albino Lake are no longer present (Table 1). No potential spawning habitat was identified along the lake shoreline and only poor quality habitat was identified in the outlet stream. The lake receives little use and there were no amphibians observed.

Hidden Lake

Hidden Lake is located in a rift in the southern side of the Big Swamp Creek valley. The lake is 7.0 acres, has a maximum depth of 23 ft and sits at an elevation of 8092 ft. The lake is forested on the north and west shores and there is a talus and bedrock slope on the southern shore. Accordingly, the shoreline is steep on the south side of the lake and the grade is less on the north side of the lake. A small inlet stream is present in the southwest corner of the lake and the outlet stream to the north is low gradient for approximately 300 yards before cascading off the side of the mountain. An apparent avalanche on the southwest side of the lake resulted in the input of hundreds of trees into the lake. There is no stocking record for Hidden Lake, but the lake has been surveyed 2 times previously in 1981 (Wells 1981) and again in 1992 (Oswald 1992). The lake was reported to containing a self-sustaining population of cutthroat trout (subspecies was unspecified). Access to the lake is obtained by driving up Big Swamp Creek Road and pulling off the road to the north of the lake. No trail was identified to the lake so one must cross Big Swamp Creek and hike 0.5 miles south up a steep slope to the lake.

Hidden Lake was sampled on July 13th, 2010 when a single gillnet was set across the southeast part of the lake and fish for 3 hours. Two people also angled the lake for 3 hours. A total of 35 fish were captured (20 via angling primarily from the outlet stream and 15 from the gillnet). All fish captured resembled Yellowstone cutthroat trout (Table 1). It should be noted that the fish captured in the outlet stream were actively spawning and in general were smaller and in poorer condition than those captured in the lake. Fish size in 2010 closely resemble that observed in 1981 (mean length = 9.2, range 6.4-12.0, Wells 1981), but fish were smaller and in poorer condition than those captured in 1992 (mean length = 12.1, range 9.5-14.5, K = 41.9, Oswald 1992). Although fish size and likely fish abundance appears to fluctuate through time, it is apparent that the population is self-sustaining through time. The stability of the population is likely due to the high quality spawning habitat present in the outlet stream. Hundreds of fish were observed in the outlet stream attempting to spawn. Limited spawning habitat was also present in the lake along the eastern shore (actively spawning fish present). Use at the lake was light and no camp sites were identified. No amphibians were observed at the lake.

Lena Lake (Lower)

Lena Lake is a relatively large lake (25.6 acres) with a maximum depth of 29 ft (Wells 1981) located at an elevation of 8345 ft. The lake shoreline is mostly forested except for the western end of the lake which has a talus/bedrock slope that extends into the lake. Most of the lake substrate is a mix of boulders and silt, but there is more gravel toward the inlet of the lake. There are abundant trees that have been blown into the outlet of the lake. The inlet from Upper Lena Lake enters on the southwest corner of the lake and the outlet that drains to Big Swamp Creek is located at the southeast corner of the lake. Lena

Lake was stocked with rainbow trout in 1942 and 1958 and with cutthroat trout in 1948. It has been sampled twice before in 1973 and 1981 and found to contain a self-sustaining population of rainbow trout up to 14 inches long (Wells 1981). Access to the lake is obtained by driving up the Big Swamp Creek road toward Ajax Lake. Approximately 1 mile downstream of Ajax Lake the Continental Divide Trail crosses the road. There is a small pull off in this area giving access to the trail north of the road. The lake is located approximately 1 mile from the road. The trail does not go directly to the lake but crosses the outlet stream approximately 100 yards downstream from the lake.

Lower Lena Lake was sampled on July 14th, 2010 when the lake was angled by 2 people for approximately 2 hours and 23 fish that appeared to be non-hybridized rainbow trout were captured (Table 1). The average size and was slightly greater than that observed in 1973 (9.2 in) and 1981 (9.1 in, Wells 1981), suggesting there may be slightly larger fish presently in the lake than in previous years. Angling can sometimes be bias toward larger individuals, but the size range of fish angled in 2010 included smaller individual similar to past netting (1973 range = 6.2-13.9 and 1982 range = range 6.0-14.1 in, Wells 1981). Therefore, it is more likely that the lake currently contains fish that are slightly larger than those observed in previous decades. Although the fish are currently slightly longer than in the past, their condition is below average suggesting an overabundance of fish relative to the available food supply. Fish were observed spawning in the inlet and outlet streams and along the shoreline. The inlet spawning habitat was ranked as good and the outlet as fair with good spawning in the lake near the inlet stream. Use at the lake was moderate because of the relative ease of access. Three campsites were noted at the outlet stream and 2 at the inlet. No amphibians were observed at the lake.

Upper Lena Lake

Upper Lena Lake (unnamed on USGS Topographical Map) is located 0.18 miles southwest of Lower Lena Lake and is at an elevation of 8587 ft. The lake is approximately 7.9 acres and has a steep talus slope on the southwest side of the lake. The east and north sides of the lake have a more gradual slope and are sparsely forested. The inlet and outlet streams are located on the north shore and northeast corner of the lake respectively. The lake substrate is a mix of boulders and silt with limited areas of gravel. No depth measurements were made, but it appears that most of the lake is more than 8 ft deep. There is no stocking record for Upper Lena Lake and no record of it ever being sampled; however, the Beaverhead National Forest Lake and Fish Inventory (1992) lists the lake as containing cutthroat trout. Access to the lake is the same as Lena Lake, but once at the lower lake proceed, to the inlet stream at the southwest corner of the lake and follow this stream to Upper Lena Lake.

Upper Lena Lake was sampled on July 15th, 2010 when a single gill net was set across the northeast corner of the lake. No fish were captured in the net. It is unclear why the lake was listed as containing cutthroat trout because there is no record of it being stocked and no evidence was found of a self-sustaining population of fish. Very little suitable spawning habitat was identified in either the inlet, or outlet, or shoreline. Despite having no fish, the lake showed signs of moderate use and 2 camp sites were identified. No amphibians were found at the lake.

Unnamed Lake

A 2.0-acre unnamed lake located 0.1 miles southwest of Albino Lake was also surveyed to determine if fish were present. No fish were captured in an overnight gillnet set and the lake appears fishless. It was identified during the survey as one that has the potential to support a fishery, but observations of historical aerial photography indicate the lake decreases dramatically in depth and sized in dry years, likely making it too shallow to sustain fish through the winter.

Management Recommendations for Big Swamp Creek Lakes

No management recommendations are warranted for Ajax, Hidden and Lena lakes. All lakes have self-sustaining populations of fish. Anglers should be encouraged to keep their limit of fish at Hidden and Lena lakes to help reduce the total number of fish in the lakes and improve and/or maintain the fisheries. Albino Lake and Upper Lena Lake appear to have the potential to support stocked fisheries. It is recommended that the lakes be stocked with golden trout on a 4 year basis at a rate of 100 fish/acre. The lakes would be ideal places to stock golden trout because there are no known native westslope populations in Big Swamp Creek and all of the neighboring lakes have non-native fisheries (i.e., rainbow and Yellowstone cutthroat trout). Golden trout can be highly sought after and increasing the opportunity to catch these fish in the Big Hole drainage would be desirable.

Van Houten Lake

Van Houten Lake is easily accessible by vehicle and has 2 associated Forest Service campgrounds around the lake. The lake is 8 acres and has a maximum depth of 14 ft. The lake has a mostly silt bottom but some cobbles are present on the downwind (northeast and east) shorelines. Lily pads surround much of the shoreline but are especially prominent on the north and west shores. The lake is fed by a small spring from the north and a small drainage on the west shore. The outlet is located in the southeast corner of the lake and flows approximately 1 mile through a boggy meadow to the Big Hole River. Access to the lake is gained by taking the Skinner Meadows Road approximately 1 mile north of Jackson and following the signs to the lake. Van Houten Lake was first sampled in 1959 when a single gillnet was fished in the lake. At that time 5 rainbows and 3 brook trout were captured along with 3 burbot and 88 unspecified suckers (Heaton 1960). The lake was sampled again in 1965 when 2 gillnets were fished in the lake and caught only brook trout (108, average length 9.6 inches, range 6.9-11.0 in) and longnose suckers (34 total) (unpublished data). The Beaverhead Forest Lake and Fish Inventory (1991) lists the lake as containing rainbow and brook trout. The stocking record for the lake indicates it was stocked extensively primarily with rainbow trout from 1941 through 1963. Undesignated cutthroat trout were stocked in 1945 and 1946 and brook trout were stocked in 1963.

Two gillnets were fished overnight in Van Houten Lake on June 3rd, 2009. Brook trout, white suckers and longnose suckers were on the only fish species captured (Table 1). The sucker population in Van Houten Lake outnumbered the brook trout nearly 10:1 which is a dramatic change in the fishery from the 1960's when brook trout outnumbered suckers 3:1. It is likely that given the abundance of suckers in the lake they are competing with and depressing growth in the trout population. However, despite the abundance of suckers, several moderate sized (15-17 in) brook trout, which were not present in previous sampling events, were captured in the nets. It is likely that once the brook trout attain an adequate size they become pisciverous and prey upon the abundant suckers. It is unclear where brook trout are currently spawning. There is some gravel in the inlet stream on the north shore but this

stream is quite small in the fall. It is possible that the fish spawn in the areas of cobble on the northwest and west shore lines. White suckers were previously undocumented in the lake but it is unclear if they naturally colonized the lake through the connection with the Big Hole River or if they were illegally introduced. Similar to the 1965 sampling no burbot were caught in nets in 2009.

Management Recommendations

The nature of Van Houten Lake (shallow with a silt bottom and abundant littoral areas) would suggest that it is capable of supporting a much more abundant trout fishery than it currently contains. Additionally, easily accessible lakes such as this one with campgrounds should provide a consistent and reliable family fishery. Management actions should be taken to reduce the white and longnose sucker populations to enhance the trout fishery. The introduction of a native predator species such as burbot should be considered. In Big Hole lakes where burbot are present (Miner, Mussigbrod, Twin, Pintler), sucker populations are kept in check and their abundance does not appear to affect trout growth. However, it is unclear if burbot would survive in Van Houten Lake given its small size and shallow nature; but, if they did survive they would likely control the sucker population which would enhance the trout fishery and they would also provide and additional fishery in the lake. If burbot introduction is not feasible or successful, mechanical suppression of suckers should be considered. Mechanical suppression would consist of deploying trap nets in the spring when suckers are congregated along the shoreline attempting to spawn and killing all suckers captured in the nets while releasing the trout. Efforts would likely have to be repeated on a 2 to 4 year basis to maintain suckers at low abundance. Once sucker abundance is reduced, the brook trout population should be closely monitored for a response. If they do not respond with increases in numbers and average size, supplemental stocking should be considered.

Table 1. Fisheries survey data from West Big Hole lakes from 2008-2010 where length is in inches and weight is in pounds. The fish species abbreviations are: LL = brown trout, RB = rainbow trout, EB = brook trout, WCT = westslope cutthroat trout, YCT = Yellowstone cutthroat trout, M COT = mottled sculpin, LSU = longnose sucker, WSU = white sucker and AG = Arctic grayling. Condition factor (K) and Spawning habitat are described in the methods section. Use is a qualitative measure of use and recreation related impacts at the lake. Amphibian abbreviations are: SF = Columbia spotted frog, TF = tailed frog, WT = western toad and SS = spotted salamander.

Lake	Temp (^{o}F)	pH	Cond. (µS)	Species	#/net	Avg L (range)	Avg W (range)	Condition	Spawning Habitat			Use	Amphibians
									Inlet	Outlet	Shore		
Berry	54.6	8.55	3	WCT-YCT	37	12.0 (7.0-14.8)	0.60 (0.14-1.23)	34.8	P4	P5	P2,3	Light	None
Timberline	45.4	6.88	0	WCT-YCT	34	11.2 (7.2-14.6)	0.47 (0.11-0.94)	30.4	P4	P5	P2	Light	None
Cowbone	57.0			WCT	1	6.6	0.09	30.7				Heavy	None
				YCT	8	14.4 (13.5-15.5)	0.91 (0.61-1.16)	29. 9					
Englejard	69.4	7.67	9	LSU	12	6.5 (6.2-6.7)	0.12 (0.11-0.14)	44.4	P4	P4	P2	Light	SF, WT
Hamby	60.0	7.81	4	EB	21	9.1 (5.8-12.4)	0.28 (0.07-0.60)	33.0	E1,2,3	F3	F2	Mod	SF
				YCT	4	9.6 (7.2-13.3)	0.30 (0.11-0.66)	29.0					
Lake Geneva	58.6	6.94	2	YCT	14	10.3 (7.2-14.3)	0.38 (0.10-0.91)	31.0	G1,2,3	F2	F2.3	Light	None
Ovis	53.2	8.79	5	Fishless	0				P4	P4,5	P3	Light	SF
Schultz Reservoir	53.0	8.34	3	WCT	34	10.3 (5.6-14.2)	0.44 (0.10-0.94)	37.7	G1,2,3	NA	P3	Mod	
				EB	2	15.9 (15.6-16.2)	1.74 (1.72-1.75)	43.7					

Table 1 (cont.)

Lake	Temp (°F)	pH	Cond. (µS)	Species	#/net	Avg L (range)	Avg W (range)	Condition	Spawning Habitat			Use	Amphibians
									Inlet	Outlet	Shore		
Peterson	62	7.88	30	WCT	14	11.3 (10.2-12.2)	0.51 (0.40-0.66)	35.4	P4	G1,2,3	P2,3	Mod	None
				RB	6	10.8 (7.8-14.9)	0.42 (0.11-0.73)	31.9					
Highup				Fishless	0				F3		F3	Light	None
Skytop		8.55	0	GT	6	7.1 (6.5-7.8)	0.12 (0.09-0.17)	32.8	P4	P5	F3	Light	None
Ajax	46.8	8.34	6	RB	23	12.7 (5.8-18.2)	0.90 (0.08-2.18)	35.7	P4	G2	F2,3	Heavy	None
Albino				Fishless	0				P1	P2	P1	Light	None
Hidden				YCT	35	9.8 (5.7-13.5)	0.47 (0.10-0.88)	35.8	F2,3	E1,2,3	P3	Light	None
Lena					23	11.2 (6.2-15.3)	0.49 (0.10-1.03)	32.4	G1,2,3	F3	G2	Mod	None
Upper Lena				Fishless	0				P3	P2	P2	Mod	None
Unnamed		7.84	5	Fishless	0				P4	F3	G3	Light	None
Van Houten	58			EB	13	10.2 (6.2-17.2)	0.57 (0.10-2.36)	39.4	F2,3	F3	F3	Heavy	
				LSU	43	7.9 (6.2-17.4)	0.25 (0.12-1.75)	41.0					
				WSU	83	11.1 (6.3-18.3)	0.58 (0.11-2.60)	36.5					

Pintler Range Lakes

Hellroaring Creek Lakes

Phlox Lake

Phlox Lake is located near the headwaters of Hellroaring Creek in the Anaconda-Pintler Wilderness Area. The lake was surveyed on July 30th 2008. At the time of the survey there was no defined lake present, rather a large boggy meadow and few small spring seeps of running water were found. There is no fisheries potential in this named "lake".

Surprise and Violet Lake

Surprise Lake (6.6 acres) and Violet Lake (3.4 acres) are located at the headwaters of unnamed tributaries to Hellroaring Creek near the southwest corner of the Anaconda-Pintler Wilderness Area. The lakes are located upstream of a non-hybridized population of westslope cutthroat trout in Hellroaring Creek, but the status of the lakes is unknown. The Beaverhead National Forest Lake and Fish Inventory (1992) lists Surprise and Violet lakes as fishless, but there is no reference detailing the source of this information and no other reports list the lakes as having been formally inventoried. Access to these lakes was gained by driving up the Johnson Creek Road to the Forest Service Bender Cabin then hiking northwest on trial 374 to the lakes.

On July 29, 2008 the lakes were formally surveyed and a single gill net was set overnight in each lake. No fish were captured. Both lakes appeared to have adequate depth to support a fishery, but no fish appear to have been introduced to the lakes. Abundant aquatic invertebrates including caddis flies and leaches were noted.

Management Recommendations for Hellroaring Creek Lakes

Because these lakes are fishless they pose no potential threat to the non-hybridized westslope cutthroat trout present in Hellroaring Creek. Although these lakes could support fish, they should be left fishless to protect the character of the native fauna in wilderness lakes.

Mudd Lake

Mudd Lake (15.8 acres) is located at the headwaters of the East Fork of Mudd Creek. Although located at the headwates of the creek, the lake is used as a pass-through system for irrigation water diverted from Palisades Creek in the West Fork of Fishtrap Creek drainage. An approximately 1.6 mile long ditch located within the Anaconda-Pintler Wilderness diverts all of the surface flow of Palisades Creek to Mudd Lake. From Mudd Lake, the water is ditched along Trail 377 to Clavert Creek to augment flows in that stream for irrigation. Mudd Lake is a very shallow (<3 ft) silt bottom lake with abundant lily pads. Near the outlet is a small section of what appears to be slightly deeper water. There is no stocking record for Mudd Lake. Access to the lake can be gained by traveling the well used Trail 377, which appears to be used to by ATV's to access and maintain the irrigation diversions on Mudd Lake and Palisades Creek. No previous fisheries information was available for Mudd Lake and the Lake and the Beaverhead Forest Lake and Fisheries Inventory (1992) lists the lake as barren.

Mudd Lake was sampled on July 29th 2008 with a single overnight gill net set across the deepest portion of the lake. Only a single brook trout was captured. The condition of the brook trout was very high likely owing to the warm water temperature and very low density of fish. It is likely that the lake, because of its shallow nature and lack of suitable spawning areas is not able to support a viable fishery. The only potential spawning habitat available is in the irrigation ditch feeding the lake and it is unknown if water is present in the ditch year round. It is likely the fish present in the lake migrated from Palisades Creek, which has an abundant brook trout population. Spotted frogs were common at Mudd Lake. Recreational use at the lake was light except for apparent traffic the trail sees associated with irrigation management.

Management Recommendations

No management changes are proposed for Mudd Lake. The lack of suitable habitat in the lake will limit its ability to be a viable fishery. Further, the lake appears to provide important habitat for amphibians. Westslope cutthroat trout restoration is being considered in the Mudd Creek drainage and it should be noted that any restoration in the drainage that occurs downstream of the confluence of the East and West Forks of the stream should also include Palisades Creek because of the across-drainage connection between these two systems.

Pintler Creek Lakes

Oreamnos Lake

Oreamnos Lake is the only lake in the Pintler Creek drainage that contains a fish population. The lake is approximately 8.3 acres and 33 ft deep (Wipperman 1964) and is located within the Anaconda Pintler Wilderness Area. The lake habitat consists of a generally silt/sandy bottom on the south shore with bedrock outcrops on the western side of the lake. Access to the lake can be gained either by hiking up the Pintler Creek Trail (approx 6 miles from trailhead) or from the Rock Creek side of the Continental Divide. In 1934, 1959 and 1960 the lake was stocked with rainbow trout. In 1951 undesignated cutthroat trout were stocked into the lake. Beginning in 1990 the lake was stocked on a 4 year cycle with rainbow trout and in 2006 the species was changed from rainbow trout to westslope cutthroat trout. The lake has been surveyed twice in the past. Wipperman (1964) sampled the lake with 2 gillnets fished for 48 hours and caught 44 rainbow trout while Shepherd (1990) surveyed the lake with a single gillnet and captured only 2 rainbow trout.

On August 13th, 2009 the lake was surveyed and one gillnet was set overnight capturing 12 fish that phenotypically appeared to be rainbow trout. No fish from the 2006 westslope cutthroat trout plant were captured and if they were present, they should have been large enough (age 3 = 8 inch) to be captured in the gillnet. It is unclear if this plant of fish was unsuccessful or if it did not occur. The condition of the fish captured was average (Table 2), but the overall catch was low for a lake that is on a 4 year stocking schedule. Spawning habitat is present in the inlet and along the shoreline, but it did not rank as high quality habitat. Based on the size range of fish captured, it appears that no recent fish plants have been successful and that the lake is being sustained through natural reproduction. Despite the difficulty in accessing the lake, it sees moderate use. There is a well established trail to the lake and camping areas are present near the outlet.

Unnamed Lake.

Located approximately 0.15 miles to the north and west of Oreamnos Lake (45.94270, 113.50996) at the top of the Continental Divide is a 3.3 acre unnamed lake that was also surveyed on August 13th 2009. No previous fisheries information was available for this lake. While deep enough to support fish, no fish were captured in an overnight gill net set. Much of the lake appears to be > 8 ft deep, but no actual depth measurements were made. Tamarack trees are present at the lake and surrounding area.

Sawed Cabin Lake

Sawed Cabin Lake is located approximately 0.7 miles to the southwest of Oreamnos Lake. The lake is 5.0 acres and the maximum depth of the lake is 13 ft (Shepherd 1990). There is no stocking record for the lake and it was fishless when it was surveyed last in 1989 (Shepherd 1990). Although the lake is within the Anaconda-Pintlar Wilderness Area, it was recommended for stocking with westslope cutthroat trout, but stocking has not occurred. Access to the lake is best achieved by taking Trail 9 (Continental Divide Trail) from the Pintler Creek Trail south to Elk Park. From Elk Park one must travel cross country though a small saddle and to the north and drop down a grassy chute to the lake. The lake is located on an unnamed tributary to Pintler Creek. Approximately 100 ft downstream of the lake outlet, is a sizeable waterfall and cascade.

Similar to the 1989 survey, when the lake was sampled on August 13th, 2009 no fish were captured. The habitat in the lake appeared very favorable for the establishment of a self-sustaining population of fish, but it appears that no fish have been introduced to the lake. The lake inlet contains good spawning habitat and several areas of the shore line also had suitable spawning habitat. Tailed frog adults were noted at the lake. Scuds (*Gammarus sp*.) were also abundant in the lake, but are not native to alpine lakes in the region. The source of this invertebrate to the Sawed Cabin Lake is unknown in, but they were noted in previous surveys in Oreamnos Lake (Shepherd 1990). Use of the lake is light, which is likely associated with the lack of fish and remote nature of the lake. There is no established trail to the lake and no campsites are present.

Bear Lake

Bear Lake is a 2.7-acre lake located at the headwaters of Beaver Creek, a tributary to Pintler Creek. The lake is in the latter stages of succession and is shallow and eutrophic. The eastern shore line is more tree covered with some rocks whereas the north, south and west shore are primarily boggy with abundant sedges. A floating bog is present at the northern end of the lake. The floating sedge bog extends approximately 50 ft out into the lake. The lake is at least 8 ft deep, much deeper than previously reported (5 ft, Shepard 1992), at the edge of the floating bog. Access to the lake was gained by traveling up the Pintlar Creek Trail to the Continental Divide Trail then traveling west on said trail through Elk Park. Approximately 1.75 miles southwest of Elk Park, the lake is reached by leaving the trail and going cross country to the east approximately 0.2 miles. A fire recently burned the area to the west of Bear Lake including the trees on the western shoreline.

A single gillnet was fished in Bear Lake for 2 hours on August 13th, 2009. The net was set from the floating bog to the outlet located at the southeast corner of the lake. No fish were captured in the net

and no fish were observed in the lake during the time the net was fishing. No fish were present in Beaver Creek downstream of the lake until approximately 1 mile upstream of the confluence with Pintler Creek. Spotted frogs adults and recently metamorphosed juveniles were abundant at the lake. A 5 ft dip net was used to determine that the bog on the north end of the lake was floating and to determine that the lake was > 8 ft deep.

Management Recommendations for Pintler Creek Lakes

No management changes are recommended for the lakes in the Pintler Creek drainage. Oreamnos Lake should be monitored to determine if the stocking is successful. Pintler Creek is one of several streams that is being considered for westslope cutthroat trout restoration. Because of the natural waterfall on the stream near the wilderness boundary and the approximately 8 miles of habitat upstream, it is a prime candidate for cutthroat restoration. Cutthroat restoration would likely involve the removal of rainbow trout from Oreamnos Lake and restocking the with westslope cutthroat trout.

Lower Seymour Lake

Seymour Lake is a small (3.8 acres) and shallow (much of the lake appears less than 5 ft deep) lake located at an elevation of 6750 ft. The lake is a popular recreation area because it is readily accessible by car or truck and has an associated Forest Service Campground adjacent to the lake. Seymour Creek feeds the lake from the north and exits on the south end of the lake. The stream at the lake inlet is low gradient with abundant spawning habitat while the outlet shortly downstream of the lake is moderate gradient with larger boulder and cobble substrate. The lake has a silt bottom with a marshy inlet and many sunken trees, particularly near the outlet. The Beaverhead National Forest Lake and Fish Inventory list the lake as containing brook trout, but there is no record of the lake being sampled. There is also no stocking record for Lower Seymour Lake. Chub Creek which converges with Seymour Creek upstream of Seymour Lake is reported to contain a conservation population of westslope cutthroat trout.

A single gill net was fished overnight in Lower Seymour Lake on June 23rd, 2009. Brook trout and what appeared to be a hybrid between a rainbow and cutthroat trout were captured (Table 2) in the net. The average size of brook trout was small (8.5 in) but one larger fish (13 in) was captured. The shallow nature of Seymour Lake and the overly-abundant brook trout population likely limit its fishery potential. However, given its proximity to a popular campground, the abundant brook trout provide a good family fishery with the opportunity to catch eager fish. Spotted frogs were common in the marshy inlet of the lake.

Management Recommendations for Lower Seymour Lake

No management changes are recommended for Lower Seymour Lake. Anglers are encouraged to keep brook trout from the lake to facilitate better fish growth and overall fish size.

Tenmile Creek Lakes

Tenmile lakes are located at the eastern edge of the Anaconda-Pintler Range at headwaters of Tenmile Creek. There are three major lakes (not named, but called Lower, Middle and Upper in this report) all

separated by less than 0.15 miles. Each lake is separated from the other by a short, steep, cascading reach of Tenmile Creek. The Lower Lake is the smallest (6.7 acre) and is at 8,602 ft elevation. The shoreline of this lake is heavily forested and although no depth measurements were made it appears to be a relatively shallow lake. The northeastern and eastern shores are relatively shallow with boulder substrate while the western and southern shores have finer substrate with cobble, gravel and sand. The inlet stream is high gradient with large boulder substrate and has limited spawning habitat, but the outlet stream has fair spawning habitat but in limited quantity. Some shoreline spawning habitat is present on the western and eastern shores. The Middle Lake is long and narrow and has a mostly boulder bottom. It is 7.6 acres and is at an elevation of 8730 ft. The south shore of the lake is steep and the water appears > 10 ft deep, but the north shore consists of a shallow boulder reef. Limited spawning areas are present in the inlet and along the north shore. The Middle Lake is less forested than the Lower Lake. The forest type changes from the lower to the middle lake from mostly spruce and lodgepole pine at the Lower Lake to whitebark pine and tamarack at the middle and upper lakes. The Upper Lake is the largest of the three lakes (15.2 acres) and is an 8860 ft elevation. The western shore of the lake is steep and the lakebed drops rapidly from the shoreline. The northern and eastern shores of the lake are much more gradual sloped. Only the northern shore has a silt bottom while the rest of the lake has boulder substrate. It should be noted that the northern end of the middle lake and all of the upper lake are located on private property. There is no stocking record for Tenmile Lakes and there is no record of the lakes being surveyed prior to this report. The Beaverhead National Forest Lake and Fish Inventory (1992) lists the Lower and Middle lakes as containing cutthroat hybrids and the upper lake as fishless. A conservation population of westslope cutthroat trout is present in Tenmile Creek downstream of the lakes. Access to the lakes can be obtained via the Slaughterhouse Creek Road (2492) to the parking area and end of the road. From there take trail 783 located immediately to the northe of the parking area approximately 2 miles to lower Tenmile Lake.

A single gill net was set across the outlet portion of each of the 3 lakes on July 22nd 2010 and fished overnight. Eleven fish were captured in the Lower Lake and all fish phenotypically appeared to be rainbow trout. In the Middle Lake, 22 fish were captured, 8 of which had the appearance of rainbow trout and the other 14 appeared to Yellowstone cutthroat trout. No fish were captured in the Upper Lake. The size and condition of the fish between the lower and middle lakes were similar. The condition of the fish was average, but the maximum size was relatively small (Table2). Both lakes appear to be self-sustaining, but higher quality spawning habitat is present in the lower lake. The lack of widespread hybridization in the middle lake suggest either that there is separation in timing or location of spawning of rainbow and Yellowstone cutthroat trout or that the Yellowstone cutthroat trout were introduced relatively recently. Given the lack of stocking records for the lower 2 lakes and yet the presence of self-sustaining fisheries, it is likely that fish were historically introduced into the Upper Lake as well but currently the Upper Lake does not contain a fishery. The apparent lack of suitable spawning habitat is likely the reason why a self-sustaining fishery is not present today in this lake. Use at the Middle and Lower lakes was moderate. Two campsites were present at the Lower Lake on the south shore near the outlet and one on the small peninsula on the eastern shore. Two campsites were also present at the Middle Lake: one on the northeast peninsula and one heavily used one on the western shore near the inlet. The remains of small cabin are also present near the western shore campsite. Spotted frog adults were present at the lower and middle lakes, but not at the upper lake. This lack of amphibians at the

upper lake was interesting because it is fishless and possesses the best amphibian habitat along the north shore of the three lakes.

An additional lake was surveyed in the Tenmile Creek basin located approximately ½ mile north of the upper Tenmile Lake. This lake is approximately 5 acres and is at an elevation of 8990 ft. The lake is relatively shallow (< 8ft) throughout with a mostly silt bottom. It is not hydrologically connected to the Tenmile lakes, rather it drains the north side of the Tenmile Creek valley and appears to converge with Tenmile Creek downstream of the lakes. The lake was observed from a high location for approximately 1 hour and there was no evidence of fish. The lake is likely too shallow to support a fishery through the winter. No amphibians were observed at the lake.

Management Recommendation

Fish harvest should be encouraged at the Lower and Middle lakes. The upper lake appears very capable of sustaining a stocked fishery. This lake is located on private property, and while public access is not restricted by posting or fencing, stocking would not likely occur without an agreement to ensure public access to the lake. Because the water body is a natural lake, the private landowners would not be permitted to stock fish. The landowner was contacted and was not interested in having the lake stocked with fish and allowing public access. Tenmile Creek was surveyed in 2010 downstream of the lakes and genetic samples were collected from westslope cutthroat trout. The data in indicate that a conservation population of westslope cutthroat trout is still present in the stream, but at low density. A 5 fish sample collected from 1993 indicated that there were still non-hybridized fish present in the stream, but 13 samples collected in the 2010 indicated the fish were very slightly hybridized with rainbow trout (99.3% WCT) with the exception of one individual that was predominantly rainbow trout (hybrid index of 11, Leary 2010). The one individual that was mostly rainbow trout was likely from the lower of the Tenmile lakes. The management of the fish-bearing lakes in the drainage may have to be altered to protect the native fish in the stream.

Table 2. Fisheries survey data from Pintler Range lakes from 2008-2010 where length is in inches and weight is in pounds. The fish species abbreviations are: LL = brown trout, RB = rainbow trout, EB = brook trout, WCT = westslope cutthroat trout, YCT = Yellowstone cutthroat trout, M COT = mottled sculpin, LSU = longnose sucker, WSU = white sucker and AG = Arctic grayling. Condition factor (K) and Spawning habitat are described in the methods section. Use is a qualitative measure of use and recreation related impacts at the lake. Amphibian abbreviations are: SF = Columbia spotted frog, TF = tailed frog, WT = western toad and SS = spotted salamander.

Lake	Temp (°F)	pH	Cond. (µS)	Species	#/net	Avg L (range)	Avg W (range)	Condition	Spawning Habitat			Use	Amphibians
									Inlet	Outlet	Shore		
Phlox												Light	
Surprise	67.5	8.60	12	Fishless	0				P1	P1,4		Light	None
Violet	59.4	8.04	13	Fishless	0				P1	P1	F3	Light	
Mudd	56.0	8.82	114	EB	1	10.5	0.58	50.4				Light	SF
Oreamnos		6.52	0	RB	12	8.7 (6.6-13.0)	0.27 (0.11-0.90)	35.8	G2	P5	F3	Mod	None
Unnamed	60.2		23	Fishless	0				P4	P1,4	F2,3	Light	None
Sawed Cabin	51.7	8.89	65	Fishless	0				G1	P5	G2,3	Light	TF
Bear				Fishless	0				P4	P1,4	P2	Light	SF
Lower Seymour	36.0	8.60	32	EB	7	8.5 (6.2-13.0)	0.32 (0.09-0.97)	36.0	E1,2,3	F3	P2	Heavy	SF
				RBxCT	1	9.2	0.27	34.7					
Tenmile (low)	55.5	7.74	8	RB	11	8.7 (5.9-10.5)	0.23 (0.07-0.42)	33.4	P3	F2,3	F2	Mod	SF
Tenmile (mid)	56.1	7.60	5	RBxYCT	22	8.1 (6.3-11.0)	0.20 (0.09-0.47)	35.8	P3	P5	F3	Mod	SF
Tenmile (up)	59.9	7.77	6	Fishless	0				P5	P5	P3	Light	None
Unnamed	52.8	6.97	5	Fishless	0								None

Fleecer Lakes

Fish Lake

Fish Lake is a series of two lakes separated by a small stream located at the headwaters of Long Tom Creek in the Jerry Creek drainage. The lake elevation is 7960 ft and it is the only natural lake that is known to support fish on Fleecer Mountain. The lakes have extensive littoral areas around the entire shore line with shallow silt flats and lily pads. Although no depths were taken, the center of the lakes appears to be deeper. The shore line is grassy with a shallow slope and sedges reach out into the margins of the lake. Beyond the grassy banks, the lake is surrounded by lodgepole pine forest. There is no stocking record for Fish Lake but anecdotal evidence indicates that at one time the lake did support a trout fishery. Access to the lake is gained by Forest Service Road 83 (Jerry Creek Road) to Road 2480 (Jimmy New Creek Road) to Road 1201. It should be noted that Forest Service Road 1201 is closed to motorized traffic except for snowmobiles during winter. At the end of Road 1201, the road crosses over the outlet stream of Fish Lake and there is an established trail leading ¼ mile to the south and west to the lake.

A single gillnet was set in the lower Fish Lake on July 8th, 2010 and fished for 5 hours. Only longnose suckers were captured in the net (Table 3) and they were only present in the smallest mesh size. No other fish species were observed or captured in the net. Many longnose suckers were observed in the lake that were too small to be captured in the gillnet. It is unclear if longnose suckers are native to Fish Lake or if they were introduced. Evidence of the latter includes a lack of the species in Jerry Creek at similar elevation to the lake and the lack of the species in Long Tom Creek upstream of the confluence of the outlet of Fish Lake. Longnose sucker were rare in Long Tom Creek downstream of the lake outlet. Longnose suckers are reported to be present in the upper Fish Lake as well but the lake was not netted. Spotted frog adults and tadpoles were abundant at the lake. There were two established campsites at the lake, but there was little evidence of recent use.

Management Recommendations:

Fish Lake should be stocked with westslope cutthroat trout from within the Jerry Creek drainage. Jerry Creek is home to 3 conservation populations of cutthroat trout (Jerry Creek, Delano Creek and Spruce Creek). Delano Creek and Spruce Creek have recently become hybridized; however some non-hybridized fish remain. It may be possible to salvage some of these non-hybridized fish to conserve these populations. Prior to cutthroat trout introduction in Fish Lake, bathymetric work should be done to determine if adequate habitat is present to sustain trout during winter. Oxygen measurements under the ice in February may also provide valuable information about the suitability of the lake to harbor trout. Given the overabundance of longnose suckers, it may also be necessary to remove this species from the lake to provide suitable conditions for trout growth.

South Fork Reservoir

South Fork Reservoir is formed by a dam approximately 30 ft high on the South Fork of the North Fork of Divide Creek. Water is piped from an outlet structure located in the reservoir near the dam to the Butte water treatment plant at Feeley. The spillway of the pond is a fish barrier and is located on the

northeast corner of the reservoir. It directs water horizontally along the hillside before it drops down a high gradient cascade to the streambed below the dam. The level of the reservoir fluctuates with the demand for water in Butte-Silverbow. However, recent water management has resulted in the reservoir remaining full all year and the stored water used as a backup in the event there is a problem with the Big Hole water source or with the transmission line. The elevation of the inlet of the reservoir has been raised to create a sediment catch basin. Within this basin is series of baffles that slow flow and allow suspended sediments to settle to the bottom. The water leaves the basin through an 18-inch pipe that discharges approximately 4 ft above the surface of the reservoir at full pool. When stream flows are too great for this pipe, a secondary culvert also exists on the north end of the sediment basin that discharges the water directly to the pond, bypassing the sediment catch basin. Fish passage from the reservoir to the stream upstream is not present or is very limited. There is no public access to the reservoir because it is part of the Butte municipal water supply.

There was no spawning habitat observed in the reservoir, and there was limited habitat in the inlet stream immediately upstream of the catch basin. An overnight gillnet was fished in the reservoir on July 8th, 2009. Both brook and westslope cutthroat trout were captured in the net, but at low numbers. Although numbers were low, the condition of the fish was excellent. Low numbers in the reservoir are likely due to the lack of spawning habitat in the reservoir and lack of access to suitable spawning habitat found upstream in the stream.

Management Recommendations:

As part of a westslope cutthroat trout restoration project, brook trout should be removed from the reservoir and creek upstream. Once brook trout are removed, fish passage should be established between the reservoir and the stream to allow cutthroat in the pond access to the stream to spawn. FWP should work with Butte-Silverbow to coordinate this cutthroat restoration project.

Table 3. Fisheries survey data from Fleecer lakes from 2008-2010 where length is in inches and weight is in pounds. The fish species abbreviations are: LL = brown trout, RB = rainbow trout, EB = brook trout, WCT = westslope cutthroat trout, YCT = Yellowstone cutthroat trout, M COT = mottled sculpin, LSU = longnose sucker, WSU = white sucker and AG = Arctic grayling. Condition factor (K) and Spawning habitat are described in the methods section. Use is a qualitative measure of use and recreation related impacts at the lake. Amphibian abbreviations are: SF = Columbia spotted frog, TF = tailed frog, WT = western toad and SS = spotted salamander.

Lake	Temp (^{o}F)	pH	Cond. (µS)	Species	#/net	Avg L (range)	Avg W (range)	Condition	Spawning Habitat			Use	Amphibians
									Inlet	Outlet	Shore		
Fish				LSU	9	6.5 (6.1-6.8)	0.11 (0.09-.011)	38.4	P2	P3	P2	Light	SF
S Fk Res.				EB	4	11.9 (9.3-13.6)	0.81 (0.38-1.04)	47.1	P4	P4	P2	Light	None
				WCT	3	11.1 (10.4-12.0)	0.52 (0.42-0.65)	37.3					

West Pioneer Lakes

Johanna Lake

Johanna Lake is located on an unnamed tributary near the headwaters of Alder Creek. The lake is at 8100 ft elevation and 4.6 acres. The lake is long and narrow and has a boulder bottom. The shore line is forested near the outlet and the eastern shore and broken by boulder fields on the western shore. The western shore is steep and this steep grade continues into the lake with depths > 10 ft within 20 ft of the bank. A shallow boulder reef is present on the eastern shore extending from the inlet to the outlet. Johanna Lake was originally stocked three times with rainbow trout between 1940 and 1949. From 1953 to 1963 four plants of unspecified cutthroat trout occurred. The next stocking of the lake occurred in 1990 with Yellowstone cutthroat trout and the lake has been stocked on a four year cycle with 125 fish/acre since that time. In 2006, the plant was switched from Yellowstone to westslope cutthroat trout. The lake has no record of being sampled, but the Beaverhead National Forest Lake and Fish Inventory (1992) indicates that both cutthroat trout and rainbow trout are present in the lake. Access to the lake is achieved by traveling the Bryant Creek Road to the gate at the Ferguson Lake trailhead. Continue past the gate (road is closed) on foot and cross Alder Creek (no bridge). Approximately 0.3 miles after crossing Alder Creek, head due south through an old clear-cut, paralleling the Johanna Lake outlet stream. Once through the clear-cut, a primitive trail exists on the south side of the stream leading to the lake.

Johanna Lake was sampled on June 30th, 2010 by setting a single gillnet for 3 hours near the outlet and angling. A total of 13 westslope cutthroat trout were captured (3 by angling) and 1 Yellowstone cutthroat trout (Table 4). Condition factor and water chemistry could not be calculated because the appropriate instruments were not brought to the lake. The westslope cutthroat trout were age-4 and in excellent condition. The Yellowstone cutthroat trout was age 8 and also in excellent condition. No evidence of natural reproduction was found and no suitable spawning habitat was identified. Use at the lake is moderate and appeared to be mostly people hiking in for day trips. A single campsite was present near the inlet of the lake on the southeast shore.

Management Recommendations

No changes in fisheries management are necessary at Johanna Lake. The stocking frequency and rate appear to produce optimal fish growth and a quality fishery. The lake should be monitored in 2013 or 2014 to determine if the westslope cutthroat will be as long-lived as the Yellowstone cutthroat trout.

Lily Lake

Lily Lake is located on an unnamed tributary of Steel Creek east of Wisdom, MT. The lake is 14.2 acres and 7167 ft in elevation. Lily Lake gets its name from the abundant lily pads that emerge from the sandy, silty bottom along the north and east shores. The lake's western shore is more steep and rocky. The entire shoreline is forested with large spruce trees. The inlet of the lake is located approximately half way down the eastern shore and is low gradient and heavily forested with abundant coarse granitic sand. The outlet near the southeast corner of the lake is moderate gradient for approximately 200 ft then enters a low gradient meadow before cascading down a high gradient reach approximately 0.2

miles downstream from the lake. There is no stocking history for Lily Lake nor is there record of the lake having been sampled, but the Beaverhead National Forest Lake and Fish Inventory (1992) lists the lake as containing cutthroat rainbow hybrids. Access to the lake is achieved by driving to the Steel Creek Guard Station then taking a 4x4 road to the north from the parking area. At the end of the road, continue north approximately 1.6 miles to the Lake on Trail 380. There is a junction at 0.9 miles and a sign that directs one to the east toward Lily Lake. It should be noted that this trail is open to two-wheeled motorized vehicles, but from the trail junction to Lily Lake is quite steep with lose ground.

Lily Lake was surveyed on June 24th, 2010 by setting a single gillnet across a bay on the eastern shore near the inlet for 4 hours and by angling. Twenty-two rainbow trout were captured (17 angling). The fish captured did not have phenotypic characteristics of rainbow- cutthroat trout hybrids but appeared to be only rainbow trout. The size of fish was small, but the condition was slightly above average (Table 3). Based on the size of fish present in the lake and capability of similar shallow siltly bottom lakes of producing larger fish, it appears Lily Lake is overpopulated. The majority of spawning is occurring along the shoreline of the lake. A large spawning area with actively spawning fish was identified at the southern part of the lake near the outlet. Although the inlet and outlet are low gradient, there is very little available gravel for spawning. The dominate substrate is granitic sand. Use at the lake was light with only one camp spot at the north end of the lake. No amphibians were observed but it is likely they are present given the elevation of the lake and the habitat present, but they were not likley active at the time of the survey at the end of June.

Management Recommendations

No management changes are recommended for Lily Lake other than encouraging anglers to keep fish to reduce numbers and increase growth. It should be noted that non-hybridized westslope cutthroat trout are present in Steel Creek downstream of the lake. Recent genetic samples have not been collected from the creek to determine if rainbow trout from Lily Lake have colonized Steel Creek. If Lily Lake rainbow trout are deemed a threat to the native westslope cutthroat trout, additional management action may be necessary.

<u>Pettengill Creek Lakes</u>

Stone Lake (Upper)

Upper Stone Lake is located on an unnamed tributary to Stone Creek, a tributary to Pettengill Creek. The lake is 14.7 acres and 8480 ft in elevation and has a maximum depth of 29 ft (McMullin 1983). The lake is one of the least productive in the Wise River drainage (HCO_3 = 63 mg/l), but is more productive than most lakes in the Big Hole (McMullin 1983). The lake on the western shoreline is steep and has a mix of forested and talus slopes. The slope of the northern, southern and eastern shoreline is much more gradual and a large boulder reef is present along most of the east side of the lake. No defined inlet was observed and the outlet stream was small and contained coarse cobbles and boulders. The lake was stocked 3 times between 1939 and 1946 with rainbow trout. Beginning in 1968 the lake was stocked with Yellowstone cutthroat trout (it should be noted that prior to 1986 stocking record only indicated fish were planted in Stone Lakes and did not specify which lake). From 1986 to the present Upper Stone Lake has been stocked with 800 fish (53 fish/acre) every four years. In 2006, westslope

cutthroat were stocked in lieu of Yellowstone cutthroat trout. Sampling in 1967 indicated the lake was barren of fish and when the lake was sampled again in 1982 was found to contain only 2 age classes of Yellowstone cutthroat trout (McMullin 1983). Access to the lake is gained by driving up the Doolittle Creek Road from Highway 43 (Road 2421) then to the North Fork of Doolittle Road (2422) then left on to Road 2423 to the end of the road and parking area. From there take trail 90 1.1 miles to the Pioneer Scenic Loop Trail (750). Head north on Scenic Loop Trail approximately 0.5 miles where an unmarked trail will intersect from the east and cross Stone Creek. This is the trail leading to Upper and Lower Stone lakes.

Upper Stone Lake was surveyed on August 9th, 2010 when a single gillnet was fished for 5 hours across a bay at the southern end of the lake. Only 4 westslope cutthroat trout were captured in the net (Table 4). Both the size and condition of the westslope cutthroat captured was good and similar to that of Johanna Lake. Although not captured in the net, several 8-year-old Yellowstone cutthroats were observed from the bank and appeared to be between 18 and 20 inches long. No evidence of reproduction was found at the lake and there was no potential spawning habitat identified. Use at the lake was moderate and 5 established campsites were present on the northern and eastern shores of the lake. Spotted frog adults were common on the eastern shore of the lake.

Stone Lake (Lower)

Lower Stone Lake is located approximately 0.6 miles to the east of Upper Stone Lake. The lake is 10 acres, at an elevation of 8000 ft and has a maximum depth of 47 feet. The northern and eastern shores of the lake are shallow with an extensive reef extending out into the lake approximately 200 ft. Most of the reef is made of boulders but the western edge of the lake has a mud bottom and lily pads. Many trees from the forested shoreline have fallen into the lake. The southern side of the lake is much steeper and dominated by talus slopes and fewer trees. The lake is < 10 ft deep within 20 ft of the bank on the western side of the lake. Two small inlet streams are present on the southwestern corner of the lake and the outlet stream is at the northeast side of the lake. The stocking history prior to 1983 did not specify between Upper and Lower Stone Lake, but sampling in 1967 (19 years after the last plant) indicated that Lower Stone Lake had a self-sustaining population of rainbow trout (McMullin 1982). However, when sampled next in 1982, only Yellowstone cutthroat trout were captured (McMullin 1982). It is unclear what happened to the rainbow trout population between 1967 and 1982. From 1986 to the present, Lower Stone Lake has been stocked with 600 Yellowstone cutthroat trout (60 fish/acre) every four years. Similar to other stocked lakes in the Big Hole, Lower Stone Lake stocking was switched from Yellowstone cutthroat trout to westslope cutthroat trout in 2006. Access to the lake is gained using the same route as Upper Stone Lake. Once at Upper Stone Lake hike cross country (no trail) from the southern end of the lake directly east approximately 0.6 miles to the lower lake.

Lower Stone Lake was sampled on August 9th, 2010 when a single gillnet was fished for 2 hours across east end of the lake. Only 3 westslope cutthroat trout were captured in the net. The average size of these fish was slightly smaller than that found in Upper Stone Lake, but the condition was similar. Large (18-20 inch) 8-year-old Yellowstone cutthroat were also observed cruising the shoreline, but none were captured in the gillnet. Spawning habitat was very limited and the only suitable habitat identified was in the outlet stream which contained limited amounts of gravel. Although limited, the spawning potential

is much greater in Lower Stone Lake than Upper Stone Lake. No juvenile fish were observed in the stream or lake and it appears that no reproduction is occurring. Use at the lake was light and only one, not well-used campsite was identified. Spotted frogs were present, but not as abundant as at Upper Stone Lake.

Baldy Lake

Baldy Lake is a large (28 acres) deep lake (max depth 90 ft) located near the headwaters of Pettengill Creek. The lake is perched in a deep rift between the divide between the Big Hole Valley and Pettengill Creek below. Baldy Lake is one of the least productive in the Pettengill drainage (McMullin 1982). The inlet stream flows parallel to the divide along the rift before cascading down to Baldy Lake. The outlet is a small, potentially intermittent stream that flows through coarse cobble and boulders. The western side of the lake is very deep whereas the southern and eastern shores are shallower. The southern end of the lake has a silt bottom, but the rest of visible lake substrate is boulders. Baldy Lake was stocked with cutthroat trout in 1933 and with rainbow trout in 1941 and 1944 and has not been stocked since. It has been sampled two previous times in 1967 and in 1982 and only rainbow trout were captured (McMullin 1982). Access to the lake is the same as access to Lily Lake (see above) except at the trail junction mentioned above, continue on Trail 380 to the Pioneer Scenic Loop Trail (750) then south on said trail past Sand Lake to Baldy Lake.

Baldy Lake was sampled on August 10th, 2010 when a single gillnet was fished overnight at the northern end of the lake. Only 7 rainbow trout were captured in the net (Table 4). The fishery in Baldy Lake appears to be very stable because the length range and number of fish captured in 2010 were very similar to the previous 2 sampling events in 1967 and 1982 (McMullin 1982). The condition of the fish was above average and all size classes of fish appeared healthy. Limited, suitable spawning habitat was identified along the shoreline and around the inlet. However, the spawning success of the rainbow trout appears equal to the productivity of the lake resulting in a consistent quality fishery. Depth measurements were made at the lake and a bathymetric map was generated (Figures 3 and 4). The lake is very clear and the bottom was clearly visible to depths greater than 20 ft. Use at the lake was light, despite being on the Pioneer Scenic Loop Trail and only 1 campsite was identified. Spotted frogs were common at the lake.

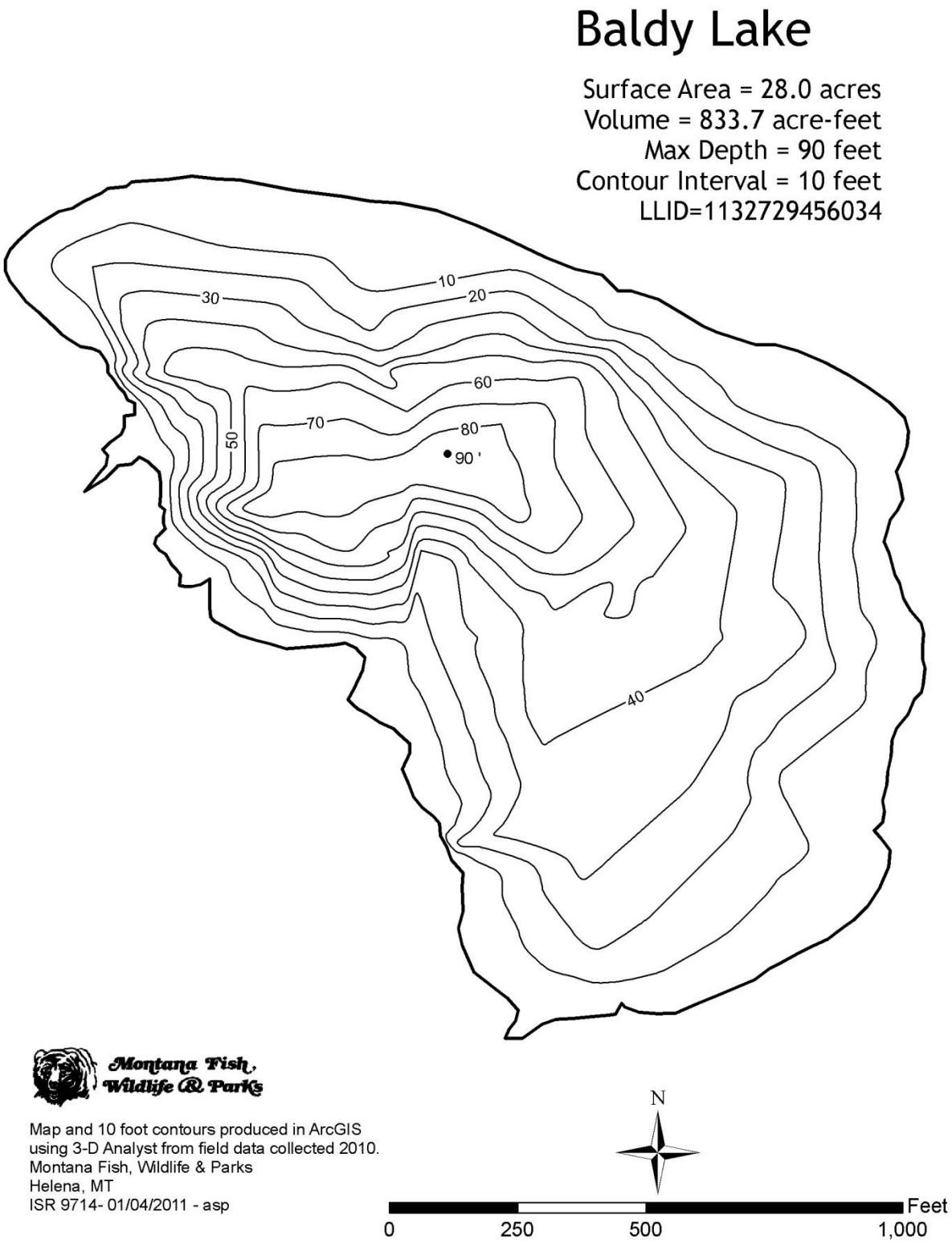

Figure 3. Bathymetric map of Baldy Lake generated from the data collected in 2010 shown in Figure 4.

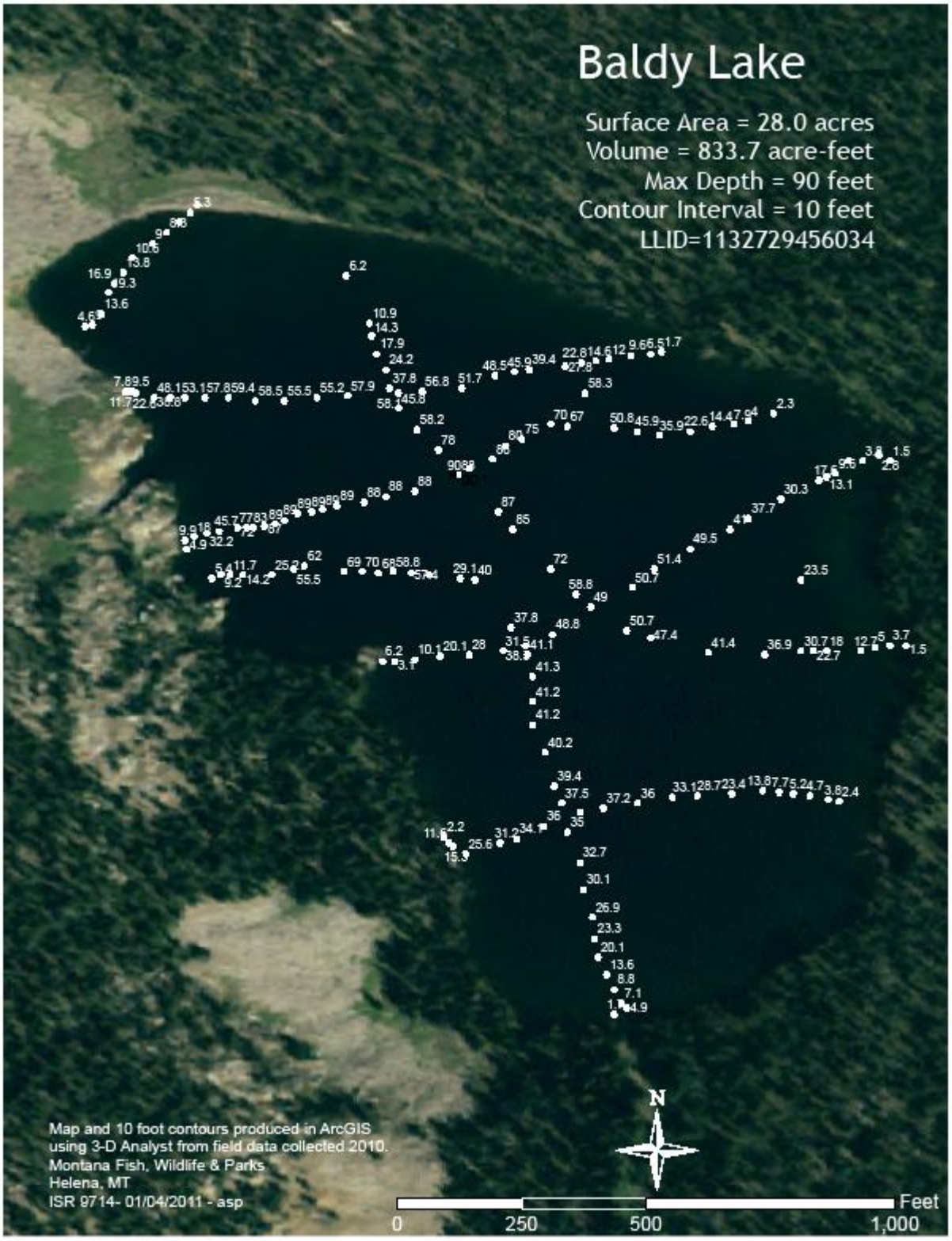

Figure 4. Aerial photo of Baldy Lake showing GPS-depth points collected in 2010 and used to generate bathymetric map in Figure 1.

Sand Lake

Sand Lake is a large, round lake located on the crest of the divide between the Big Hole valley and Pettengill Creek. It is at an elevation of 8277 ft and is 38.5 acres and is 58.2 ft deep. Sand Lake has a grassy gentle sloping shore along the north and east sides of the lake. The lake gets its name from the large, shallow, sandy area on the eastern shore of the lake near the inlets. The lake substrate on the southern and western margins of the lake is primarily smaller boulders with one area at the southwest corner of the lake having a mud bottom. Sand Lake is not a typical mountain cirque lake; rather it is located in a large, flat meadow system surrounded by broken timber and good camping areas. An outfitter camp is located at the southeastern side of the lake. The inlet streams enter the lake along the northeast shore and the outlet exits the lake on the eastern shore. Sand Lake was originally stocked with rainbow trout in 1934 and was stocked an additional 9 times between 1934 and 1971. In 1976 and 1970 Yellowstone cutthroat trout were also stocked in the lake. Sand Lake has been sampled on 2 previous occasions in 1967 when only rainbow trout were captured and in 1982 when 22 rainbow and 2 Yellowstone cutthroat were captured. Access to the lake is the same as described above to reach Baldy Lake.

Sand Lake was sampled on August 11th, 2010 when a single gillnet was set at the southeast corner of the lake. A total of 18 trout were captured that appeared to be mix of rainbow trout and rainbow-Yellowstone cutthroat hybrids. All fish were lumped into one category (rainbow trout) for analysis. The catch and condition of fish was similar to that reported in previous sampling (McMullin 1982), but it appears that the average size of fish in 2010 was larger. McMullin (1982) did not report a mean size but the largest fish captured between 1967 and 1982 was 14.5 inches and in 2010, 9 of the 18 fish captured were greater than 14 inches and 3 were greater than 15 inches. Spawning habitat in the inlet and outlet streams is good and would have ranked higher except for the preponderance of coarse granitic sand. However, between the inlets and outlet there is more than 0.5 mile of low gradient, good quality habitat and this habitat is adequate to produce a self-sustaining fishery. The outlet of Sand Lake was electrofished and found to have both age-1 fish (3.5-4.3 inches) and age-2 fish (5.5-7.2 inches). A bathymetric map was generated from GPS-depth points taken throughout the lake (Figures 5 and 6). Use at the lake was moderate to high. A well developed campsite is present on the northern shore of the lake and an outfitter camp is present on the eastern shore of the lake. Spotted frog adults and tadpoles were noted at the lake.

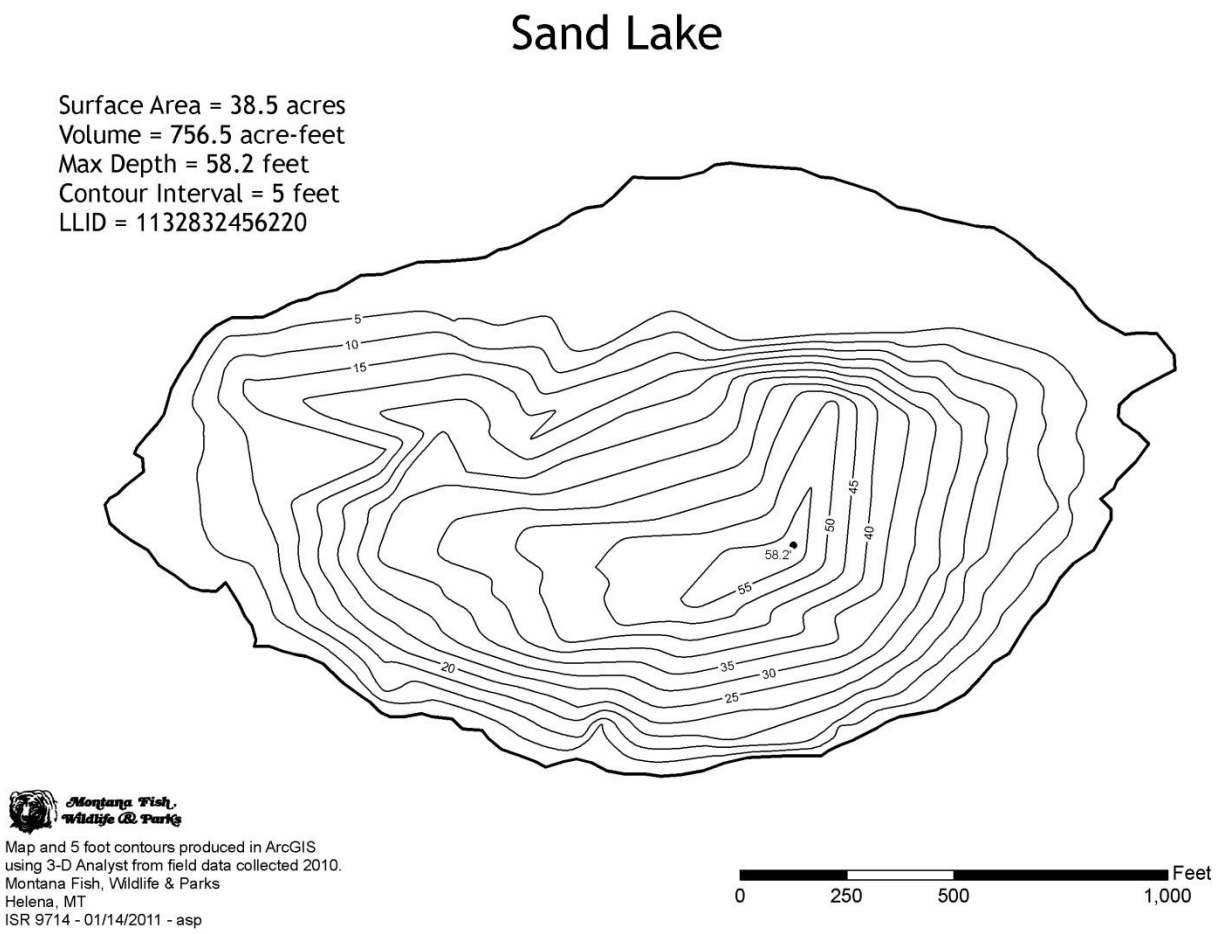

Figure 5. Bathymetric map of Sand Lake generated from the data collected in 2010 shown in Figure X.

Figure 6. Aerial photo of Sand Lake showing GPS-depth points collected in 2010 and used to generate bathymetric map in Figure 3.

Elbow Lake

Elbow Lake is located at the headwaters of Pettengill Creek in the same rift as Baldy Lake. The lake is at 8660 ft in elevation and is 12.6 acres when full. The hydrology of Elbow Lake is unique because the lake elevation appears to naturally fluctuate. When surveyed in 2010, the water surface elevation was approximately 6 ft lower than what appeared to be full pool. There was no inlet stream and the outlet stream was dry until approximately 200 yards downstream of the lake where it emerged from the ground and began flowing. It appears that the lake has a natural underground drain, but that drain has a limited capacity such that in spring when snowmelt is occurring, the lake fills and drains through the surface outlet; however, as inflows diminish, the lake slowly looses elevation to the height of the underground drain. Figure 7 shows an aerial view of Elbow Lake in the summer of 2006 during a drought cycle and in the summer of 2009, a wetter year. Note the large elevation drop in the lake between years. Elbow Lake was stocked with rainbow trout in 1944, but there is no record of subsequent sampling of the lake. Access to the lake is best achieved from Baldy Lake by following the inlet stream south to its headwaters then continue south and past an unnamed lake to the outlet of Elbow Lake.

A single gillnet was fished overnight in Baldy Lake on August 11th, 2010 and no fish were captured. It is unclear if fish could survive in Elbow Lake because of the lower water conditions later in the year. 2010 was an above average water year, yet the lake was still at least 6 ft below full pool. The lake appeared to be 8-10 ft deep at the deepest, but no actual depth measurements were made. Very little potential spawning habitat was observed, but the lake fluctuations would likely preclude any successful shoreline or outlet spawning for springtime spawning fish. Despite fluctuating lake levels, Elbow Lake has abundant aquatic life. Spotted frog adults and juveniles were present along with abundant large caddis flies, leaches and dragon flies. The abundance of aquatic life, and particularly insects and vertebrates that have multiannual lifecycles, suggests the lake retains some water through the winter. There was no evidence of use at the lake.

Figure 7. Elbow Lake during summer 2006 (left) and 2009 (right) showing differences in water surface elevation.

Table 4. Fisheries survey data from West Pioneer lakes from 2008-2010 where length is in inches and weight is in pounds. The fish species abbreviations are: LL = brown trout, RB = rainbow trout, EB = brook trout, WCT = westslope cutthroat trout, YCT = Yellowstone cutthroat trout, M COT = mottled sculpin, LSU = longnose sucker, WSU = white sucker and AG = Arctic grayling. Condition factor (K) and Spawning habitat are described in the methods section. Use is a qualitative measure of use and recreation related impacts at the lake. Amphibian abbreviations are: SF = Columbia spotted frog, TF = tailed frog, WT = western toad and SS = spotted salamander.

Lake	Temp (^{o}F)	pH	Cond. (µS)	Species	#/net	Avg L (range)	Avg W (range)	Condition	Spawning Habitat			Use	Amphibians
									Inlet	Outlet	Shore		
Johanna				WCT	13	14.1 (11.8-15.5)			P5	P5	P5	Mod	None
				YCT	1	20.6							
Lily	52	7.28	25	RB	22	9.5 (7.8-11.8)	0.24 (0.17-0.31)	36.7	P2	P3	G3	Light	None
Baldy	60.8	6.89	2	RB	7	12.5 (8.1-15.9)	0.70 (0.22-1.18)	37.5	P3	P1,2	F3	Light	SF
Elbow	62.6	7.20	3	Fishless					P4	P4	P3	Light	SF
Sand	55.6	7.73	9	RBxCT	18	0.86 (6.2-17.7)	0.86 (12-1.95)	37.1	G2,3	G2,3	G3	Mod	SF
Stone (upper)	59.8	6.90	4	WCT	4	14.3 (13.0-14.9)	1.03 (0.82-1.19)	35.4	P4	P1,3	P3	Mod	SF
Stone (lower)	62.8	7.38	2	WCT	3	12.8 (12.5-13.0)	0.74 (0.73-0.75)	35.2	P1,2	P3	P3	Light	SF

East Pioneer Lakes

Cherry Lake

Cherry Lake is one of two lakes located at the headwaters of the Cherry Creek drainage. The lake is 7.4 acres and 25.7 ft deep (Figure 8 and 9). It was stocked with undesignated cutthroat trout in 1946 and with rainbow trout in 1948 and no other recorded stocking has occurred at the lake (stocking records list lake as Cherry Lakes, which may have included adjacent Granite Lake). Access to the lake is gained by an ATV trail that is rough and steep. The fishery was previously sampled in 1992 and 2005. Genetic samples collected during the 2005 sampling event indicated the fish in Cherry Lake were non-hybridized westslope cutthroat trout. Subsequent testing in 2006 indicated the fish in the lake were highly hybridized with both rainbow and Yellowstone cutthroat trout. These very different results from samples collected only a year apart has led to confusion about how the fish in this lake should be managed.

Cherry Lake was sampled on July 8, 2008. Two nets were set in the lake and 49 westslope cutthroat trout were captured. Catch rates in the net were approximately ½ those observed in the 1992 sampling, but the mean size and size range (Table 5) were nearly identical (mean L=10.6, range 6.5-17.8, Brammer et al. 1992). Brammer et al. (1992) reported that Cherry Lake is a relatively productive lake and the fishery reflects the higher productivity with relatively large fish for a self-sustaining lake. Because of the ATV access to the lake, use is high and substantial impacts to the landscape surrounding the lake are present relative to other alpine lakes. Very little spawning habitat is present in the outlet stream and it likely goes dry during drought years. Results from genetic testing indicate that what was once thought to be a non-hybridized population of westslope cutthroat trout is actually a significantly hybridized population with both rainbow trout (2%) and Yellowstone cutthroat trout (16.4%). The 2004 results were based on a limited sample size, but it is still unclear how such significant hybridization was not detected.

Management Recommendations:

Prior management recommendations for Cherry Lake included the maximum regulatory and habitat protection for the population because of its healthy, self-sustaining population of non-hybridized westslope cutthroat trout. However, in light of the recent genetic results, such management does not appear necessary and in fact may be detrimental to the cutthroat trout in Cherry Creek. It is likely that hybridized cutthroat originating from Cherry Lake are breeding with non-hybridized fish downstream in Cherry Creek; therefore management of Cherry Lake should be switched to eliminate the hybridized cutthroat population and replace the fishery with non-hybridized westslope cutthroat trout. Cherry Lake is part of a proposed project to restore non-hybridized westslope cutthroat trout to Cherry Creek and remove all hybridized and non-native fish. Once hybridized fish are removed, Cherry Lake would be restocked with non-hybridized westslope cutthroat trout from a variety of sources within the Big Hole and would likely become a brood source of fish for future restoration projects.

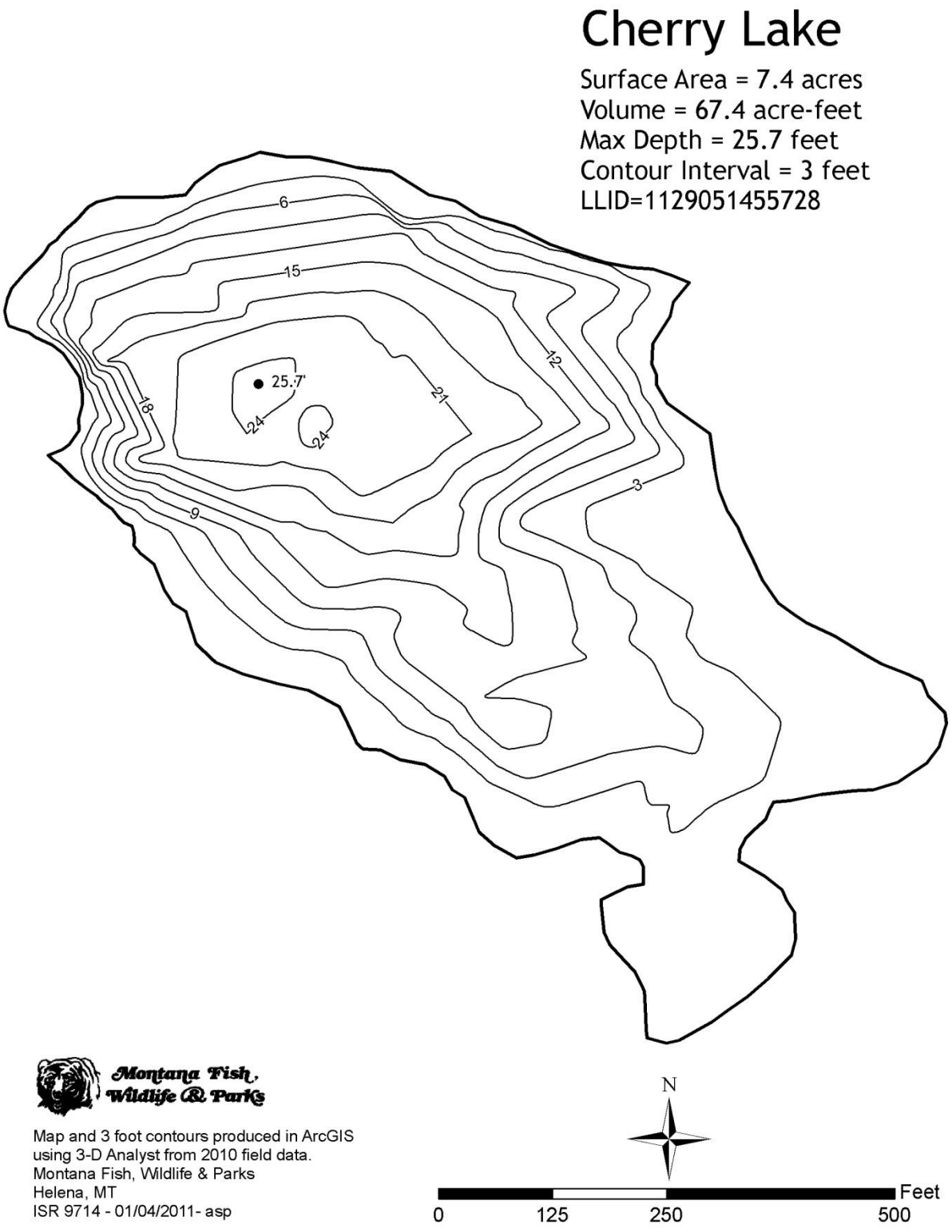

Figure 8. Cherry Lake bathymetric map generated from data collected in 2009 and 2010.

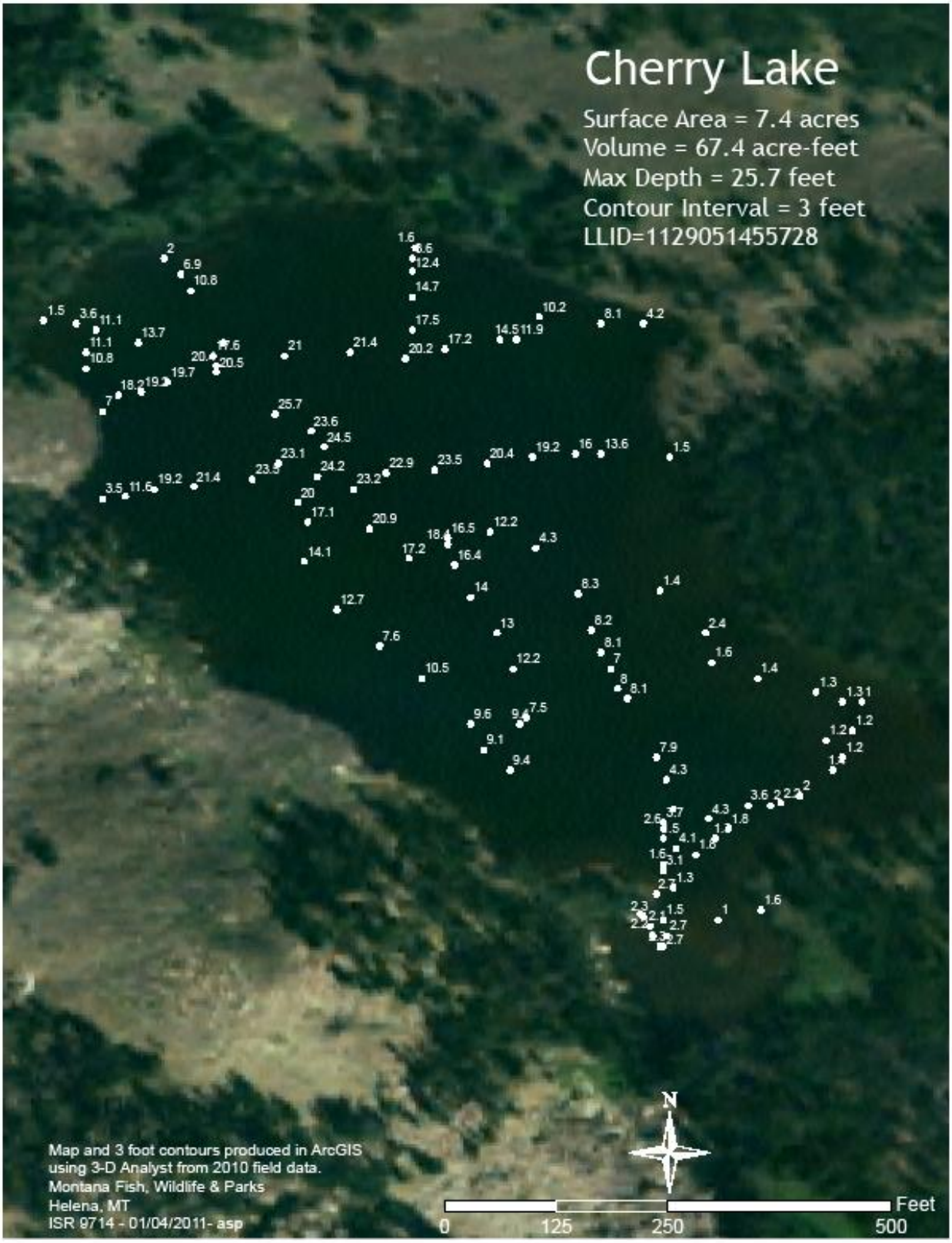

Figure 9. Aerial view of Cherry Lake showing GPS-depth points collected in 2009 and 2010 used to generate bathymetric map in Figure 6.

Granite Lake

Granite Lake is located approximately 0.5 miles from Cherry Lake at the headwaters of the Cherry Creek drainage. It is 7.0 acres and has a maximum depth of 15.9 ft (Figure 10 and 11). Access to the lake is via the same ATV trail as Cherry Lake except that shortly after the last crossing over Cherry Creek the trail forks and the right hand fork leads to Granite Lake. This lake is shallow with an extensive silt flat on the eastern end near the outlet. The inlet and outlet streams are larger than Cherry Lake and contain good quality spawning habitat. There is no historical stocking record for Granite Lake and the origin of the fish in the lake is unknown (Brammer et al. 1992). It is likely that it and Cherry Lake were historically fishless because large cascades located farther downstream in Cherry Creek which likely precluded upstream fish passage. Genetic testing of the cutthroat trout in the lake in 2004 indicated the population was slightly hybridized with both rainbow trout (5%) and Yellowstone cutthroat trout (3%). Because the cutthroat in the lake are > 90% westslope cutthroat trout they are considered a conservation population.

Granite Lake was sample on July 8, 2008 to determine the status of the fishery and document habitat and use at the lake. Two nets were set in the lake. Average size and the condition of the cutthroat captured in 2008 was slightly greater than that observed in 1992 (L = 9.14, range 6.2-10.3, K = 33.7, Brammer et al. 1992), but the lake still exhibits a high rate of reproduction yielding an over-abundance of fish and small average fish size. Total catch rate of 22 fish per net was similar to that observed in 1992 (27/net). The reason for the overabundance of fish at the lake is the higher quality of spawning habitat present in the outlet stream. The outlet of Granite Lake is much larger than that of Cherry Lake and contains substantial gravels suitable for spawning. The high quality spawning habitat likely leads to greater recruitment each year of juvenile fish to the population and although use at that lake is high, angler harvest does not appear adequate to reduce the fish population.

Management Recommendations

Granite Lake is part of a proposed project to restore non-hybridized westslope cutthroat trout to Cherry Creek drainage and remove all hybridized and non-native fish. Granite Lake would be repopulated with non-hybridized westslope cutthroat trout from a variety of sources within the Big Hole and likely become a brood source of fish for future restoration projects. Once restoration has occurred it is anticipated that the introduced cutthroat will become self-sustaining and no future management changes will be necessary to maintain the fishery.

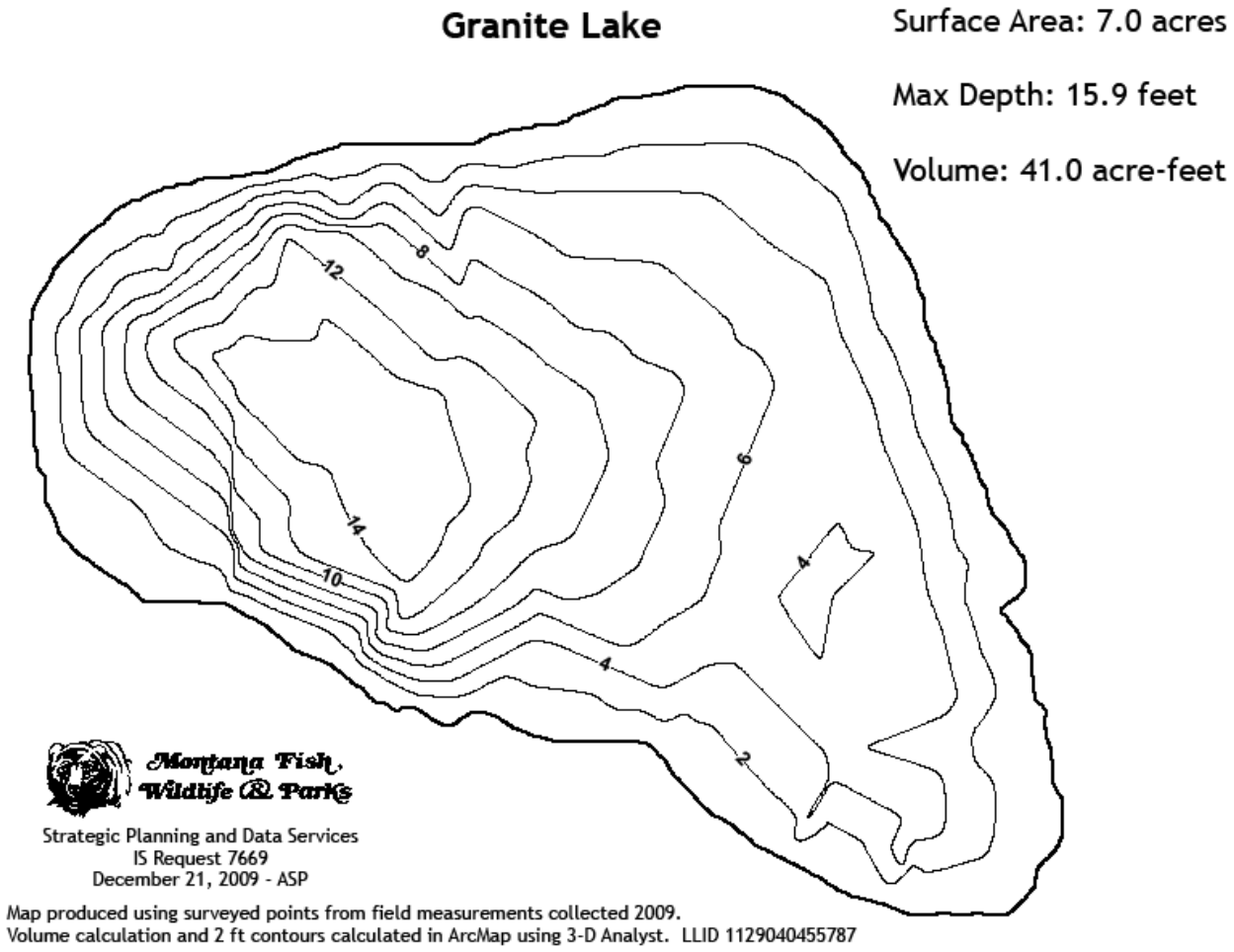

Figure 10. Granite Lake bathymetric map generated from data collected in 2009.

Figure 11. Aerial photo of Granite Lake showing GPS-depth points collected in 2009 used to generate the bathymetric map shown in Figure 10.

Rock Creek Lakes

Green Lake

Green Lake is located approximately 0.5 miles to the south of Cherry Lake in the Rock Creek drainage. It is a large (23.8 acre) and deep (max depth 92 ft) lake (Brammer et al. 1992). Access to the lake is gained via the Cherry Creek trail to Cherry Lake and then by foot over a small divide to Green Lake. There is no stocking record for Green lake, but sampling in 1992 indicated the lake contains a self-sustaining population of what phenotypically appear to be highly hybridized rainbow-westslope cutthroat trout with a preponderance of rainbow trout genes.

Sampling done on July 16, 2008 at Green Lake confirmed the data collected in 1992 that the lake contains a self-sustaining population of hybridized rainbow-cutthroat trout. Data from 2008 netting (Table 5) were nearly identical to those collected in 1992 (16/net, mean L = 11.8, Range 8.7-14.3) however, the condition factor observed in 2008 (38.3) was slightly greater than that observed in 1992 (33.8), suggesting fish are now in slightly better condition than in 1992. No spawning habitat data were collected at the lake during the 2008 survey, but it is apparent that adequate habitat is present to sustain the fishery.

Brownes Lake

Brownes Lake is a moderately-sized (38 acres) lake that is readily accessible by vehicles traveling up the Rock Creek Road (Road 8210) from the Glen Exit on I-15. The lake is located at an elevation of 6,550 ft

and is a natural cirque basin located on Rock Creek. A primitive camping area is located near the outlet of the lake with outhouses and a primitive boat launch. The outlet bay of the lake is shallow (<6 ft) but quickly drops off after entering the main lake area to depths greater than 25 ft (32 ft was the deepest depth encountered when netting in 2009). The inlet on the west shore of the lake is shallow with a silt bottom. Where Rock Creek enters the lake the stream is low gradient with a sand bottom that quickly transitions to clean gravels ideal for spawning farther upstream. A dense willow thicket is present at the inlet. Both north and south shores of the lake are steep with limited littoral areas. The north shore is a talus rock slope extending down into the lake. The south and east shores are forested with Douglas fir trees. The outlet of the lake was historically fitted with an irrigation device that could regulate the elevation of the lake. This structure appears to have washed out and is no longer serviceable. The stream grade increases rapidly downstream of the lake and a cascade is present less than 1 mile below. The lake has been extensively stocked with records dating back to the early 1930's. The lake was stocked with rainbow, brook, and undesignated cutthroat trout from 1931-1954. In addition to trout, Coho salmon were stocked in 1933 and walleye were stocked in 1948. The Beaverhead National Forest Lake and Fish Inventory lists the lake as containing cutthroat, rainbow and brook trout. The lake was first surveyed in 1963 when only brook trout and rainbow trout were captured (Wipperman 1964). Brook trout at that time were noted to be abundant and in poor conditions (101 fish captured, average size 7.9 in).

Three sinking gillnets were fished in the lake overnight on June 15th, 2009. The predominant fish captured in the gillnets were brook trout followed by rainbow, brown and Yellowstone cutthroat trout (Table 5). The brook trout in the lake are small on average (8.6 in) and in poor condition relative to other lakes. It appears that the brook trout fishery is overabundant and exceeds its food supply and therefore is not able to attain a very large maximum size. Brown trout were previously undocumented in Brownes Lake. It is likely that these fish have naturally colonized the lake from Rock Creek farther downstream where there is a resident population. Brown trout in Brownes Lake will likely initially be beneficial to the fishery because they will prey on the over-abundant population of brook. A reduction in brook trout numbers would likely result in an increase in average size and make a higher quality fishery. No suckers or other forage fish were captured in gill nets so brook trout will likely serve as the primary food base for the larger, pisciverous brown trout present in the lake. With the presence of a larger predatory fish in the lake, however, more regular monitoring may be necessary to determine the impact of brown trout on other species present in the lake. Brownes Lake contains a diverse trout fishery. Few lakes in the Big Hole drainage contain more than one trout species. The abundant brook trout provide the opportunity to catch high numbers of fish albeit their size is small. The rainbow and cutthroat trout in the lake provide opportunities to catch larger pan-sized fish and the brown trout provide a trophy fishery. Although none were captured in gill nets, mottled sculpin were also present in the lake as evidenced by their presence in the stomach of one fish.

Lake Agnes

Lake Agnes is the second largest lake in the Big Hole at 108 acres and is located at 7490 ft in elevation on a bench south of Rock Creek. Only Mussigbrod Lake is larger than Lake Agnes. Not only is Lake Agnes, large, it is unique because it has abundant sandy beaches scattered around the lake. The entire lake shore is forested. Portions of the lake shore consist of weathered granite boulders, particularly on the

south shore, but the majority of the lake and shore substrate is coarse granitic sand. An irrigation structure is located at the outlet of the lake that is capable of lowering the water surface elevation approximately 10-15 ft. The lake has a series of 4 inlet streams: three are located on the west end of the lake and one is located on the south. All four inlet stream are small and the main inlet is the most northerly stream on the western shore. The fishery in Lake Agnes consists of only Arctic grayling. Nearly 1.4 million grayling were stocked between 1928 and 1960. Lake Agnes was the source of many egg takes that occurred from the 1940's through 1960's, but the original source of the grayling in Lake Agnes is uncertain. Despite playing an important role as a brood source of fish, very little fisheries monitoring data is available for the lake, particularly in the past 30 years. There is no record of the lake being surveyed. Access to the lake is gained by traveling up Rock Creek Road (Road 8210) to Brownes Lake. From Brownes Lake there are two ways to access the lake. A trail originating at the outlet of Brownes Lake parallels the lake and climbs to Lake Agnes. An alternative route to the lake includes continuing on the Rock Creek Road past Brownes Lake approximately 0.9 miles to a fork in the road. Going left at the fork will lead a short distance to a parking area and former bridge across Rock Creek that accessed a mining area. Cross Rock Creek at this point and join the road heading back east to the mine on the face of the mountain above Brownes Lake. At the end of the mining road, continue left to join the trail from the outlet of Brownes Lake.

Lake Agnes was sampled on June 16th, 2009 by angling with 4 anglers fishing for 1.5 hrs. Only grayling were captured (Table 5). The size of grayling may have been biased toward larger fish in our sampling (i.e., smallest fish captured was 11.7 in) because angling can be biased toward larger fish and because the sampling was done during active grayling spawning when adult fish are more vulnerable. However, the data collected indicate that grayling in Lake Agnes continue to be self-sustaining and abundant. The condition factor of the fish was low suggesting that there may be an overabundance of grayling relative to their food supply. Spawning activity was common on the sandy beaches of the lake along the south and western shores, but spawning activity was greatest in the inlet streams. Hundreds of fish were observed in these small streams congregated in sandy-bottomed pools. Recreational use at the lake was moderate to high. At least 5 well used camping areas were identified primarily near the outlet stream. An old cabin is present at the lake on the northwest shore. The short hike, unique beaches and abundant fish population likely make Lake Agnes a popular recreational destination. No amphibians were observed at the lake, but a shed skin of what appeared to be a garter snake was found.

Management Recommendations for Rock Creek Lakes

No management recommendations are proposed for Green Lake. The lake provides good numbers of average to slightly above average sized fish. Its proximity to Cherry and Granite lakes adds diversity to the species that are available to anglers in the area. Because the lake is self sustaining, no future stocking is necessary. The rainbow trout do not pose any known threat to native westslope cutthroat trout populations in the Rock Creek basin. Anglers should be encouraged to keep brook trout in Brownes Lake to reduce the brook trout population and potentially increase the average size of the species in the lake. The impact of the brown trout population should be monitored in the next 5-10 years. No management changes are recommended for Lake Agnes. Anglers should be encouraged to keep their limit grayling at the lake.

Trapper Lake

Trapper Lake is a small (4.3 acre), shallow (max depth 7.5 ft), silt-bottom lake located near the headwaters of Trapper Creek on an unnamed tributary. No stocking records are available for Trapper Lake and there is no record of it being previously sampled. The Beaverhead National Lake and Forest Inventory (1992) lists the lake as containing cutthroat trout. Genetic samples were collected from Trapper Creek immediately downstream of Trapper Lake in 1994 and the fish were found to be hybridized westslope cutthroat (69%) rainbow (3.6%), and Yellowstone cutthroat trout (26.5%). Access to lake is gained via the Trapper Creek road then a short 0.25 mile hike down to the lake on a primitive but well used trail.

Trapper Lake was sampled on July 28, 2008. A single gill net was set for 2 hours and 18 fish were captured. All fish captured had phenotypic traits of fish that were heavily hybridized between westslope and Yellowstone cutthroat trout. Genetic samples were collected but not analyzed because of the apparent high frequency of non-native genes and other sampling priorities. Average fish size was small and condition was poor in the lake suggesting the population of fish is too large for its food supply (Table 5). A bathymetric map was generated from 68 GPS/depth measurements made in the lake (Figure 12). The inlet and outlet streams of Trapper Lake were moderate size and contained good flow. The substrate consisted of primarily coarse granitic sand with larger cobble and boulders. There was little potential shoreline spawning habitat. It appears the fish are using the coarse granitic sand as spawning substrate in the inlet and outlet. Age-1 fish (2.5-3.2 inches) were captured in the outlet stream using electrofishing. It is somewhat surprising that the fishery in Trapper Lake does not winter kill given its shallow depth; however, the moderate size of the inlet stream may maintain adequate oxygen levels in the lake under the ice. Use at the lake was moderate owing the ease of access. No amphibians were observed at the lake.

Management Recommendations

Because Trapper Creek farther downstream contains a conservation population of westslope cutthroat trout it may become a priority to remove the existing highly hybridized population of cutthroat trout in Trapper Lake and replace it with non-hybridized westslope cutthroat trout. Sappington Creek less than 1 mile to the north contains a nonhybridized population of cutthroat trout and could be used to repopulate Trapper Lake. Once the fishery in the lake is replaced with non-hybridized fish, there should be no need for further management actions as the fishery should become self-sustaining.

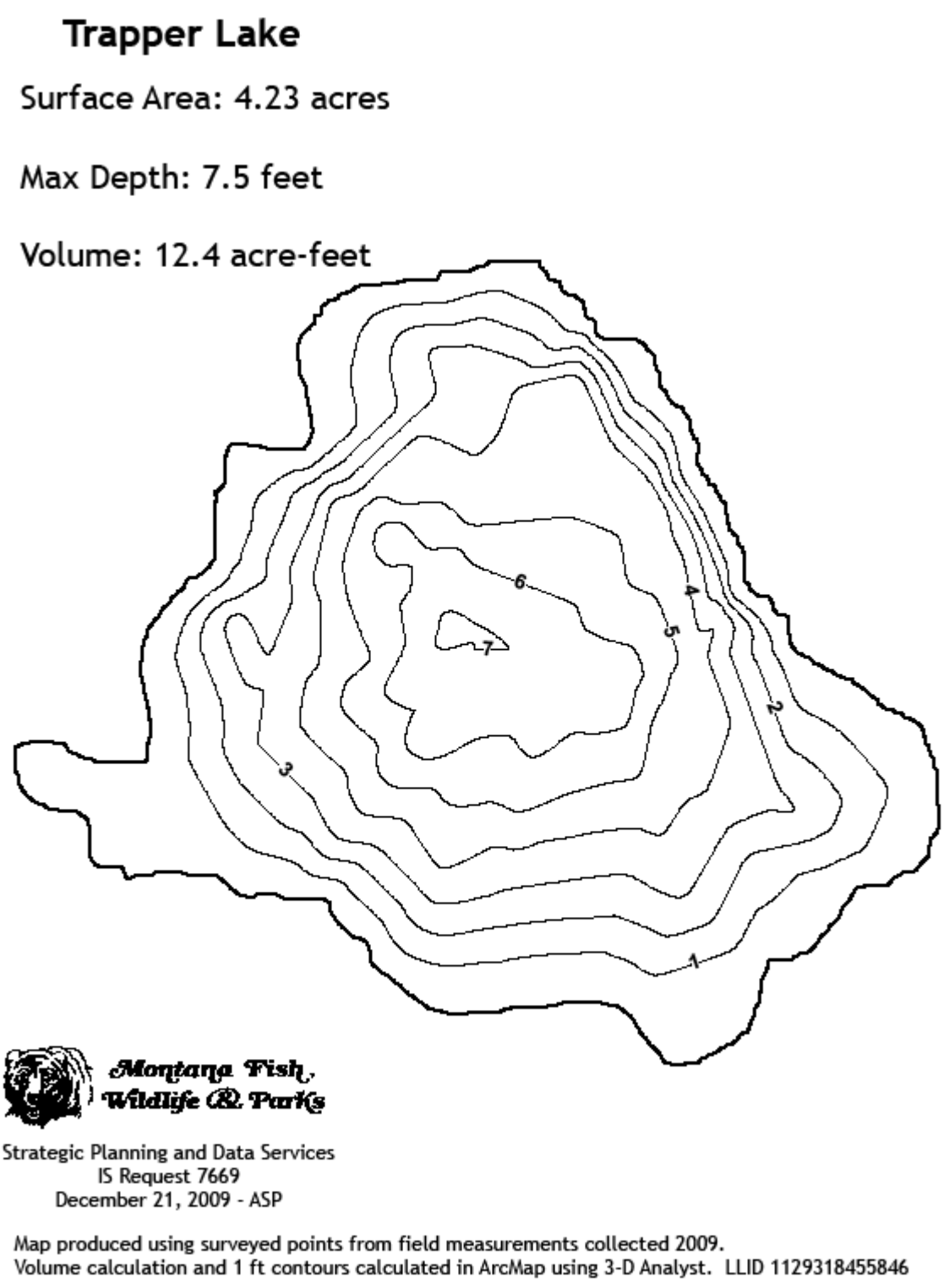

Figure 12. Trapper Lake bathymetric map produced from data collected in 2009.

Table 5. Fisheries survey data from East Pioneer lakes from 2008-2010 where length is in inches and weight is in pounds. The fish species abbreviations are: LL = brown trout, RB = rainbow trout, EB = brook trout, WCT = westslope cutthroat trout, YCT = Yellowstone cutthroat trout, M COT = mottled sculpin, LSU = longnose sucker, WSU = white sucker and AG = Arctic grayling. Condition factor (K) and Spawning habitat are described in the methods section. Use is a qualitative measure of use and recreation related impacts at the lake. Amphibian abbreviations are: SF = Columbia spotted frog, TF = tailed frog, WT = western toad and SS = spotted salamander

Lake	Temp (^{o}F)	pH	Cond. (µS)	Species	#/net	Avg L (range)	Avg W (range)	Condition	Spawning Habitat			Use	Amphibians
									Inlet	Outlet	Shore		
Cherry		7.67	17	WCTxYCTxRB	24.5	10.8 (6.3-16.5)	0.51 (0.08-1.48)	35.5	F1	P5	F3	Heavy	None
Granite		7.88	20	WCTxYCTxRB	22	9.1 (6.5-14.4)	0.33 (0.10-1.57)	36.3	F2,3	G2,3		Heavy	None
Green		8.30	14	RB	14	11.5 (6.3-14.5)	0.62 (0.11-0.95)	38.3				Mod	None
Brownes	43			EB	25	8.6 (6.0-11.4)	0.22 (0.04-0.50)	30.3	E1,2,3	F2		Heavy	
				RB	8	11.2 (7.2-13.0)	0.50 (0.10-0.73)	32.9					
				LL	4	21.2 (14.0-26.7)	4.30 (0.92-8.00)	37.6					
				YCT	1	12.2	0.67	34.1					
Lake Agnes	56.0	8.76	70	AG	53	13.1 (11.7-14.8)	0.62 (0.40-0.97)	27.6	F1,2	P4	F2	Mod	None
Trapper	65.1	8.13	66	WCTxYCTxRB	18	10.0 (7.9-11.5)	0.30 (0.13-0.49)	29.2	F2	F2	P2	Mod	None

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