MOUNTAIN LAKE SURVEYS AND FISHERIES MANAGEMENT RECOMMENDATIONS

Rattlesnake Wilderness Lakes

W. Ladd Knotek, William J. Schreck, Raven A. Rashap & John C. Thabes
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Executive Summary

The Rattlesnake National Recreation Area and Wilderness (RNRAW), considered the project area for this document, contains approximately 45 alpine and sub-alpine "mountain" lakes (> 1 acre) that lie at 5,600-7,700 ft elevation. The RNRAW is located just north of Missoula at the southern extent of the Mission Mountain Range in west-central Montana on lands managed by the Lolo National Forest (Missoula Ranger District).

The RNRAW consists of formally designated Wilderness in the headwaters of Rattlesnake Creek, Grant Creek, and West Fork Gold Creek, as well as bordering non-wilderness lands to the south which make up the Rattlesnake National Recreation Area. Because nearly all mountain lakes in the project area lie within the Wilderness boundary (except Farmers Lake #3), we simply refer to them as Rattlesnake Wilderness lakes.

Despite difficult access and relatively low recreational use compared with similar waters in the region, Rattlesnake Wilderness lakes are physically diverse and provide a range of recreational opportunities. All of these lakes were presumed to be historically fishless. However, trout were introduced into most of the larger waters in the 1960s -1980s. Many of these populations did not persist when stocking was discontinued after Wilderness designation. Currently, 16 of the lakes larger than one acre support trout fisheries (36%), some of which are maintained through stocking. The remaining lakes (~ 29) are not fish-bearing.

Lake Surveys

In 2006-2010, Montana Fish, Wildlife and Parks (MFWP) fisheries personnel and volunteers surveyed nearly all fish-bearing and fishless mountain lakes in the RNRAW project area to describe physical and biological characteristics. These surveys consisted of fish population assessments, amphibian searches, bathymetric mapping, water chemistry measurements, and a description of recreation sites and trail networks.

Lake surveys revealed a diverse set of lake environments ranging from high, very oligotrophic alpine waters positioned in rocky glacial cirques to sub-alpine, mesotrophic lakes bounded within forested glacial troughs. Physical measurements collected at most lakes (secchi depth, PH, conductivity, TDS and surface water temperature) reflected this diversity. Lake size and depth were also extremely variable, although most of the deepest and largest water bodies supported introduced trout populations.

Lake fisheries were comprised of three trout species: westslope cutthroat trout (*Oncorhynchus clarki lewisi;* 12 lakes), Yellowstone cutthroat trout (*O. clarki bouvieri*; 1 lake) and rainbow trout (*O. mykiss;* 3 lakes). The majority of these non-indigenous populations were self-sustaining, although three are supplemented with periodic stocking of westslope cutthroat trout to maintain fishery quality (Bull, Fly, and Gold Creek Lakes).

Species of fish and level of natural reproduction were important factors affecting trout abundance, body condition and size structure at mountain lake fisheries. Self-sustaining trout

populations (stocked historically) typically displayed high rates of natural reproduction, low body condition, and truncated size structure. Body condition and relative abundance were significantly lower for self-sustaining rainbow trout relative to cutthroat trout. Currently stocked westslope cutthroat trout populations (with limited natural reproduction and managed densities) exhibited significantly greater mean lengths, maximum lengths, and body condition relative to self-sustaining populations. Stocked westslope cutthroat trout fisheries represent the best opportunities to actively manage species composition, fish density and fishery quality.

Fishless lakes comprised 64% of the water bodies > 1 acre in the RNRAW project area. Numerous other potholes, wetlands and seasonal ponds (< 1 acre) were also noted. Fishless lakes were broadly distributed across the project area and represented a diverse range of physical aquatic environments. Although fishless lakes were generally smaller, higher and shallower than fish-bearing water bodies, at least nine fishless lakes (31%) were > 12 ft deep and considered capable of supporting (over-wintering) trout populations.

Several amphibian and reptile species were documented at Rattlesnake Wilderness lakes. The two most common amphibian species were the Columbia spotted frog *(Rana luteiventris)* and long-toed salamander *(Ambystoma macrodactylum krausei)*. Columbia spotted frogs were common or abundant along the perimeter of nearly half (47%) of all lakes and fish populations appeared to have limited impact on the abundance or distribution of this species. Although not quantified, Columbia spotted frog adult, juvenile, larval densities appeared most closely related to the amount of emergent aquatic vegetation, lakeshore habitat and the timing of our lake surveys. In contrast, the density and likely the distribution of long-toed salamanders did appear to be inhibited by the presence of fish in mountain lakes. Although 15 fish-bearing lakes were surveyed, long-toed salamanders were documented at only one. Surprisingly, long-toed salamanders were not observed at many of the larger fishless lakes, but dense congregations of larvae were documented at smaller wetlands and ponds throughout the project area. Western and common garter snakes were the only reptiles observed during lake surveys. These species were common along lakeshores, apparently because amphibians and fish are important dietary components.

Access was an important factor contributing to the range of recreational opportunities at Rattlesnake Wilderness lakes, as most are remote and require 8-10 miles of non-motorized travel to access them from various USFS trailheads. However, the presence of fish in lakes had an obvious impact on the location of maintained routes and the relative amount of use. More than 65% of fish-bearing lakes (11 of 16) were accessible by established trails, while less than 25% of fishless lakes (7 of 29) were accessible by designated trails or distinguishable routes. None of the lakes in the project area were directly accessible via roads or routes open to motorized travel.

Angling pressure and overall recreational use at Rattlesnake Wilderness lakes was low when compared with other mountain lakes in western Montana and was very low relative to nearby valley floor lakes and rivers. However, modest human disturbance and evidence of long-term use was visible at most fish-bearing lakes (73%). This included established campsites, fire pits, trails around the lake perimeter, and infrequent human refuse. Evidence of recreational use and disturbance was minimal at fishless lakes, with only a few exceptions (e.g., Upper and Lower Twin Lakes).

Biological, Social and Administrative Considerations for Mountain Lake Management

Recommended management strategies and objectives were developed for each lake and each sub-basin (management unit) based on collective lake survey results, pertinent biological and social considerations, and current MFWP management philosophies. Key biological and social considerations in mountain lake management include: (A) providing a diversity of recreational opportunities and fishery qualities, (B) preserving the integrity of natural aquatic systems, (C) minimizing impacts to native fish populations, (D) land management designation and regulations, and (E) levels/patterns of recreational use. MFWP's lake management guidelines and priorities for the area essentially reflect these considerations.

The complex interaction of land management and fisheries management makes coordination among State and Federal resource managers essential, particularly in designated Wilderness. Although management objectives and mandates may conflict, MFWP and USFS managers have worked to develop a reasonable balance between fishery management and wilderness integrity through the *AFWA/USFS/BLM Agreement* (2006) and the *Cooperative Agreement for Fish, Wildlife, and Habitat Management on National Forest Wilderness Lands in Montana* (USFS & MFWP 2008). Mountain lake fisheries and aquatic resource management in Wilderness areas on National Forest system lands are important components of these agreements.

MFWP management philosophies for mountain lakes in the RNRAW project area stress: (1) providing diverse opportunities for anglers and recreationists, (2) maintaining fishless waters to sustain ecological integrity and natural processes, (3) promoting native fish where possible, (4) stocking fish only where required to meet fisheries objectives, (5) managing individual lakes in the context of the overall watershed and management unit, and (6) practicing adaptive lake management as new information and tools become available.

Improving fishery quality/diversity and preserving natural ecological integrity were the major biological objectives identified for mountain lakes management in the project area. Although seemingly conflicting, both objectives are achievable at the sub-basin scale and, in some situations, concurrently at the same lake. The impacts of introducing fish into historically fishless lakes have raised concern for a range of indigenous species and communities. With limited information, MFWP has addressed these concerns by stocking responsibly (i.e., species, location, density) and incorporating a physically diverse and geographically dispersed range of fishless waters into lake management plans. Maintaining ecological integrity also includes conserving native fish species in stream networks associated with lakes. Wild, non-indigenous trout populations in lakes serve as a continual headwater source of emigrants which may hybridize and compete with native fish populations, particularly bull trout and westslope cutthroat trout.

Management of Lakes and Lake Fisheries in the RNRAW Project Area

Rattlesnake Wilderness lakes were divided into three management units based on their geographic and hydrologic location: Gold Creek, Rattlesnake Creek and Grant Creek. The descriptions and management approaches for these units combine information from fishless lakes with historical data, recent survey information, and management strategies for individual fish-bearing lakes and associated stream networks.

Mountain lakes in the Gold Creek Management Unit are relatively accessible and are actively managed as quality westslope cutthroat trout fisheries. Three of the lakes (Bull, Fly, Gold Creek Lakes) have a long history of stocking and are still supported by scheduled plants every 5-7 years. Boulder Lake was planted prior to 2001, but stocking was discontinued since consistent natural reproduction was observed in our surveys. We generally propose to continue existing management practices to maintain these fisheries in the future. Lakes in this management unit support higher angler use relative to the other two units. This can be attributed to their close proximity to the USFS road system and trailheads, as well as the excellent westslope cutthroat trout fisheries that the lakes provide.

The three lakes included in the MFWP fish planting program are stocked exclusively with age-0 westslope cutthroat trout (M012 hatchery strain) as it is currently considered the only appropriate species for stocking in the project area. Alternative species will be evaluated in the future as new hatchery strains (particularly sterile stocks) are developed.

The Rattlesnake Creek Management Unit contains the majority of lakes in the RNRAW project area (37), including numerous fishless (25) and fish-bearing (12) waters. Lakes in this unit are generally difficult to access and receive light recreational use, regardless of fishery status. Although many of these lakes were stocked historically and some maintain self-sustaining fish populations, no stocking has occurred in the Rattlesnake Management Unit for more than 25 years.

Mountain lakes in the Rattlesnake Management Unit exhibit a range of morphological and ecological conditions, including those which have been modified by levees and water control structures constructed at the lake outlets (10 lakes). Dams and other infrastructure require periodic maintenance and typically result in exaggerated annual water level fluctuations. Water level instability results in an obvious lakeshore "varial" zone which is not conducive to growth of aquatic or terrestrial vegetation, and significantly limits productivity and littoral habitat quality of many lakes in this unit. Management of outlet structures to minimize unnatural water level fluctuations is recommended at these lakes.

Fish-bearing lakes are widely distributed across the headwaters of Rattlesnake creek, and all support self-sustaining *Onchorhynchus* populations of westslope cutthroat trout (8 lakes), Yellowstone cutthroat trout (1 lake) or rainbow trout (3 lakes) that were established in the mid-1900s. Trout abundance, size structure and condition vary among populations.

Overall, we propose to maintain the current management status of lakes in the Rattlesnake Creek Management Unit, but changes in species composition may be warranted at some lakes. Regular stocking is considered unnecessary given the number and distribution of self-sustaining fisheries in the area, as well as the low level of angler use. However, conversion of rainbow trout fisheries to westslope cutthroat trout at Big, McKinley, and Sheridan Lakes may be warranted to improve the quality of these fisheries and enhance genetic compatibility with native populations downstream.

The Grant Creek Management Unit contains only three small fishless lakes that receive very little recreational use. Although Grant Creek Lake #1 (Rankin Lake) is likely capable of supporting a trout fishery, there are no records of stocking or fish presence. We do not recommend fish stocking or any changes in management for lakes in this unit.

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Table 1 – Rattlesnake Wilderness Lake Stocking Program Summary (2012)

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Boulder Lake Summary
Bull Lake Summary
Carter Lake Summary
Farmers Lake #1 Summary
Farmers Lake #2 Summary
Farmers Lake #3 Summary
Farmers Lake #4 Summary
Farmers Lake #5 (Peterson Lake) Summary
Farmers Lake #6 (Cliff Lake) Summary
Fly Lake Summary
Glacier Lake Summary
Gold Creek Lake Summary
Grant Creek Lake #1 (Rankin Lake) Summary
Little Lake Summary
McKinley Lake Summary
Rattlesnake Lake #15 Summary
Rattlesnake Lake #17 Summary
Rattlesnake Lake #22 (McLeod Lake) Summary
Roosevelt Lake Summary
Sanders Lake Summary
Sheridan Lake Summary
Lower Twin Lake Summary
Upper Twin Lake Summary
Worden Lake Summary

Introduction

The Rattlesnake National Recreation Area and Wilderness (RNRAW), considered the project area for this document, contains approximately 45 alpine and sub-alpine "mountain" lakes (> 1 acre) that lie at 5,600-7,700 ft elevation (Figure 1). The RNRAW is located just north of Missoula at the southern extent of the Mission Mountain Range in west-central Montana on lands managed by the Lolo National Forest (Missoula Ranger District).

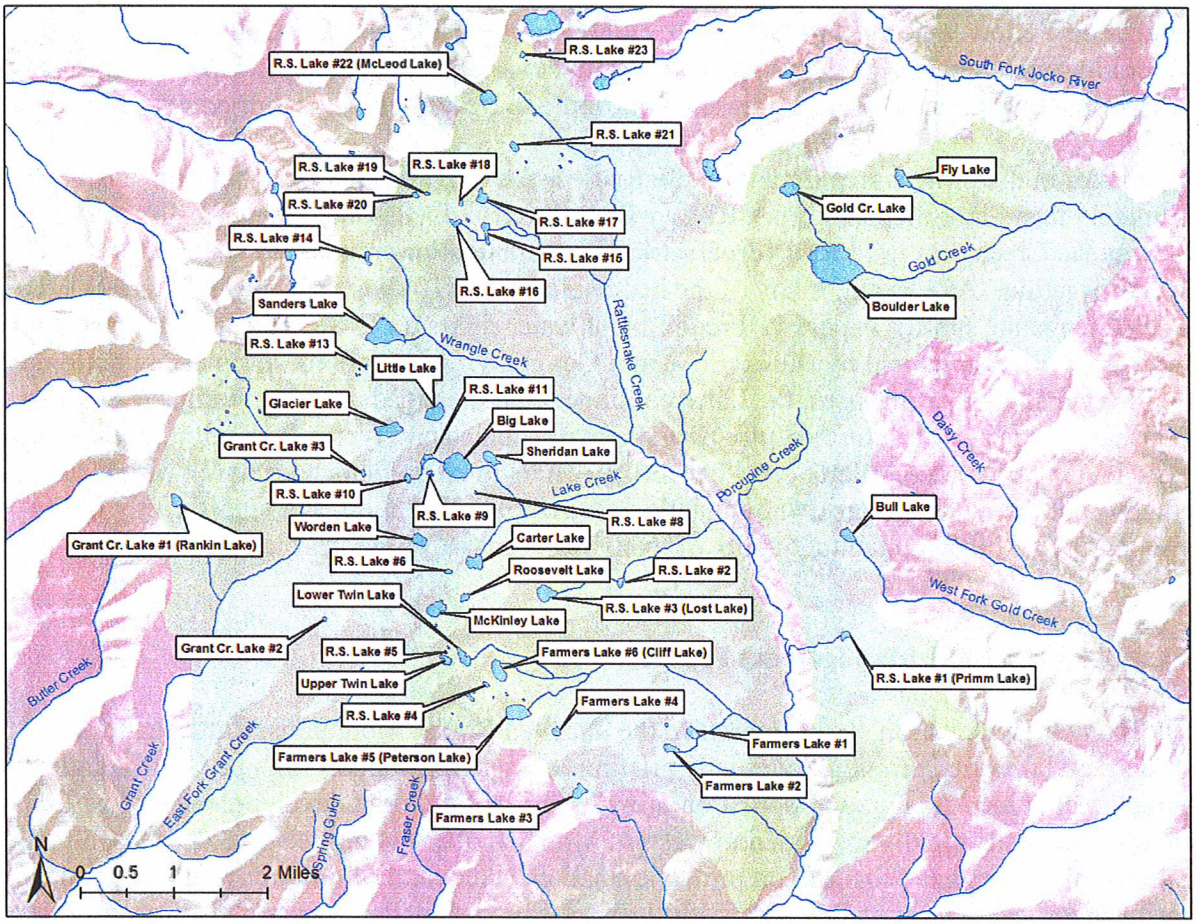


Figure 1. Distribution of mountain lakes in the Rattlesnake National Recreation Area and Wilderness project area (highlighted in green).

The RNRAW consists of formally designated Wilderness in the headwaters of Rattlesnake Creek, Grant Creek, and West Fork Gold Creek, as well as bordering non-wilderness lands to the south which make up the Rattlesnake National Recreation Area. Because nearly all mountain lakes in the project area lie within the Wilderness boundary (except Farmers Lake #3), we will simply refer to them as Rattlesnake Wilderness lakes.

These mountain lakes are somewhat unique because of their location, both in terms of Wilderness designation and access. Even though all of the lakes lie within 15 air miles of Missoula (a major city and recreation hub for Western Montana), most require at least 8-10 miles of non-motorized travel to reach them from established trailheads. As a result, recreational use is relatively low compared with similar, more accessible waters in the region (e.g., middle Clark Fork lakes described in Knotek and Thabes 2008).

Despite difficult access, Rattlesnake Wilderness lakes are physically diverse and provide a range of recreational opportunities. About a third (16) of the lakes support trout fisheries, including self-sustaining populations and those that are maintained through stocking. Native westslope cutthroat trout (*Oncorhynchus clarki lewisi*) is the most common fish species, although introduced Yellowstone cutthroat trout (*O. clarki bouvieri*) and rainbow trout (*O. mykiss*) are present in some waters. Fishless lakes (n = 29) with variable morphology, depth and surface area are distributed across the project area and contribute to overall ecological diversity.

Most lakes in the project area lie within the Rattlesnake Creek drainage. Rattlesnake Creek ultimately flows into the Clark Fork River within the city of Missoula. Historically, lower Rattlesnake Creek was used for hydroelectric power generation, municipal water supply and minor irrigation. As a result, many of the headwater lakes (10) were physically altered (1910-1925) to enhance storage capacity. Predominant water rights on these lakes and Rattlesnake Creek are presently owned by Mountain Water Company. Although these rights are no longer used for consumptive purposes, the lakes continue to be managed as water storage reservoirs. Dams and other infrastructure require periodic maintenance and typically result in exaggerated water level fluctuations. Water level instability results in an obvious lakeshore "varial" zone which is not conducive to growth of aquatic or terrestrial vegetation, and significantly limits productivity and littoral habitat quality of many Rattlesnake Wilderness lakes.

The Need for a Lake Management Program

Like many high elevation environments in the northern Rocky Mountains, Rattlesnake Wilderness lakes lie in remote, relatively pristine settings that support high ecological and recreational value. As human population growth, residential/urban development, and natural resource demands rapidly expanded in western Montana over the past several decades, aquatic resource managers have focused on protection and enhancement of productive middle and low elevation resources (e.g., valley and foothill rivers, streams, wetlands) that face imminent threats of degradation and support the majority of recreational use. During this period, mountain lakes were generally managed less intensively. In the Rattlesnake project area, limited recreational use and a Wilderness management policy that stresses natural processes and ecological function have also contributed to relatively passive lake management.

Recent research and evaluation efforts have revealed many biological and social issues that expand the range of considerations involved with mountain lake management programs (Bahls 1992; Dunham et al. 2004). These considerations reflect the complexity of contemporary resource management and the desired balance between ecological and recreational values. Advocates for the unique attributes of fishless lakes, the basin-wide impacts of non-native fish introductions, and the importance of diverse recreational opportunities have expanded the importance of mountain lakes beyond their traditional value as remote trout fisheries. Observed

or expected increases in recreational use associated with rapid human population growth have also necessitated the need for more comprehensive natural resource planning.

Management responsibility for Rattlesnake Wilderness lakes is essentially shared by Montana Fish, Wildlife and Parks (MFWP), charged with fish, wildlife and aquatic resource management in the state, and the United States Forest Service (USFS), the federal agency which manages all lands in the project area. The respective roles and responsibilities of these agencies are outlined in the "Cooperative Agreement for Fish, Wildlife and Habitat Management on National Forest Wilderness Lands in Montana" (USFS & MFWP 2008).

Recent activities at Rattlesnake Wilderness lakes have included periodic stocking by MFWP, with adjustments in stocking frequency, number, or species based on infrequent monitoring and anecdotal reports from anglers regarding the status of lake fisheries. The USFS has integrated mountain lakes into larger scale plans for Wilderness protection and Limits of Acceptable Change for the greater RNRAW (Missoula Ranger District 2010). To date, there has been no formal coordinated effort to identify resource conditions and values or to develop management objectives, priorities or long range plans for mountain lake resources within the Rattlesnake Wilderness.

Goals and Objectives

In this document, we summarize recent survey data for Rattlesnake Wilderness lakes and recommend management strategies for specific lakes and sub-basins. This framework incorporates survey information, relevant biological and social considerations, the desire for diversified recreational opportunities, and an emphasis on native fish and intact ecological systems.

Specific goals and objective of the report include:

Goal 1) Summarize current information on mountain lakes in the Rattlesnake Wilderness.

Objective A. Compile and incorporate historical information for all lakes > 1 acre, including stocking histories and previous surveys.

Objective B. Summarize and report data collected in recent surveys of all fish-bearing and fishless lakes.

Objective C. Provide current information for each lake in a useful format for public use.

Goal 2) Present and discuss relevant considerations and guidelines for mountain lake management.

Objective A. Discuss significant social and biological issues that are considered pertinent for mountain lake management.

Objective B. Present MFWP lake management philosophies and general fishery management objectives.

Goal 3) Provide a management framework that outlines rationale and specific recommendations for individual lakes and sub-basins.

Objective A. Designate and describe mountain lake management units in the Rattlesnake National Recreation Area and Wilderness.

Objective B. Describe proposed management strategies for each lake including fishless lakes, self-sustaining fisheries, and stocked fisheries.

Objective C. Provide stocking schedules for mountain lakes in the MFWP fish planting program.

Mountain Lake Surveys

Introduction

All fish-bearing mountain lakes within the RNRAW project area (except Rattlesnake Lake #3) were surveyed by MFWP field crews in 2006-2010. The objective of investigations was to describe physical and biological lake attributes, as well as evaluate accessibility and relative levels of recreational use. Surveys included fish population assessments, amphibian searches, bathymetric mapping, water chemistry measurements, and a description of recreation sites and trail networks.

Most of the fishless lakes in the project area were also surveyed in 2006-2010 (Figure 2). Basic assessment information included photo records, measurement or estimation of maximum depth, shoreline searches for amphibians, and gill net sets if there was any possibility of fish presence. Descriptive information (e.g., elevation, surface area, specific location) for some fishless lakes was approximated from USGS topographic maps and existing GIS data.

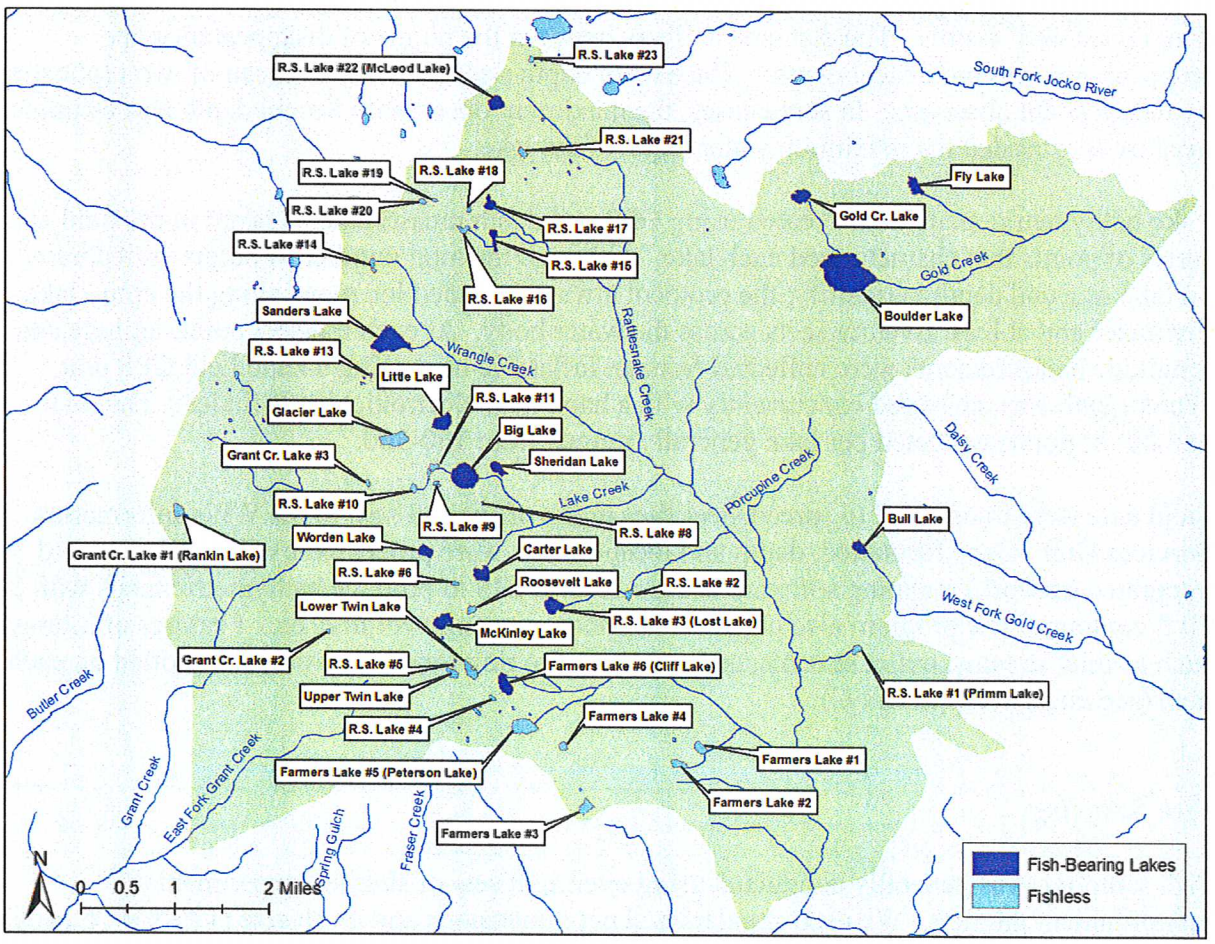


Figure 2. Geographic distribution of fish-bearing and fishless lakes in the Rattlesnake National Recreation Area and Wilderness.

Methods

Fish-bearing mountain lakes in the Rattlesnake Wilderness were surveyed between July 12 and September 12 in 2006-2010 by MFWP biologists, technicians and volunteers. Lakes were accessed primarily on foot, although a helicopter was used on one trip where we could land outside the Wilderness boundary (Farmers Lake #3). We followed standard protocols to collect biological and physical data at each lake (described below). Deviations from these methods are noted where applicable or no data are reported. As mentioned above, sampling protocols were generally less intensive for fishless lakes as bathymetric mapping, fish population metrics, etc. were often unnecessary or not applicable.

Lake Physical Measurements

Basic water chemistry measurements were collected at shoreline and mid-lake locations using a hand-held electronic meter (Hanna model HI-98129). Measurements included surface water temperature, pH, conductivity (uS/cm), and total dissolved solids (TDS; ppm). Water transparency was also measured from an inflatable boat with a Secchi disk between 10:00 and 17:00 while wearing polarized sunglasses. The disk was lowered until it was no longer visible, then raised until visible. The distance halfway between the points of disappearance and reappearance was the Secchi depth. The Secchi depth reported was the mean of two replicates by independent observers. In some cases, the maximum observable Secchi depth was estimated because it exceeded the maximum water depth of the lake.

Lake bathymetric maps were created using GPS and depth measurements taken in the field at a series of points that characterized each lake. Although the total number of points varied based on lake size and depth variability, the protocol always included locations along the entire lake perimeter and at least five transects across the water body. At each transect point, latitude and longitude measurements were collected from an inflatable boat using a hand held GPS unit. Water depth was measured concurrently with a hand held electronic depth-finder . The total number of points collected per lake generally ranged from 150-300.

Field data were transferred to spreadsheet files in the office and sent to MFWP's Information Services Unit. Once formatted, depth and location data were processed by TIN (triangulated integrated network) mapping software using Arc-Info GIS to produce bathymetric maps with 2-20 ft contours. The program also calculated surface area, lake volume, etc. Features of interest such as inlet streams, outlet streams, and campsite/fire ring locations were later plotted on each map (see maps in Appendix C).

Fish Sampling

Fish sampling was generally conducted using overnight sets of sinking, experimental, monofilament gill nets. We used standardized net dimensions and mesh size (125'x 4'; 5 panels; 0.75", 1.00 ", 1.25",1.5", and 2.0" bar) specified for alpine lake sampling in Montana (Stiff 2000). Nets were typically set for a single sampling period (minimum 10 hrs) usually beginning between 18:00 and 20:00 hrs. However, at three lakes, logistic constraints forced us to used shortened day sets (4-6 hrs) instead of overnight sampling. Nets were typically anchored to a log

or rock on the shoreline (small mesh end) near a point or prominent feature with gradual depth gradient. We used an inflatable boat or float tube to stretch and set the remainder of the net (maximum depth rarely exceeded 30 ft). Small lakes (< 20 acres) were sampled for one night or sampling period with one net. On larger lakes (> 20 acres) and in instances where fish abundance was obviously low based on visual observations (during bathymetric mapping and lakeshore surveys), we set two nets concurrently at widely-spaced locations to help ensure a representative sample. For analysis, all gill net catch results were standardized by species as number of fish/net/hr.

Fish caught in gill nets were sacrificed and processed on shore. We weighed (g) and measured (TL, mm) each individual, assessed sex and maturity, and noted a qualitative description of major taxa in stomach contents. Scales and otoliths were removed from 20 fish per lake when possible, stored in envelopes and archived for subsequent age and growth analyses (not performed in this study). In most instances where *Oncorhynchus* spp. were present, we preserved 20-25 fin clips (caudal or anal fin) in individual vials filled with 95% ethanol. These samples were stored to allow future determination of the relative genetic contribution of westslope cutthroat trout, rainbow trout, and Yellowstone cutthroat trout in lake populations. In some instances, additional fish were collected to complete genetic or age/growth (otoliths and scale) samples. We typically angled from shore to supplement gill net catch, but did not include these samples in gill net catch summaries.

Relative Weight as an Index of Fish Condition

Indices of well-being or condition are used to describe length-weight relationships ("plumpness") in fish. Relative weight (Wr) is a common index where average fish of all species have a value of 100, regardless of the units of measure (Anderson and Neumann 1992). Relative weight for an individual fish is derived through the following equation:

$$Wr = (W / Ws) \times 100$$

Where W is the weight of an individual and Ws is a length-specific standard weight. Standard weight equations are of the form:

$$\log_{10} Ws = a' + b' (\log_{10} L)$$

where a' and b' account for the genetically determined shape characteristics of a species and L is the total length. Species-specific a' and b' values yield a Wr of 100 for fish that are well fed and have an average condition or "plumpness" that reflect "ecological and physiological optimality". Ws was calculated for cutthroat trout and rainbow trout using the following equations (Anderson and Neumann 1996):

Rainbow Trout	$\log_{10} Ws = -4.898 + 2.990 (\log_{10} L)$
Cutthroat Trout	$\log_{10} Ws = -5.192 + 3.086 (\log_{10} L)$

Relative weight was calculated for individual trout based on total length and weight measurements. Means and ranges were then computed to represent the condition or well-being of each lake population. Trout with high condition generally exhibit faster growth rates and may

achieve larger sizes. High average condition for a population was considered an indication that fish densities were appropriate for the inherent carrying capacity of a lake and that natural reproduction and or stocking levels were not excessive.

Estimates of Trout Natural Reproduction and Spawning Habitat

Level of trout natural reproduction was qualitatively classified as *low, moderate* or *high* for each fish-bearing lake based on observations of trout juvenile recruitment, population size structure, and gill net catch rates (Table 1). Because age-0 and age-1 trout year classes were usually too small to be caught in gill nets, relative juvenile abundance had to be estimated visually as shoreline surveys were completed. Juveniles were typically observed in lake inlets or outlets and near cover along lake margins. Juvenile abundance was described as low (none observed), moderate (a few juveniles seen sporadically along shoreline) or abundant (juveniles seen at numerous locations) based on these observations. Characteristics of population size structure and gillnet catch rate corresponding to various levels of estimated natural reproduction are also displayed in Table 1.

In estimating natural reproduction, the 2000 year class was excluded for stocked cutthroat trout populations because including stocked fish would significantly bias the estimates. This was the only recent stocking event, and only occurred in the four lakes in upper Gold Creek (surveyed in 2006). The 2000 year class was generally dominant and easy to identify within a size class histogram generated from gill net catch.

Table 1. Population characteristics collectively considered in estimating level of trout natural reproduction in Rattlesnake Wilderness lakes.

	Population Characteristics[1]		
Estimated Natural Reproduction	**Juvenile Trout Abundance**	**Population Size Structure[2]**	**Gill Net Catch Rate (#/net/hr)[2]**
Low	Low	Most size classes missing	< 0.6
Moderate	Moderate	Multiple size classes present, but gaps evident	0.6-1.5
High	Abundant	All size classes present	>1.5

1 Attributes of trout juvenile abundance, size structure and gill net catch rate were considered collectively when assigning levels of estimated natural reproduction.

[2] Stocked cutthroat trout (2000) were excluded when assessing population size structure and gill net catch rate.

Availability of trout spawning habitat in lake inlets, outlets and springs was also noted. Suitable spawning habitat included accessible lotic (flowing water) areas with adequate discharge at the time of survey, estimated water velocities of 1-4 ft/sec, suitable spawning gravels (0.25-1.0 inch dominant size classes), and slopes < 3% (see Bjornn and Reiser 1991).

Amphibian Surveys

Amphibian surveys were conducted around the perimeter of each lake using the methods of Maxell et al. (2002). Surveys essentially involved sweeping shoreline emergent vegetation with a short-handled dip net (< 0.25" mesh) and visually searching for adult and larval amphibians along lake margins. All amphibians were identified to species and life stage, and total abundance was noted. For descriptive purposes, we also categorized populations as absent (none observed), rare (1-10 observed), common (11-50), or abundant (> 100) at each lake.

Description of Recreational Use

Relative recreational use at each lake was estimated and described, primarily based on qualitative observations. Indicators included trail presence/absence and condition, number and condition of campsites/fire rings, amount of refuse, and ease of access. These observations were combined with quantitative estimates of fishing pressure from MFWP mail surveys to portray overall recreational use. Locations of trailheads, distances to lakes from access points, trail numbers, etc. were obtained from field observations, USGS topographic maps and current USFS maps.

Statistical Analyses

Basic descriptive statistics, including means, ranges, tests for normality, etc., were calculated for most quantitative data collected during lake surveys. A series of statistical comparisons were also performed to test for significant (alpha=0.05) differences between lake types and fishery characteristics. In all comparisons, either a two-tailed t-test (two categories) or simple analysis of variance (ANOVA) procedure (multiple categories) with unequal sample sizes was used to detect differences among categories. If significant differences were found in ANOVA procedures, a post-hoc HSD test was performed to determine which categories were different (unequal sample sizes).

Results and Discussion

A total of 45 mountain lakes (> 1 acre) were identified in the Rattlesnake Wilderness project area. All but one of the 16 fish-bearing lakes were surveyed in 2006-2010. Field data and existing information were also collated for the 29 fishless waters. Tabular summaries of existing data for all lakes, including physical attributes, fish population and amphibian information, etc., are found in Appendix A (Tables 1-6). These data are also included in the individual lake summaries in Appendix C (fish-bearing lakes and selected fishless lakes).

Lake Physical Attributes

Mountain lakes were distributed throughout the project area, but concentrated within the upper and western portion of the Rattlesnake Creek drainage (see Figure 2 and Appendix A). The majority of lakes (>70%) were situated in high, glacial cirque basins near the headwaters of Grant, Rattlesnake and Gold Creeks. The remainder were found in glacial troughs or other

landforms at similar elevations. Mountain lakes occurred in alpine and sub-alpine environments at elevations ranging from 5,620 - 7,690 ft (msl). Qualitative physical descriptions of fish-bearing lakes are included with individual lake summaries in Appendix C.

Lake morphology, water chemistry and other physical characteristics were variable (Appendix A, Tables 1 & 2). Water bodies ranged in size from 1 - 108 surface acres (0.4 - 44 ha), maximum depth ranged from 2 - 217 ft (~ 1 - 66 m), and lake volume ranged from 2 - 3,778 acre-ft. Water chemistry measurements (fish-bearing lakes only) included pH (range 7.3 - 9.3), conductivity (range 1-50 uS/cm), and total dissolved solids (range 1-25 ppm). These data complement existing information collected by the USFS to monitor acidification and eutrophication trends in RNRAW lakes (Traci Sylte, Lolo National Forest, personal communication). Secchi depth measurements of lake transparency were recorded from 6 - 45 ft (1.8 - 13.6 m). In some lakes, Secchi depth exceeded the maximum water depth. Surface water temperatures were not reported because we only visited lakes once and these measurements are not meaningful (highly variable daily and seasonally).

Lake Fisheries and Trout Population Characteristics

Lake fisheries were comprised of westslope cutthroat trout (12 lakes), rainbow trout (3 lakes), and Yellowstone cutthroat trout (1 lake). These were the only fish species observed and no lakes supported more than one species (Table 2). Overall, 13 of 16 populations were considered self-sustaining since they had not been stocked in more than 20 years. Trout in most of these lakes exhibited consistent, abundant natural reproduction, low average body condition, and a 'stunted' (truncated) size structure (see Appendices A and C). Rainbow trout and Yellowstone cutthroat trout fisheries were all located in the Lake Creek and Wrangle Creek basins in upper Rattlesnake Creek. All remaining populations were comprised of westslope cutthroat trout (Figure 3).

Table 2. Categories of Rattlesnake Wilderness lake fisheries.

Wild Westslope Cutthroat Trout Fisheries	9
Wild Yellowstone Cutthroat Trout Fisheries	1
Wild Rainbow Trout Fisheries	3
Total Self-Sustaining Fisheries	**13**
Stocked Westslope Cutthroat Trout Fisheries	3
Total Stocked Fisheries (2007)	**3**
Total Fish-bearing Lakes	**16**

Westslope cutthroat trout in Bull, Gold Creek and Fly Lakes are the only populations currently supported by stocking. Boulder Lake was also included in the stocking program through 2000, but was removed since our survey indicated that natural reproduction was prevalent. Westslope cutthroat populations supplemented with stocking all exhibited some level of natural reproduction based on length distributions and overall fish densities. However, periodic

supplementation was continued because natural recruitment was considered inadequate or too inconsistent to meet management objectives. These lakes also generally support higher angling pressure due to their close proximity to major trailheads in upper Gold Creek.

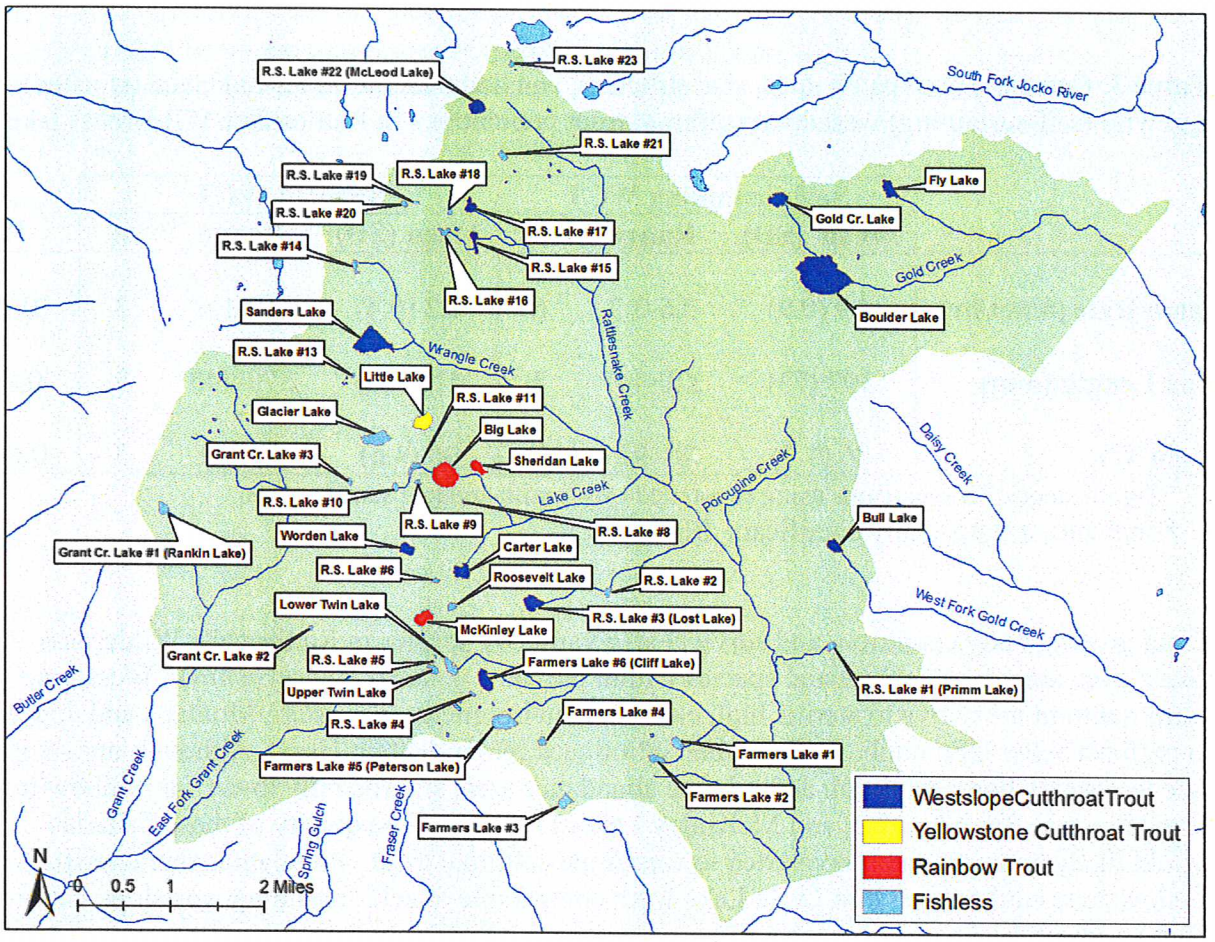


Figure 3. Species composition of mountain lake fisheries in the RNRAW project area.

Accurate estimates of fish population abundance are difficult to obtain in lentic waters, particularly when lakes are numerous and remote. In our lake surveys, we used experimental gill net catch-per-unit-effort as an index of trout abundance. Gill net catch rates ranged from 0.2 – 3.2 (mean 1.8) trout/net/hr. Local weather conditions, lake morphology and limited effort likely affected catch rates, but relative abundance estimates based on gill net catch were generally consistent with anecdotal angler reports and our visual observations of fish abundance (with high water clarity in mountain lakes, fish are visible from boats and shoreline). Average gill net catch rates in Rattlesnake Wilderness lakes were higher than those of fish-bearing lakes in the nearby middle Clark Fork region (Knotek and Thabes 2008), likely reflecting the higher proportion of abundant, self-sustaining populations in the RNRAW.

Fish species and level of natural reproduction appeared to be the most important factors affecting trout abundance and growth characteristics in Rattlesnake Wilderness lakes. In general,

self-sustaining trout populations were characterized by high densities and poor body condition (Wr) relative to stocked fisheries, where densities are intentionally kept lower (Table 3). Rattlesnake Wilderness lakes are generally sterile environments that offer finite food resources. Therefore, trout populations that exhibit consistent and abundant natural reproduction are often food-limited and "stunted".

Table 3. Comparison of catch rates, size structure, and body condition for managed (stocked) and wild (self-sustaining) westslope cutthroat trout populations in Rattlesnake Wilderness lakes.

	Self-sustaining WCT			Stocked WCT			
	Mean (SD)	**Range**	**n**	**Mean (SD)**	**Range**	**n**	**P[1]**
Catch Rate (#/net/hr)	1.9 (0.9)	0.6-3.2	6	1.2 (0.4)	0.9-1.6	3	0.13
Max Length (mm)	307 (73)	220-447	7	412 (33)	379-445	3	0.01*
Mean Wr	86 (3.7)	81-92	7	96 (4.6)	92-101	3	0.04*

[1] Significance of comparisons using two-tailed t-tests with unequal sample sizes.
* Indicates a statistically significant difference.

Trout growth, body condition, and survival also varied by species in Rattlesnake Wilderness lakes; even among closely related species within the same genus (*Oncorhynchus*). Westslope cutthroat trout are native to sterile, high elevation environments in western Montana and appear to perform better than rainbow trout when introduced into mountain lakes. Although our sample size was small, body condition and relative abundance were significantly lower for rainbow trout populations in Big, Sheridan, and McKinley Lakes (Table 4). The quality of these fisheries would likely be improved if converted to westslope cutthroat trout. Population characteristics of Yellowstone cutthroat trout in Little Lake were comparable to self-sustaining westslope cutthroat trout in adjacent lakes.

Table 4. Comparison of catch rate, size structure and body condition for wild (self-sustaining) westslope cutthroat trout and rainbow trout populations in Rattlesnake Wilderness lakes.

	Self-sustaining WCT			Self-sustaining RBT			
	Mean (SD)	**Range**	**n**	**Mean (SD)**	**Range**	**n**	**P[1]**
Catch Rate (#/net/hr)	1.9 (0.9)	0.6-3.2	6	0.4 (0.25)	0.2-0.7	3	0.01*
Max Length (mm)	307 (73)	220-447	7	334 (48)	295-388	3	0.5
Mean Wr	86 (3.7)	81-92	7	72 (4.7)	67-76	3	0.02*

[1] Significance of comparisons using two-tailed t-tests with unequal sample sizes.
* Indicates a statistically significant difference.

In previous studies, trout growth in mountain lakes was positively correlated with concentrations of dissolved solids, summer water temperatures, and prey density, and was negatively related to lake elevation, lake depth and stocking density (Bailey and Hubert 2003; Donald et al. 1980; Donald and Anderson 1982; Stiff 1998). Small lake sample size and the limited number of measured physical variables prevented us from evaluating statistical relationships between trout population characteristics and environmental variables. However, it appears that the general trends mentioned above apply to Rattlesnake Wilderness lakes.

Similarly, we found that trout growth and condition were negatively correlated with abundance and level of natural reproduction in middle Clark Fork lakes located just west of the Rattlesnake Wilderness (Figure 4). These relationships are likely consistent across both study areas.

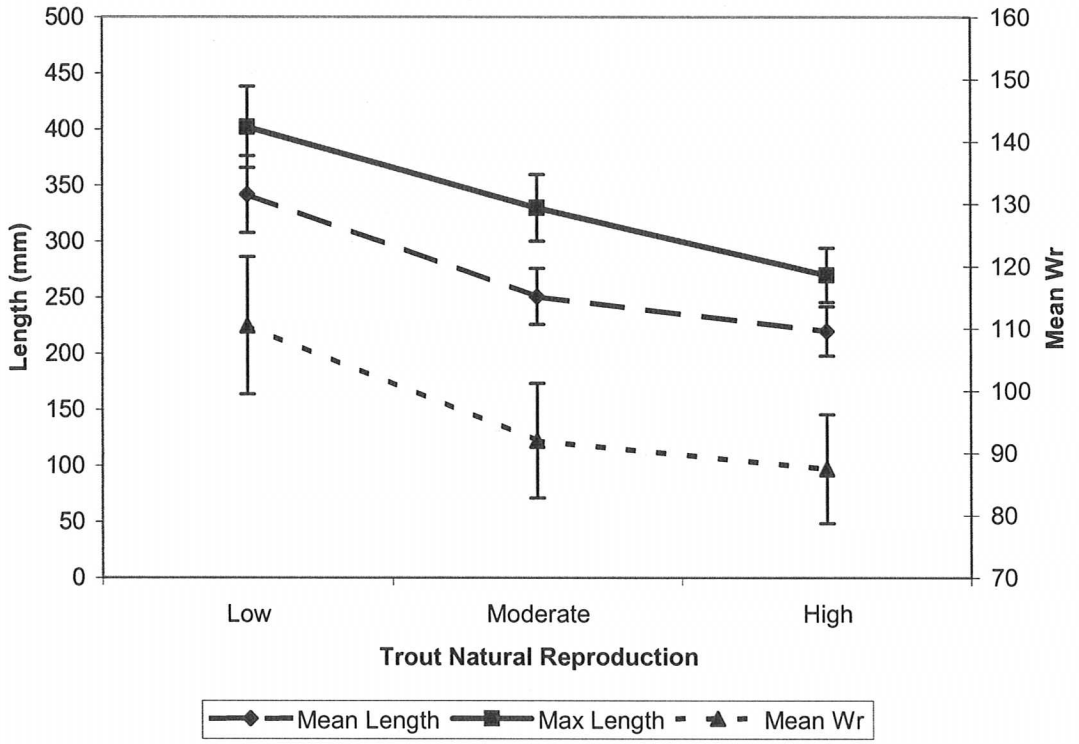


Figure 4. Relationship of estimated natural reproduction with mean length, maximum length and mean relative weight for trout populations in the middle Clark Fork region. Values displayed represent mean +/- 1 SD (Knotek and Thabes 2008).

These data and comparisons are relevant for management of Rattlesnake Wilderness lake fisheries because they highlight the limitations and opportunities for various types of fisheries, and form the basis for the long-term management objectives. Although angler catch rates are often high, truncated size structure and low body condition are unsatisfactory for many anglers. Most self-sustaining westslope cutthroat trout fisheries are less than optimal in this regard, but the quality of wild rainbow trout fisheries was even lower. Stocked westslope cutthroat trout populations provide the best opportunity for quality fisheries because densities and growth can be managed.

Trout Diet Information

Trout diet was described qualitatively at each lake with field observations of stomach contents (no microscopic analysis). These data should be considered anecdotal, as no quantitative assessment or formal taxonomic classifications were completed. Terrestrial insects, aquatic macroinvertebrates and zooplankton were the dominant diet items in late summer for > 95% of lake populations. Preliminary laboratory analyses of several zooplankton samples indicated that larger copepods and cladocerans (e.g., *Daphnia* spp.) were the primary components. Most macroinvertebrates in trout diets were larval dragonflies and damselflies (Odonata), mayflies (Ephemeroptera), and midges, mosquitos, etc. (Diptera). Terrestrial insects were also common, including bees and ants (Hymenoptera) and beetles (Coleoptera). At several lakes, particularly more productive waters with higher fish condition, leeches (Hirudinea) and "scuds" (*Gamarus* spp. shrimp) were a significant component of stomach contents. Snails (Gastropoda) were additional, infrequent diet items at < 10% of lakes.

Trout Genetic Composition and Age/Growth Information

At the time of report preparation, genetic data for fish species identification and age/growth information were not available. Although fin clips, scales, and otoliths were collected from individual fish in each population, these samples have not been processed due to time and funding limitations. Basic fish recruitment and growth data were inferred from population length frequency distributions, relative abundance, and other data.

Fish species identification was based on (morphological) diagnostic characteristics. This has proven to be effective in identifying populations with a predominant Yellowstone cutthroat trout or rainbow trout component, but is unreliable for identifying populations with a low non-native *Oncorhynchus* genetic contribution (i.e., late generation hybrid swarms that are primarily westslope cutthroat trout). More thorough analysis of age, growth and genetic information will be conducted for individual lakes as it is relevant for management decisions.

Fishless Lakes

Fishless lakes are widely distributed across the Rattlesnake Wilderness area, both in terms of geographic location and elevation. Although generally higher, smaller and shallower than adjacent fish-bearing waters (see Table 5), fishless lakes are also physically and biologically diverse. Fishless "lakes" actually included the range of high elevation lentic habitats from shallow ponds and wetlands to classic glacial cirque lakes. At least nine of these waters (31%) were greater than 12 feet deep and are likely capable of over-wintering fish (see Appendix A - Table 5 for attributes).

Several of the currently fishless lakes were historically stocked with trout. When stocking was discontinued in the 1980s, these populations did not persist. Stocking was generally deferred following Wilderness designation to promote the natural character of the RNRAW and because existing angling opportunities appeared adequate given the limited amount of angler use.

Table 5. Comparison of elevation and morphology between fishless and fish-bearing mountain lakes in the Rattlesnake Wilderness Area.

	Fishless Lakes			Fish-Bearing Lakes			
	Mean (SD)	**Range**	**n**	**Mean (SD)**	**Range**	**n**	**P[1]**
Elevation (ft-msl)	6,911 (418)	5,620-7,488	29	6,736 (384)	6,099-7,690	16	0.17
Max Depth (ft)	17 (22)	2-89	21	65 (54)	15-217	15	<0.01*
Surface Acreage	5 (5)	1-21	29	22 (26)	6-108	16	<0.01*

[1] Significance of comparison between fishless and fish-bearing lakes using two-tailed t-tests.
* Indicates a statistically significant difference

Fishless lakes are an important component of the overall diversity and natural integrity of the Rattlesnake Wilderness Area. Incorporating a number of physically variable and geographically dispersed fishless lakes is currently the best method of integrating the many unique biological communities (e.g., benthic, zooplankton, etc.) and processes that are certainly affected by introduced fish populations, but are not specifically described or considered in management decisions.

Amphibian and Reptile Observations

Shoreline amphibian surveys were conducted at most fish-bearing and fishless lakes (> 1 acre) in the project area, as well as at many of the smaller, adjacent fishless ponds and wetlands. Although several amphibians and reptiles have been documented in the region, Columbia spotted frogs (*Rana luteiventris*) and long-toed salamanders (*Ambystoma macrodactylum krausei*) are the most common species in alpine and sub-alpine lake environments (Werner et al. 2004). Since our descriptions of lentic amphibian populations were typically based on a single visit, they should be considered anecdotal and interpreted cautiously. These populations are known to be highly cyclical, with seasonal variability in abundance (Werner et al. 2004). Despite this variability, several large-scale trends were evident.

Overall, amphibians were more abundant at fishless lakes relative to those that supported fish (Table 6). However, spatial distribution and density varied by species and was heavily influenced by lake morphology and shoreline habitat quality.

Similar to findings at mountain lakes in the nearby middle Clark Fork area (Knotek and Thabes 2008), Columbia spotted frogs were present along the perimeter of most lakes (Appendix A, Table 6). Adults, juveniles, and/or larvae (tadpoles) were observed at 12 of 15 (80%) fish-bearing lakes and 16 of 23 (70%) fishless lakes we surveyed. Frog egg masses were also noted at some water bodies.

Table 6. Summary of observations and relative abundance of Columbia spotted frogs and long-toed salamanders at Rattlesnake Wilderness lakes.

	C. SPOTTED FROGS				LONG-TOED SALAMANDERS			
	Abund.	Common	Rare	Absent	Abund.	Common	Rare	Absent
Fish-bearing Lakes	0	6	6	3	0	1	0	14
Fishless Lakes	9	3	5	6	2	4	6	11

* Descriptions of amphibian relative abundance during lakeshore surveys: absent = none observed, rare = 1-10 observed, common = 10-50 observed, abundant = >50 observed

Presence of fish appeared to have limited impact on the density or distribution of Columbia spotted frog adults in Rattlesnake Wilderness lakes. We observed no obvious correlation of fish relative abundance, fish species or fish presence/absence with the presence or density of this frog species along lake perimeters. These observations are consistent with recent mountain lake studies in the nearby middle Clark Fork region (Knotek and Thabes 2008), the Flathead River drainage of northwest Montana (Maxell 2002; Grisak et al. 2006) and in northern Idaho (Meyer and Schill 2007; E. Shriever, IDF&G, personal communication). Although only described qualitatively, Columbia spotted frog abundance (adult, juvenile, larval) appeared most closely related to the amount of emergent aquatic vegetation and shallow, littoral habitat along the lakeshore, as well as the timing of our lake surveys (Appendix A, Table 6). Adult frogs were typically observed anytime during summer, but tadpoles and juveniles were not common until latter portions of the summer sampling period.

In contrast, the number (and likely the distribution) of long-toed salamanders appeared to be inhibited by the presence of fish in Rattlesnake Wilderness lakes. This species was documented at only one of the 15 fish-bearing lakes surveyed, which is also consistent with findings at middle Clark Fork lakes (Knotek and Thabes 2008) and other study areas in the northern Rockies (Pilliod and Peterson 2001; Maxell 2002; E. Shriever, IDF&G, personal communication). Surprisingly, long-toed salamanders were also rare or absent at many of the larger fishless lakes in the project area. Larval salamanders were documented at 12 fishless lakes (52%), but were common or abundant at only five of these (22% of all fishless lakes > 1 acre). Long-toed salamanders were much more common at fishless ponds and wetlands adjacent to larger lakes. Dense congregations were noted in numerous small, shallow, vegetated water bodies, particularly in the Lake Creek, High Falls Creek, and Five Lakes Basin areas.

Western and common garter snakes were also observed along the shorelines of several lakes. These reptiles are common at mountain lakes as amphibians and fish are important dietary components. Incidental observations of western boreal toads (*Bufo boreas boreas*) and Pacific tree frogs (*Pseudacris regilla*) were also noted. An expanded discussion of other amphibian and reptile species that may utilize lentic environments in the project area is presented in the *Biological, Social, and Administrative Considerations* section of this report (see pages 20-22).

Recreational Use and Visitation

Rattlesnake Wilderness lakes provide a range of recreational opportunities through diversity in fisheries, access, terrain, lake morphology and aesthetics. Although the focus of this report was fisheries, and angling was the most frequent activity observed during surveys at fish-bearing lakes, recreationists also traveled to mountain lakes for solitude, swimming, unique scenery, and many other reasons associated with Wilderness visitation (Missoula Ranger District 2010; informal field interviews and observations).

As mentioned previously, Rattlesnake Wilderness lakes are generally remote and most require 8-10 miles of non-motorized travel to access them from various USFS trailheads. However, the presence of fish in lakes had an obvious impact on the location of maintained routes and the relative amount of use. More than 65% of fish-bearing lakes (11 of 16) were accessible by established trails, while less than 25% of fishless lakes (7 of 29) were accessible by designated trails or distinguishable routes on our survey trips. Fish-bearing lakes that did not have reasonable trail access were generally found in the Rattlesnake Creek headwaters and Five Lakes Basin areas. The four lakes in upper Gold Creek were the closest fish-bearing waters to USFS trailheads (Gold Creek and West Fork Gold Creek). None of the lakes in the project area were directly accessible via roads or routes open to motorized travel. Existing travel routes and logistics are specified for each fish-bearing water body and several of the larger fishless lakes in Appendix C.

Human disturbance and evidence of long-term use was visible at most fish-bearing lakes (11 of 16). This included established campsites, fire pits, trails around the lake perimeter, and infrequent human refuse. Recreationist activity was generally most evident near lake inlets and outlets, and was concentrated on constructed levees where lakes have been impounded. The locations of primary campsites and fire pits are displayed on bathymetric maps in Appendix C. Evidence of recreational use and disturbance was minimal at fishless lakes, with only a few exceptions (e.g., Upper and Lower Twin Lakes).

Angling pressure and overall recreational use at Rattlesnake Wilderness lakes was low when compared with other mountain lakes in western Montana (e.g., Knotek and Thabes 2008) and was very low relative to nearby valley floor lakes and rivers (MFWP State-wide Mail Surveys 1999-2009). Estimated angler use averaged less than 50 angler-days per year for nearly every lake in the project area and most likely supported less than 25 angler-days per year. Mail surveys of angling use and satisfaction are conducted state-wide every two years by MFWP and are most useful for tracking major fisheries with thousands of angler-days estimated based on a large number of respondents. In the case of mountain lakes and other lower use waters, estimates are usually inconsistent, with high error rates. However, mail surveys are helpful for identifying long-term trends in fishing pressure and major differences among lakes. In this study area, differences in angler use suggested by mail surveys were largely consistent with field observations and intuitive assumptions. Differences in use appeared to be closely tied to access (travel distance from trailheads) and fishery quality (high catch rates or larger fish). For example, lakes in upper Gold Creek received more use than lakes that were more difficult to reach or supported poor fisheries.

Biological, Social and Administrative Considerations For Mountain Lake Management

MFWP is charged with managing fisheries and aquatic resources within the state of Montana, including alpine and sub-alpine (mountain) lakes. In designated Wilderness, this responsibility is formally shared by the USFS, who manages nearly all public lands in these areas (AFWA/USFS/BLM Agreement 2006; USFS & MFWP 2008). There is no doubt that the range of considerations involved with mountain lake management has increased in recent decades. These considerations reflect the complexity of contemporary resource management and the balance between biological and social values.

Management objectives and recommended prescriptions for individual lakes were developed within the three Rattlesnake Wilderness management units delineated by local geography and hydrologic connectivity (see *Mountain Lake Management Unit* descriptions later in this report). The following section describes major considerations that form the basis for current and recommended lake management strategies.

Diversity of Opportunity and Fishery Quality

For the purposes of this document, fishery *quality* reflects a combination of fish size structure, abundance, and average body condition (Wr as an index of "plumpness"). The highest quality mountain lake fishery would be one that supports an abundant population of large, plump trout. Unfortunately, many of these population characteristics are biological trade-offs that are balanced at the lake and management unit scales to help provide diverse opportunities. Diverse fisheries support a range of species with varied fish size structure, body condition, and angler catch rates. Later in this section, fishery objectives such as "quality" fisheries, "self-sustaining" fisheries, etc. are defined that indicate this desire for angling diversity. In a broader perspective, these aspects are combined with interspersed fishless waters, considerations for native fish, variable access and scenery, and different levels of solitude to provide overall recreational and ecological diversity.

Alpine and sub-alpine lakes are relatively simple, oligotrophic and meso-oligotrophic environments that presumably provide a finite carrying capacity for top aquatic predators such as trout (Bailey and Hubert 2003). Therefore, basic lake productivity and fish population abundance generally dictate fish growth rates, size structure, and body condition within a water body. Trout population density appears most influenced by the level of reproductive success or stocking, species of fish, and, in some cases, level of harvest (Donald et al 1980; Donald and Anderson 1982; Bailey and Hubert 2003). Once fish are introduced and become self-sustaining, the greatest challenge for fisheries managers is maintaining optimal and consistent fish densities.

Since the character of mountain lake fisheries is highly dependent on trout density, prolific populations that reproduce consistently are essentially "unmanaged" unless aggressive actions are implemented (rare). The high level of natural reproduction in these populations is primarily dictated by the availability of inlet spawning habitat. Self-sustaining westslope cutthroat trout populations are the prevalent example of this situation in our project area. Of the 12 lakes

supporting westslope cutthroat trout fisheries, 9 were self-sustaining. Trout were very abundant and stunted in most of these populations, with low body condition (mean Wr 81-92) and a maximum length of 8.7-13.2 inches (220-335 mm). In these cases, we consider overall fishery quality and diversity of opportunity to be low.

Additional fishery diversity is provided by rainbow trout and Yellowstone cutthroat trout populations in RNRAW lakes. However, rainbow trout fisheries lacked quality, with very poor body condition (Wr 67-74) and low abundance (0.4-0.7 fish/net/hr). Yellowstone cutthroat trout performance in Little lake was comparable to neighboring westslope cutthroat trout populations. Higher quality fisheries were primarily provided in lakes stocked with westslope cutthroat trout (Bull, Gold Creek and Fly lakes), where natural reproduction was limited and trout densities could be managed (see Figure 4).

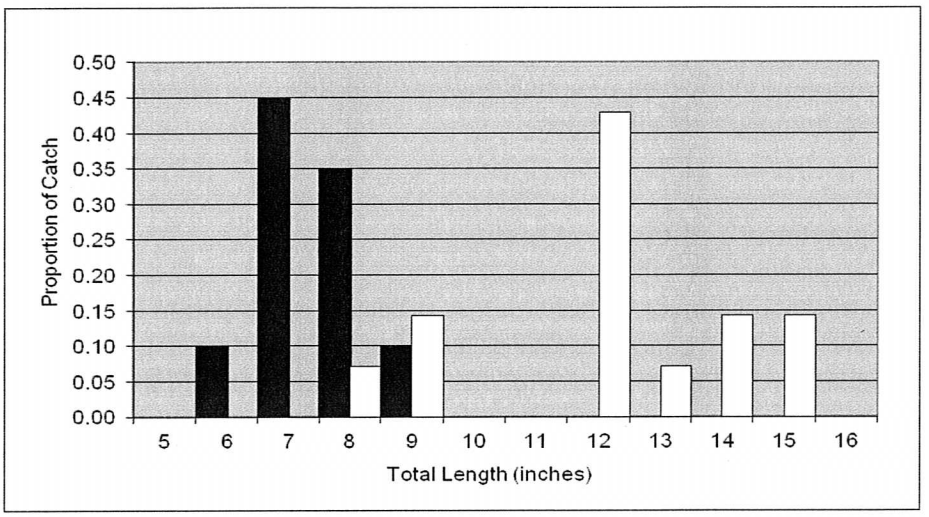


Figure 4. Size distributions for a self-sustaining, "stunted" cutthroat trout population with low average body condition (mean Wr = 82) in Rattlesnake Lake #15 (dark bars) and a "quality", stocked cutthroat trout population with good average body condition (mean Wr = 95) in Gold Creek Lake (white bars).

The best opportunity for fishery improvement in current fish-bearing lakes is likely replacement of rainbow trout populations with westslope cutthroat trout. Although fishery diversity would be compromised, these lakes (Big Lake, McKinley Lake, and Sheridan Lake) would likely produce larger cutthroat trout with better body condition. Similar to lakes currently stocked, these water bodies appear to have limited or moderate potential for natural reproduction and densities could likely be controlled through conservative stocking. Elimination of rainbow trout would also eliminate headwater sources of a non-native, hybridizing species from the headwaters of Rattlesnake Creek that have impacted native westslope cutthroat populations.

Angling opportunity could also be improved by re-introducing trout into selected fishless lakes. Given the emphasis on natural integrity and limited anthropogenic change in wilderness, this would only be considered in lakes that were previously stocked and supported fisheries prior to Wilderness designation (e.g., Lower Twin Lake and Farmers Lake #5 (Peterson Lake)). Future

management of these lakes is discussed in the Rattlesnake Creek Management Unit section later in the document (pages 44-47).

The quality of some lake fisheries in the Wrangle Creek, Lake Creek, and High Falls Creek sub-basins within the Rattlesnake Creek Management Unit could also be improved by limiting unnatural water level fluctuations associated with artificial impoundment. Dams and outlet structures were installed on at least ten lakes in the early 1900s to enhance storage capacity. Currently, many of these structures are dilapidated and contribute to large annual fluctuations in surface elevation. These fluctuations appear to significantly affect the productivity of shoreline and littoral areas. Shoreline and shallow water habitats are normally extremely productive and biologically diverse, with abundant vegetation, aquatic invertebrates, and other species. Unfortunately, many of the impounded lakes exhibit a bare "varial" zone around the lake perimeter, which likely limits productivity and ultimately trout growth. Removal, replacement, or more frequent management of these structures would likely improve fishery quality and habitat conditions for other species (e.g., amphibians) by restoring a more natural hydrologic regime.

In summary, options to diversify and improve angling opportunities are limited in Rattlesnake Wilderness lakes. Lakes in the project area support low productivity relative to other waters in western Montana and Wilderness designation necessitates minimal active management. However, minor changes in fishery management could concurrently improve the quality of angling, promote native trout species, and support other aquatic conservation objectives. If implemented, these changes would primarily involve replacement of rainbow trout populations with genetically compatible westslope cutthroat trout, minor modifications to the fish stocking program, and improved management of water levels at impounded lakes.

Preserving Integrity of Natural Aquatic Systems

Background

Most mountain lakes in the Rattlesnake Wilderness Area were historically fishless. As fish stocking became common practice and recreationists' desire for new fishing opportunities increased in the 1950s - 1960s, non-native trout were introduced into many of the larger mountain lakes that were perceived as capable of supporting (over-wintering) fisheries. The fish stocking program continued to expand in the 1960s -1970s as aircraft for stocking became available, new fish species were raised in hatcheries, and public demand for fisheries continued to grow.

By the 1990s, concern over the ecological impacts of widespread fish introductions in mountain lakes was increasing (particularly in designated wilderness and proposed wilderness areas). Primary issues included: 1) the sensitivity of these relatively fragile ecosystems and their native fauna to fish introductions (Dunham et al. 2004, Pister 2000), 2) the use of aircraft and other mechanized tools to stock in wilderness and back-country areas, 3) human social impacts (and related resource impacts) of crowding, displacement and focused recreational use driven by recently established lake fisheries, and 4) the stocking of non-indigenous trout species that compete and hybridize with native fish populations downstream (see section below).

Research on the impacts of fish stocking to natural alpine lake systems has focused on many different trophic levels (Knapp et al. 2001; Schindler et al. 2001; Parker et al. 2001), but effects on native amphibian populations have been the most recognized and contentious. In particular, studies documenting the decline of yellow-legged frogs (*Rana muscosa*) and Pacific treefrogs (*Hyla regilla*) in response to non-native trout introductions in Sierra-Nevada mountain lakes initially heightened awareness of the issue (Matthews and Knapp 1999; Knapp and Matthews 2000; Pope and Matthews 2001; Matthews et al. 2001). In the northern Rocky Mountain region (including western Montana), similar relationships have been reported between introduced fish and long-toed salamanders (*Ambystoma macrodactylum)* in alpine and sub-alpine lakes (Maxell 2002; Funk and Dunlap 1999).

Amphibian and Reptile Species in the Rattlesnake Wilderness Area

The southern Mission Mountains are inhabited by several native amphibian species that depend on lotic and lentic environments at various life stages. Descriptions from Werner et al. (2004) are paraphrased throughout this section. The most common are two frog species, Columbia spotted frog (*Rana luteiventris*) and Rocky Mountain tailed frog (*Ascaphus montanus*). In the northern Rocky Mountains, Columbia spotted frogs are common in high elevation wetlands, ponds and lakes with emergent aquatic vegetation. Various lentic waters are used during all life stages and the importance of larger ponds and lakes is often stressed as adult over-wintering habitat. Shallow ponds and wetlands used for breeding are often near these deeper waters used for over-wintering. Columbia spotted frog adults and larvae were common or abundant at many lakes we surveyed in the RNRAW. Rocky Mountain tailed frogs are also common at high elevations in the northern Rocky Mountains. This species is most closely tied to cold mountain streams. Both adults and larvae are well adapted to headwater stream environments, where water temperatures often do not exceed 13° C. This species was not observed at any mountain lakes we surveyed, but is common in outlet streams and cold tributaries throughout the project area. Tailed frog adults have also been observed in lakes and wetlands in late fall and early spring, indicating that they may use these areas as over-wintering habitats (Maxell et al 2003). The Pacific treefrog (*Pseudacris regilla*) is also present in the southern Mission Mountains. This species uses ponds, lakes and temporary wetlands for breeding and larval development, but is typically found at lower elevations in this region. Habitation of high elevation alpine lakes appears to be uncommon.

Although several salamander species have been documented in western Montana, only the long-toed salamander (*Ambystoma macrodactylum krausei*) has been observed in the RNRAW. This species has a widespread distribution in the northern Rocky Mountains of Montana. The northern long-toed salamander subspecies frequents ponds, lakes, and marshes, particularly for breeding and larval development. At higher elevations, larvae likely overwinter in lentic waters at least once, and possibly twice, prior to metamorphosis (Maxell et. al 2003). Long-toed salamander larvae were observed in low numbers at several fishless lakes in the project area, but were very abundant in some of the smaller wetlands and ponds adjacent to mountain lakes.

Photos by Bryce Maxell

Columbia spotted frog larvae

Long-toed salamander larva

Boreal toads (*Bufo boreas boreas*), the western toad subspecies found in Montana, were historically common throughout western Montana. They are now a Species of Concern in Montana because breeding has only been documented in 2%-5% of lentic sites surveyed in recent years and the species has reportedly been extirpated from a high percentage of historic breeding sites (Bryce Maxell, Montana Natural Heritage Program, personal communication). While they still appear to be widespread with healthy populations in some local watersheds, breeding populations are observed in a much lower percentage of watersheds and sites relative to the 1950s, and most breeding populations do not appear to be as robust (Maxell et al 2003). Adults are primarily terrestrial, but have been shown to use streams and other watercourses during long range movements (Adams et al. 2005). Boreal toads are able to breed in any standing water, including ditches, gravel pits, wetlands, temporary ponds, larger lakes and backwaters of streams. Although this species is commonly observed during stream surveys adjacent to the project area, very few were noted during Rattlesnake Wilderness lake surveys.

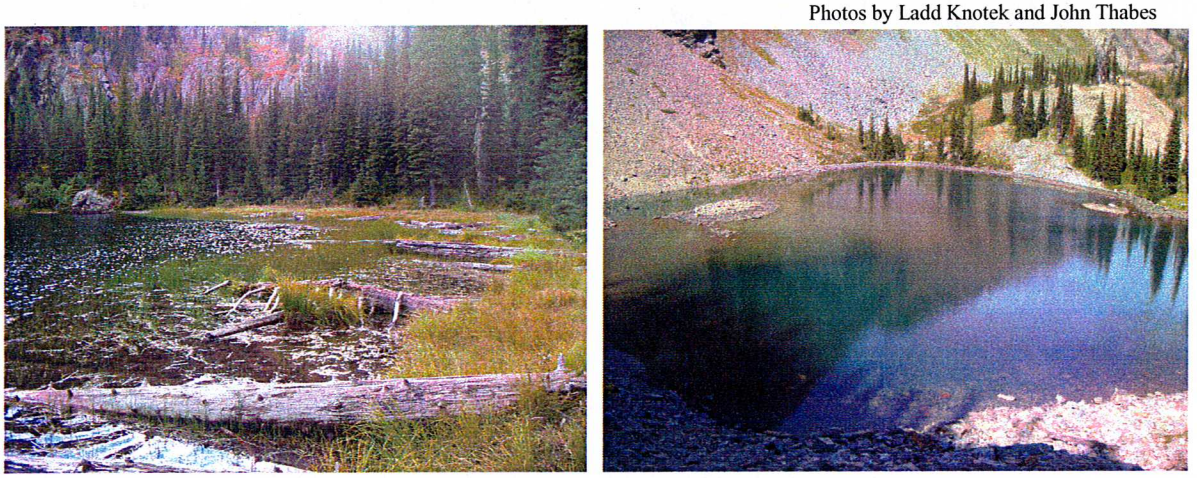
Several reptile species also inhabit west-central Montana, but most are not obligate inhabitants of high elevation aquatic environments. The only reptile species we encountered during lake surveys were common (*Thamnophis sirtalis*) and terrestrial (*Thamnophis elegans*) gartersnakes, which were often observed sunning or feeding on Columbia spotted frogs along shorelines. These species are common at lakes, ponds, and wetlands and along stream corridors in alpine and sub-alpine environments in the region where they forage on amphibians, fish, small mammals, birds and a variety of invertebrates.

Impacts of Introduced Trout on Native Amphibians in Mountain Lakes

Columbia spotted frogs and long-toed salamanders are the two primary species of concern with regard to impacts of introduced mountain lake fish populations on native amphibians in the project area. Although we did not conduct rigorous investigations, trout populations appeared to have limited impact on the abundance or distribution of Columbia spotted frog adults in Rattlesnake Wilderness lakes. Columbia spotted frogs were present or common at most fish-bearing lakes we surveyed (12 of 15 or 80%). We observed no significant correlation of fish

abundance, fish species or fish presence/absence with the presence or abundance of this frog species along lake perimeters (P >0.5 in all comparisons). These observations are consistent with recent alpine lake studies in the middle Clark Fork portion of western Montana (Knotek and Thabes 2008), the Flathead River drainage of northwest Montana (Maxell 2002; Grisak 2006) and in northern Idaho, where Columbia spotted frogs were observed at 83% of fish-bearing lakes and 87% of fishless lakes (Meyer and Schill 2007; E. Shriever, IDF&G, personal communication).

Photos by Ladd Knotek and John Thabes



Typical lakeshore habitats where Columbia spotted frog larvae and adults were common (left) and rare (right)

Although not quantified, Columbia spotted frog adult, juvenile, and larval abundance was most closely related to the amount and quality of shoreline habitat and the timing of our surveys. Adults and larvae primarily inhabit shallow littoral areas with ample shoreline foliage and emergent aquatic vegetation. Adult frogs were typically observed anytime during summer, but tadpoles and juveniles were not common until latter portions of sampling periods. Others (e.g., Pilliod and Peterson 2001) have reported that Columbia spotted frog abundance is lower at sites with fish relative to fishless waters, but acknowledged that habitat variables may play a primary role in this relationship (fish-bearing waters tend to be deeper, with less suitable shoreline habitat). This and other studies suggest a more complex, basin-scale interaction where Columbia spotted frogs may experience higher over-winter survival in deeper lakes and seasonally migrate to these waters that are now largely inhabited by predaceous fish.

In contrast, the abundance and likely the distribution of long-toed salamanders in Rattlesnake Wilderness lakes appear to be inhibited by the presence of fish. Although we failed to detect salamanders at many of the larger, deeper lakes, they were conspicuously absent from all fish-bearing lakes except one (Bull Lake). Long-toed salamanders also appeared to be absent from nearly half (48%) of fishless lakes larger than one acre. This was unexpected based on similar surveys in middle Clark Fork basin lakes (Knotek and Thabes 2008), but suggests that factors other than fish presence are important determinants of salamander distribution. In contrast, many smaller fishless lakes and ponds in the project area (often directly adjacent to larger lakes) supported dense congregations of long-toed salamander larvae. The negative relationship between introduced trout and long-toed salamanders is consistent with other studies in the

northern Rockies (Pilliod and Peterson 2001; Maxell 2002; Knotek and Thabes 2008). These results were also consistent with mountain lake surveys in northern Idaho (since 2003) where long-toed salamanders were observed at 72% of fishless lakes and only 18% of fish-bearing waters (E. Shriever, IDF&G, personal communication).

Herpetologists have speculated that depredation impacts to long-toed salamanders are exacerbated by the extended aquatic larval period at high elevations. In cold mountain lake environments, it is not uncommon for larvae to over-winter in lakes for multiple years prior to metamorphosis (Pilliod and Peterson 2001). Therefore, the period when they are vulnerable to fish predation may be extended relative to other amphibian species (e.g., Columbia spotted frogs) that also use lakes as larval nursery habitats.

Direct and indirect impacts of fish introductions on other (vertebrate) species are not clear. For instance, reptiles such as common and terrestrial gartersnakes are common along lakeshores and may experience increased competition as amphibians are frequent diet items. This is especially true for the common gartersnake, which is an amphibian specialist. Beneficial aspects of alpine lake fish populations are also possible, but rarely acknowledged. New food resources for piscivorous mammals and birds may support larger populations, with expansion into new habitats.

Ultimately, responsible management of Wilderness lake resources demands a balance of trout fisheries, diverse recreational opportunities, and conservation of natural ecological integrity. This includes consideration of a range of native species and trophic interactions. With limited information, resource managers attempt to achieve this balance by stocking fish responsibly (i.e., species, location, density) and by incorporating a physically diverse and geographically dispersed range of fishless waters into alpine lake management plans.

Impacts To Native Fish Populations

Expansion of non-indigenous fish and other organisms into additional lakes and stream networks is one of the major threats facing native aquatic populations and existing fisheries. Expansion may occur as established populations progressively colonize new, accessible waters or by intentional and unintentional introductions by humans. Identifying secure habitats and where remaining native fish populations occur are important components of developing management and conservation actions. Regulations and public education efforts discouraging transfer of fish and species among waters (i.e., bucket biology) are also critical.

Introduction of non-native fish and other aquatic species have contributed to the significant decline in distribution and abundance of native coldwater fish in Montana (Shepard et al. 2005; MBTSG 1996). Although many species have been impacted, native salmonids such as westslope cutthroat trout and bull trout are the primary concern in Gold Creek, Rattlesnake Creek and Grant Creek when non-native species introductions or management changes are considered for headwater lakes.

In the case of Rattlesnake Wilderness lake fisheries, existing wild populations and continued stocking raise two primary levels of concern. The first involves overall impacts of fish introductions to multiple trophic levels in historically fishless water bodies. In essence,

predatory trout can disrupt the natural food webs of fragile alpine and sub-alpine aquatic systems (discussed above). The second major biological consideration is the compatibility of introduced species with existing stream fish populations in the drainage. Trout introduction into headwater lakes typically equates to new fish introductions in the entire watershed via eventual emigration and colonization. Most trout species have a strong instinctive desire to move downstream from lake outlets to lower stream reaches. Introduced trout constitute a risk of hybridization with similar native species, a threat of increased competition with numerous aquatic and terrestrial species, and may alter the natural genetic variability or the unique, drainage-specific makeup of native trout populations (particularly westslope cutthroat trout). For instance, the impact of rainbow trout and Yellowstone cutthroat trout introduced into at least four mountain lakes is very evident in Rattlesnake Creek, where hybrids of these species with native westslope cutthroat trout are now found throughout.

Photos by David Schmetterling, Bill Thomas and Ladd Knotek

Common native fish and amphibian species that inhabit headwater stream systems associated with mountain lakes: sculpin (top left), westslope cutthroat trout (top right), tailed frog larva (bottom left) and bull trout (bottom right)

Introduced *Oncorhynchus* species and subspecies (genus containing cutthroat trout and rainbow trout) primary affect the genetic composition of native westslope cutthroat trout stream populations. Yellowstone cutthroat trout, rainbow trout and westslope cutthroat trout readily hybridize and produce completely viable offspring. As non-native emigrants from lakes are incorporated into native westslope cutthroat trout populations, the genetic make-up and integrity

of these populations can change. This has been clearly recognized in many western Montana drainages through genetic testing of stream populations decades after non-native trout were introduced into headwater lakes. The result of this "introgression" is believed to be significant (possibly detrimental) changes in unique, localized adaptations that characterize stream-dwelling westslope cutthroat trout populations. The same concerns may apply even when "genetically pure" westslope cutthroat trout are stocked in headwater lakes. Because the stocked strain does not have the same unique genetic make-up of the native population, biologists fear that interbreeding may affect the natural integrity of the native population. MFWP has responded to this concern by developing the M012 strain of westslope cutthroat trout, which is now used for all mountain lake stocking in the project area (see Fish Stocking section). This strain was derived from a number of genetically non-introgressed populations in western Montana that presumably contributed a diversity of localized genetic characteristics to the stock. Therefore, this "generalist" hatchery strain with high genetic variability is considered compatible with native westslope cutthroat trout populations in the region.

Currently, MFWP is pursuing additional measures to ensure genetic compatibility. Sterile (triploid) trout are being produced for use in lakes and private ponds where introgression of wild populations is a concern. Drainage-specific hatchery stocks for westslope cutthroat trout re-introduction efforts in the Flathead Drainage of northwest Montana (Matt Boyer, MFWP, personal communication) are also being developed. This project uses "nearest neighbor" sources or fish from the same drainage to re-stock headwater lakes after chemical rehabilitation.

Fish Stocking in Mountain Lakes

Stocking is a frequently used tool to diversify, maintain and improve mountain lake fisheries. Over the past century, stocking policies and techniques have evolved in response to advances in technology, recognition of natural resource impacts, increased public demand for fisheries, and new information gained through trial and error.

Background

Accounts from the early 1900s indicate that most alpine and sub-alpine lakes in the Rattlesnake Wilderness and other portions of western Montana were historically fishless (MFWP, unpublished file data). MFWP stocking records report that initial fish plants in Rattlesnake Wilderness lakes began in the 1970s or earlier. Rainbow trout and various strains of cutthroat trout were planted repeatedly in many of the current fish-bearing lakes and in some lakes that are now fishless (MFWP, unpublished data). Recorded stocking histories for each lake are described (through 2007) within individual lake summaries in Appendix C. It is evident that many undocumented lake plants also occurred since the mid-1900s. Self-sustaining trout populations currently exist in several lakes where there is no record of fish being stocked. This is not surprising as public groups and individuals were apparently provided with fish and encouraged by state and federal agencies to "seed" new waters during this time period.

Stocking was deferred at most of the mountain lakes in the RNRAW by the late 1980s, shortly after formal Wilderness designation in 1980. Although existing stocking practices could continue under Wilderness Act and AFWA/USFS/BLM Agreement (2006) provisions, stocking

has been discontinued by MFWP to promote natural ecological function and self-sustaining fisheries at most lakes. Currently, only three of the most accessible lakes are stocked on a regular basis with westslope cutthroat trout.

In the early 1980s, concerns amplified regarding the compatibility of hatchery trout stocks and native trout populations. In response, MFWP began collecting wild westslope cutthroat trout for development of the M012 hatchery stock in 1984. This strain was derived from non-introgressed stream populations in the lower Clark Fork and Flathead River systems for use in the Clark Fork and Flathead Basins in western Montana. The objective was to create a diverse stock that incorporated the genetic variation among numerous local populations. The M012 stock was designed to be genetically compatible with existing native populations and perform well over a range of environmental conditions. Since upper Gold Creek and Rattlesnake Creek support native westslope cutthroat trout, use of the M012 strain was a logical application for stocking in the Rattlesnake Wilderness area.

As stocking of non-native or non-compatible fish stocks in alpine lakes was increasingly scrutinized, the impacts of fish stocking (as a general practice) on sensitive, high elevation aquatic communities was also emphasized and questioned, particularly in designated Wilderness areas (Carter 1997; Knapp et al. 2001(a)). The 'unnatural' presence of fish in pristine, historically fishless waters and documented effects of fish on several species (e.g., amphibians, zooplankton) that inhabit and thrive in fishless waters suggested the need to better balance benefits of alpine trout fisheries with the overall ecological diversity and function provided, in part, by fishless waters (Knapp et al. 2001(b); Pilliod and Peterson 2001).

By 1988, M012 strain westslope cutthroat trout were the only fish stocked in Rattlesnake Wilderness lakes and the value of fishless lakes was considered in development of the stocking program. These practices were continued as lake surveys were completed and this management plan was developed.

Stocking Rates

Bull Lake, Fly Lake, Gold Creek Lake, and other mountain lakes in the middle Clark Fork region are stocked with ~ 50 mm (TL) M012 strain westslope cutthroat trout in accordance with the MFWP stocking program. Base stocking rates are 50 fish per surface acre every 5-7 years. These rates were based on 1) prescribed stocking rates in other regions and states, 2) evaluation of past stocking at middle Clark Fork and RNRAW mountain lakes, and 3) a conservative philosophy that over-stocking lakes will decrease the diversity and quality of fisheries.

For some lakes, stocking rates are adjusted from the base rate to meet management objectives and accommodate perceived rates of natural reproduction. Natural reproduction was estimated during lake surveys from fish population size structure, adult and juvenile trout relative abundance, and availability of spawning habitat. For instance, stocking rates were reduced to 35-40 per acre every seven years at Bull Lake, which has moderate natural reproduction.

Stocking Methods

Alpine lake stocking is now completed almost exclusively by helicopter. This method is efficient, cost-effective and causes minimal disturbance to lakes and recreationists. All three lakes currently stocked in the Rattlesnake Wilderness can be planted in about 20 minutes. MFWP currently uses a helicopter with a series of individual, external holding tanks, aeration system, and an automated release from within the aircraft. Typically the pilot slowly circles over water body and releases the allotted fish from 50 ft or less above the water surface.

Future Alternatives

Westslope cutthroat trout (M012) are currently the only strain of fish planted in Rattlesnake Wilderness lakes because no other hatchery stocks are considered compatible with native stream populations (primarily bull trout and westslope cutthroat trout in lake-associated stream networks). As sterile (triploid) stocks are developed and tested, alternative species may be considered. Stocking of completely non-reproductive individuals would further reduce the risk of introgression with native populations and the possibility of significant long-term expansion.

Another technique that has been used to help alleviate the threat of genetic introgression is "swamping", where high numbers of genetically compatible westslope cutthroat trout are stocked frequently in lakes containing rainbow trout or Yellowstone cutthroat trout populations. The rationale is that the nonnative *Oncorhynchus* component of a wild population will be replaced by genetically compatible individuals by overwhelming them numerically via stocking. The effectiveness of this method may be maximized when coordinated with removal methods that first suppress the population being "swamped". This technique was originally applied (and continues) in the South Fork Flathead River drainage of northwest Montana, where mixed results have been reported (Leary et al. 2006). Field trials and monitoring will continue in the process of evaluating this tool.

2012 Stocking Program for Rattlesnake Wilderness Lakes

Appendix B summarizes the stocking program for Rattlesnake Wilderness lakes in 2012. Three lakes (Bull, Fly and Gold Creek Lakes) were stocked most recently in 2007 and are scheduled to be re-stocked in 2014 to maintain quality westslope cutthroat trout fisheries. Stocking was recently discontinued in Boulder Lake because the population appears to be self-sustaining. No other stocking is planned in the project area, but the program may evolve as new information is gathered and management priorities change.

Managing Recreational Use and Angling Pressure

Social and biological aspects of lake management are closely tied and inherently inter-dependent. Desire for quality fishing and solitude are two common, but often contradictory, reasons why recreationists choose to put forth great effort to reach remote mountain lakes. Some effects of introduced trout populations on lake environments and human use patterns are obvious. Our lake surveys indicated that the majority of fish-bearing lakes had developed trail access

systems and camp locations, while few fishless lakes had these features. Introduced fish not only directly affect the ecology of a lake, but also apparently influence the level of human use and disturbance.

Because all mountain lakes in the RNRAW lie within the Lolo National Forest, sound lake management is dependent on an effective working relationship between MFWP and USFS staff. These agencies share the responsibility for managing aquatic resources, recreational use and levels of angling pressure. The USFS does this directly by designating and restricting access points, developing and maintaining trail systems, designating legal modes of transportation, managing outfitter use permits, etc. MFWP indirectly facilitates or deters use through the distribution of introduced trout fisheries, frequency and level of stocking, and by setting and enforcing angling restrictions.

As the popularity and demand for mountain lake resources rises, the need for coordination and consistent management direction among agencies will become increasingly important. Fishery management objectives presented in this plan are compatible with *current* USFS regulations, access points, and travel routes. However, effective and adaptive resource management requires that fishery management objectives be proactively incorporated with USFS plans for Forest management. In summary, communication among natural resource agencies has become one of the most important mountain lake management tools.

Angling Restrictions

Angling restrictions, imposed through state fishing regulations, are a common method for limiting or encouraging harvest in lake fisheries. Managing harvest rates can be extremely important in small, relatively unproductive waters where varied population densities, size structures, and species are desired. Regulations are also commonly implemented to diversify social experiences and to limit crowding. These would include limitations such as no-wake restrictions, non-motorized access, variable season structures, etc. on waters with high levels of recreational use.

Because Rattlesnake Wilderness lakes are relatively remote and use is light, angling restrictions have limited influence on trout populations and the quality of lake fisheries. The remote setting also creates logistical challenges for enforcement. To date, MFWP has not implemented specialized angling restrictions on mountain lakes in the Rattlesnake Wilderness Area. These lakes currently fall under the standard harvest restrictions and other regulations for lakes and reservoirs in the Western Fishing District (MFWP 2012). Current regulations allow fishing year-round, with no special gear restrictions. Daily limits are restrictive for westslope cutthroat trout (3) and more liberal for rainbow trout (5). This framework has likely been adequate to maintain a diversity of quality angling and recreational opportunities because of the inherent variability in lake access, stocking rates, trout reproductive rates, etc., as well as the high number of widely distributed waters that currently receive limited use.

Restrictions that help to limit shoreline habitat disturbance and impacts to wilderness integrity are an integral component of lake protection. Regulations that ensure lake environments remain within wilderness "Limits of Acceptable Change" are an important responsibility of the Lolo

National Forest. For instance, stock access was recently restricted at lakes in an effort to reduce impacts to shoreline and riparian vegetation.

Wilderness Designation and Lake Management

Since all of the mountain lakes in the RNRAW project area lie within the Lolo National Forest, lake management objectives should be consistent and compatible with Forest Service land use and land management designations. However, some of the most contentious disputes among natural resource management agencies involve stocking of mountain lakes and introduced fisheries in Wilderness and primitive areas (Fraley 1996). Mountain lake fisheries and Wilderness designation are often at odds because wilderness values stress natural biological integrity, non-mechanized transport, non-motorized use, and resources that are minimally influenced by man, while state fisheries managers often desire to continue stocking and management activities using standard methods (that pre-date Wilderness designation) to provide diverse fisheries for recreation. Although management objectives and mandates may conflict, State and Federal managers have worked to develop a reasonable balance between fishery management and wilderness integrity through the *AFWA/USFS/BLM Agreement* (2006) and the *Cooperative Agreement for Fish, Wildlife, and Habitat Management on National Forest Wilderness Lands in Montana* (USFS & MFWP 2008). These agreements specify polices and guidelines for fish and wildlife management in designated Wilderness areas. Mountain lake fisheries and aquatic resource management in Wilderness areas on National Forest system lands are important components of the agreements.

There are many other important land management considerations that extend to USFS lands. These include the location and configuration of trailheads and access points, the location and condition of trail routes, camping and recreation restrictions, location and methods for timber management, fire management policies and practices, mining and water rights administration, and allowable methods of transportation. These elements of land management have direct and indirect impacts on the quality of lake fisheries and on the recreational experience of visitors. The complex interaction of land management and fisheries management makes coordination among State and Federal resource managers essential.

MFWP Mountain Lake Management Guidelines

Based on current biological and social considerations, management tools, constraints, and other aspects mentioned in this report, the following approaches were emphasized in developing management strategies for mountain lakes in the Rattlesnake Wilderness, as well as other regions of western Montana:

1. Provide diverse opportunities for anglers and recreationists

Lake management strategies include fisheries with a range of trout species, size categories, fish densities and accessibility. Diversity is provided through conservative stocking strategies and natural variation in self-sustaining, wild trout populations. These fisheries are broadly distributed geographically within the Rattlesnake Wilderness and occur at altitudes from 6,099 – 7,690 ft (msl).

2. Maintain fishless waters to sustain ecological integrity and natural processes

In addition to numerous shallow ponds and wetlands, more than 60% of alpine and sub-alpine lakes (> 1 acre) in the Rattlesnake Wilderness are currently fishless. These include at least nine lakes that are capable of supporting fisheries (> 15 ft deep), but stocking has been deferred. Trout were historically introduced into several of these lakes (1960s-1970s), but populations naturally dissipated when stocking was discontinued (e.g., Lower Twin Lake, Farmers Lake #5).

3. Promote native fish where possible

Three Rattlesnake Wilderness lakes (Bull, Fly, and Gold Creek Lakes) are stocked exclusively with genetically compatible (M012 strain) westslope cutthroat trout. These fish presumably possess local adaptations that promote excellent growth and survival in high lake environments as they were derived from wild populations in western Montana. This strain will also reduce potential genetic risks to native cutthroat populations that inhabit the Gold Creek system downstream of the lakes. Lakes that support self-sustaining, non-native trout (Big, Little, McKinley and Sheridan Lakes) may be candidates for conversion to westslope cutthroat trout, which would likely improve the quality of these fisheries. However, benefits to the genetic status of native cutthroat trout in receiving waters (Rattlesnake Creek) would be minimal as these populations are already hybridized. Conversion of rainbow trout and Yellowstone cutthroat trout fisheries to westslope cutthroat trout could likely be accomplished through genetic "swamping" or high density stocking with hatchery raised (M012) westslope cutthroat trout.

4. Stock fish only where required to meet fisheries management objectives

The lake stocking program has already been reduced and refined in the Rattlesnake Wilderness Area. FWP currently stocks only three lakes, where plants are important to retain fishery quality. Trout populations in the remaining 13 fish-bearing lakes are maintained through natural reproduction. Non-native fisheries (particularly rainbow trout) could be improved by stocking and conversion to self-sustaining westslope cutthroat trout, but this would decrease fishery diversity.

5. Manage individual lakes in the context of the overall watershed and management unit

Individual mountain lakes are often part of larger chain or cluster of lakes and are typically connected with other water bodies within a watershed via tributary stream networks. This context has been considered in the design of current management strategies and should be weighed in future decisions.

6. Practice adaptive lake management as new information and tools become available

Lake management strategies were based on one-time surveys, as well as limited historical and anecdotal information. These strategies will inevitably need to be adjusted as we learn more and as conditions change, particularly for stocked lakes. Examples of conditions likely to change include significant increases in recreational use, extirpation of self-sustaining populations and unauthorized introductions.

Definitions of Mountain Lake Fishery Management Objectives

Mountain lakes have inherent differences (physical, biological, geographic) that underlie their potential as lake fisheries and productive aquatic communities. Selective fish introductions, variable fish species, and other manipulations further diversify these environments. Below, we identify specific management objectives and characteristics for six different categories of mountain lakes and lake fisheries.

Rattlesnake Wilderness lakes are considered fishless, self-sustaining fisheries, or quality fisheries. The remaining categories identified below are not represented in the RNRAW project area, but are present on other nearby public lands.

High Density / Harvest-Oriented Fishery: Alpine or sub-alpine lake supporting westslope cutthroat trout, where individuals > 300 mm are common and angler catch rates exceed 1.5 fish per hour. Typically lakes that are easily accessible (often by road) and more heavily stocked (> 50 fish/surface acre every 2-4 yrs).

Quality Fishery: Alpine or sub-alpine lake supporting westslope cutthroat trout with a mean relative weight (Wr) > 95, where individuals > 360 mm are common and angler catch rates exceed 1 fish per hour. Typically productive lakes accessible by established trails with low/moderate natural reproduction that are stocked at the standard 50 fish/surface acre as needed to supplement natural reproduction.

Trophy Fishery: Alpine or sub-alpine lake supporting westslope cutthroat trout with a mean relative weight (Wr) > 110 and where individuals > 460 mm are common. Typically productive, relatively inaccessible lakes with limited natural reproduction that are stocked infrequently, at low densities (< 30 trout/surface acre).

Self-sustaining Fishery: Alpine or sub-alpine lake supporting a wild trout population (native or non-native species) that persists solely through natural reproduction (no hatchery supplementation after initial stocking). Fish density, condition, size, and catch rates vary with local conditions, but trout are often abundant and stunted.

Diversified Fishery: Alpine or sub-alpine lake supporting a self-sustaining population of non-native trout (rainbow or brook trout) where cutthroat trout are also stocked to provide diversity in angler catch. Fish density, condition, size, and catch rates vary with local conditions.

Fishless Lake: Alpine or sub-alpine lake believed to be naturally devoid of fish (historically) that is not stocked and does not currently support a self-sustaining fish population. Typically more "pristine" lakes with minimal human use and disturbance, where natural processes and ecological integrity are the emphasis.

Mountain Lake Management Units

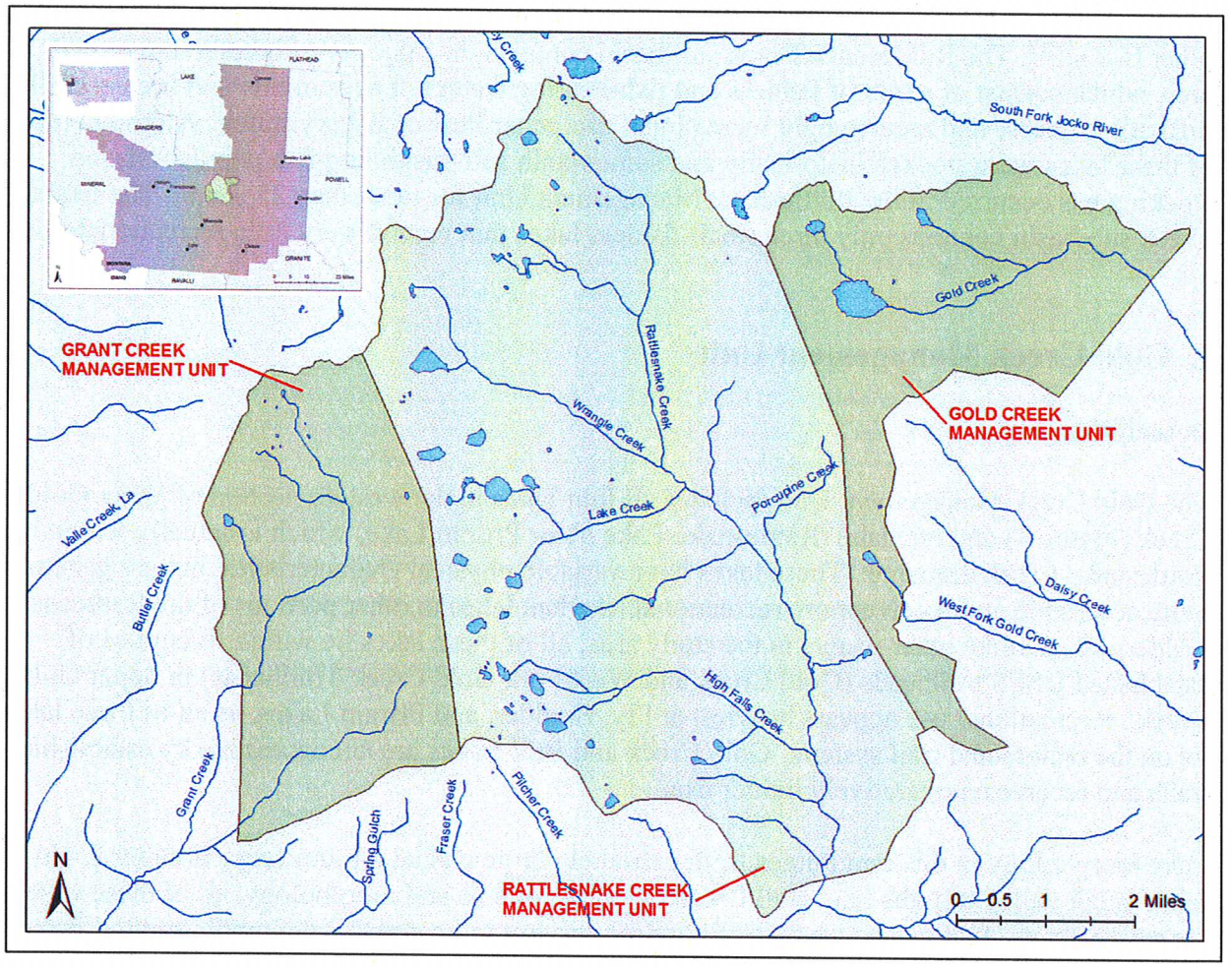


Figure 5. Lake management units in the Rattlesnake National Recreation Area and Wilderness.

Mountain lakes in the Rattlesnake Wilderness Area were divided into three management units (sub-basins) based on their geographic and hydrologic location (Figure 5). Since lakes and stream networks within each sub-basin are hydrologically connected, fish stocking, non-native fish introductions, and other management actions affect waters and species outside the individual lake vicinity. Similarly, many terrestrial, insect and amphibian species utilize a network of water bodies or require different aquatic environments at various life stages at the sub-basin scale. Fisheries management actions or designations also impact the distribution and intensity of human recreational use. Mountain lakes are a focal point for back-country recreation and the status of lake fisheries directly influences patterns and intensity of use in the Wilderness. In terms of recreational use, relative ease of public access is an additional factor that distinguishes these three lake management units.

Lake management in the Rattlesnake Wilderness emphasizes diverse angling opportunities and recreational experiences within the context of wilderness management goals for the area. Mountain lakes in the Gold Creek Basin are relatively accessible and are actively managed as sport fisheries. This includes regular stocking and significantly higher angler use relative to the other two units. The Rattlesnake Creek sub-basin contains the majority of lakes in the project area, which consist of a mix of fishless and fish-bearing waters. Lakes in this unit are generally difficult to access and receive light recreational use, regardless of fishery status. Although many of these lakes were stocked historically and some retain self-sustaining fish populations, no stocking has occurred in the Rattlesnake Management Unit for more than 25 years. The Grant Creek sub-basin contains only three small fishless lakes that receive very little recreational use.

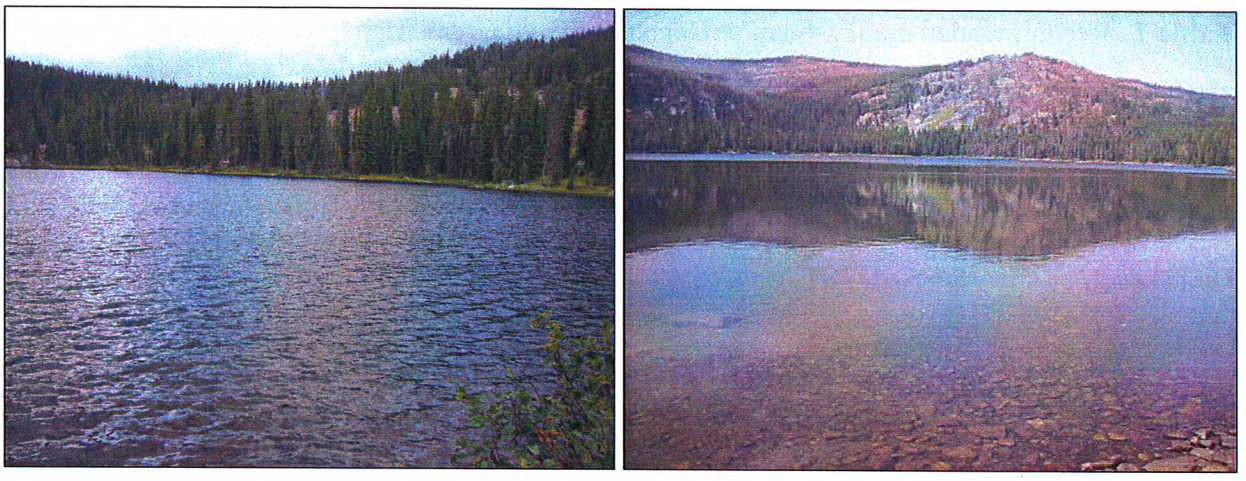
I. Gold Creek Management Unit

Description

The Gold Creek Management Unit includes all four lakes in the western portion of upper Gold Creek (Figure 4) and one lake (Rattlesnake Lake #1 or Primm Lake) which is actually within the Rattlesnake Creek drainage. These lakes have variable physical characteristics, but are generally more accessible and receive more recreational use than lakes in other portions of the Rattlesnake Wilderness. Unlike other waters in the study area, all of these lakes lie within five miles of established USFS trailheads (Gold Creek and West Fork Gold Creek Trailheads) in upper Gold Creek. Recreational use appears heaviest at Fly, Boulder, and Primm Lakes, as all of these lakes lie on the maintained trail system. Gold Creek and Bull Lakes are not accessible by established trails and receive comparatively lighter use.

Lake morphology in this unit ranges from extremely large glacial cirques (e.g., Boulder L.) to fairly small valley troughs (e.g. Bull L.). Regardless of size and morphology, all of these waters are relatively productive and pristine. Shoreline surveys indicated that Columbia spotted frogs were present at all five lakes and long-toed salamanders were common at Bull Lake. No other amphibians or reptiles were observed in our surveys. Stream and river reaches immediately downstream in Gold Creek support primarily westslope cutthroat trout, brook trout, and sculpin. Further downstream in Gold Creek, westslope cutthroat trout x rainbow trout hybrids, bull trout, brown trout, and mountain whitefish become more abundant. Fish species composition in Rattlesnake Creek (downstream of Primm Lake) is described below.

Comparatively high angling use in this management unit is attributed to close proximity to the USFS road system, as well as the excellent westslope cutthroat trout fisheries that the lakes provide. Three of the lakes (Bull, Fly, Gold Creek Lakes) have a long history of stocking and are still supported by scheduled plants every 5-7 years. Boulder Lake was planted prior to 2001, but stocking was discontinued since consistent natural reproduction was observed in our surveys. Primm Lake is fishless and likely incapable of supporting a trout fishery. Fish stocking in this unit is somewhat unique within the context of the project area as aerial plants were discontinued in most other Rattlesnake Wilderness lakes by the 1980s. Stocking was continued in the Gold Creek unit lakes based on the quality of the fisheries, accessibility for anglers, and the need to supplement natural reproduction.



Gold Creek Lake (left) and Boulder Lake (right) provide quality westslope cutthroat trout fisheries. Gold Creek Lake is periodically supplemented with stocking, while the Boulder Lake population is considered self-sustaining.

Unfortunately, higher recreational use associated with lake fisheries can result in conflicts with other wilderness management objectives. For instance, Bull and Gold Creek Lakes are considered Opportunity Class 1 areas under the Lolo National Forest's management plan for the RNRAW (Missoula Ranger District –USFS 2010). In other words, these lake environments are some of the most pristine areas remaining in the Rattlesnake Wilderness and added human disturbance could compromise land management objectives. Monitoring impacts of fish stocking and recreationists on the natural integrity of these areas is an important component of wilderness lake management.

Lake Management

With the exception of Primm Lake (Rattlesnake Lake #1), lakes in the Gold Creek Management Unit all support quality westslope cutthroat trout fisheries. We generally propose to continue existing management practices to maintain these fisheries in the future (Table 7). Frequency and level of stocking, as well as the performance of stocked westslope cutthroat trout, will continue to be evaluated. For instance, high use and accessibility at Fly Lake may warrant more frequent stocking. Boulder Lake will be monitored to ensure wild populations are self-sustaining. Termination of stocking at this lake is the only significant management change proposed in the unit. However, if monitoring indicates that the quality of fisheries may be improved through adjustments in frequency or quantity of stocking, additional changes will be considered.

Primm Lake is a shallow, relatively productive fishless lake that lies approximately 1.5 miles southwest of the West Fork Gold Creek trailhead. The lake's proximity to the trailhead and direct access via USFS Trail #52 make it the most accessible fishless lake in the study area. In other portions of upper Gold Creek, naturally occurring wetlands and small ponds provide suitable habitats for amphibians and other aquatic organisms potentially limited by introduced trout.

Table 7. Recommended management strategies for Gold Creek Management Unit lakes.

Water Body	Current Fishery*	Recommended Future Actions
Boulder Lake	Wild WCT	Confirm that WCT population is self-sustaining
Bull Lake	Stocked WCT	Stock with M012 WCT every 5-7 years; Evaluate performance and survival of stocked WCT; Monitor human disturbance to ensure LAC** compliance (OC1)
Fly Lake	Stocked WCT	Stock with M012 WCT every 5-7 years; Evaluate performance and survival of stocked WCT
Gold Creek Lake	Stocked WCT	Stock with M012 WCT every 5-7 years; Evaluate performance and survival of stocked WCT; Monitor human disturbance to ensure LAC** compliance (OC1)
Rattlesnake L. #1 (Primm Lake)	Fishless	Maintain fishless status; Identify any unauthorized fish introductions

* *Species abbreviations: WCT = westslope cutthroat trout*

** *LAC = Limits of Acceptable Change in designated Wilderness*

Conservation of downstream aquatic communities also requires that the compatibility of stocked fish species be considered. Fish stocked in headwater lakes frequently exit the lake and colonize outlet streams where native fish and amphibian species persist. In this management unit, outlet stream systems are inhabited by both native and introduced trout species. However, some reaches of upper Gold Creek support native westslope cutthroat trout with high genetic purity (MFWP, unpublished data). As a result, MFWP plants only the M012 westslope cutthroat trout strain and no longer considers the stocking of (reproductively viable) non-native *Oncorhynchus* species to be appropriate in these headwater lakes.

II. Rattlesnake Creek Management Unit

Description

The Rattlesnake Creek drainage and management unit includes 37 lakes (> 1 acre) and numerous un-named ponds and wetlands (< 1 acre). Nearly all of these water bodies lie in the upper and west side of the Rattlesnake Creek basin, making public access difficult.

Lakes in the Rattlesnake Management Unit exhibit a range of morphological and ecological conditions, including those which have been modified by levees and water control structures constructed at the lake outlets (nine lakes). Impounded lakes include larger water bodies on the western edge of the management unit at the head of Wrangle, Lake, and High Falls Creeks (see Figure 6). Water control structures were installed to improve storage and water management in the early 1900s. Impounded lakes continue to be managed by Mountain Water Company, which retains the right for motorized access and annual maintenance on lake infrastructure.

The majority (n = 25) of mountain lakes in the Rattlesnake Creek drainage are fishless (> 65%). These water bodies are physically diverse and widely distributed across the management unit. Approximately one third (n = 8) of fishless lakes are considered capable of supporting viable

trout fisheries (> 12 ft max depth). Stocking has been deferred at these lakes since the 1980s to maintain Wilderness character and promote native aquatic communities.

Fish-bearing lakes are also widely distributed across the headwaters of Rattlesnake creek. All support self-sustaining *Onchorhynchus* populations of westslope cutthroat trout (8 lakes), Yellowstone cutthroat trout (1 lake) or rainbow trout (3 lakes) that were established in the mid-1900s. Trout abundance, size structure and condition vary among populations (see Appendix C for individual lake summaries).

Stream and river reaches immediately downstream of Rattlesnake drainage lakes support stream-resident populations of hybridized westslope cutthroat trout and bull trout. Lakes containing introduced rainbow trout and Yellowstone cutthroat trout are undoubtedly the source of hybridization for westslope cutthroat trout populations in the upper stream network. Further downstream (below the East Fork confluence), species composition in Rattlesnake Creek consists of similar species throughout, but non-native trout make up a higher proportion of the community closer to the Clark Fork river confluence. Fish species in the main stem include bull trout, brook trout, brown trout, sculpin, mountain whitefish, and westslope cutthroat trout with high levels of hybridization.

Shoreline amphibian surveys were completed on nearly all fishless and fish-bearing lakes in 2007-2009. Columbia spotted frogs were present along the perimeter of most lakes and densities appeared correlated with the amount of emergent aquatic vegetation and shallow littoral habitat, regardless of fishery status. Long-toed salamander distribution and abundance were highly variable. This species was not observed at any fish-bearing lakes, but was also absent at many of the fishless waters. Interestingly, numerous long-toed salamander larvae were noted in small ponds and wetlands adjacent to larger waters (fishless and fish-bearing), where none were detected.

Recreational use is relatively low at lakes in the Rattlesnake Creek basin due to difficult access. Most lakes require a minimum of eight miles of non-motorized travel on the USFS trail system. Although lakes directly accessible via maintained trails appear to receive more use, angling pressure is consistently low at all fish-bearing lakes relative to mountain lakes in other portions of western Montana.

Lake Management

Overall, we propose to maintain the current management status of lakes in the Rattlesnake Creek basin. This includes 12 self-sustaining trout fisheries and numerous fishless waters (Figure 6). Trout fisheries include westslope cutthroat trout, Yellowstone cutthroat trout and rainbow trout. Changes in species composition may be warranted at some lakes.

Previous management strategies (e.g., Peters and Workman 1988) included sustained stocking of several larger lakes in the Rattlesnake Management Unit. Since aerial stocking was an established management activity at numerous lakes prior to Wilderness designation in 1980, FWP retains the authority to continue this practice. Nevertheless, we currently consider regular

stocking unnecessary given the number and distribution of self-sustaining fisheries in the area, as well as the low level of angler use. Stocking may be required periodically to maintain existing fisheries (stocked historically) if natural reproduction is inadequate. Natural resource managers may also propose to convert lakes from non-native trout fisheries to westslope cutthroat trout populations that are more genetically compatible with native populations downstream. Given the extent of cutthroat trout hybridization in the Rattlesnake Creek stream network, this justification appears unwarranted. However, conversion of rainbow trout populations to westslope cutthroat trout would likely improve the quality of these fisheries.

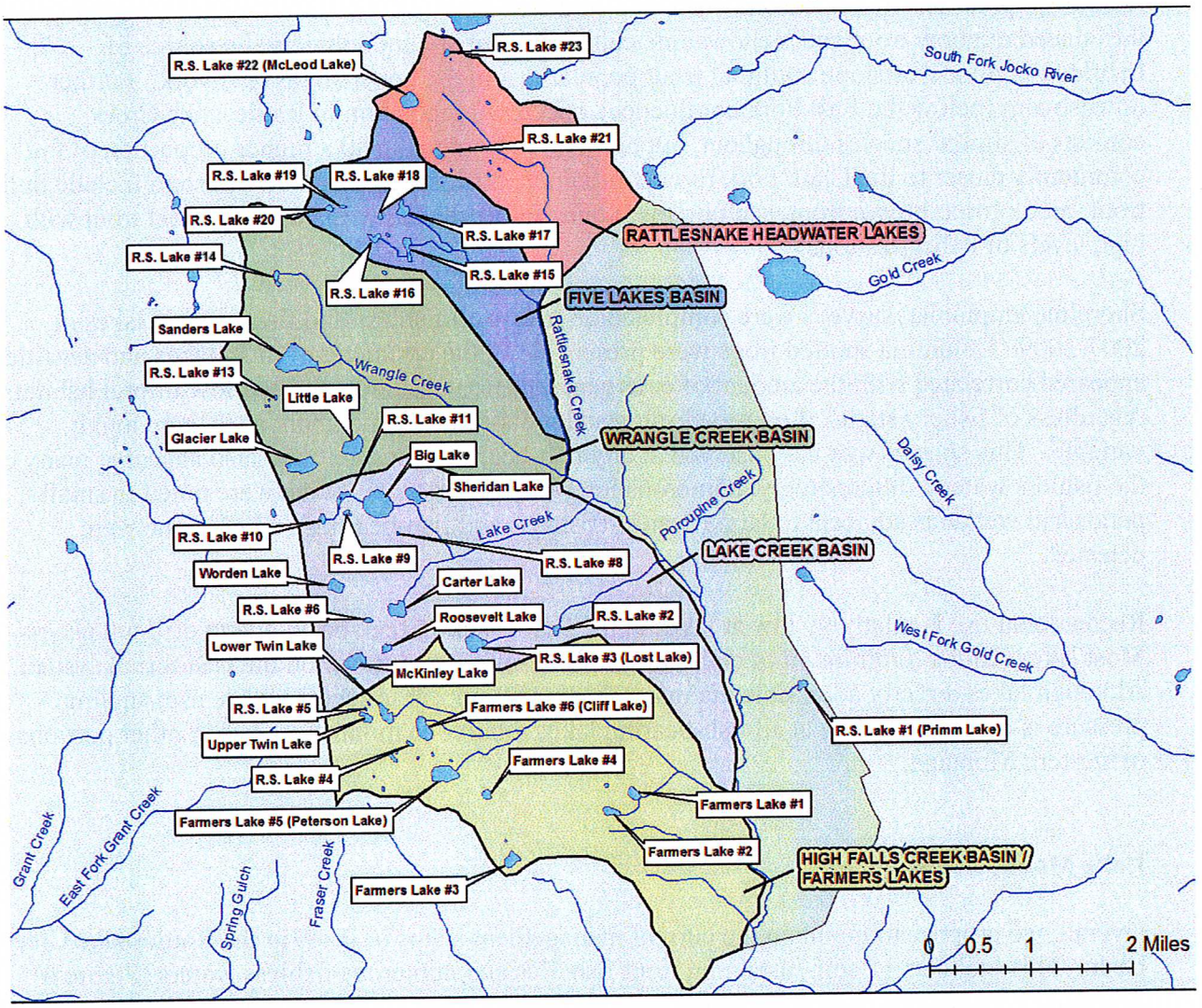


Figure 6. Lake sub-units within the Rattlesnake Creek Management Unit.

Dams and other infrastructure were installed on at least ten of the Rattlesnake Management Unit lakes to enhance storage capacity. These modifications typically exaggerate annual water level fluctuations, leaving an obvious "varial" zone along the lakeshore which is not conducive to

growth of aquatic or terrestrial vegetation. Water level instability in this zone appears to significantly limit productivity and littoral habitat quality at many of the lakes. Therefore, management of outlet structures to minimize unnatural water level fluctuations is recommended.

Lakes within the Rattlesnake drainage were grouped into sub-units based on their geographic location and the tributary watershed where they occur (Figure 6). A brief description of the status and management recommendations for lakes within each sub-unit is provided below.

Rattlesnake Headwater Lakes

Three lakes lie just below McLeod Peak at the headwaters of main stem Rattlesnake Creek. McLeod Lake, the largest of the three, occupies a large, deep glacial cirque and supports a self-sustaining WCT population that was likely introduced in the 1970s (Table 8). Small cutthroat trout with poor body condition are abundant in this relatively sterile environment, which is the highest fish-bearing lake in the study area. Rattlesnake Lakes #21 and #23 are comparatively small (< 5 acres), shallow (<10 ft) and productive. Long-toed salamanders and Columbia spotted frogs were observed at both lakes. No amphibians were observed at McLeod Lake.

The Rattlesnake headwater lakes are remote and not accessible via the USFS trail system. We observed very little evidence of recreational use or human presence, other than remnants of a plane crash at McLeod Lake. The few visitors that reach this area likely travel up main stem Rattlesnake Creek on USFS Trail #515 to its terminus, then ascend about two miles off-trail to the top of the drainage or drop into the basin from the Rattlesnake Wilderness – Flathead Indian Reservation divide.

Table 8. Recommended management strategies for Rattlesnake headwater lakes.

Water Body	Current Fishery	Recommended Future Actions
Rattlesnake L. #21	Fishless	Maintain fishless status; Identify any unauthorized fish introductions
Rattlesnake L. #22 (McLeod Lake)	Wild WCT	Maintain WCT fishery; Confirm that population is self-sustaining
Rattlesnake L. #23	Fishless	Maintain fishless status; Identify any unauthorized fish introductions

* *Species abbreviations: WCT = westslope cutthroat trout*

Five Lakes Basin

The Five Lakes Basin area actually contains six lakes larger than one acre (Table 9). Two of these lakes support westslope cutthroat trout populations and the remainder are fishless. Cutthroat trout in Rattlesnake Lakes #15 and #17 are abundant and self-sustaining. Both populations are stunted (e.g., Figure 7), with low body condition (see individual lake reports, Appendix C).

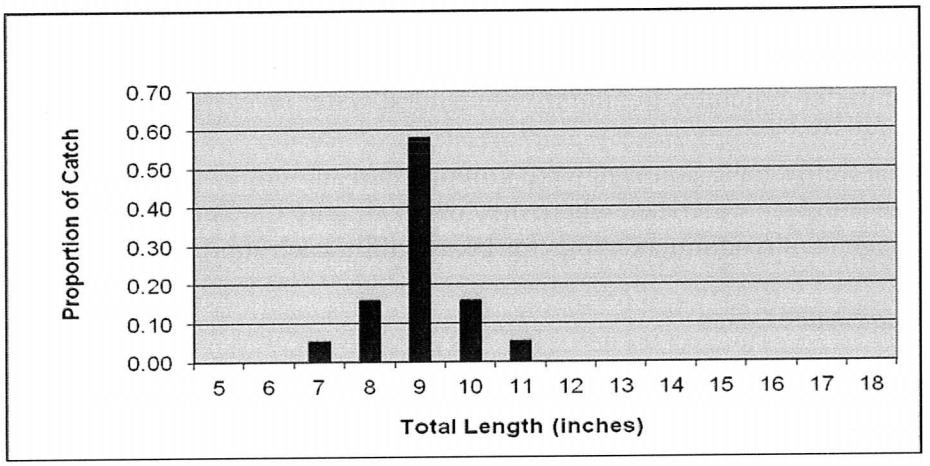


Figure 7. Size distribution of westslope cutthroat trout sampled in Rattlesnake Lake #17. This size structure was typical of lake fisheries in the Rattlesnake Headwaters and Five Lakes Basin areas.

Fishless lakes in the Five Lakes Basin are shallow (2-10 ft max depth) and are likely incapable of supporting trout populations because of unsuitable overwinter conditions. However, these productive lakes do support abundant amphibian populations and likely other native fauna. Extremely high densities of long-toed salamanders were observed at Rattlesnake Lakes #19 and #20. Columbia spotted frogs were also common or abundant at most lakes in the basin, including fishless and fish-bearing waters. Similar to the Rattlesnake Headwater Lakes area, the Five Lakes Basin is remote and difficult to access. We observed very little evidence of recreational use. People visiting this sub-basin likely access it via routes similar to those described above for the Rattlesnake Headwater lakes.

Table 9. Recommended management strategies for Five Lakes Basin area lakes.

Water Body	Current Fishery	Recommended Future Actions
Rattlesnake L. #15	Wild WCT	Maintain WCT fishery; Confirm that population is self-sustaining
Rattlesnake L. #16	Fishless	Maintain fishless status; Identify any unauthorized fish introductions
Rattlesnake L. #17	Wild WCT	Maintain WCT fishery; Confirm that population is self-sustaining
Rattlesnake L. #18	Fishless	Maintain fishless status; Identify any unauthorized fish introductions
Rattlesnake L. #19	Fishless	Maintain fishless status; Identify any unauthorized fish introductions
Rattlesnake L. #20	Fishless	Maintain fishless status; Identify any unauthorized fish introductions

* *Species abbreviations: WCT = westslope cutthroat trout*

Wrangle Creek Basin

The upper Wrangle Creek Basin contains a diverse group of lakes, including several larger waters (Sanders, Little and Glacier Lakes) where dams have been installed to enhance storage volume. The most prevalent is Sanders Lake, which is very deep (> 220 ft at full pool) and the second largest water body in the Rattlesnake Wilderness (~ 48 acres). Glacier Lake and Little Lake are also significant cirque lakes that are now > 55 ft deep with impoundment. Rattlesnake Lake #14 and a cluster of smaller lakes/ponds (< 1 acre) located just south of Sanders Lake have not been modified with dams and remain relatively pristine (includes Rattlesnake Lake #13).

Table 10. Recommended management strategies for Wrangle Creek Basin lakes larger than one acre.

Water Body	Current Fishery	Recommended Future Actions
Glacier Lake	Fishless	Maintain fishless status; Identify any unauthorized fish introductions
Little Lake	Wild YCT	Maintain wild fishery; Evaluate removal of YCT and conversion to WCT fishery
Rattlesnake L. #14	Fishless	Maintain fishless status; Identify any unauthorized fish introductions
Sanders Lake	Wild WCT	Maintain WCT fishery; Confirm that population is self-sustaining

* *Species abbreviations: WCT = westslope cutthroat trout, YCT =Yellowstone cutthroat trout*

Fish-bearing lakes in the unit include Sanders Lake and Little Lake (Table 10). Sanders Lake supports one of the best fisheries in the study area. Westslope cutthroat trout in this lake exhibit relatively high growth (up to 19 inches) and body condition (mean Wr = 92). Little lake is inhabited by abundant, stunted Yellowstone cutthroat trout that were introduced prior to 1970. As this is the only Yellowstone cutthroat trout population in the Rattlesnake drainage, it is assumed that out-migrants from this population are the primary source of YCT genes detected in Rattlesnake Creek cutthroat trout populations downstream. Glacier Lake was also stocked with cutthroat trout through the 1970s, but natural reproduction was not adequate for them to persist. The remaining smaller, shallower lakes in the basin are also fishless, but appear very productive with high amphibian abundance. We observed large numbers of long-toed salamanders and Columbia spotted frogs in most of these water bodies, particularly at Rattlesnake Lakes #13 and #14.

Major lakes in the Wrangle Creek Basin, including Sanders, Little and Glacier Lakes, are remote, but directly accessible via the USFS trail system. Most recreationists access these lakes from the USFS Trail #502 trailhead at the Rattlesnake Wilderness Area - Recreation Area boundary on the main stem of Rattlesnake Creek (which many people reach by bicycle). We noted fire rings and user-created trails along the perimeter of Sanders Lake and Little Lake (typically on the constructed levees near lake outlets). No evidence of camping or recreational use was observed at any of the other lakes.

Little Lake supports the only Yellowstone cutthroat trout population in the study area and is likely the source of Yellowstone cutthroat trout hybridization with native westslope cutthroat trout stocks in Rattlesnake Creek.

Lake Creek Basin

The extended Lake Creek Basin contains 12 lakes larger than one acre, as well as several small wetlands and ephemeral ponds (e.g., Rattlesnake Lakes #8 and #9; Figure 6). Similar to adjacent sub-basins on the west side of Rattlesnake Creek, many of the larger lakes were artificially enhanced with outlet dams in the early 1900s to enhance storage capacity. These larger, impounded lakes support the majority of the lake fisheries.

The six fish populations in Lake Creek Basin lakes include self-sustaining rainbow trout and westslope cutthroat trout (Table 11). Rainbow trout inhabiting Big, McKinley, and Sheridan Lakes maintain low to moderate densities, but all exhibited limited growth (max length 11-15 inches) and poor or very poor body condition (mean Wr = 67-76). This series of populations is likely the upstream source of rainbow trout genes detected in hybridized Rattlesnake Creek cutthroat trout populations. Size structure and condition of wild westslope cutthroat trout in Carter Lake, Worden Lake, and Rattlesnake Lake #3 were more variable. Carter Lake supports an abundant, stunted population (10 inch max length), while Worden Lake contains larger fish (up to 14 inches) with higher body condition (mean Wr = 87). Rattlesnake Lake #3 apparently contains lower densities of larger fish based on anecdotal reports, but we were unable to sample this lake to verify population characteristics.

Table 11. Recommended management strategies for Lake Creek basin lakes larger than one acre.

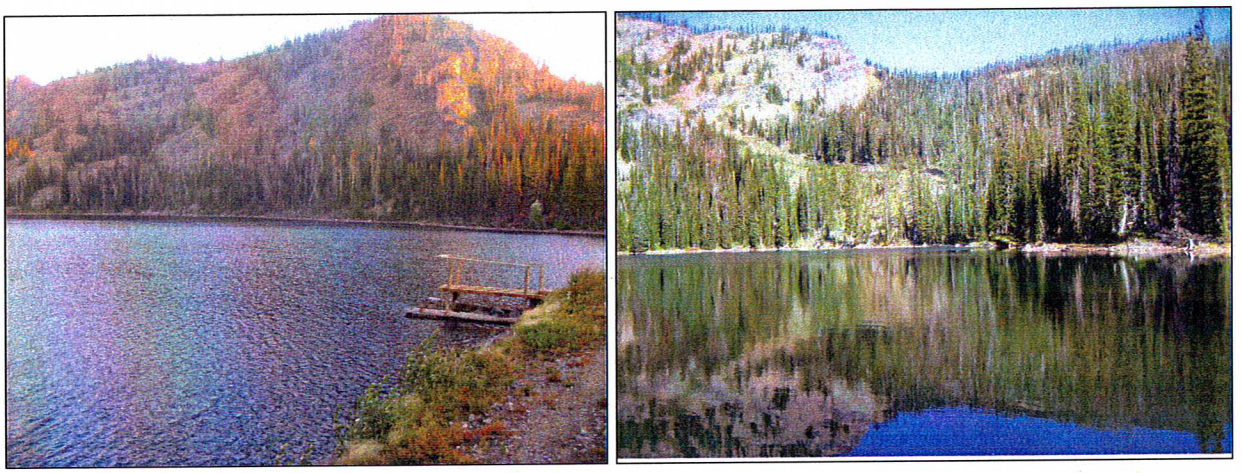
Water Body	Current Fishery	Recommended Future Actions
Big Lake	Wild RBT	Maintain wild fishery; Evaluate removal of RBT and conversion to WCT fishery
Carter Lake	Wild WCT	Maintain WCT fishery; Confirm that population is self-sustaining
McKinley Lake	Wild RBT	Maintain wild fishery; Evaluate removal of RBT and conversion to WCT fishery
Rattlesnake L. #2	Fishless	None; Identify any unauthorized fish introductions
Rattlesnake L. #3 (Lost lake)	Wild WCT	Maintain WCT fishery; Confirm that population is self-sustaining
Rattlesnake L. #6	Fishless	Maintain fishless status; Identify any unauthorized fish introductions
Rattlesnake L. #9	Fishless	Maintain fishless status; Identify any unauthorized fish introductions
Rattlesnake L. #10	Fishless	Maintain fishless status; Identify any unauthorized fish introductions
Rattlesnake L. #11	Fishless	Maintain fishless status; Identify any unauthorized fish introductions
Roosevelt Lake	Fishless	Maintain fishless status; Identify any unauthorized fish introductions
Sheridan Lake	Wild RBT	Maintain wild fishery; Evaluate removal of RBT and conversion to WCT fishery
Worden Lake	Wild WCT	Maintain WCT fishery; Confirm that population is self-sustaining

* *Species abbreviations: WCT = westslope cutthroat trout, RBT = rainbow trout*

Mountain lakes sampled in the Lake Creek watershed were relatively unproductive. At the larger lakes, exaggerated water level fluctuations associate with impoundment also inhibited establishment and growth of aquatic shoreline vegetation. Lack of productivity was reflected in the generally low growth and body condition of trout populations, as well as the apparent low overall density of amphibians. We only documented long-toed salamanders at one location where Rattlesnake Lake #9 was nearly dry and 10-15 larvae were concentrated in a small pool. Columbia spotted frogs were present at most lakes, but densities were low and individuals tended to be associated with sparse shoreline vegetation. The few exceptions (with abundant Columbia spotted frogs), were smaller wetland/pond environments where emergent vegetation was plentiful and lake water levels had not been manipulated (e.g., Rattlesnake Lake #11).

Most of the lakes in the Lake Creek Basin are easily accessible from the Lake Creek trail system (USFS Trail #534), which originates at the Rattlesnake Wilderness Area - Recreation Area boundary on the main stem of Rattlesnake Creek ~ 2.5 miles to the east. The lower portion of Trail #534 is actually a maintained road connected with the Rattlesnake recreation corridor. Vehicle access is used by Mountain Water Company to reach Carter Lake for infrastructure maintenance. Other larger lakes supporting trout fisheries can be accessed via maintained spur

trails from Trail #534. We noted fire rings and established campsites at all of these lakes, typically on the constructed levees at lake outlets. In contrast, nearby fishless lakes were not directly accessible by trail and we observed little evidence of recreational use. Rattlesnake Lakes #2 and #3, located in a small drainage adjacent to Lake Creek, are very difficult to access because of steep terrain and a prominent ridge which isolates them from normal travel routes.



Big Lake (left) and Sheridan Lake (right) support self-sustaining rainbow trout populations and are likely the primary sources of this species in upper Rattlesnake Creek.

High Falls Creek Basin – Farmers Lakes

The High Falls Creek watershed contains numerous named and un-named water bodies that range from small, shallow wetlands to moderate-sized cirque lakes. This diverse area includes the group of six waters known as 'Farmers Lakes', as well as the Twin Lakes and several small numbered Rattlesnake Lakes (see Figure 6). With the exception of Farmers Lake #6 (Cliff Lake), all of these water bodies are currently fishless.

Cliff Lake and both Twin Lakes were historically modified with the installation of levees and control structures at the lake outlets. Although these structures have not been maintained and are now dilapidated, they still appear to exaggerate annual water level fluctuations which result in a "varial" zone around the lake perimeter. This zone is clearly visible as an un-vegetated shoreline band which typically extends 4-8 ft above the low water surface elevation. This band represents the vertical difference between annual maximum and minimum lake surface elevations, and generally remains devoid of vegetation because wide water level fluctuations make the zone unsuitable for most aquatic and terrestrial plants. Other fishless lakes in the basin remain in relatively pristine condition, and provide a range of physical conditions and habitat types. Smaller, typically un-named, water bodies are particularly diverse (see photos below).

Range of physical environments and aquatic habitats observed at smaller fishless lakes in the High Falls Creek – Farmers Lakes area.

Cliff Lake supports abundant, self-sustaining westslope cutthroat trout that were likely established by an aerial plant in 1976. Despite high densities, this population exhibits relatively good body condition (mean Wr = 88) and size structure (fish up to 14 inches total length). Several fishless lakes in the basin are also considered suitable for trout populations, but stocking has been deferred since the 1970s or earlier. These include Lower Twin Lake and Farmers Lakes #1, #3, #4 and #5 (Peterson Lake). Peterson Lake was previously stocked and supported wild rainbow trout (Peters and Workman 1988), but apparently natural reproduction was not sufficient to maintain the population once stocking ceased.

The High Falls Creek basin lakes are geographically the closest to the city of Missoula, yet can be some of the most difficult to reach. This area is generally accessed from the Stuart Peak Trail # 517, which requires more than 8 miles of non-mechanized travel from established USFS trailheads. Upper portions of Trail #517 generally follow the ridge between the Grant Creek and Rattlesnake Creek watersheds and reaching lakes in the High Falls Creek basin involves initially dropping into the Twin Lakes area from the ridge via USFS Trail #330. This trail is not regularly maintained and can be difficult to discern past the Twin Lakes. The lower Farmers Lakes require 1.5 – 2.5 miles of additional, off-trail travel over steep terrain for access. Farmers

Lake #3 actually lies outside (south) of the Wilderness boundary in the Beescove Creek drainage. We were able to survey most of the Farmers Lakes by landing an aircraft on this lake and hiking to other nearby waters. Given the difficult in reaching many of these lakes, it is not surprising that we observed little evidence of recreational use or disturbance.

Farmers Lake #6 (Cliff Lake) currently supports the only trout population in the High Falls Creek Basin area. Similar to other lakes in the study area that have been impounded to enhance storage, the un-vegetated shoreline exhibits the affect of exaggerated annual water level fluctuations.

Although the High Falls Creek Basin area contains only one fish-bearing lake and several others that are suitable for trout populations, we do not recommend establishing any new lake fisheries (Table 12). With the exception of Lower Twin Lake, most of the suitable trout waters are the most difficult to access. Cliff Lake is the easiest of the Farmers Lakes to reach, but we observed no established campsites or sign of regular recreational use - despite supporting the only fishery in the area. Other lakes in the area would likely support fishing opportunities similar to Cliff Lake if stocked, except that they would be significantly more difficult to access.

Table 12. Recommended management strategies for High Falls Creek Basin lakes larger than one acre.

Water Body	Current Fishery	Recommended Future Actions
Farmers Lake #1	Fishless	Maintain fishless status; Identify any unauthorized fish introductions
Farmers Lake #2	Fishless	Maintain fishless status; Identify any unauthorized fish introductions
Farmers Lake #3	Fishless	Maintain fishless status; Identify any unauthorized fish introductions
Farmers Lake #4	Fishless	Maintain fishless status; Identify any unauthorized fish introductions
Farmers Lake #5 (Peterson Lake)	Fishless	Maintain fishless status; Identify any unauthorized fish introductions
Farmers Lake #6 (Cliff Lake)	Wild WCT	Maintain WCT fishery; Confirm that population is self-sustaining
Rattlesnake L. #4A	Fishless	Maintain fishless status; Identify any unauthorized fish introductions
Rattlesnake L. #4B	Fishless	Maintain fishless status; Identify any unauthorized fish introductions
Rattlesnake L. #4C	Fishless	Maintain fishless status; Identify any unauthorized fish introductions
Twin L. - Lower	Fishless	Maintain fishless status; Identify any unauthorized fish introductions
Twin L. - Upper	Fishless	Maintain fishless status; Identify any unauthorized fish introductions

* *Species abbreviations: WCT = westslope cutthroat trout*

If MFWP and USFS managers were to pursue fish re-introductions in this area, Lower Twin Lake and Farmers Lake #5 (Peterson Lake) appear to be logical locations, both in terms of physical/biological compatibility and access. Lower Twin Lake has already been modified by construction of an outlet structure, lies close to the Stuart Peak trail, is adequately sized (41 ft max depth, 7 acres), and was previously stocked. Peterson Lake is the largest fishless lake in the study area. It was last stocked in the 1970s and supported a rainbow trout population prior to Wilderness designation. Both lakes can be reached via USFS Trail #330 and appear to support limited populations of amphibians and native fauna based on a single site visit. However, both lakes also appear to have limited trout spawning habitat in inlets and outlets, so they would likely require regular stocking to maintain trout fisheries.

III. Grant Creek Management Unit

Description and Lake Management

The upper Grant Creek basin contains three dispersed fishless lakes (> 1 acre) and several small ponds/wetlands in the northwest corner of the drainage (Figure 8). All of the Grant Creek unit

lakes are fairly small (< 7 acres), shallow (<19 feet maximum depth), glacial cirque lakes that receive very light recreational use. Although Grant Creek Lake #1 (Rankin Lake) is likely capable of supporting a trout fishery, there are no records of stocking or fish presence.

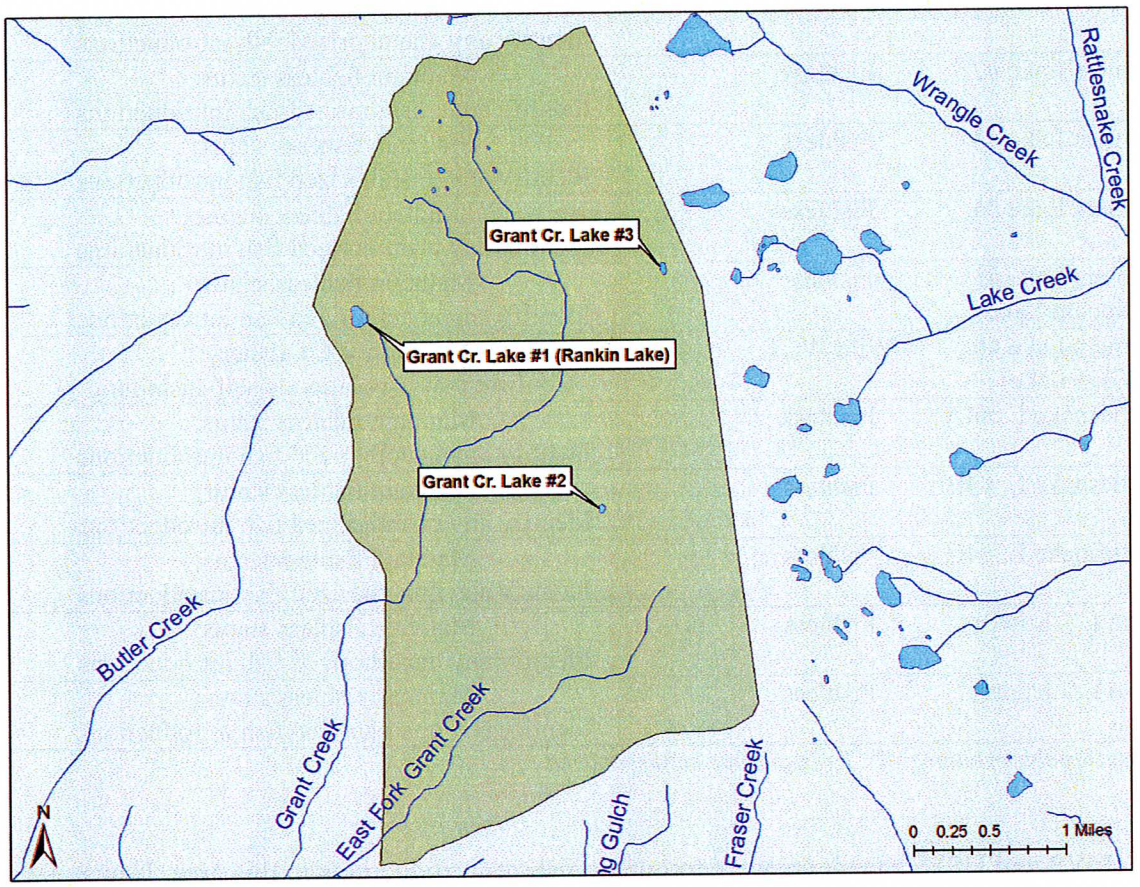


Figure 8. Location of mountain lakes in the Grant Creek Management Unit.

Grant Creek Lakes #1 and #3 have plentiful littoral habitat and shoreline vegetation. Surprisingly, no amphibians were observed at Grant Creek Lake #3 and only Columbia spotted frogs were abundant along the perimeter of Rankin Lake. No active management is recommended at these waters other than periodic verification that fish have not been introduced (Table 13).

None of the lakes in the upper Grant Creek basin lie can be accessed via USFS trails, but all are less than one mile from established trails or roads. Grant Creek Lakes #2 and #3 are both less than one mile off of the main ridge trail (USFS Trail #517) that runs along the Rattlesnake Creek/Grant Creek drainage divide. Lake #1 can be reached relatively easily from the Montana Snow Bowl Ski Area – Point Six vicinity in upper Butler Creek.

Table 13. Recommended management strategies for Grant Creek Management Unit lakes.

Water Body	Current Fishery	Recommended Future Actions
Grant Cr Lake #1 (Rankin Lake)	Fishless	Maintain fishless status; Identify any unauthorized fish introductions
Grant Cr Lake #2	Fishless	Maintain fishless status; Identify any unauthorized fish introductions
Grant Cr Lake #3	Fishless	Maintain fishless status; Identify any unauthorized fish introductions

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APPENDIX A.

TABLES SUMMARIZING SURVEY INFORMATION FOR MOUNTAIN LAKES IN THE RATTLESNAKE WILDERNESS AREA.

Table 1. Summary information for fish-bearing mountain lakes in the Rattlesnake Wilderness Area.

Lake	Water Code	Date Surveyed	Stream Drainage	Location (T, R, S)	GPS Location Latitude	GPS Location Longitude	Lake Type
Big Lake	06-7391	9/12/2007	Lake Cr. (Rattlesnake)	15N,18W,19D	N 47.0398	W 113.9180	Impounded Glacial Cirque*
Boulder lake	04-6180	8/29/2006	Gold Creek	15N,18W,11A/D	N 47.0744	W 113.8350	Glacial Cirque
Bull Lake	04-6225	8/12/2006	Gold Creek	15N,18W,26A	N 47.0327	W 113.8290	Trough/Valley Depression
Carter Lake	06-9747	8/17/2007	Lake Cr. (Rattlesnake)	15N,18W,30D	N 47.0252	W 113.9130	Impounded Glacial Cirque *
Farmers L. #6 (Cliff L.)	06-9476	8/4/2008	High Falls Cr.(Rattlesnake)	15N,18W,32C	N 47.0087	W 113.9070	Impounded Glacial Cirque*
Fly Lake	04-6596	8/28/2006	Gold Creek	15N,18W,1B	N 47.0880	W 113.8210	Glacial Cirque
Gold Creek Lake	04-6598	8/31/2006	Gold Creek	15N,18W,2C	N 47.0855	W 113.8470	Glacial Cirque
Little Lake	06-8417	8/24/2007	Wrangle Cr. (Rattlesnake)	15N,18W,19B	N 47.0478	W 113.9240	Impounded Glacial Cirque*
McKinley Lake	06-8645	7/12/2007	Lake Cr. (Rattlesnake)	15N,18W,31A/B	N 47.0177	W 113.9210	Impounded Glacial Cirque*
Rattlesnake L. #3 (Lost L.)	06-7505	None	Unnamed trib (Rattlesnake)	15N,18W,32A	N 47.0213	W 113.8967	Glacial Cirque
Rattlesnake Lake #15	06-8980	8/28/2009	Upper Rattlesnake Creek	15N,18W,7A	N 47.0764	W 113.9156	Glacial Trough
Rattlesnake Lake #17	06-8980	8/28/2009	Upper Rattlesnake Creek	15N,18W,6D	N 47.0809	W 113.9169	Glacial Cirque
Rattlesnake Lake #22	06-8980	8/29/2009	Upper Rattlesnake Creek	16N,18W,31D	N 47.0966	W 113.9174	Glacial Cirque
Sanders Lake	06-9139	8/12/2008	Wrangle Cr. (Rattlesnake)	15N,19W,13A	N 47.0592	W 113.9366	Impounded Glacial Cirque*
Sheridan Lake	06-9177	9/13/2007	Lake Cr. (Rattlesnake)	15N,18W,20C	N 47.0414	W 113.9110	Impounded Glacial Cirque*
Worden Lake	06-9480	7/17/2007	Lake Cr. (Rattlesnake)	15N,18W,30C	N 47.0282	W 113.9260	Impounded Glacial Cirque*

** Dams were constructed at the outlets of many lakes to increase water surface elevation and enhance lake storage*

Table 2. Physical attributes of fish-bearing mountain lakes in the Rattlesnake Wilderness Area.

Lake	Approx. Elevation	Surface Acres (ha)	Max Depth ft (m)	Lake Volume (acre-ft)	Secchi Depth ft (m)	PH	Conductivity (uS)	TDS (ppm)	Lake Aspect
Big Lake*	6,875 ft	40.2 (16.2)	136 (41.2)	2,255	45 (13.6)	8.3-8.6	<5	<5	SE
Boulder lake	6,488 ft	107.5 (43.3)	93 (28.2)	3,778	29 (8.8)	8.6-8.7	3-4	7	E
Bull Lake	6,099 ft	8.9 (3.6)	43 (13)	183	19.5 (5.9)	7.9	49-50	25	SE
Carter Lake*	6,300 ft	12.9 (5.2)	31 (9.4)	171	No Data	7.5-7.8	5-6	2-3	NE
Farmers L. #6 (Cliff L.)*	6,595 ft	13.7 (5.5)	89 (27)	578	42 (12.7)	No Data	No Data	No Data	NE
Fly Lake	6,381 ft	11.9 (4.8)	36.5 (11.1)	176	28 (8.5)	No Data	No Data	No Data	SE
Gold Creek Lake	6,870 ft	13.8 (5.6)	60 (18.2)	257	23 (7.0)	9.2-9.3(?)	20-21	10	SSE
Little Lake*	6,425 ft	13.9 (5.6)	52 (15.8)	309	30 (9.1)	7.5-7.8	4-5	2	NNE
McKinley Lake*	6,860 ft	15.8 (6.4)	28 (8.5)	211	28 (8.5)	7.3-7.8	4-7	2	NE
Rattlesnake L. #3 (Lost L.)	6,858 ft	15.9 (6.4)	No Data	No Data	No Data	No Data	No Data	No Data	ENE
Rattlesnake Lake #15	7,102 ft	5.6 (2.3)	15 (4.5)	31	13 (3.9)	No Data	No Data	No Data	SSE
Rattlesnake Lake #17	7,112 ft	7.8 (3.2)	27 (8.2)	110	6 (1.8)	No Data	No Data	No Data	SSE
Rattlesnake Lake #22	7,690 ft	13 (5.3)	85 (25.8)	58	19 (5.8)	No Data	No Data	No Data	NE
Sanders Lake*	6,885 ft	47.5 (19.2)	217 (65.8)	3,543	>30 (>9)	No Data	No Data	No Data	ENE
Sheridan Lake*	6,535 ft	9.8 (4.0)	33 (10)	168	23 (7.0)	8.0	1 - 3	1	SE
Worden Lake*	6,700 ft	9.1 (3.7)	23 (7)	112	>23(>7)	No Data	4	2	SSE

* *Many lakes have been artificially impounded to increase maximum surface elevation and storage. This also increases annual fluctuations in water level and many of the physical attributes measured.*

Table 3. Summary of fish population and amphibian information for fish-bearing mountain lakes in the Rattlesnake Wilderness Area.

Lake	Date Surveyed	Current Fishery*	Gill Net Catch Rate (#/net/hr)	Trout Size Range Sampled in (mm)	Trout Condition - Wr Mean (range)	Amphibians Observed**
Big Lake	9/12/2007	RBT	0.4	182 - 320	67 (48-81)	None
Boulder lake	8/29/2006	WCT	1.5	155 - 385	90 (72–104)	CSF - adult/larval
Bull Lake	8/12/2006	WCT	1.0	278 - 445	101 (91-109)	CSF -adult/larval, LTS - larval
Carter Lake	8/17/2007	WCT	1.7	167 - 251	81 (71-97)	CSF – adult
Farmers L. #6 (Cliff L.)	8/4/2008	WCT	1.6	193 - 335	88 (70-104)	CSF – adult
Fly Lake	8/28/2006	WCT	1.6	166 - 413	92 (74-107)	CSF – adult
Gold Creek Lake	8/31/2006	WCT	0.9	216 - 379	95 (83-121)	CSF - adult/larval
Little Lake	8/24/2007	YCT	1.3	181 - 363	87 (71-103)	CSF - adult
McKinley Lake	7/12/2007	RBT	0.2	331 - 388	76 (68-85)	CSF – adult
Rattlesnake L. #3 (Lost L.)	None	WCT (?)	No Data	No Data	No Data	No Data
Rattlesnake Lake #15	8/28/2009	WCT	2.4	164 - 220	82 (72-97)	CSF - adult/larval
Rattlesnake Lake #17	8/28/2009	WCT	3.2	175 - 281	86 (78-95)	CSF – adult
Rattlesnake Lake #22	8/29/2009	WCT	>3.0	124 - 294	85 (64-106)	None
Sanders Lake	8/12/2008	WCT	0.6	236 - 447	92 (77-107)	None
Sheridan Lake	9/13/2007	RBT	0.7	169 - 295	74 (53-100)	CSF - larval
Worden Lake	7/17/2007	WCT	1.8	151 - 323	87 (75-109)	CSF - adult

** Fish Species Codes: WCT = westslope cutthroat trout, YCT = Yellowstone cutthroat trout, RBT = rainbow trout*

*** Amphibian Species Codes: CSF = Columbia spotted frog, LTS = long-toed salamander*

Table 4. Summary of fishery management information for fish-bearing mountain lakes in the Rattlesnake Wilderness Area.

Lake	Current Fishery*	Juv. Trout Abundance	Spawning Habitat	Trout Natural Reproduction	Fish Planting Status (WCT)	Fishery Management Objective
Big Lake	RBT	Low	Some Suitable	Limited	Not Stocked	Self-sustaining RBT or Convert to WCT Fishery
Boulder lake	WCT	Moderate	Abundant	Moderate	Not Stocked**	Self-sustaining WCT Fishery
Bull Lake	WCT	Low	Marginal	Limited	Stocked	Quality WCT Fishery
Carter Lake	WCT	Abundant	Abundant	High	Not Stocked	Self-sustaining WCT Fishery
Farmers L. #6 (Cliff L.)	WCT	Abundant	Some Suitable	High	Not Stocked	Self-sustaining WCT Fishery
Fly Lake	WCT	Moderate	Some Suitable	Moderate	Stocked	Quality WCT Fishery
Gold Creek Lake	WCT	Low	Marginal	Limited	Stocked	Quality WCT Fishery
Little Lake	YCT	Moderate	Some Suitable	Moderate	Not Stocked	Self-sustaining YCT or Convert to WCT Fishery
McKinley Lake	RBT	Low	Marginal	Limited	Not Stocked	Self-sustaining RBT or Convert to WCT Fishery
Rattlesnake L. #3 (Lost L.)	WCT	No Data	No Data	No Data	Not Stocked	Self-sustaining WCT Fishery or Fishless Lake
Rattlesnake Lake #15	WCT	Abundant	Abundant	High	Not Stocked	Self-sustaining WCT Fishery
Rattlesnake Lake #17	WCT	Abundant	Abundant	High	Not Stocked	Self-sustaining WCT Fishery
Rattlesnake Lake #22	WCT	Abundant	Some Suitable	High	Not Stocked	Self-sustaining WCT Fishery
Sanders Lake	WCT	Low	Marginal	Limited	Not Stocked	Self-sustaining WCT Fishery
Sheridan Lake	RBT	Moderate	Some Suitable	Moderate	Not Stocked	Self-sustaining RBT or Convert to WCT Fishery
Worden Lake	WCT	Abundant	Some Suitable	High	Not Stocked	Self-sustaining WCT Fishery

* *Species Codes: WCT = westslope cutthroat trout, YCT = Yellowstone cutthroat trout, RBT = rainbow trout*

** *Boulder Lake was stocked with WCT through 2000*

Table 5. Summary information for fishless mountain lakes larger than one acre in the Rattlesnake Wilderness Area.

Lake	Location (T, R, S)	GPS Location Latitude	GPS Location Longitude	Date Last Surveyed	Surface Acres (ha)	Maximum Depth (m)	Approx. Elevation	Bathymetric Map?	Capable of Supporting Fish?
Farmers Lake #1	14N,18W,3B	N47.0010	W113.8620	8/24/2010	7.0 (2.8)	27 ft (8.2)	6,250 ft	Yes	Yes
Farmers Lake #2	14N,18W,3C	N46.9983	W113.8666	8/24/2010	7.2 (2.9)	8 ft (2.4)	6,459 ft	Yes	No
Farmers Lake #3	14N,18W,9B	N46.9908	W113.8870	8/25/2010	10.2 (4.1)	21 ft (6.4)	6,597 ft	Yes	Yes
Farmers Lake #4	14N,18W,5D	N46.9998	W113.8930	8/5/2008	5.5 (2.2)	14 ft (4.2)	6,630 ft	Yes	Yes
Farmers L. #5 (Peterson L.)	14N,18W,5B	N47.0025	W113.9020	8/5/2008	20.5 (8.3)	89 ft (27.0)	6,750 ft	Yes	Yes
Glacier Lake	15N,19W,24A	N47.0448	W113.9350	8/25/2007	18.4 (7.4)	71 ft (21.5)	6,980 ft	Yes	Yes
Grant Creek L. #1(Rankin L.)	14N,19W,27A	N47.0318	W113.9925	8/8/2012	6.7 (2.8)	19 ft (5.7)	6,815 ft	Yes	Yes
Grant Creek Lake #2	15N,19W,36B	N47.0151	W113.9475	1970	1.1 (0.4)*	< 10 ft (3)	6,870 ft	No	No
Grant Creek Lake #3	15N,19W,24D	N47.0378	W113.9408	8/25/2007	1.7 (0.7)*	< 12 ft (3.6)	7,220 ft	No	No
Rattlesnake L. #1 (Primm L.)	15N,18W,35A	N47.0173	W113.8297	1970	4.2 (1.7)*	< 8 ft (2.4)	5,620 ft	No	No
Rattlesnake Lake #2	15N,18W,28D	N47.0234	W113.8811	1963	3.4 (1.4)*	< 10 ft (3)	6,340 ft	No	No
Rattlesnake Lake #4A	14N,18W,5B	N47.0065	W113.9100	8/4/2008	1.5 (0.6)*	< 10 ft (3)	6,820 ft	No	No
Rattlesnake Lake #4B	14N,18W,6A	N47.0053	W113.9128	8/4/2008	1.0 (0.4)*	< 10 ft (3)	7,150 ft	No	No
Rattlesnake Lake #4C	14N,18W,6A	N47.0045	W113.9136	8/4/2008	2.5 (1.0)*	< 10 ft (3)	7,170 ft	No	No
Rattlesnake Lake #6	15N,18W,30D	N47.0235	W113.9200	7/12/2007	2.1 (0.9)*	< 5 ft (1.5)	6,535 ft	No	No
Rattlesnake Lake #9	15N,18W,19C	N47.0384	W113.9256	9/12/2007	1.4 (0.6)*	< 5 ft (1.5)	7,030 ft	No	No
Rattlesnake Lake #10	15N,18W,19C	N47.0374	W113.9305	9/12/2007	3.0 (1.2)*	< 10 ft (3)	7,180 ft	No	No
Rattlesnake Lake #11	15N,18W,19C	N47.0400	W113.9270	9/12/2007	5.4 (2.2)*	12 ft (3.6)	7,020 ft	No	Yes
Rattlesnake Lake #13	15N,19W,13D	N47.0543	W113.9406	8/13/2008	1.1 (0.4)*	< 10 ft (3)	7,250 ft	No	No
Rattlesnake Lake #14	15N,19W,12D	N47.0711	W113.9417	8/12/2008	3.7 (1.5)*	5 ft (1.5)	7,140 ft	No	No
Rattlesnake Lake #16	15N,18W,7A	N47.0770	W113.9225	8/28/2009	2.2 (0.9)*	9 ft (2.7)	7,348 ft	No	No
Rattlesnake Lake #18	15N,18W,6/7	N47.0802	W113.9216	8/28/2009	2.1 (0.9)*	< 5 ft (1.5)	7,227 ft	No	No
Rattlesnake Lake #19	15N,18W,6C	N47.0813	W113.9296	8/28/2009	1.2 (0.5)*	< 5 ft (1.5)	7,316 ft	No	No
Rattlesnake Lake #20	15N,18W,6C	N47.0810	W113.9322	8/28/2009	2.5 (1.0)*	< 5 ft (1.5)	7,350 ft	No	No
Rattlesnake Lake #21	15N,18W,5B	N47.0894	W113.9102	8/27/2009	4.9 (2.0)*	< 5 ft (1.5)	7,310 ft	No	No
Rattlesnake Lake #23	16N,18W,32B	N47.1035	W113.9096	8/29/2009	1.6 (0.6)*	< 10 ft (3)	7,488 ft	No	No
Roosevelt Lake	15N,18W,31A	N47.0198	W113.9150	7/12/2007	3.8 (1.5)	19 ft (5.8)	6,630 ft	Yes	Yes
Upper Twin Lake	15N,18W,31D	N47.0102	W113.9190	8/3/2008	5.0 (2.0)*	9 ft (2.7)	7,220 ft	Yes	No
Lower Twin Lake	15N,18W,31D	N47.0106	W113.9140	8/4/2008	6.8 (2.8)	41 ft (12.4)	7,065 ft	Yes	Yes

* *Surface area estimated from topography maps.*

Table 6. Summary of amphibian observations for fishless and fish-bearing mountain lakes in the Rattlesnake Wilderness Area.

Lake	Columbia Spotted Frogs*	Life Stages Observed	Long-toed Salamanders*	Life Stages Observed	Acres / Max Depth (ft)	Shoreline Vegetation	Emergent Aquatic Veg.	Other Features
Farmers Lake #1	rare	adult	absent	-	7.0 / 27	limited	limited	Natural drawdown zone
Farmers Lake #2	abundant	adult/larval	absent	-	7.2 / 8	moderate	moderate	Heavy algal bloom
Farmers Lake #3	common	adult	absent	-	10.2 / 21	moderate	limited	-
Farmers Lake #4	abundant	adult	rare	larval	5.5 / 14	abundant	abundant	-
Farmers L. #5 (Peterson L.)	absent	-	rare	adult	20.5 / 89	limited	limited	Dam - drawdown zone
Glacier Lake	absent	-	absent	-	18.4 / 71	limited	limited	Dam - drawdown zone
Grant Creek L. #1(Rankin L.)	abundant	adult/larval	absent	-	6.7 / 19	abundant	moderate	-
Grant Creek Lake #3	absent	-	absent	-	1.7 / < 12	moderate	limited	-
Rattlesnake Lake #6	common	adult/larval	rare	larval	2.1 / < 5	moderate	abundant	-
Rattlesnake Lake #9	absent	-	common	larval	1.4 / < 5	moderate	moderate	Almost dry at survey
Rattlesnake Lake #10	absent	-	absent	-	3.0 / <10	limited	limited	Natural drawdown zone
Rattlesnake Lake #11	abundant	adult/larval	absent	-	5.4 / 12	moderate	abundant	-
Rattlesnake Lake #13	abundant	adult/larval	common	larval	~ 1 / <10	abundant	moderate	-
Rattlesnake Lake #14	abundant	adult/larval	common	larval	3.7 / 5	moderate	moderate	-
Rattlesnake Lake #16	abundant	adult/larval	common	larval	2.2 / 9	moderate	moderate	-
Rattlesnake Lake #18	abundant	adult/larval	absent	-	2.1 / < 5	abundant	abundant	Shallow marsh
Rattlesnake Lake #19	rare	adult	abundant	larval	1.2 / < 5	moderate	limited	-
Rattlesnake Lake #20	absent	-	abundant	larval	2.5 / < 5	limited	limited	-
Rattlesnake Lake #21	common	adult/larval	rare	larval	4.9 / < 5	moderate	moderate	-
Rattlesnake Lake #23	rare	larval	rare	larval	1.6 / < 10	moderate	moderate	-
Roosevelt Lake	abundant	adult/larval	absent	-	3.8 / 19	moderate	moderate	-
Upper Twin Lake	rare	adult	absent	-	5.0 / 9	moderate	limited	Dam - drawdown zone
Lower Twin Lake	rare	larval	rare	larval	6.8 / 41	moderate	limited	Dam - drawdown zone
Big Lake	absent	-	absent	-	40.4 / 136	moderate	limited	Dam - drawdown zone
Boulder lake	rare	adult/larval	absent	-	108 / 93	limited	limited	Natural drawdown zone
Bull Lake	common	adult/larval	common	larval	8.9 / 43	moderate	limited	-
Carter Lake	rare	adult	absent	-	12.9 / 31	moderate	limited	Dam - drawdown zone
Farmers L. #6 (Cliff L.)	rare	adult	absent	-	13.7 / 89	limited	limited	Dam - drawdown zone
Fly Lake	rare	adult	absent	-	11.9 / 36.5	moderate	moderate	-
Gold Creek Lake	common	adult/larval	absent	-	13.8 / 60	abundant	moderate	-
Little Lake	rare	adult	absent	-	13.9 / 52	moderate	limited	Dam - drawdown zone
McKinley Lake	common	adult	absent	-	15.8 / 28	moderate	limited	Dam - drawdown zone
Rattlesnake Lake #15	common	adult/larval	absent	-	5.6 / 15	abundant	abundant	-
Rattlesnake Lake #17	common	adult	absent	-	7.8 / 27	moderate	moderate	-
Rattlesnake Lake #22	absent	-	absent	-	13 / 85	limited	limited	-
Sanders Lake	absent	-	absent	-	48 / 217	limited	limited	Dam - drawdown zone
Sheridan Lake	rare	larval	absent	-	9.8 / 33	limited	limited	Dam - drawdown zone
Worden Lake	common	adult	absent	-	9.1 / 23	moderate	limited	Dam - drawdown zone

** Qualitative descriptions of amphibian abundance: absent = 0 observed, rare = 1-10 observed, common = 11-50 observed, abundant = >50 observed*

APPENDIX B.

SUMMARY OF THE 2012 MFWP STOCKING PROGRAM FOR MOUNTAIN LAKES IN THE RATTLESNAKE WILDERNESS AREA.

Table 1. Rattlesnake Wilderness Lake Stocking Program Summary (2012)

LAKE	CURRENT FISHERY	NATURAL REPRODUCTION	MANAGEMENT OBJECTIVE	2012 STOCKING RECOMMENDATION	BASE YEAR	FREQ	# STOCKED
Big Lake	RBT	Moderate	Self-sustaining RBT or WCT Fishery	No stocking planned	-	-	-
Boulder Lake	WCT	Moderate	Self-sustaining WCT Fishery	Removed from program	-	-	-
Bull Lake	WCT	Limited	Quality WCT Fishery	Change # stocked	2007	5-7 yr	350
Carter Lake	WCT	Abundant	Self-sustaining WCT Fishery	No stocking planned	-	-	-
Farmer's Lake #6 (Cliff Lake)	WCT	Abundant	Self-sustaining WCT Fishery	No stocking planned	-	-	-
Fly Lake	WCT	Moderate	Quality WCT Fishery	Change # stocked	2007	5-7 yr	600
Gold Creek Lake	WCT	Limited	Quality WCT Fishery	Change # stocked	2007	5-7 yr	600
Little Lake	YCT	Abundant	Self-sustaining YCT or WCT Fishery	No stocking planned	-	-	-
McKinley Lake	RBT	Limited	Self-sustaining RBT or WCT Fishery	No stocking planned	-	-	-
Rattlesnake Lake #3 (Lost Lake)	WCT	Moderate	Self-sustaining WCT Fishery	No stocking planned	-	-	-
Rattlesnake Lake #15	WCT	Abundant	Self-sustaining WCT Fishery	No stocking planned	-	-	-
Rattlesnake Lake #17	WCT	Abundant	Self-sustaining WCT Fishery	No stocking planned	-	-	-
Rattlesnake Lake #22 (McLeod L.)	WCT	Abundant	Self-sustaining WCT Fishery	No stocking planned	-	-	-
Sanders Lake	WCT	Moderate	Self-sustaining WCT Fishery	No stocking planned	-	-	-
Sheridan Lake	RBT	Moderate	Self-sustaining RBT or WCT Fishery	No stocking planned	-	-	-
Worden Lake	WCT	Moderate	Self-sustaining WCT Fishery	No stocking planned	-	-	-

Management Objectives

QUALITY FISHERY: Angler catch > 1/hr, mean Wr > 100, trout > 360 mm common
TROPHY FISHERY: Mean Wr > 110, Individuals > 460 mm common
SELF-SUSTAINING FISHERY: Wild trout population persists, no stocking required
FISHLESS: Minimal human use; promote natural processes & ecological diversity

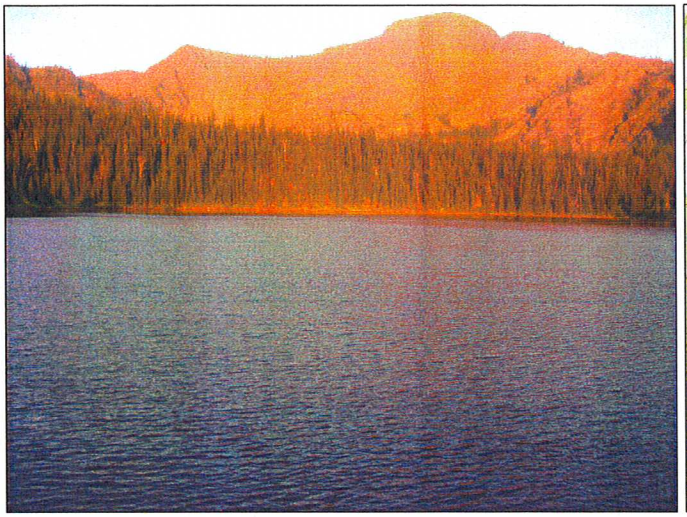
Notes

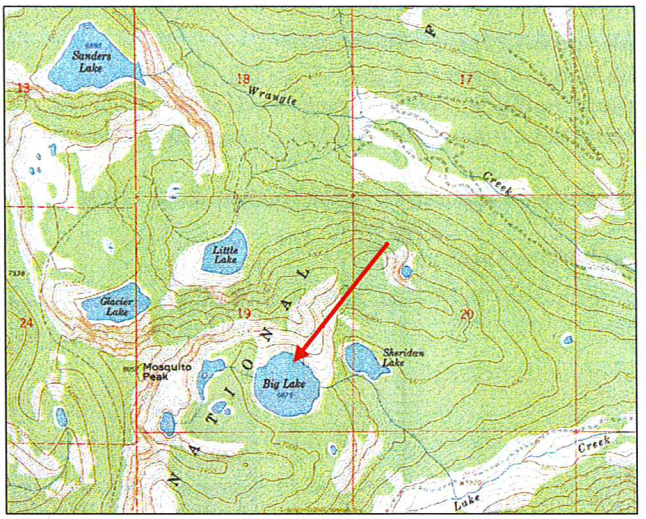
* Species Codes: WCT=westslope cutthroat trout, YCT=Yelowstone cutthroat trout, RBT=rainbow trout
* All fish stocked are 1.5-2.0 inch M012 westslope cutthroat trout
* Stocking generally completed in July
* Lakes removed from program had adequate natural reproduction or will be managed as fishless

APPENDIX C.

INDIVIDUAL LAKE SUMMARIES FOR FISH-BEARING AND SELECTED FISHLESS MOUNTAIN LAKES IN THE RATTLESNAKE WILDERNESS AREA.

Big Lake





Description: Big Lake is a large (40.2 acres), remote glacial cirque lake located within designated Wilderness in the Rattlesnake Creek drainage near Missoula at ~ 6,875 ft elevation. In order to increase storage volume, the lake was artificially impounded by a dam at the outlet in 1915. This structure elevates the normal surface water elevation, but may also increase annual water level fluctuations. Big lake is one of the three largest lakes in the Rattlesnake Wilderness Area.

Location: T15N, R18W, Section 19; Latitude N47.0398°, Longitude W113.9180°; Nearest Town: Missoula, MT Surrounding land ownership: Lolo National Forest (Missoula Ranger District). Big Lake lies near the center of the Rattlesnake Wilderness Area.

Access: Although this lake is geographically close to the city of Missoula, access is difficult. There are several USFS routes from which to choose. Route distance and difficulty varies, but all require non-motorized travel. Common starting points are the trailheads at West Fork Gold Creek (Trail # 52), Ravine Creek in lower Grant Creek (Trail # 34), or in lower Rattlesnake Creek at the main Rattlesnake National Recreation Area trailhead (Gated Road #99). Please refer to USFS maps for specific travel routes and connecting trail numbers. Total travel distance from trailheads to the lake ranges from 9-17 miles.

Camp Sites and Use: Big Lake lies in a remote setting that receives light use. There is an established trail to the lake, and one lightly used campsite on the south end of the dam embankment. 'Leave no trace' camping and recreating is essential, as the lake lies within designated Wilderness.

Angling Opportunity: Big Lake supports a wild rainbow trout population. Shoreline topography and access lend well to shoreline angling from about 75% of the lake perimeter.

Stocking History: Big Lake was historically stocked with rainbow trout (prior to 1982) and has not been planted in recent decades. There are no plans to stock in the future as the rainbow trout population is self-sustaining.

Angling Pressure: Estimated angling pressure from Montana state-wide mail surveys in 2005-2009 was low and averaged < 25 angler-days per year.

Other Nearby Lakes: There are several other lakes in the vicinity of Big Lake. Sheridan Lake lies less than 0.25 mile to the east, but access requires hiking on a steep, unmaintained trail through densely forested terrain. Worden Lake lies ~ 1 mile to the south and can easily be reached off of USFS Trails #1265 and #534. There are also several fishless lakes within 0.5 miles to the west of Big Lake (Rattlesnake Lakes #9, #10 and #11) that may be reached via easy off-trail hiking.

Montana Fish, Wildlife & Parks

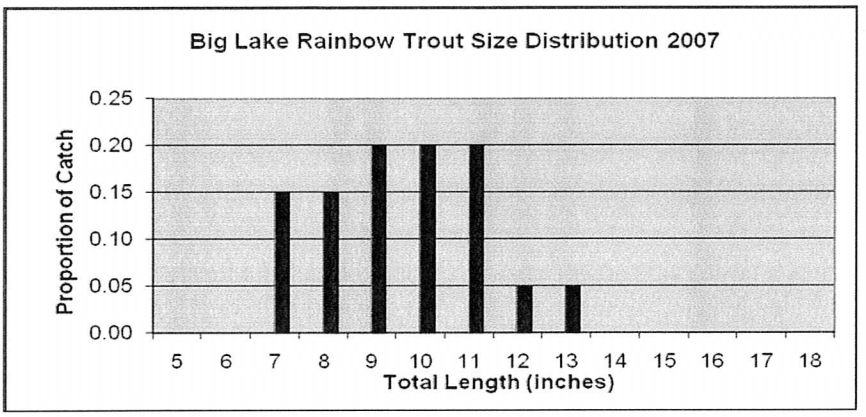
Big Lake - Biological & Physical Information

Date Sampled: 9/12/2007

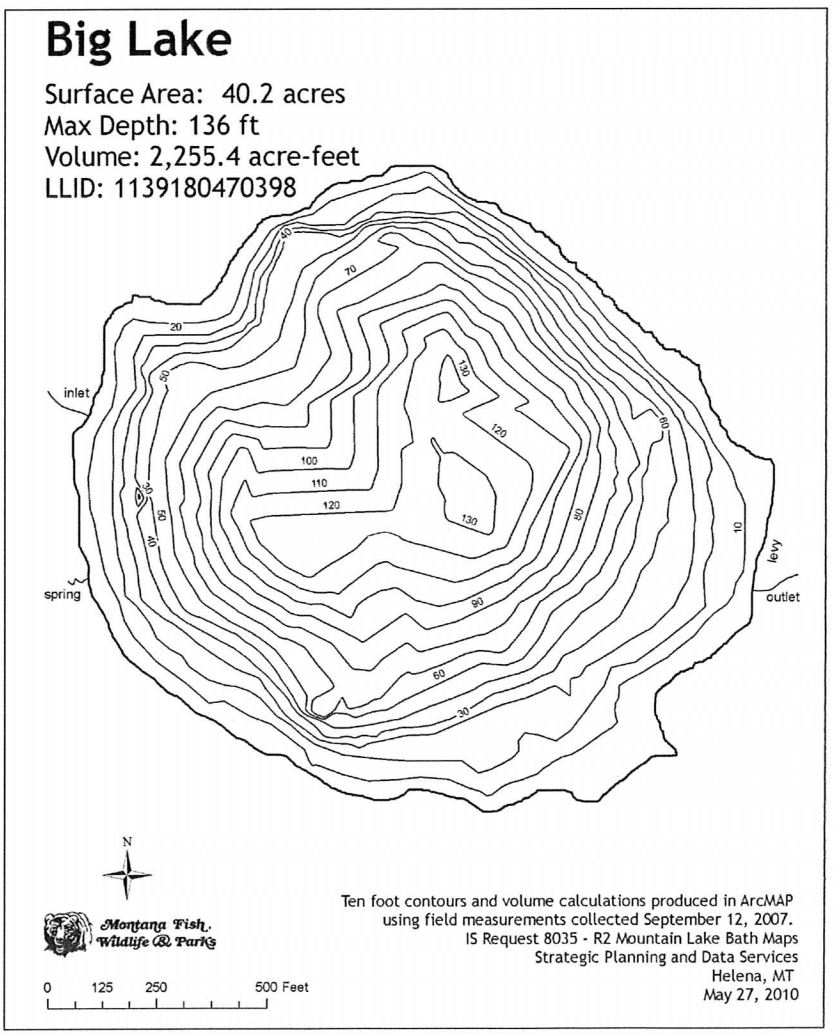
Fish Species Present: Rainbow trout
Size Range Captured: 7.2–12.6 in (182-320 mm)
Trout Condition (Wr): 67 (range 48-81) (low)
Sampling Methods: Sinking Gill Net
Gill Net Catch Rate: 0.42 trout/net/hr (low)
Natural Recruitment: Present (moderate)
Trout Diet Composition (9/12/07): Zooplankton, aquatic insects, terrestrial insects

Currently Stocked: No **Last Stocked**: Prior to 1982 **Species**: RBT **Recommended Frequency**: None

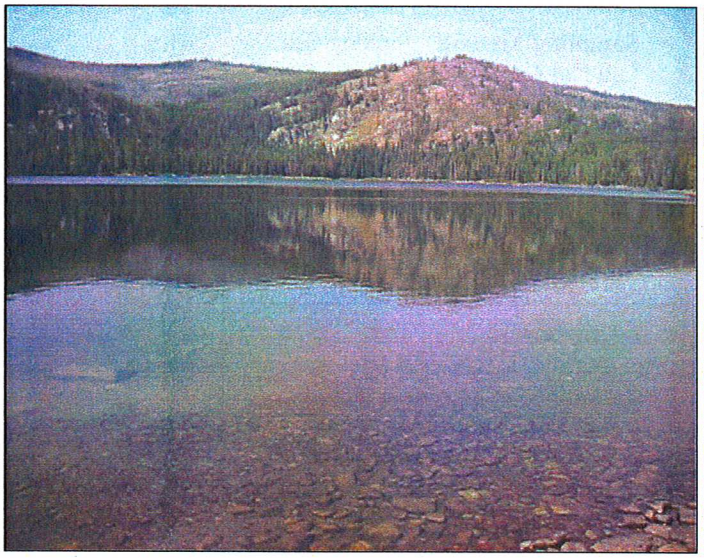
Amphibians Observed: None

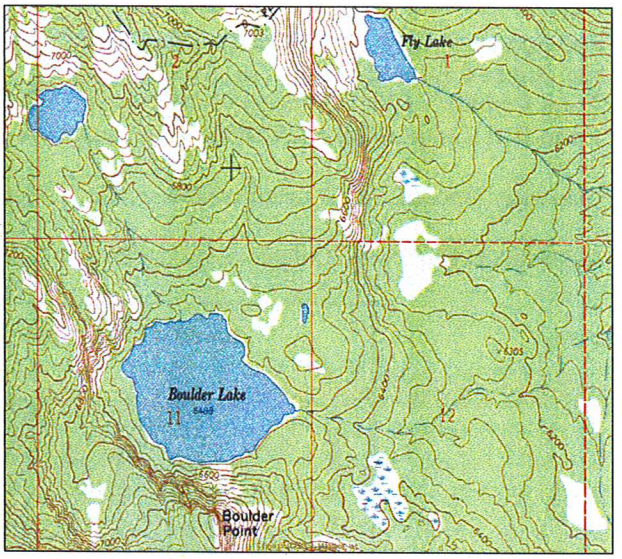


Elevation: 6,875 ft **Surface Area**: 40.2 acres **Volume**: 2,255 acre-ft **Max Depth**: 136 ft
Secchi Depth: 45 ft **PH**: 8.3-8.6 **Conductivity**: 1-5 uS **TDS**: 0-5 ppm **Aspect**: Southeast



Boulder Lake





Description: Boulder Lake is a very large (107.5 acres), remote glacial cirque lake located within designated Wilderness in the Gold Creek drainage near Missoula at 6,488 ft elevation. This is the largest lake within the Rattlesnake Wilderness Area.

Location:T15N, R18W, Section 11; Latitude N47.0744°, Longitude W113.8350°; Nearest Town: Missoula, MT Surrounding land ownership: Lolo National Forest (Missoula Ranger District). Boulder Lake lies in the eastern portion of the Rattlesnake Wilderness Area.

Access: Access to Boulder Lake can most easily be obtained by taking USFS Road #126 (Gold Creek Road) off of U.S. Highway 200 east of Missoula. Travel on Road #126 for ~ 6 miles, then USFS Road #2103 for ~ 5 miles and finally USFS Road #4323 for ~ 5 miles to the West Fork Gold Creek Trailhead and USFS Trail #333. From here, it is a ~ 5.5 mile hike on Trail #333 to Boulder Lake.

Camp Sites and Use: Boulder Lake lies in a remote setting that receives moderate use. There is an established trail around the lake with multiple campsites and fire rings. 'Leave no trace' camping and recreating is essential, as the lake lies within designated Wilderness.

Angling Opportunity: Boulder Lake currently supports a westslope cutthroat trout population with moderate natural reproduction that has been periodically supplemented with stocking. Shoreline topography and access lend well to shoreline angling along most of the lake perimeter.

Stocking History: Boulder Lake has been stocked with both Yellowstone and westslope cutthroat trout. The most recent plant occurred in 2000, when 5,550 westslope cutthroat trout were stocked. Regular stocking is not planned for this lake as natural reproduction appears adequate to support the fishery.

Angling Pressure: Estimated angling pressure from Montana state-wide mail surveys in 2005-2009 was low and averaged < 50 angler-days per year.

Other Nearby Lakes: There are two other lakes in the vicinity of Boulder Lake. Fly Lake lies less than one mile to the northeast. Travel to this lake from Boulder Lake would require off-trail hiking through steep and densely forested terrain. Fly Lake can also be accessed via USFS Trails #358 and #336, from the main Gold Creek trailhead. Gold Creek Lake lies less than one mile northwest of Boulder Lake. To access it, hike off-trail along the west side of Boulder Lake to the north and follow the stream drainage to the Gold Creek Lake outlet.

Boulder Lake - Biological & Physical Information

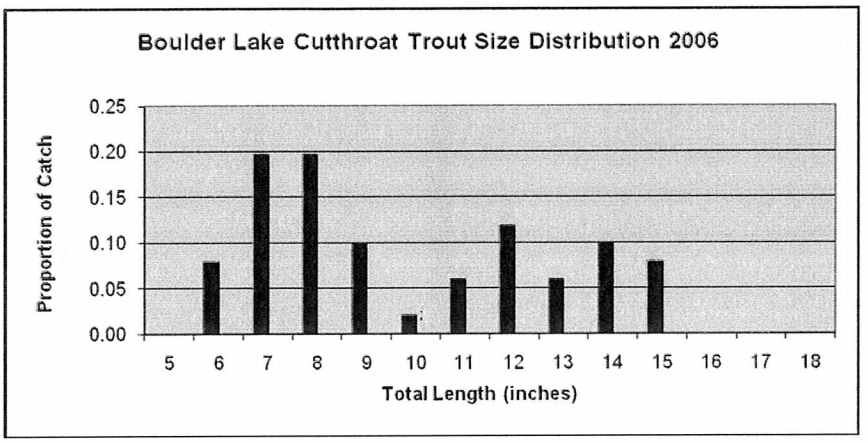
Date Sampled: 8/29/2006

Fish Species Present: Westslope Cutthroat Trout
Size Range Captured: 6.1-15.2 in (155-385 mm)
Trout Condition (Wr): 90 (range 72-104) (moderate)
Trout Diet Composition (8/29/2006): Zooplankton, aquatic insects, terrestrial insects

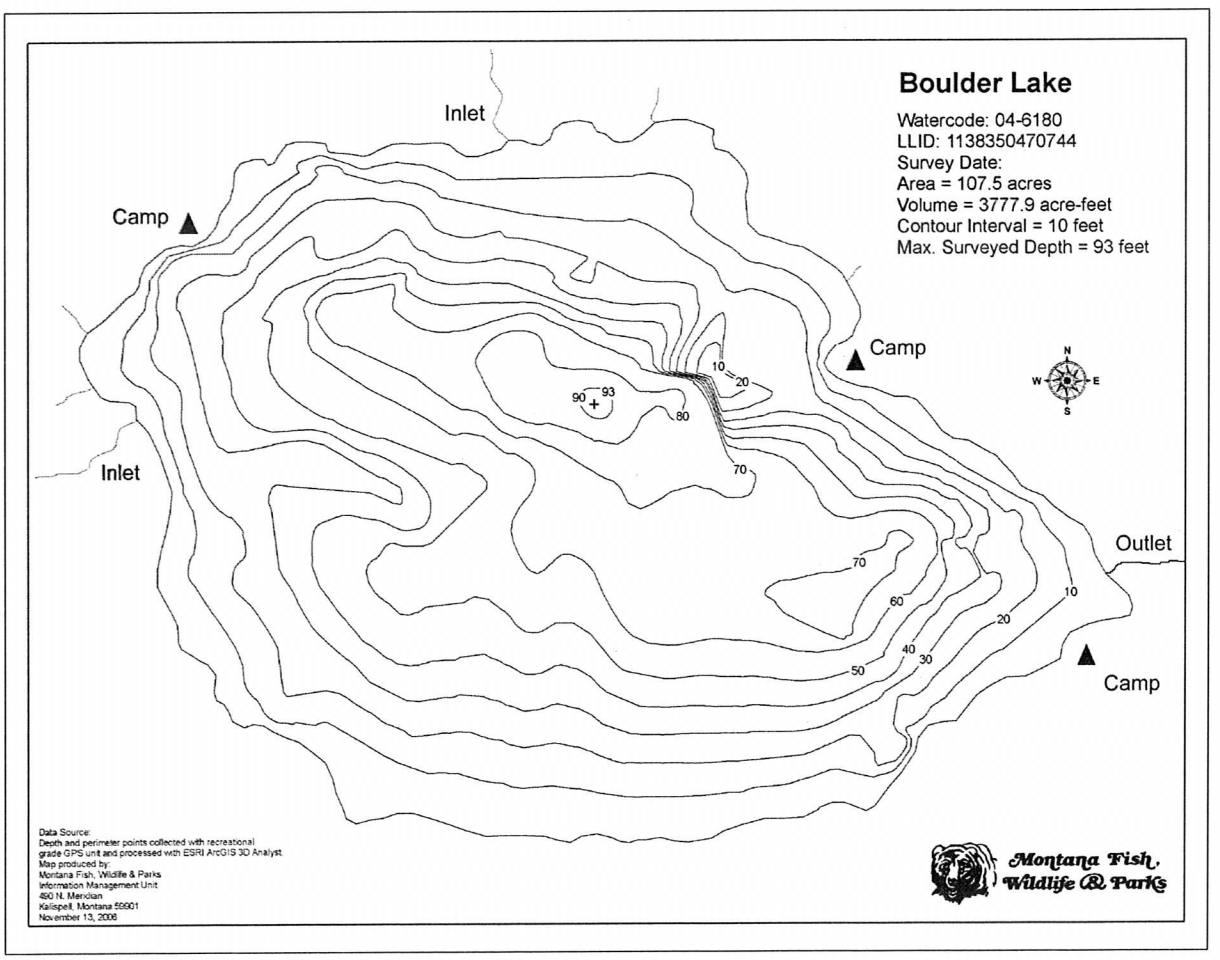
Sampling Methods: Sinking Gill Net
Gill Net Catch Rate: 1.5 trout/net/hr (moderate)
Natural Recruitment: Present (moderate)

Currently Stocked: No **Last Stocked**: 2000 **Species**: WCT **Recommended Frequency**: None

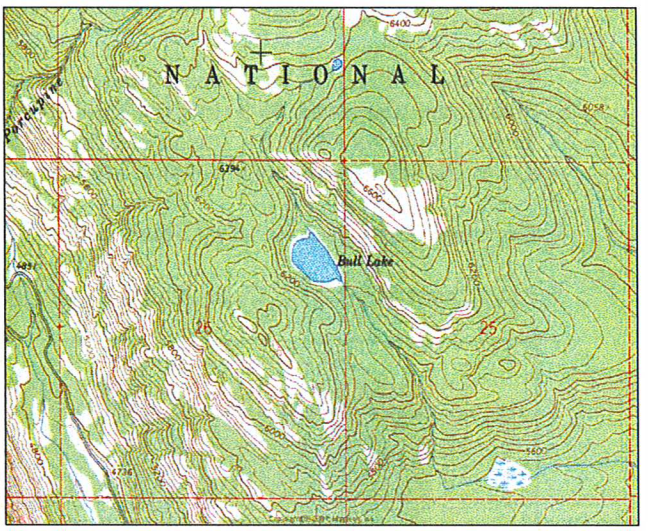
Amphibians Observed: Columbia Spotted Frogs (adults, larvae) - rare



Elevation: 6,488 ft **Surface Area**: 107.5 acres **Volume**: 3,778 acre-ft **Max Depth**: 93 ft
Secchi Depth: 29 ft **PH**: 8.6-8.7 **Conductivity**: 7 uS **TDS**: 3-4 ppm **Aspect**: East



Bull Lake



Description: Bull Lake is a small (8.9 acres), valley depression lake located within designated Wilderness in the Gold Creek drainage near Missoula at 6,099 ft elevation. Much of the lake shoreline was burned in a recent forest fire.

Location: T15N, R18W, Section 26; Latitude N47.0327°, Longitude W113.8290°; Nearest Town: Missoula, MT Surrounding land ownership: Lolo National Forest (Missoula Ranger District). Bull Lake lies within the Rattlesnake Wilderness Area.

Access: Access to Boulder Lake can most easily be obtained by taking USFS Road #126 (Gold Creek Road) off of U.S. Highway 200 east of Missoula. Travel on Road #126 for ~ 6 miles, then USFS Road #2103 for ~ 5 miles and finally USFS Road #4323 for ~ 5 miles to the West Fork Gold Creek Trailhead. There is no trail to Bull Lake and access requires a ~ 0.6 mile hike through a recent burn with extensive downfall.

Camp Sites and Use: Bull Lake lies in a remote setting and receives relatively light use. There is a trail around most of the lake, but no established campsites. 'Leave no trace' camping and recreating is essential, as the lake lies within designated Wilderness.

Angling Opportunity: Bull Lake supports a westslope cutthroat trout population that has limited natural reproduction. Shoreline topography and access lend well to shoreline angling along most of the lake perimeter.

Stocking History: Bull Lake has been stocked with westslope cutthroat trout several times since 1977. In the future, it will likely be stocked every 5-7 years with westslope cutthroat trout.

Angling Pressure: Estimated angling pressure from Montana state-wide mail surveys in 2005-2009 was light and averaged < 50 angler-days per year.

Other Nearby Lakes: There are no other lakes in the immediate vicinity of Bull Lake. Boulder Lake, Fly Lake, and Gold Creek Lake all lie ~ 3 miles north of Bull Lake, but accessing them is much easier via alternative routes from the upper Gold Creek or West Fork Gold Creek trailheads.

Montana Fish, Wildlife & Parks

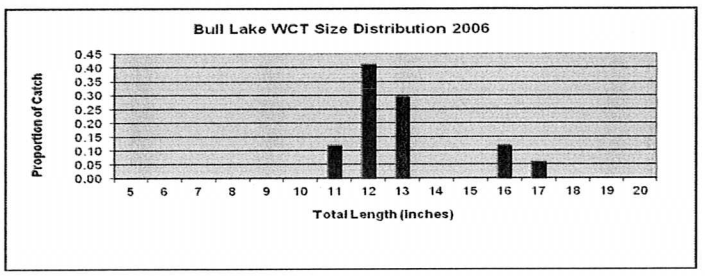
Bull Lake - Biological & Physical Information:

Date Sampled: 8/12/2006

Fish Species Present: Westslope Cutthroat Trout
Size Range Captured: 10.9–15.9 in (278-404mm)
Trout Condition (Wr): 101 (range 91-109) (moderate)
Sampling Methods: Sinking Gill Net & Angling
Gill Net Catch Rate: 1.04 trout/net/hr (moderate)
Natural Recruitment: Present (limited)
Trout Diet Composition (8/12/06): Zooplankton, aquatic insects, leeches, scuds

Currently Stocked: Yes **Last Stocked**: 2007 **Species**: WCT **Recommended Frequency**: 5-7 yrs

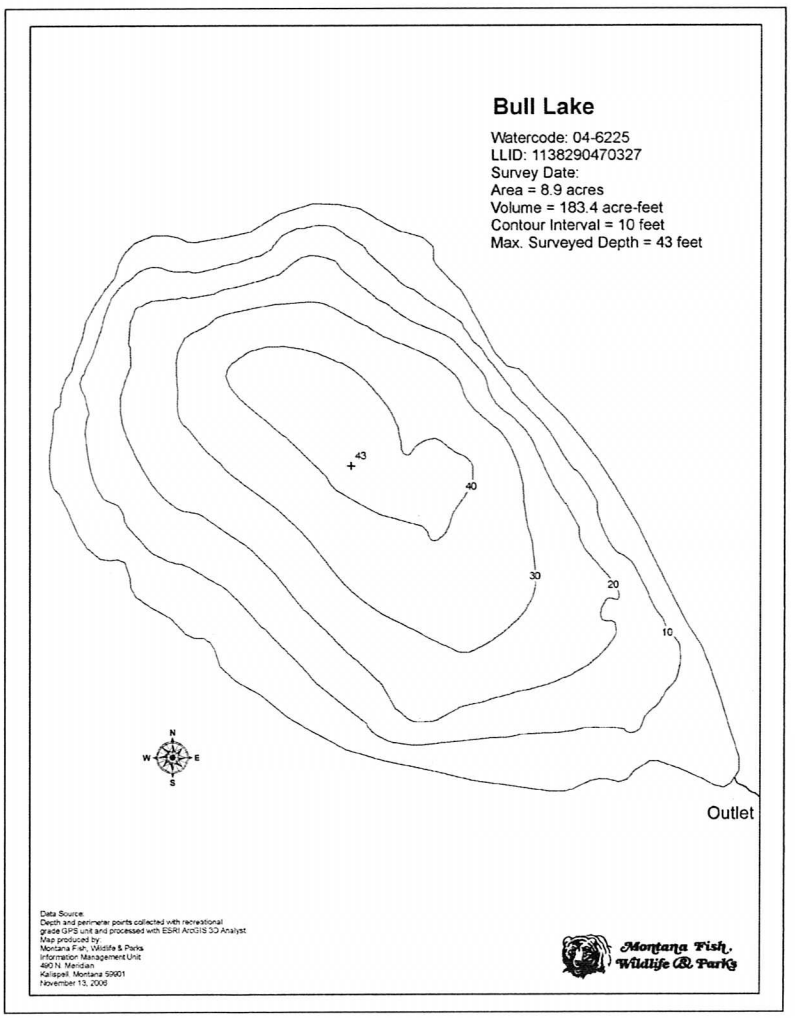
Amphibians Observed: Columbia Spotted Frogs (adults, larvae) - common; Long-toed salamanders (larvae) - common



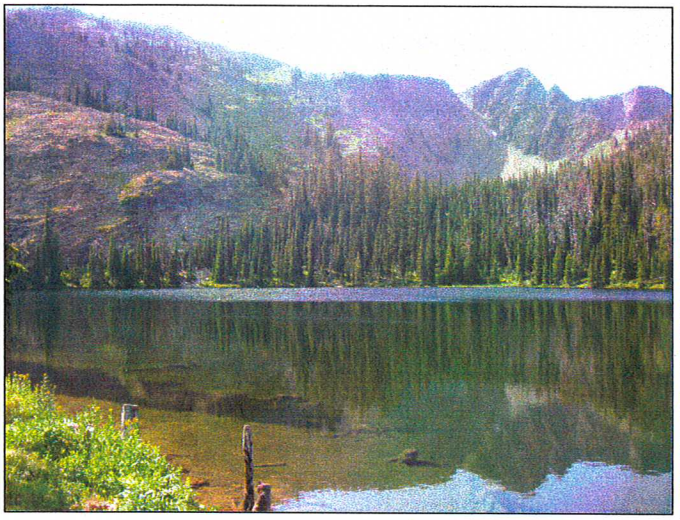
Stocking History

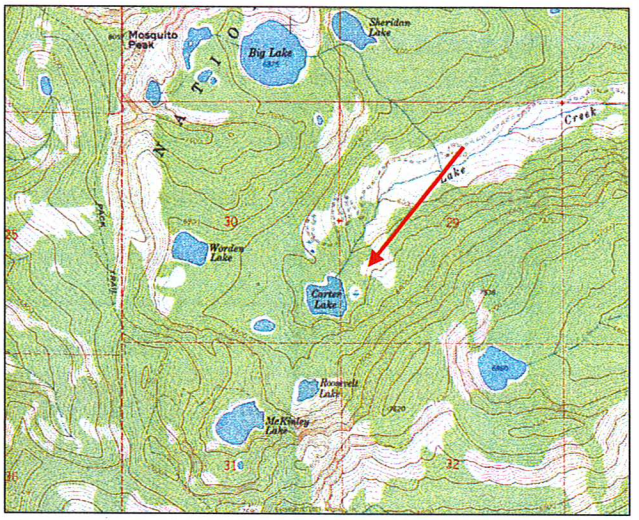
Year	Species	#
2007	WCT	350
2000	WCT	525
1977	WCT	582

Elevation: 6,099 ft **Surface Area**: 8.9 acres **Volume**: 183.4 acre-ft **Max Depth**: 43 ft
Secchi Depth: 19-20 ft **PH**: 7.92-7.94 **Conductivity**: 49-50 uS **TDS**: 25 ppm **Aspect**: Southeast



Carter Lake





Description: Carter Lake is a small (12.9 acres), remote glacial cirque lake located within designated Wilderness in the Rattlesnake Creek drainage near Missoula at ~ 6,300 ft elevation. In order to increase storage volume, the lake was artificially impounded by a dam at the outlet in 1921. This structure still elevates the normal surface water elevation, but may also increase annual water level fluctuations.

Location: T15N, R18W, Section 30; Latitude N47.0252°, Longitude W113.9130°; Nearest Town: Missoula, MT Surrounding land ownership: Lolo National Forest (Missoula Ranger District). Carter Lake lies within the Rattlesnake Wilderness Area at the head of Lake Creek.

Access: Although this lake is geographically close to the city of Missoula, access is difficult. There are several USFS routes from which to choose. Route distance and difficulty varies, but all require non-motorized travel. Common starting points are the trailheads at West Fork Gold Creek (Trail # 52), Ravine Creek in lower Grant Creek (Trail # 34), or in lower Rattlesnake Creek at the main Rattlesnake National Recreation Area trailhead (Gated Road #99). Please refer to USFS maps for specific travel routes and connecting trail numbers. Total travel distance from trailheads to lake ranges from 8-16 miles.

Camp Sites and Use: Carter Lake lies in a remote setting that receives light use. There is an established trail to the lake (USFS Trail #534) and one lightly used campsite on the east end of the dam embankment. 'Leave no trace' camping and recreating is essential, as the lake lies within designated Wilderness.

Angling Opportunity: Carter Lake supports a wild westslope cutthroat trout population with abundant natural reproduction. Shoreline topography and access lend well to shoreline angling along most of the lake perimeter.

Stocking History: Carter Lake was historically stocked with westslope cutthroat trout and the most recent record was 2,700 fish planted in 1969. No future stocking is planned as the lake supports a self-sustaining population.

Angling Pressure: Estimated angling pressure from Montana state-wide mail surveys in 2005-2009 was low and averaged < 50 angler-days per year.

Other Nearby Lakes: There are four other fish-bearing lakes within 1 mile of Carter Lake. Big and Sheridan Lakes lie ~ 1 mile to the north, Worden Lake is ~ 0.50 mile to the west, and McKinley lake lies ~ 0.5 miles to the southwest. All of these lakes can be accessed via established USFS trails from Carter Lake.

Montana Fish, Wildlife & Parks

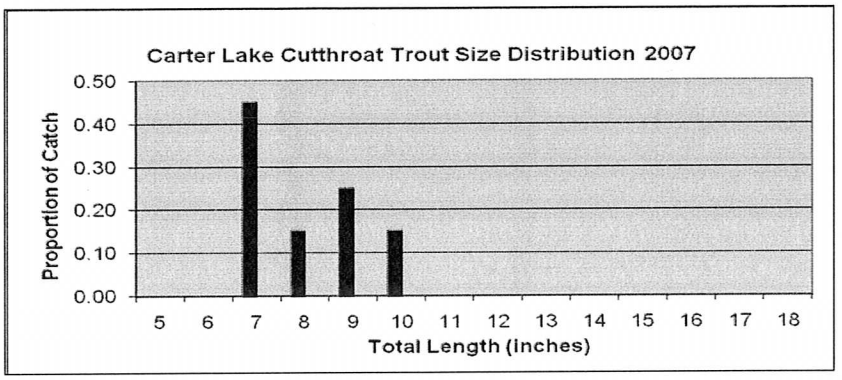
Carter Lake - Biological & Physical Information

Date Sampled: 7/13/2007

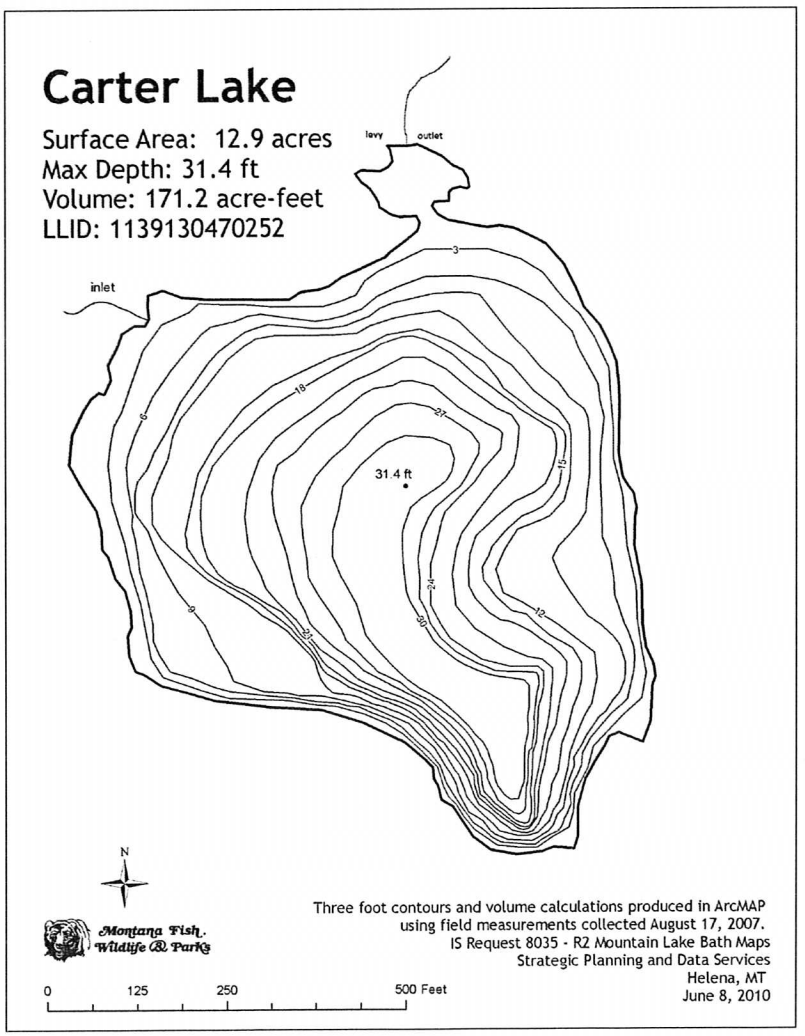
Fish Species Present: Westslope cutthroat trout
Size Range Captured: 6.6–9.9 in (167-251 mm)
Trout Condition (Wr): 81 (range 71-97) (low)
Sampling Methods: Sinking Gill Net & Angling
Gill Net Catch Rate: 1.67 trout/net/hr (moderate)
Natural Recruitment: Present (abundant)
Trout Diet Composition (7/13/07): Zooplankton, aquatic insects, terrestrial insects, scuds

Currently Stocked: No **Last Stocked**: 1969 **Species**: WCT **Recommended Frequency**: None

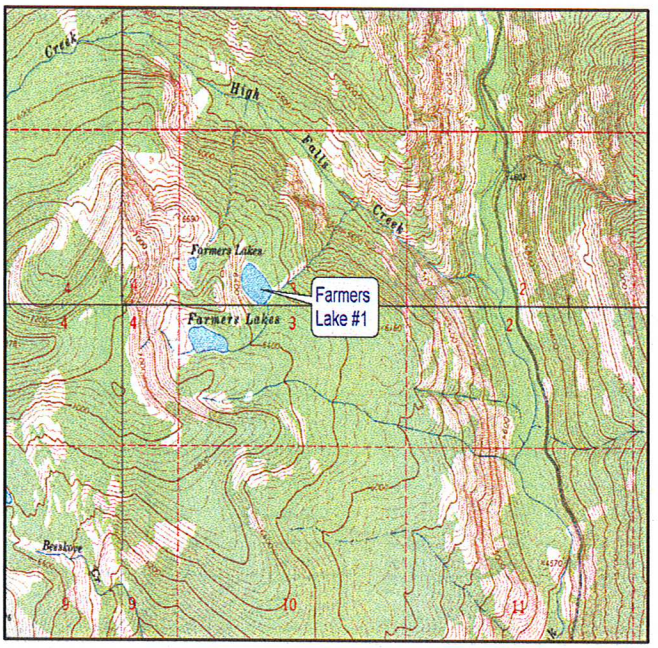
Amphibians Observed: Columbia spotted frogs (adult) – rare



Elevation: 6,300 ft **Surface Area**: 12.9 acres **Volume**: 171.2 acre-ft **Max Depth**: 31.4 ft
Secchi Depth: N/A **PH**: 7.5-7.8 **Conductivity**: 5-6 uS **TDS**: 2-3 ppm **Aspect**: Northeast



Farmers Lake #1



Description: Farmers Lake #1 is a small (7.0 acres), very remote glacial cirque lake located within designated Wilderness in the Rattlesnake Creek drainage near Missoula at ~ 6,249 ft elevation. Although this lake is likely capable of supporting a trout fishery, there is no record of fish ever being present.

Location: T14N, R18W, Section 3; Latitude N47.0008°, Longitude W113.8636°; Nearest Town: Missoula, MT Surrounding land ownership: Lolo National Forest (Missoula Ranger District). Farmers Lake #1 lies near the southern end of the Rattlesnake Wilderness Area in the High Falls Creek drainage.

Access: Although this lake is geographically close to the city of Missoula, access is very difficult. There are several USFS routes from which to choose. Route distance and difficulty vary, but all require non-motorized travel. Common starting points are the trailheads at West Fork Gold Creek (Trail # 52), Ravine Creek in lower Grant Creek (Trail # 34), or in lower Rattlesnake Creek at the main Rattlesnake National Recreation Area trailhead (Gated Road #99). Please refer to USFS maps for specific travel routes and connecting trail numbers. Regardless of the route, travel to the lake from the trail system will require strenuous hiking over steep, difficult terrain. Total travel distance from trailheads to lake ranges from 7-19 miles.

Camp Sites and Use: Farmers Lake #1 lies in a remote setting that receives very light use. There are no established trails to the lake and no campsites. 'Leave no trace' camping and recreating is essential here, as the lake lies within designated Wilderness.

Angling Opportunity: None. No fish were observed or captured at the time of sampling in 2010.

Stocking History: There are no records of stocking in Farmers Lake #1.

Other nearby Lakes: There are several other small fishless lakes in the vicinity of Farmers Lake #1. Farmers Lake #2 lies ~ 0.3 miles to the southwest and a smaller unnamed lake lies about the same distance to the west. Farmers Lake #3 is located ~ 1.5 miles to the southwest. All of these lakes lie at similar elevations and can be reached via off-trail hiking through moderately steep terrain.

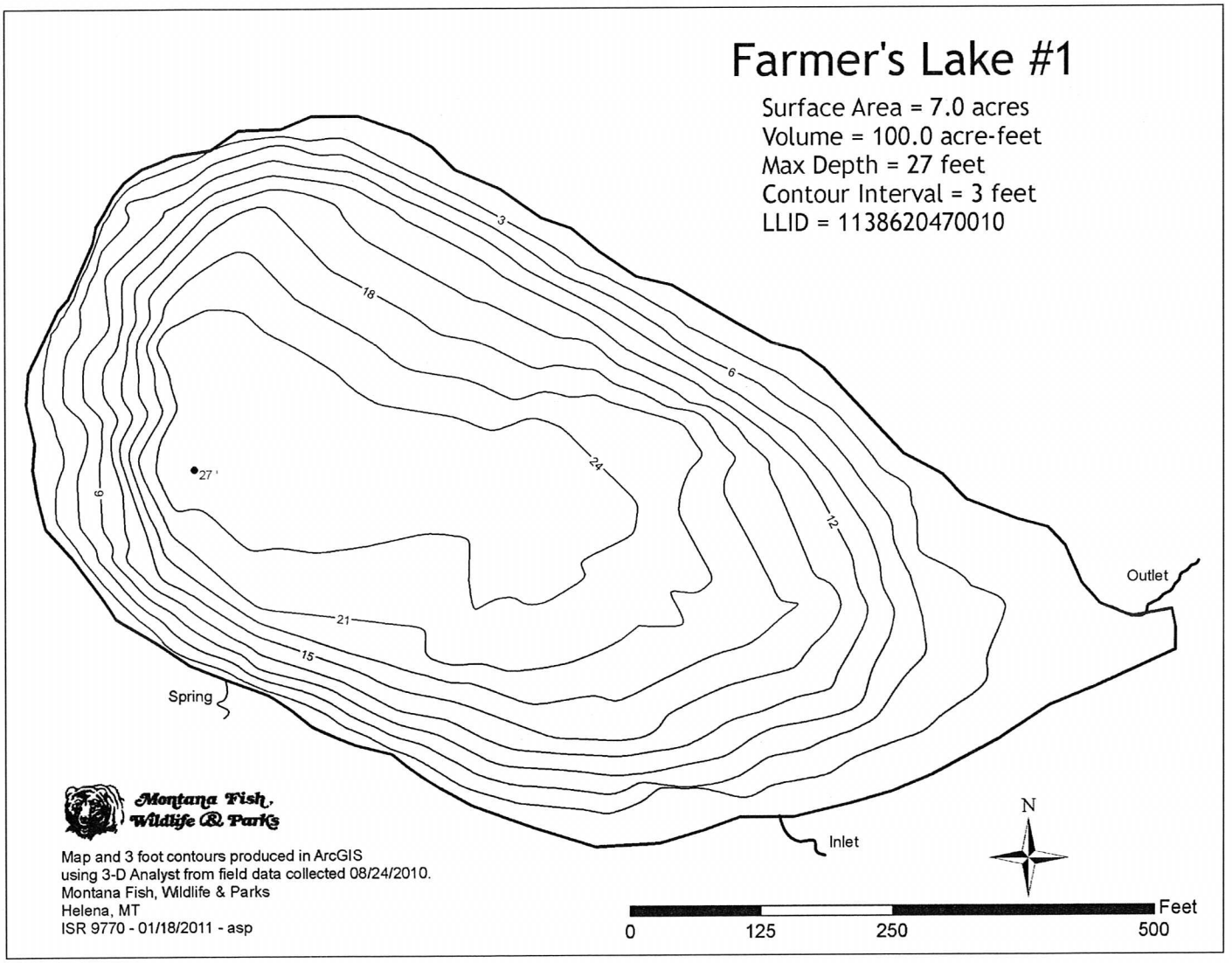
Montana Fish, Wildlife & Parks

Farmers Lake #1 - Biological & Physical Information

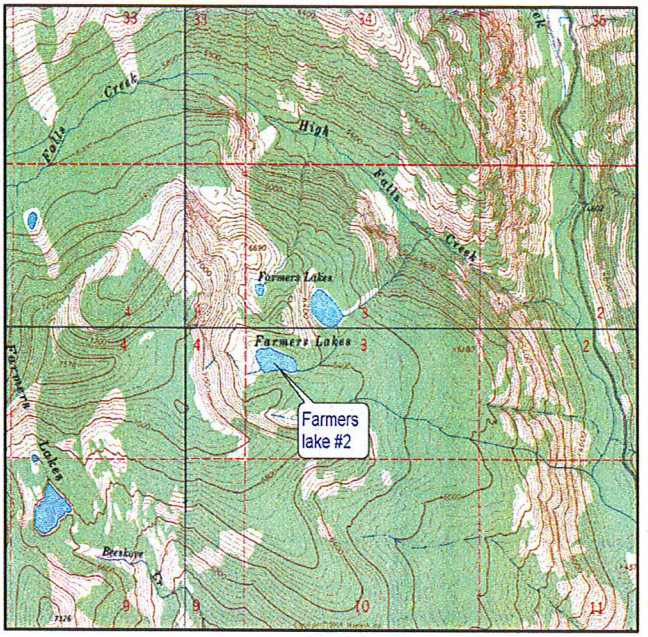
Date Sampled: 8/24/2010 **Fish Species Present**: None **Sampling Methods**: Sinking Gill Net

Amphibians Observed: Columbia Spotted Frogs (Adults) – Rare

Elevation: 6,249 ft **Surface Area**: 7.0 acres **Volume**: 100 acre-ft **Max Depth**: 27 ft
Secchi Depth: 26 (> max depth) **PH**: 8.55 **Conductivity**: < 5 uS **TDS**: < 5 ppm **Aspect**: East



Farmers Lake #2



Description: Farmers Lake #2 is a small (7.2 acres), very remote glacial cirque lake located within designated Wilderness in the Rattlesnake Creek drainage near Missoula at ~ 6,459 ft elevation. At the time of survey, there was a heavy algae bloom, resulting in a strong greenish tint with low clarity.

Location: T14N, R18W, Section 3; Latitude N46.9983°, Longitude W113.8679°; Nearest Town: Missoula, MT Surrounding land ownership: Lolo National Forest (Missoula Ranger District). Farmers Lake #2 lies near the southern end of the Rattlesnake Wilderness Area within the High Falls Creek drainage.

Access: Although this lake is geographically close to the city of Missoula, access is very difficult. There are several USFS routes from which to choose. Route distance and difficulty vary, but all require non-motorized travel. Common starting points are the trailheads at West Fork Gold Creek (Trail # 52), Ravine Creek in lower Grant Creek (Trail # 34), or in lower Rattlesnake Creek at the main Rattlesnake National Recreation Area trailhead (Gated Road #99). Please refer to USFS maps for specific travel routes and connecting trail numbers. Regardless of the route, travel to the lake from the trail system will require strenuous hiking over steep, difficult terrain. Total travel distance from trailheads to lake ranges from 7-19 miles.

Camp Sites and Use: Farmers Lake #2 lies in a remote setting that receives very light use. There are no established trails to the lake and no campsites. 'Leave no trace' camping and recreating is essential, as the lake lies within designated Wilderness.

Angling Opportunity: None. No fish were observed or captured at the time of sampling in 2010. With a maximum depth of ~ 8 feet, this lake would likely not support a trout population.

Stocking History: There are no records of stocking in Farmers Lake #2.

Other nearby Lakes: There are several other small fishless lakes in the vicinity of Farmers Lake #2. Farmers Lake #1 lies ~ 0.3 miles to the northeast and a smaller unnamed lake lies about the same distance to the north. Farmers Lake #3 is located ~ 1 mile to the southwest. All of these lakes lie at similar elevations and can be reached via off-trail hiking through moderately steep terrain.

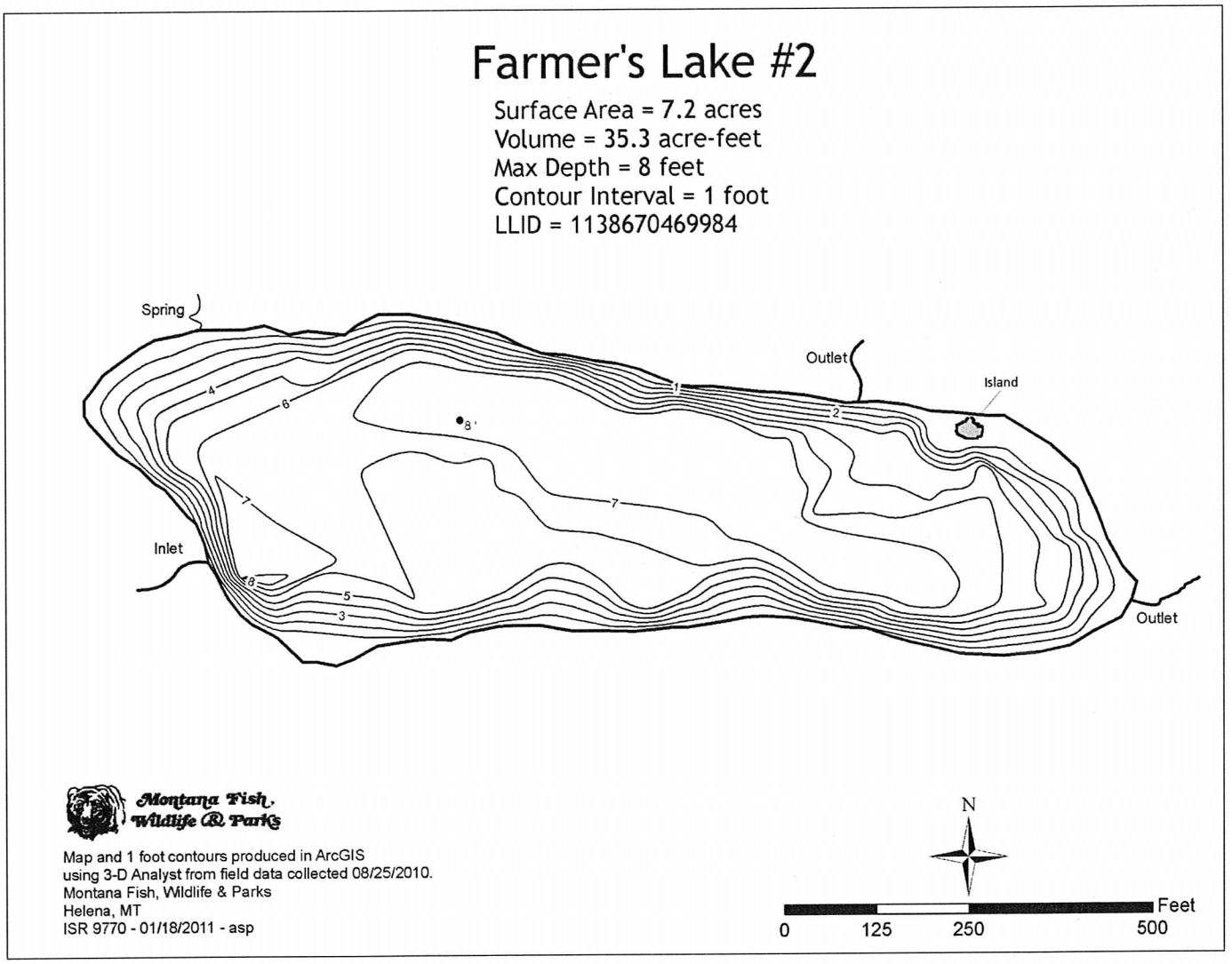
Montana Fish, Wildlife & Parks

Farmers Lake #2 - Biological & Physical Information

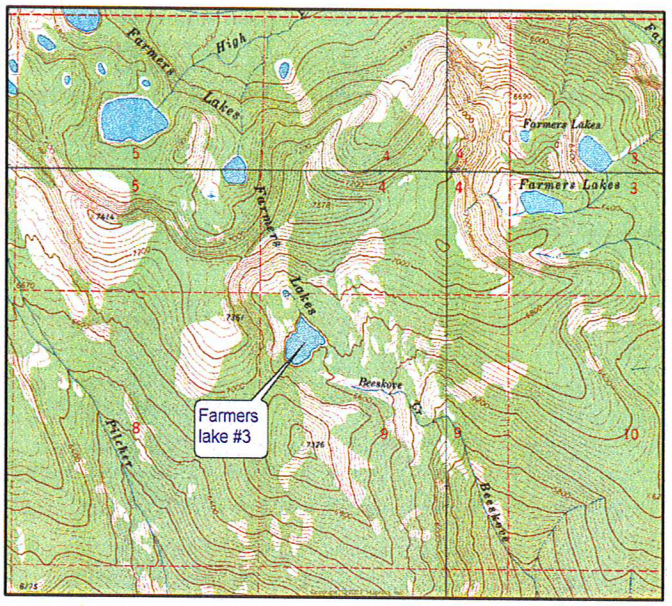
Date Sampled: 8/29/2009 **Fish Species Present**: None **Sampling Methods**: Sinking experimental gillnet

Amphibians/Reptiles Observed: Columbia Spotted Frogs (Adult & Larvae) - Abundant; W. Garter Snakes - Abundant

Elevation: 6,459 ft **Surface Area**: 7.2 acres **Volume**: 35.3 acre-ft **Max Depth**: 8 ft
Secchi Depth: 3-4 ft **PH**: 13.8 (?) **Conductivity**: No Data **TDS**: No Data **Aspect**: East



Farmers Lake #3



Description: Farmers Lake #3 is a moderate-sized (9.5 acres), very remote glacial cirque lake located just south of the Wilderness boundary in the Rattlesnake Creek drainage at ~ 6,597 ft elevation. Although certainly capable of supporting a trout fishery, there is no record of fish ever being present in the lake.

Location: T14N, R18W, Section 9; N46.9908°, Longitude W113.8882°; Nearest Town: Missoula, MT Surrounding land ownership: Lolo National Forest (Missoula Ranger District). Farmers Lake #3 lies just outside the southern boundary of the Rattlesnake Wilderness Area at the head of Beescove Creek.

Access: Although this lake is geographically close to the city of Missoula, access is very difficult. There are several USFS routes from which to choose. Route distance and difficulty vary, but all require non-motorized travel. Common starting points are the trailheads at West Fork Gold Creek (Trail # 52), Ravine Creek in lower Grant Creek (Trail # 34), or in lower Rattlesnake Creek at the main Rattlesnake National Recreation Area trailhead (Gated Road #99). Please refer to USFS maps for specific travel routes and connecting trail numbers. Regardless of the route, travel to the lake from the trail system will require strenuous hiking over steep, difficult terrain. Total travel distance from trailheads to lake ranges from 7-19 miles.

Camp Sites and Use: Farmers Lake #1 lies in a remote setting that receives very light use. There are no established trails to the lake and no campsites. One fire ring was observed at the lake. 'Leave no trace' camping and recreating is recommended, as this lake lies within the Rattlesnake National Recreation Area.

Angling Opportunity: None. No fish were observed or captured at the time of sampling in 2010.

Stocking History: There are no records of stocking in Farmers Lake #3.

Other nearby Lakes: There are several other small fishless lakes in the vicinity of Farmers Lake #3. Farmers Lakes #1 and #2 are located 1.0-1.3 miles to the northeast. Both of these lakes lie at similar elevations and can be reached via off-trail hiking through moderately steep terrain. Farmers Lake #4 is located ~ 0.75 miles to the north, but access from Farmers Lake #3 would require travel over a steep ridge.

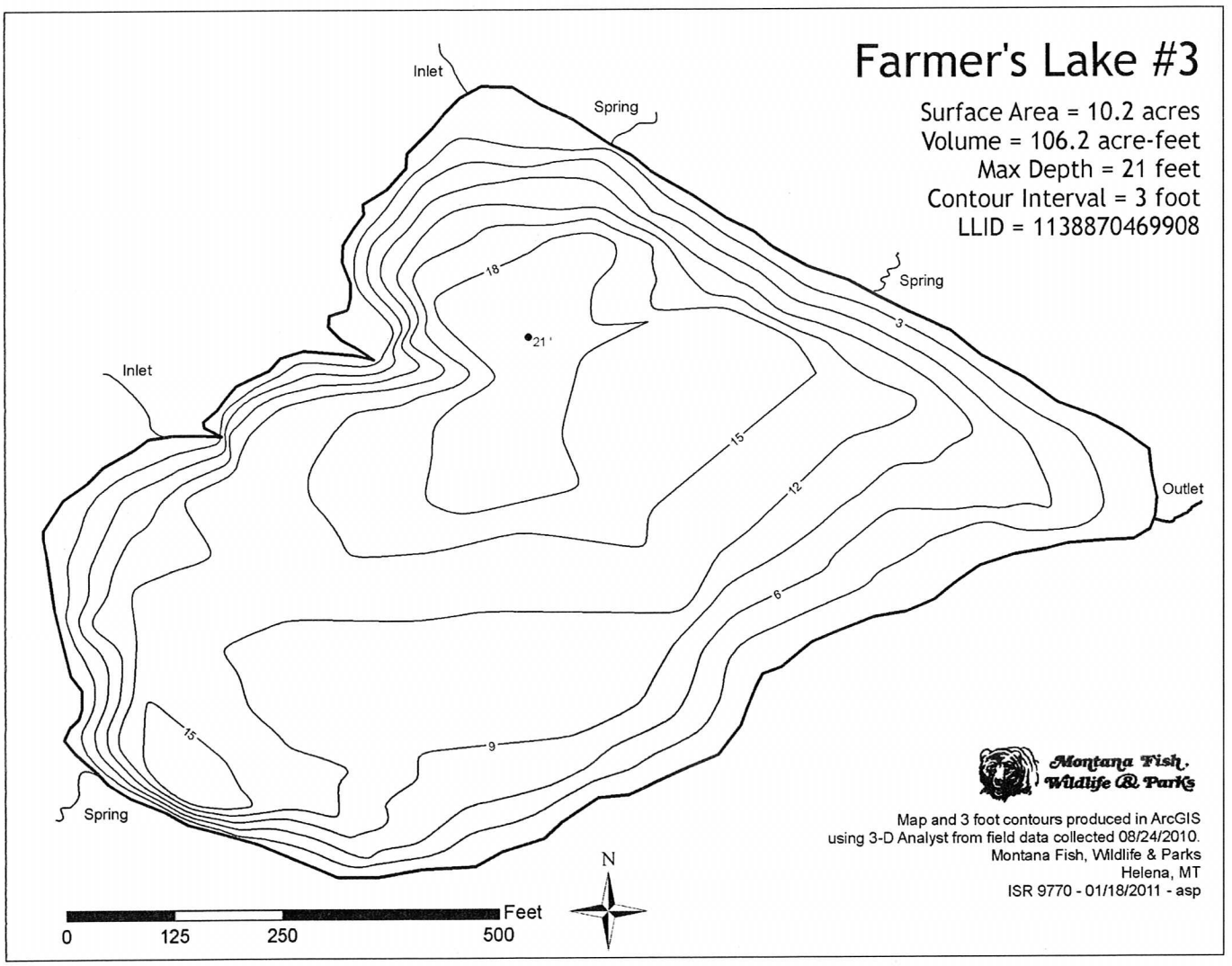
Montana Fish, Wildlife & Parks

Farmers Lake #3 - Biological & Physical Information

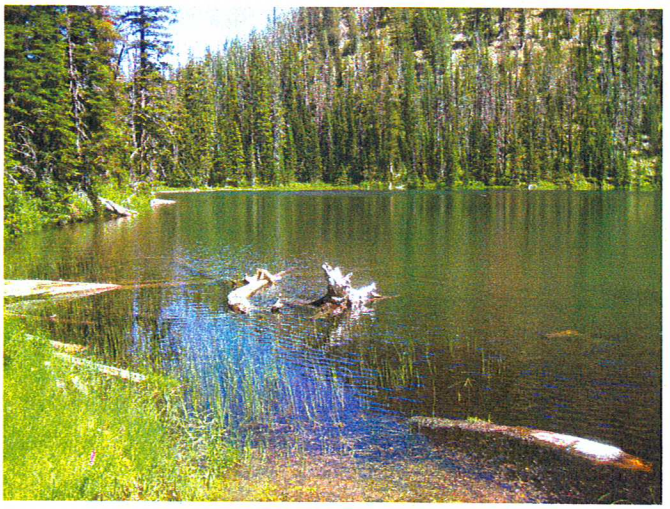
Date Sampled: 8/24/2010 **Fish Species Present**: None **Sampling Method**: Experimental Sinking Gillnet

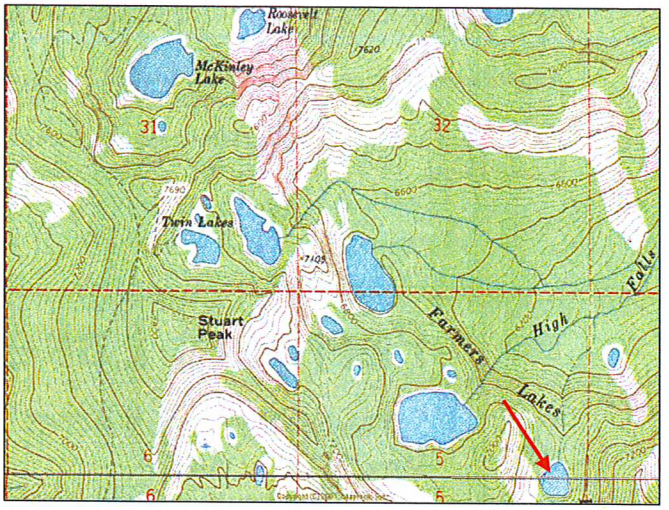
Amphibians Observed: Columbia Spotted Frogs (Adults) - Common

Elevation: 6,597 ft **Surface Area**: 10.2 acres **Volume**: 106 acre-ft **Max Depth**: 21 ft
Secchi Depth: 21(> max depth) **PH**: 6.6 (?) **Conductivity**: 27 uS **TDS**: 19 ppm **Aspect**: Southeast



Farmers Lake #4





Description: Farmers Lake #4 is a small (5.5 acres) glacial cirque lake located at the headwaters of High Falls Creek (tributary of Rattlesnake Creek) at ~ 6,630 ft elevation. The lake is a fairly shallow (max depth 14 ft) and there is no evidence that it ever supported fish.

Location: T14N, R18W, Section 5; Latitude N46.9998°, Longitude W113.8930°; Nearest Town: Missoula, MT Surrounding land ownership: Lolo National Forest (Missoula Ranger District). Farmers Lake #4 lies near the southern boundary of the Rattlesnake Wilderness Area.

Access: Although this lake is geographically close to the city of Missoula, access is very difficult. There are several USFS routes from which to choose. Route distance and difficulty vary, but all require non-motorized travel. Common starting points are the trailheads at West Fork Gold Creek (Trail # 52), Ravine Creek in lower Grant Creek (Trail # 34), or in lower Rattlesnake Creek at the main Rattlesnake National Recreation Area trailhead (Gated Road #99). Please refer to USFS maps for specific travel routes and connecting trail numbers. Total travel distance from trailheads to lake ranges from 7-19 miles.

Camp Sites and Use: Farmers Lake #4 lies in a remote setting that receives very light use. There is a remnant trail to the lake from Farmers Lake #5, but there are no campsites at the lake. 'Leave no trace' camping and recreating is essential, as the lake lies within designated Wilderness.

Angling Opportunity: None. No fish were observed or captured at the time of sampling in 2010.

Stocking History: There are no records of stocking in Farmers Lake #4.

Other nearby Lakes: There are several other fishless lakes in the vicinity of Farmers Lake #4. Farmers Lake #5 (Peterson Lake) lies ~ 0.5 miles to the northwest and can be reached via an unmaintained trail. Although Farmers Lakes #1, #2 and #3 all lie within 1.5 miles, travel routes to these lakes would require crossing difficult terrain and steep ridges. Farmers Lake #6 (Cliff Lake) supports an abundant cutthroat trout fishery and can be reached by hiking ~ 1 mile on unmaintained trails.

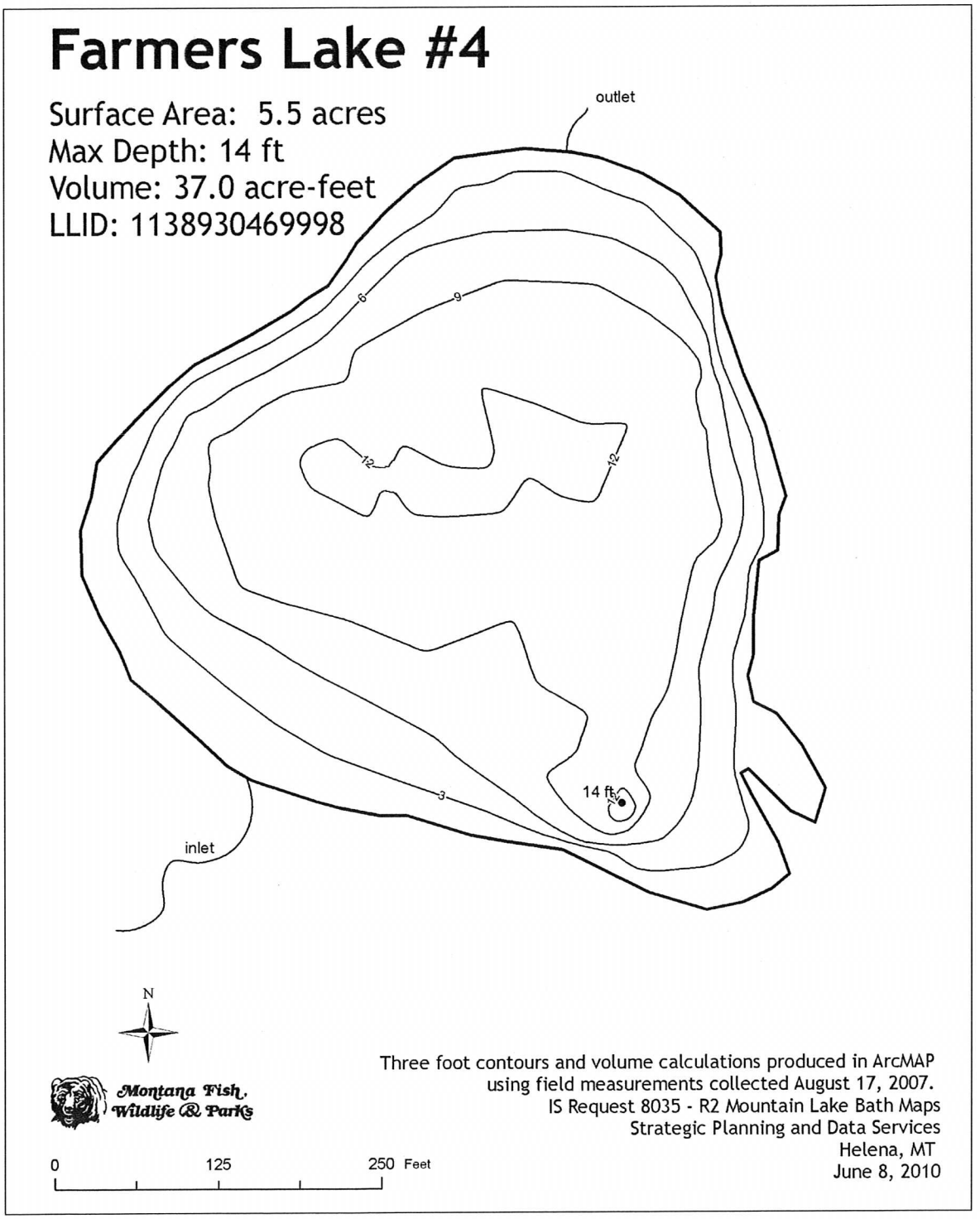
Montana Fish, Wildlife & Parks

Farmers Lake #4 - Biological & Physical Information

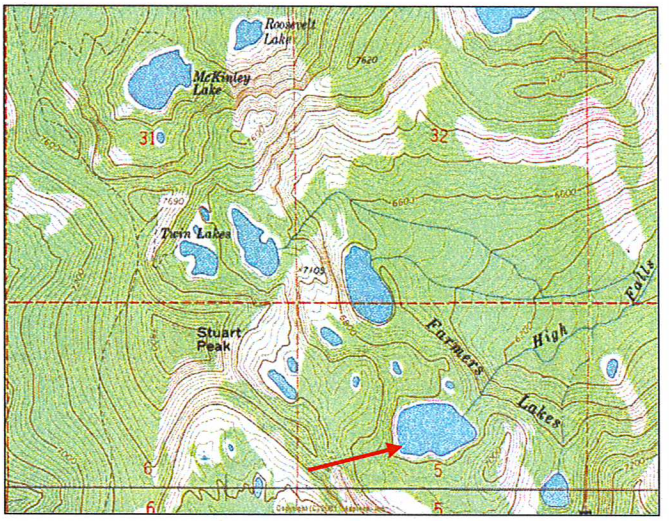
Date Sampled: 8/5/2008 **Fish Species Present**: None **Sampling Method**: Sinking Experimental Gillnet

Amphibians Observed: Columbia Spotted Frogs (Adults) – Abundant; Long-toed Salamander (Larvae) - Rare

Elevation: 6630 ft **Surface Area**: 5.5 acres **Volume**: 37 acre-ft **Max Depth**: 14 ft
Secchi Depth: 14 ft (> max depth) **PH**: No Data **Conductivity**: No Data **TDS**: No Data **Aspect**: North



Farmers Lake #5 (Peterson Lake)



Description: Farmers Lake #5 is a relatively large (20.5 acres) glacial cirque lake located within designated Wilderness at the headwaters of High Falls Creek (tributary to Rattlesnake Creek) at ~ 6,750 ft elevation. Although this lake is easily capable of supporting a trout fishery, there is no record of fish ever being present. In order to increase storage volume, the lake was artificially impounded in the early 1900s by a dam at the outlet. This structure elevates the normal surface water elevation, but may also contribute to greater annual water level fluctuations.

Location: T14N, R18W, Section 5; Latitude N47.0025°, Longitude W113.9020°; Nearest Town: Missoula, MT Surrounding land ownership: Lolo National Forest (Missoula Ranger District). Farmers Lake #5 lies near the southern boundary of the Rattlesnake Wilderness Area.

Access: Although this lake is geographically close to the city of Missoula, access is very difficult. There are several USFS routes from which to choose. Route distance and difficulty vary, but all require non-motorized travel. Common starting points are the trailheads at West Fork Gold Creek (Trail # 52), Ravine Creek in lower Grant Creek (Trail # 34), or in lower Rattlesnake Creek at the main Rattlesnake National Recreation Area trailhead (Gated Road #99). Please refer to USFS maps for specific travel routes and connecting trail numbers. Total travel distance from trailheads to the lake ranges from 7-19 miles.

Camp Sites and Use: Farmers Lake #5 lies in a remote setting that receives very light use. There is a trail from Farmers Lake #6, but there are no established campsites. 'Leave no trace' camping and recreating is essential, as the lake lies within designated Wilderness.

Angling Opportunity: None. No fish were observed or captured at the time of sampling in 2008.

Stocking History: There are no records of stocking in Farmers Lake #5.

Other nearby Lakes: There are several other lakes in the vicinity of Farmers Lake #5. Farmers Lake #6 supports an abundant cutthroat trout fishery and lies ~ 0.6 to the north on U.S. Forest service Trail #330. Four small fishless lakes (> 1 acre) are also within 0.7 miles to the northwest or southeast. These include Farmers Lake #4 and Rattlesnake Lake #4. All of these lakes lie at similar elevations and can be reached via off-trail hiking through moderate, forested terrain.

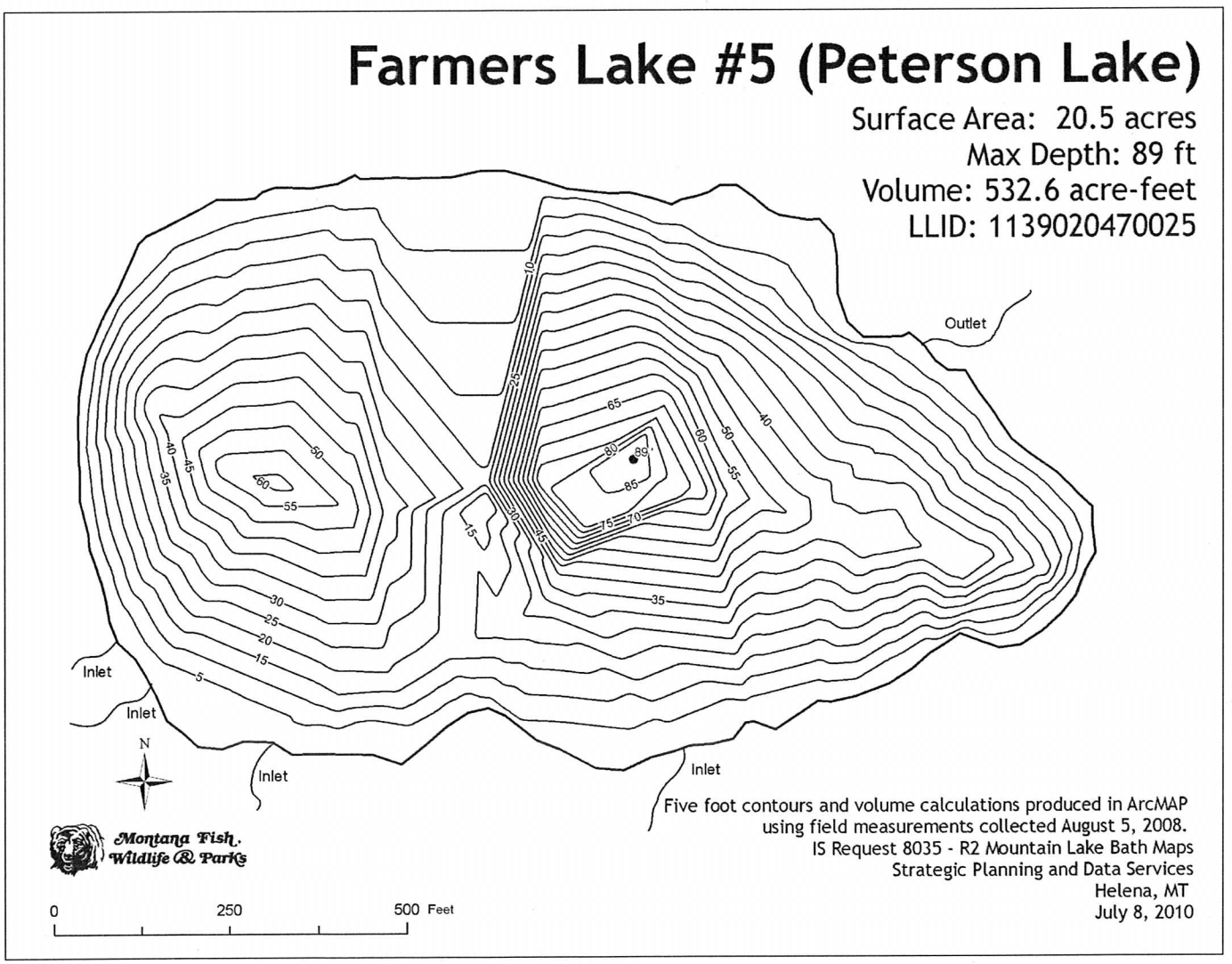
Montana Fish, Wildlife & Parks

Farmers Lake #5 (Peterson Lake) - Biological & Physical Information:

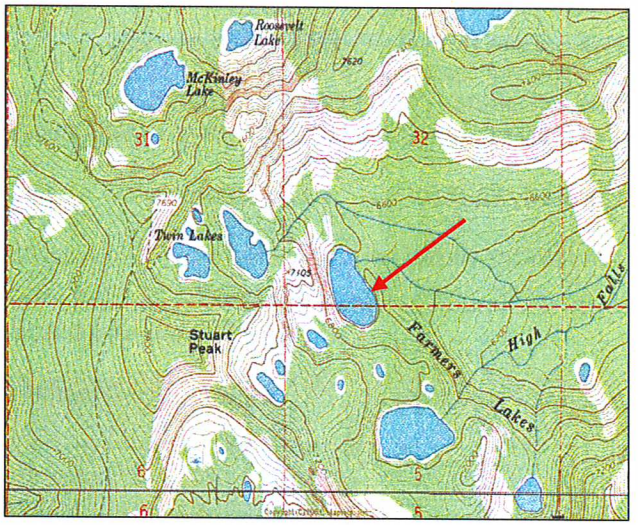
Date Sampled: 8/5/2008 **Fish Species Present**: None **Sampling Method**: Sinking Experimental Gillnet (2)

Amphibians Observed: Long-toed salamander (adult) - Rare

Elevation: 6,750 ft **Surface Area**: 20.5 acres **Volume**: 533 acre-ft **Max Depth**: 89 ft
Secchi Depth: 38-41' **PH**: No Data **Conductivity**: No Data **TDS**: No Data **Aspect**: Northeast



Farmers Lake #6 (Cliff Lake)



Description: Farmer's Lake #6 (Cliff Lake) is a moderate-sized (13.7 acres), remote glacial cirque lake located within designated Wilderness in the Rattlesnake Creek drainage near Missoula at ~ 6,595 ft elevation. In order to increase storage volume, the lake was artificially impounded by a dam at the outlet in the early 1900s. This structure elevates the normal surface water elevation, but may also increase annual water level fluctuations.

Location:T15N, R18W, Section 32; Latitude N47.0087°, Longitude W113.9070°; Nearest Town: Missoula, MT Surrounding land ownership: Lolo National Forest (Missoula Ranger District) Cliff Lake lies at the south end of the Rattlesnake Wilderness Area at the head of High Falls Creek.

Access: Although this lake is geographically close to the city of Missoula, access is difficult. There are several USFS routes from which to choose. Route distance and difficulty vary, but all require non-motorized travel. Common starting points are the trailheads at West Fork Gold Creek (Trail # 52), Ravine Creek in lower Grant Creek (Trail # 34), or in lower Rattlesnake Creek at the main Rattlesnake National Recreation Area trailhead (Gated Road #99). Please refer to USFS maps for specific travel routes and connecting trail numbers. Total travel distance from trailheads to lake ranges from 7-19 miles.

Camp Sites and Use: Farmers Lake #6 lies in a remote setting that receives light use. There is an old, remnant trail to the lake, but there are no campsites. 'Leave no trace' camping and recreating is essential, as the lake lies within designated Wilderness.

Angling Opportunity: Farmers Lake #6 supports a wild westslope cutthroat trout population that has abundant natural reproduction. Shoreline topography is very steep along the cirque headwall and is conducive to angling along about half of the lake perimeter.

Stocking History: Farmers Lake #6 was historically stocked with westslope cutthroat trout - most recently in 1975. The lake will not likely be stocked in the future as the population is self-sustaining.

Angling Pressure: Estimated angling pressure from Montana state-wide mail surveys in 2005-2009 was low and averaged < 25 angler-days per year.

Other Nearby Lakes: There are several other lakes in the vicinity Farmers Lake #6 and all are fishless. The Twin Lakes are less than 0.5 mile to the southwest and will likely be passed while accessing the lake from the Stuart Peak Trail (USFS Trail # 517). Farmers Lake #5 (Peterson Lake) lies less than 0.5 mile to the southeast and can be accessed on an unmaintained trail. Several additional, smaller lakes and ponds can be found to the west and southwest.

Montana Fish, Wildlife & Parks

Farmers Lake #6 (Cliff Lake) - Biological & Physical Information

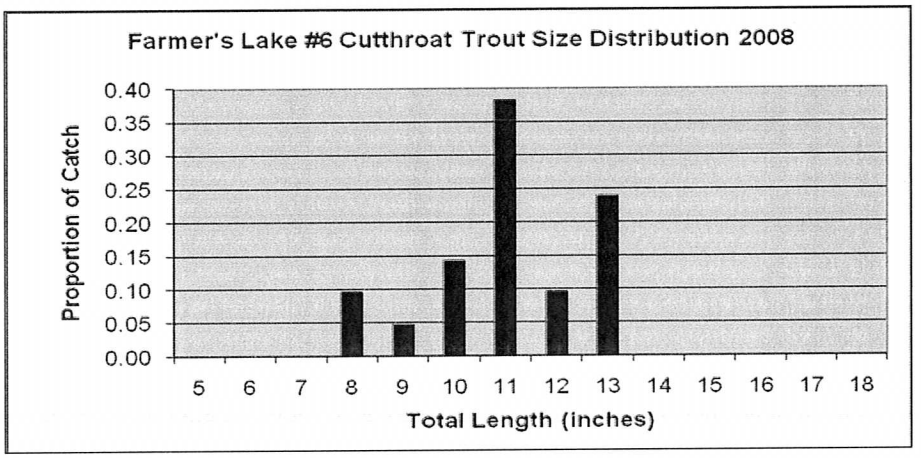
Date Sampled: 8/4/2008

Fish Species Present: Westslope cutthroat trout
Size Range Captured: 7.6–13.2 in (193-335 mm)
Trout Condition (Wr): 88 (range 70-104) (low)
Trout Diet Composition (8/13/08): Zooplankton, aquatic insects

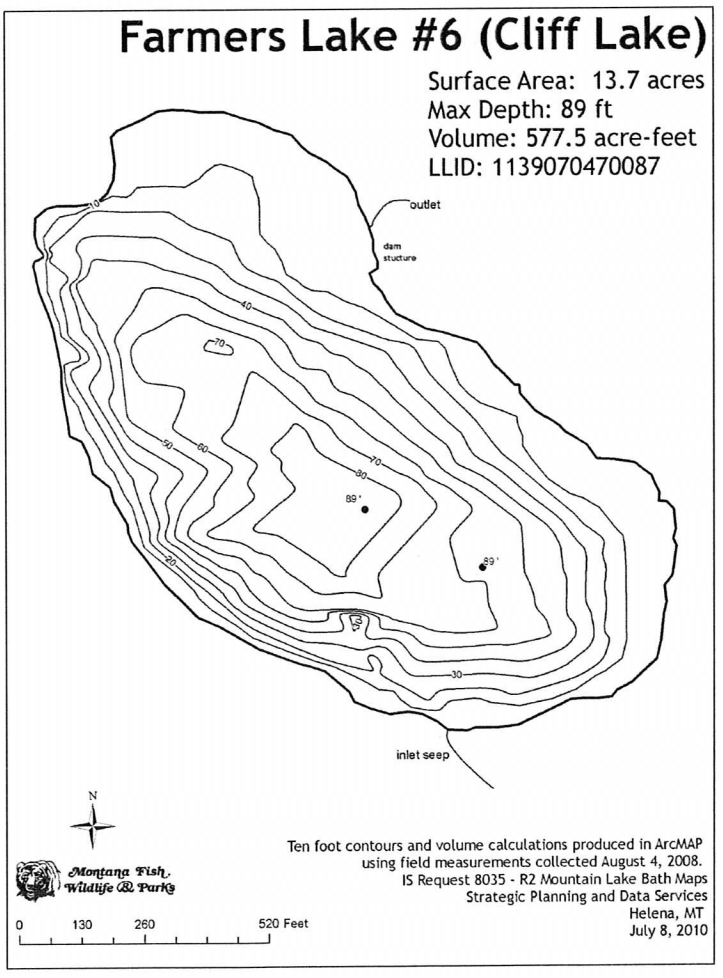
Sampling Methods: Sinking Gill Net and Angling
Gill Net Catch Rate: 1.56 trout/net/hr (moderate)
Natural Recruitment: Present (high)

Currently Stocked: No **Last Stocked**: 1975 **Species**: WCT **Recommended Frequency**: None

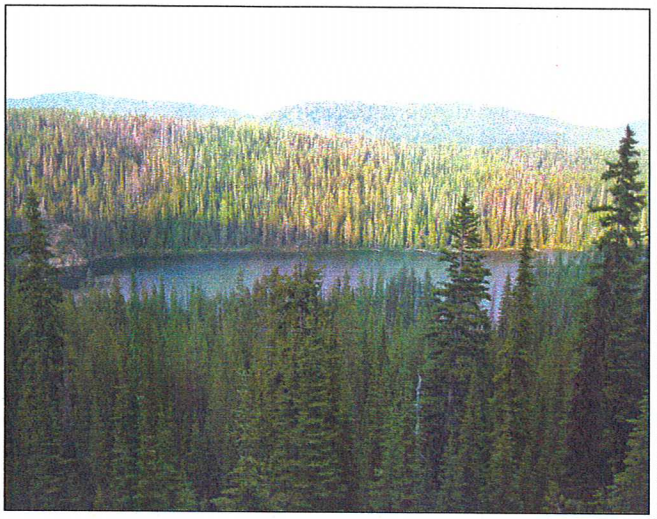
Amphibians Observed: Columbia Spotted Frogs (adults) - rare

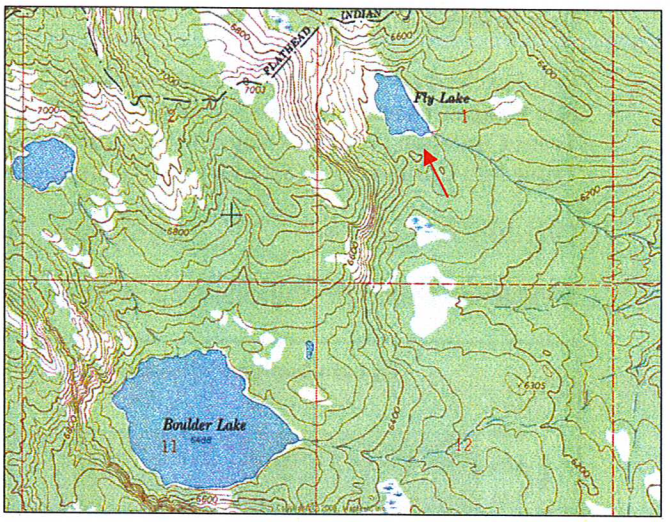


Elevation: 6,595 ft **Surface Area**: 13.7 acres (low pool) **Volume**: 577.5 acre-ft **Max Depth**: 89 ft
Secchi Depth: 41-43' **PH**: No Data **Conductivity**: No Data **TDS**: No Data **Aspect**: Northeast



Fly Lake





Description: Fly Lake is a moderate-sized (11.9 acres), semi-remote glacial cirque lake located within designated Wilderness in the Gold Creek drainage near Missoula at ~ 6,381 ft elevation.

Location:T15N, R18W, Section 1; Latitude N47.0880°, Longitude W113.8210°; Nearest Town: Missoula, MT Surrounding land ownership: Lolo National Forest (Missoula Ranger District) Fly Lake lies on the east edge of the Rattlesnake Wilderness Area.

Access: Access to Fly Lake can most easily be obtained by taking USFS Road #126 (Gold Creek Road) off of U.S. Highway 200 east of Missoula. Travel on Road #126 for ~ 9 miles, then on USFS Road #2121 for ~ 6 miles. This will take you to the head of USFS Trail #518 at the Gold Creek Trailhead. Travel on Trail #518 for ~ 1.8 miles to the junction with USFS Trail #336. Fly Lake lies ~ 1.5 miles further, at the end of Trail #336.

Camp Sites and Use: Fly Lake lies in a remote setting that receives moderate use. There is an established trail around the lake with multiple campsites and fire rings. 'Leave no trace' camping and recreating is essential, as the lake lies within designated Wilderness.

Angling Opportunity: Fly Lake supports a westslope cutthroat trout population that has moderate natural reproduction. Shoreline topography and access lend well to shoreline angling along most of the lake perimeter.

Stocking History: Fly Lake has been stocked numerous times with westslope cutthroat trout. The most recent plant was in 2007. In the future, westslope cutthroat trout stocking will likely occur every 5-7 years.

Angling Pressure: Estimated angling pressure from Montana state-wide mail surveys in 2005-2009 was low and averaged < 75 angler-days per year.

Other Nearby Lakes: There are two other lakes in the vicinity of Fly Lake. Both Boulder Lake and Gold Creek Lake lie within 1 mile, but accessing them will require strenuous off-trail hiking through steep terrain unless an alternative trail route is followed. See USFS maps to plan routes on the established trail system from either the main Gold Creek or West Fork Gold Creek trailheads.

Montana Fish, Wildlife & Parks

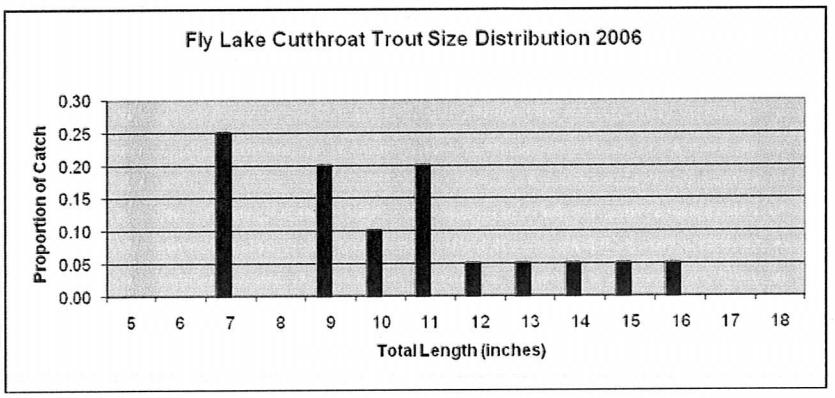
Fly Lake - Biological & Physical Information

Date Sampled: 8/28/2006

Fish Species Present: Westslope Cutthroat Trout
Size Range Captured: 6.5–16.3 in (166-413 mm)
Trout Condition (Wr): 92 (range 74-107) (moderate)
Sampling Methods: Sinking Gill Net & Angling
Gill Net Catch Rate: 1.6 trout/net/hr (moderate)
Natural Recruitment: Present (moderate)
Trout Diet Composition (8/28/06): Zooplankton, aquatic insects, snails, leeches, terrestrial insects, scuds

Currently Stocked: Yes **Last Stocked**: 2007 **Species**: WCT **Recommended Frequency**: 7 yrs

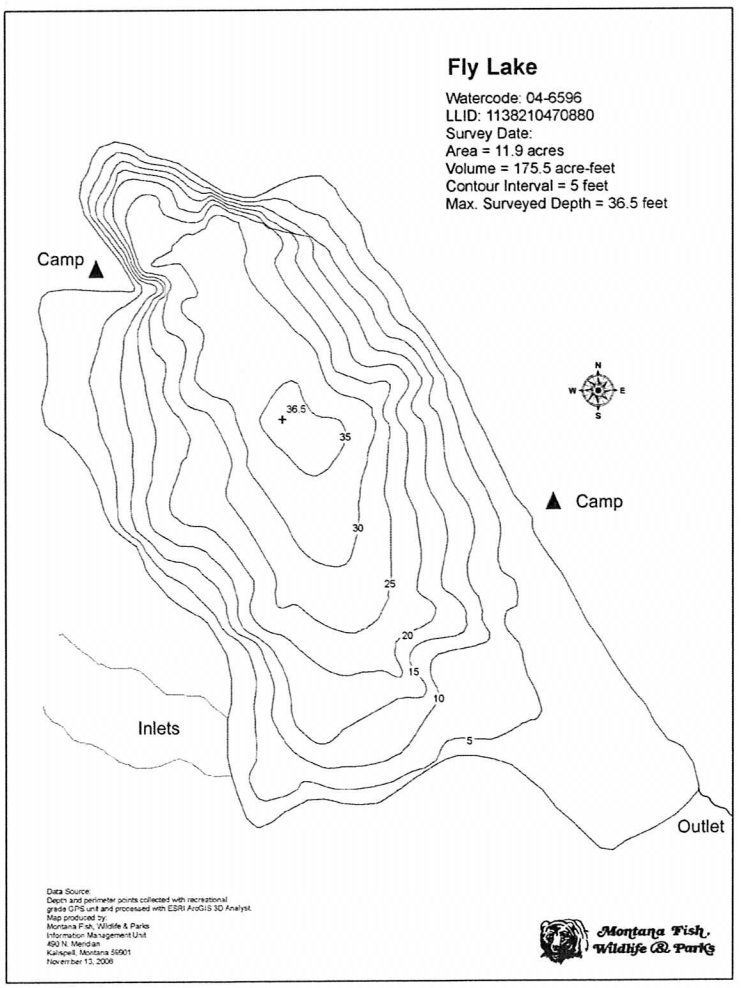
Amphibians Observed: Columbia Spotted Frogs (adults) - rare



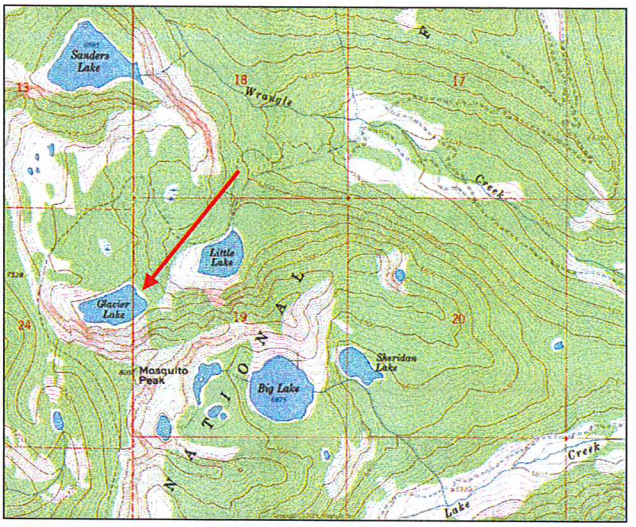
Stocking History

Year	Species	#
2007	WCT	600
2000	WCT	600
1988	WCT	634
1976	WCT	525
1973	WCT	550

Elevation: 6,381 ft **Surface Area**: 11.9 acres **Volume**: 175.5 acre-ft **Max Depth**: 36.5 ft
Secchi Depth: 28 ft **PH**: 9.3-9.5 **Conductivity**: 130-131 uS **TDS**: 65-66 ppm **Aspect**: Southeast



Glacier Lake



Description: Glacier Lake is a relatively large (18.4 acres) glacial cirque lake located at the head of the Wrangle Creek drainage (Rattlesnake Creek tributary) at ~ 6,980 ft elevation. In order to increase storage volume, the lake was artificially impounded by a dam at the outlet in 1911. This structure elevates the normal surface water elevation, but may also contribute to greater annual water level fluctuations. Glacier Lake is capable of supporting fish, but none are currently present.

Location: T15N, R19W, Section 24; Latitude N47.0448°, Longitude W113.9350°; Nearest Town: Missoula, MT Surrounding land ownership: Lolo National Forest (Missoula Ranger District). Glacier Lake lies within the Rattlesnake Wilderness Area.

Access: Although this lake is geographically very close to the city of Missoula, access is difficult. There are several USFS routes from which to choose. Route distance and difficulty varies, but all require non-motorized travel. Common starting points are the trailheads at West Fork Gold Creek (Trail # 52), Ravine Creek in lower Grant Creek (Trail # 34), or in lower Rattlesnake Creek at the main Rattlesnake National Recreation Area trailhead (Gated Road #99). Please refer to USFS maps for specific travel routes and connecting trail numbers. Total travel distance from trailheads to lake ranges from 9-17 miles.

Camp Sites and Use: Glacier Lake lies in a remote setting that receives light use. There is an established trail to the lake, but no campsites or fire rings. 'Leave no trace' camping and recreating is essential, as the lake lies within the Rattlesnake Wilderness.

Angling Opportunity: At the time of the most recent sampling (August 2007), no fish were present in Glacier Lake.

Stocking History: Stocking records indicate that Glacier Lake was historically planted with westslope cutthroat trout. Stocking was discontinued in the 1980s and the trout population did not persist, likely due to the lack of suitable spawning habitat. No future stocking is planned for this lake.

Other Nearby Lakes: There are two other lakes in the immediate vicinity of Glacier Lake. Little Lake lies less than 0.5 mi to the east and Sanders Lake lies ~ 0.9 mi to the north. Both lakes are easily accessible via established trails from Glacier Lake (USFS Trails #502 & #517). Big Lake and Sheridan Lake are also less than one mile southeast of Glacier Lake, but accessing them directly from Glacier Lake would be difficult as they lie on the opposite side of a steep ridge.

Montana Fish, Wildlife & Parks

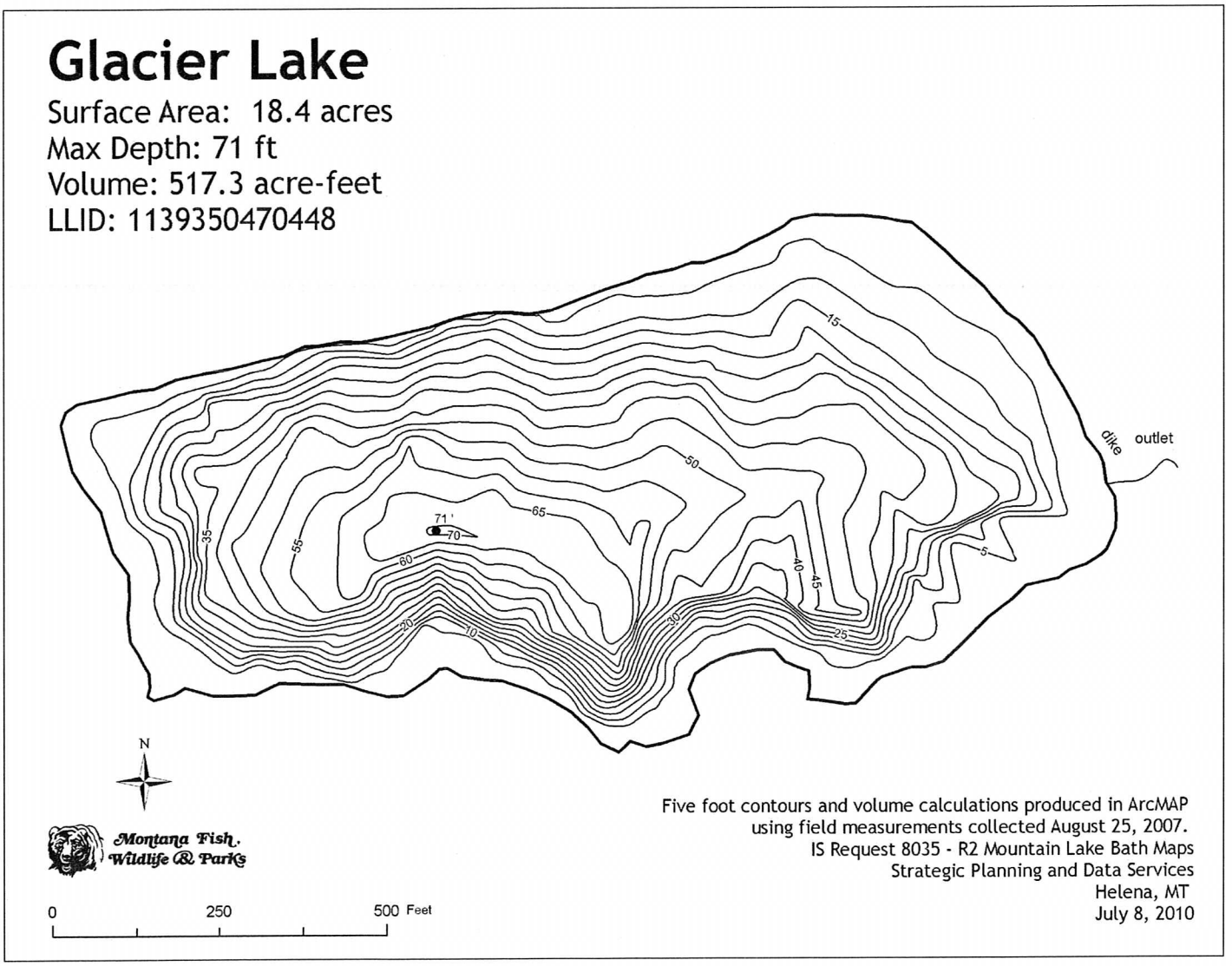
Glacier Lake - Biological & Physical Information

Date Sampled: 8/25/2007 **Fish Species Present**: None **Sampling Methods**: Sinking Experimental Gillnets (2)

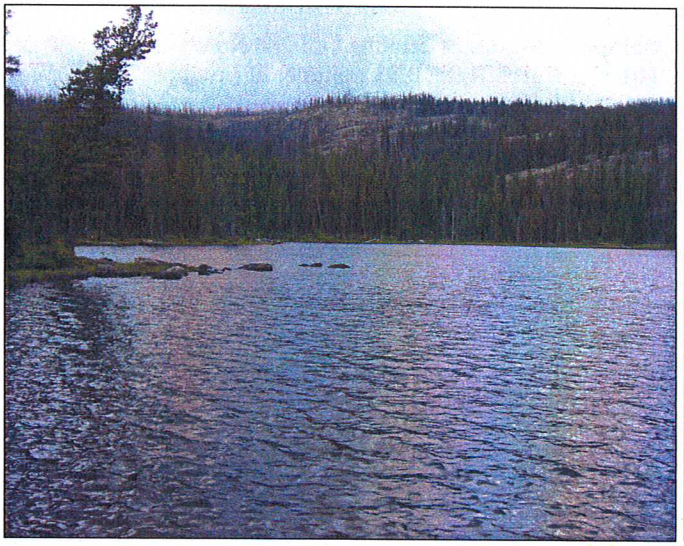
Currently Stocked: No **Last Stocked**: 1971 **Species**: WCT **Recommended Frequency**: None

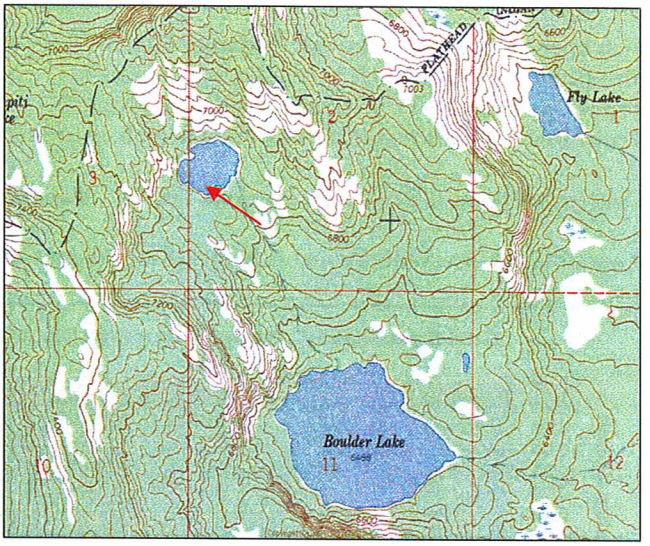
Amphibians Observed: None

Elevation: 6,980 ft **Surface Area**: 18.4 acres **Volume**: 517 acre-ft **Max Depth**: 71 ft
Secchi Depth: 17 ft **PH**: No Data **Conductivity**: 7-8 uS **TDS**: 3-4 ppm **Aspect**: ENE



Gold Creek Lake





Description: Gold Creek Lake is a moderate-sized (13.8 acres), remote glacial cirque lake located in the Rattlesnake Wilderness in the Gold Creek drainage near Missoula at 6,870 ft elevation.

Location:T15N, R18W, Section 2; Latitude N47.0855°, Longitude W113.8470°; Nearest Town: Missoula, MT Surrounding land ownership: Lolo National Forest (Missoula Ranger District). Gold Creek Lake lies in the eastern portion of the Rattlesnake Wilderness Area.

Access: Access to Gold Creek Lake can most easily be obtained by taking USFS Road #126 (Gold Creek Road) off of U.S. Highway 200 east of Missoula. Travel on Road #126 for ~ 6 miles, then USFS Road #2103 for ~ 5 miles and finally USFS Road #4323 for ~ 5 miles to the West Fork Gold Creek Trailhead and USFS Trail #333. From here, it is a ~ 5.5 mile hike on Trail #333 to Boulder Lake. From Boulder Lake, hike ~ 0.7 mile up the stream drainage on the northwest side of Boulder Lake (off-trail). This stream is the outlet of Gold Creek Lake. Gold Creek Lake can also be reached by hiking off-trail across difficult terrain for ~ 1.2 mi to the west from Fly Lake.

Camp Sites and Use: Gold Creek Lake lies in a remote setting that receives light use. There is a remnant trail around the lake and a campsite with fire ring. 'Leave no trace' camping and recreating is essential, as the lake lies within the Rattlesnake Wilderness.

Angling Opportunity: Gold Creek Lake supports a westslope cutthroat trout population that has limited natural reproduction and is supplemented with stocking. Shoreline topography and access lend well to shoreline angling along most of the lake perimeter.

Stocking History: Gold Creek Lake has been stocked numerous times with westslope cutthroat trout - most recently in 2007. In the future, Gold Creek Lake will likely be stocked every 5-7 years with westslope cutthroat trout.

Angling Pressure: Estimated angling pressure from Montana state-wide mail surveys in 2005-2009 was moderate and averaged ~ 100 angler-days per year.

Other Nearby Lakes: There are two other lakes in the vicinity of Gold Creek Lake. Boulder Lake is less than a mile southeast of Gold Creek Lake, and getting to it requires off-trail hiking through steep and densely forested terrain. Fly Lake lies ~ 1.2 mi to the east-northeast and would also require off-trail hiking to reach it from Gold Creek Lake.

Montana Fish, Wildlife & Parks

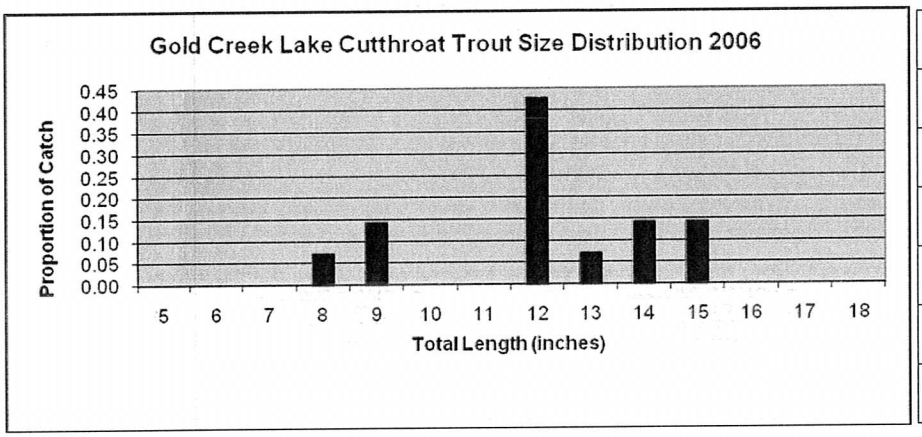
Gold Creek Lake - Biological & Physical Information

Date Sampled: 8/31/2006

Fish Species Present: Westslope Cutthroat Trout
Size Range Captured: 8.5–14.9 in (216-379 mm)
Trout Condition (Wr): 95 (range 83-121) (moderate)
Sampling Methods: Sinking Gill Net & Angling
Gill Net Catch Rate: 0.88 trout/net/hr (low)
Natural Recruitment: Present (limited)
Trout Diet Composition (8/31/06): Zooplankton, aquatic insects, terrestrial insects, scuds

Currently Stocked: Yes **Last Stocked**: 2007 **Species**: WCT **Recommended Frequency**: 5-7 yrs

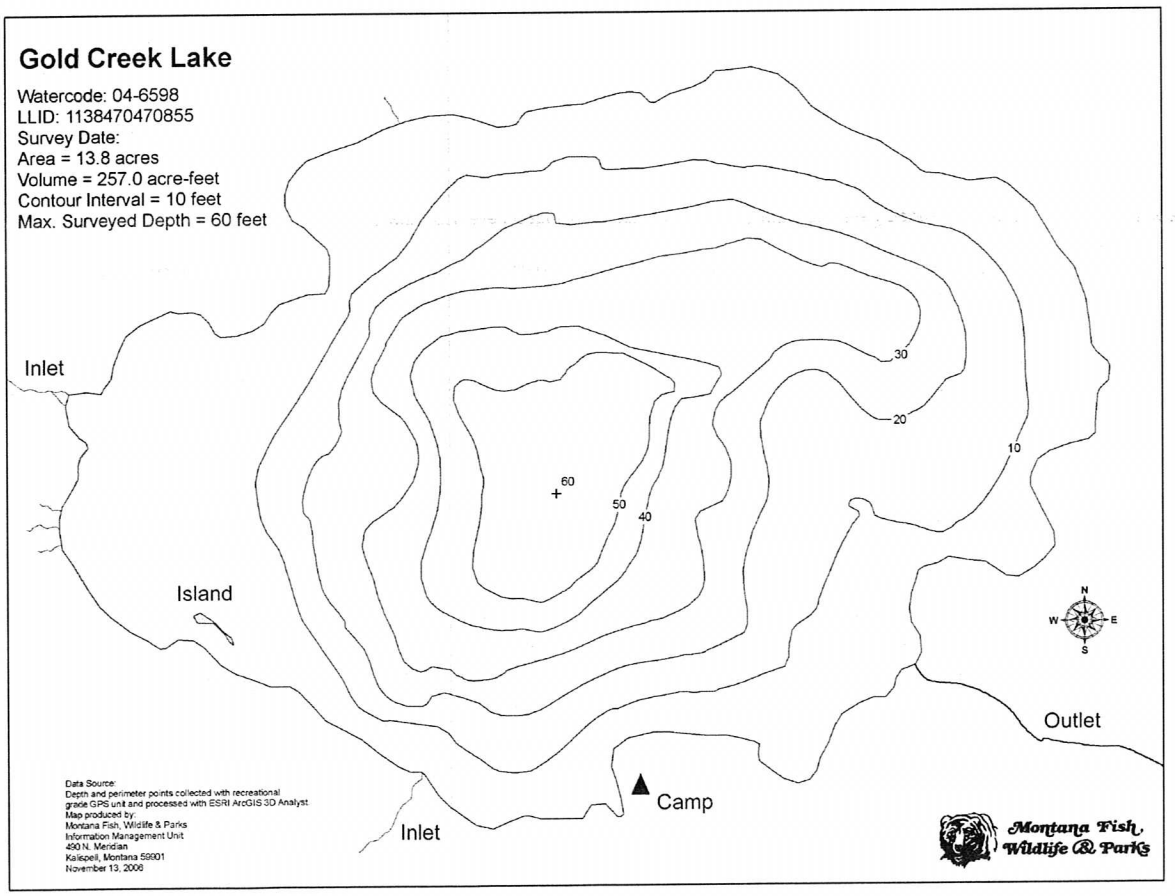
Amphibians Observed: Columbia Spotted Frogs (adults & larvae) - common



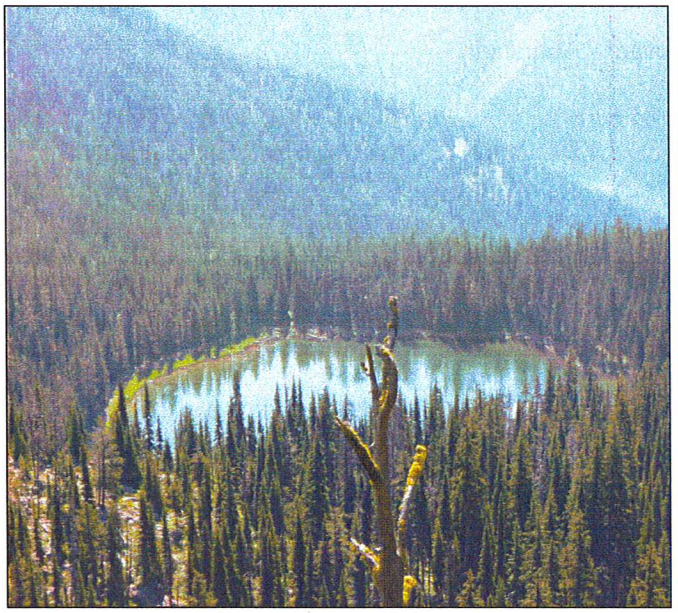
Stocking History

Year	Species	#
2007	WCT	600
2000	WCT	600
1988	WCT	634
1978	WCT	576
1976	WCT	600
1973	WCT	660

Elevation: 6,870 ft **Surface Area**: 13.8 acres **Volume**: 257.0 acre-ft **Max Depth**: 60 ft
Secchi Depth: 23 ft **PH**: 9.2-9.3 **Conductivity**: 20-21 uS **TDS**: 10 ppm **Aspect**: Southeast



Grant Creek Lake #1 (Rankin Lake)



Description: Grant Creek Lake #1 (Rankin Lake) is a small (6.7 acres), glacial cirque lake located within the Rattlesnake Wilderness in the Grant Creek drainage near Missoula at ~ 6,815ft elevation. This lake is one of three found in the upper Grant Creek drainage.

Location:T15N, R19W, Section 27; Latitude N47.0319°, Longitude W113.9824°; Nearest Town: Missoula, MT Surrounding land ownership: Lolo National Forest (Missoula Ranger District). Grant Creek Lake #1 is located near the western border of the Rattlesnake Wilderness Area, adjacent to Montana Snowbowl ski area.

Access: There are two primary routes that provide public access to the lake. The first is via USFS Trail # 516 to the southeast, and the other through Montana Snowbowl Ski Area. To reach the lake from Trail #516, travel north approximately 3.5 miles from the trailhead off of USFS Road #460. Leave the trail and follow the outlet stream drainage to the northeast for ~ 1 mile. Travel to the lake from the trail system will require strenuous hiking over steep, difficult terrain. The second route involves the summer lift service at Montana Snowbowl Ski Area or hiking up a trail within the ski area (Beargrass Highway). The Grizzly Chair runs up to 6,960 ft elevation, and 1 mile of hiking is required to reach the lake over the ridge (North Dakota Downhill ski run). Contact Montana Snowbowl Ski Area for information on fees and lift service.

Camp Sites and Use: Grant Creek Lake #1 is adjacent to Montana Snowbowl ski area but receives limited recreational use. There are no established trails or campsites around the lake. 'Leave no trace' camping and recreating are essential, as the lake lies within designated Wilderness.

Angling Opportunity: None. No fish were observed or captured at the time of sampling in 2012.

Stocking History: Despite adequate size and depth to support fish, there are no official records of stocking in Grant Creek Lake #1. There are no plans to stock the lake in the future.

Other nearby Lakes: There are only two other lakes (> 1 acre) in the Grant Creek drainage and neither lies in close proximity to Grant Creek Lake #1.

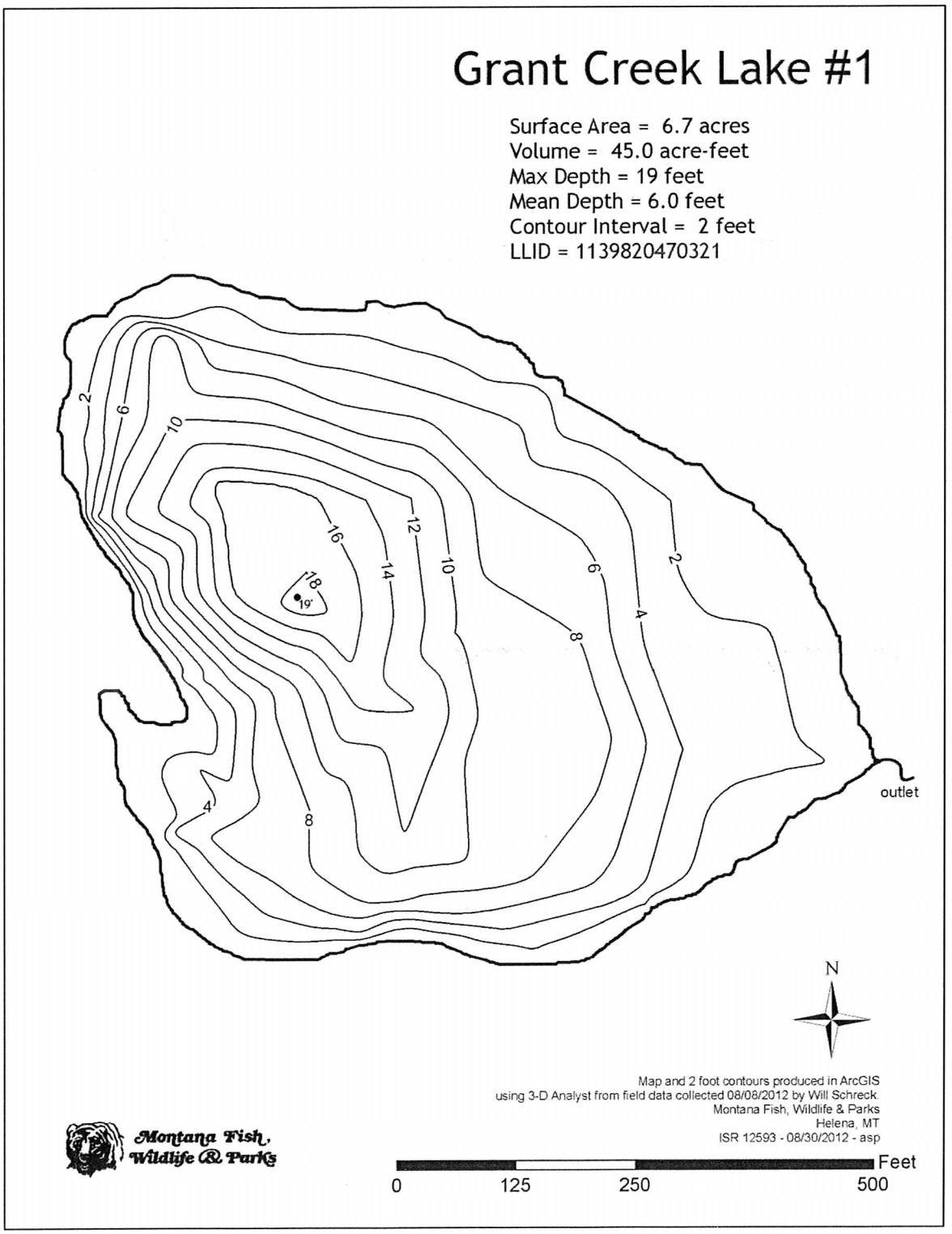
Montana Fish, Wildlife & Parks

Grant Creek Lake #1 - Biological & Physical Information:

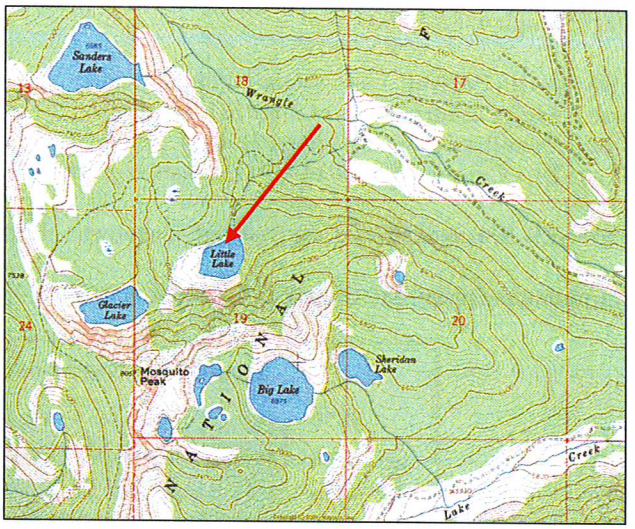
Date Sampled: 8/8/2012 **Fish Species Present**: None **Sampling Methods**: Sinking Experimental Gillnet

Amphibians Observed: Columbia spotted frogs (adults, larvae) - Abundant

Elevation: 6,815 ft **Surface Area**: 6.7 acres **Volume**: 45 acre-ft **Max Depth**: 19 ft
Secchi Depth: 15 ft **PH**: NA **Conductivity**: NA **TDS**: NA **Aspect**: Southeast



Little Lake



Description: Little Lake is a moderate-sized (~ 14 acres), remote glacial cirque lake, located within designated Wilderness in the Rattlesnake Creek drainage near Missoula at ~ 6,425 ft elevation. In order to increase storage volume, the lake has been artificially impounded by a dam at the outlet. This structure elevates the normal surface water elevation, but may also contribute to greater annual water level fluctuations.

Location: T15N, R18W, Section 19; Latitude N47.0478°, Longitude W113.9240°; Nearest Town: Missoula, MT Surrounding land ownership: Lolo National Forest (Missoula Ranger District). Little Lake lies in the Wrangle Creek drainage within the Rattlesnake Wilderness Area.

Access: Although Little Lake is geographically close to the city of Missoula, access is difficult. There are several USFS routes from which to choose. Route distance and difficulty vary, but all require non-motorized travel. Common starting points are the trailheads at West Fork Gold Creek (Trail # 52), Ravine Creek in lower Grant Creek (Trail # 34), or in lower Rattlesnake Creek at the main Rattlesnake National Recreation Area trailhead (Gated Road #99). Please refer to USFS maps for specific travel routes and connecting trail numbers. Total travel distance from trailheads to lake ranges from 8-16 miles.

Camp Sites and Use: Little Lake lies in a remote setting that receives light use. There is an established trail to the lake and a campsite near the north end of the dam embankment. 'Leave no trace' camping and recreating is essential, as this lake lies within designated Wilderness.

Angling Opportunity: Little Lake supports a wild Yellowstone cutthroat trout population that has abundant natural reproduction. Shoreline topography lends well to angling along most of the lake perimeter.

Stocking History: Although there are no records of stocking, Little Lake was apparently planted with Yellowstone cutthroat trout in the mid-1900s. No stocking has been reported since that time and no future stocking is anticipated as the cutthroat trout population is self-sustaining.

Angling Pressure: Estimated angling pressure from Montana state-wide mail surveys in 2005-2009 was low and averaged less than 25 angler-days per year.

Other Nearby Lakes: There are two other lakes in the immediate vicinity of Little Lake. Glacier Lake is less than 0.5 mi to the west and Sanders Lake lies ~ 0.8 mi to the northwest. Both lakes are easily accessible via established trails from Little Lake (USFS Trails #502 & #517). Big Lake and Sheridan Lake are also less than 1 mile southeast of Little Lake, but accessing them directly would be difficult as they lie on the opposite side of a steep ridge.

Montana Fish, Wildlife & Parks

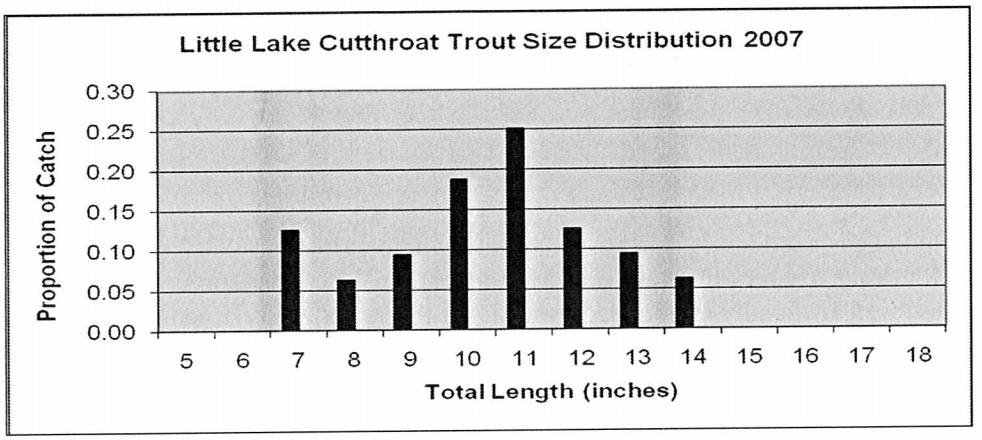
Little Lake - Biological & Physical Information

Date Sampled: 8/24/2007

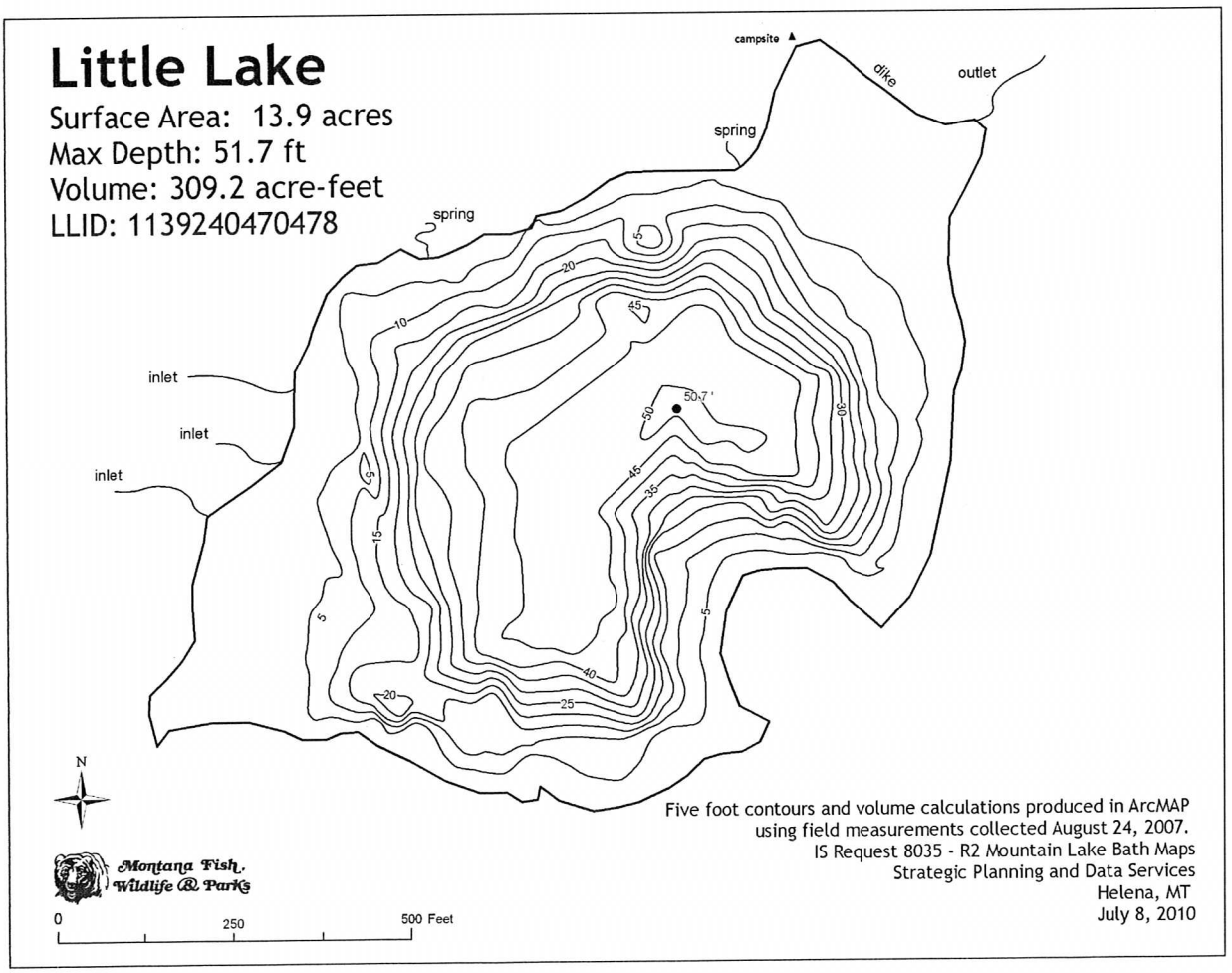
Fish Species Present: Yellowstone cutthroat trout
Size Range Captured: 7.1–14.3 in (181-363 mm)
Trout Condition (Wr): 87 (range 71-103) (low)
Sampling Methods: Sinking Gill Net & Angling
Gill Net Catch Rate: 1.25 trout/net/hr (moderate)
Natural Recruitment: Present (abundant)
Trout Diet Composition (8/24/07): Zooplankton, aquatic insects, terrestrial insects, leeches

Currently Stocked: No **Last Stocked**: Unknown - Prior to 1988 **Species**: YCT **Recommended Frequency**: None

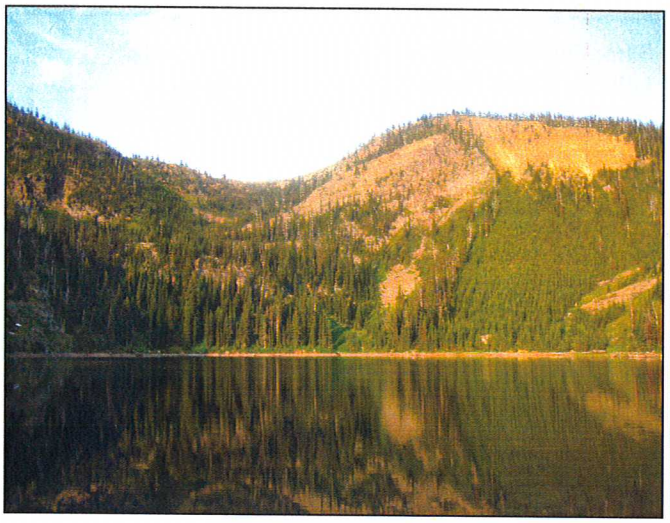
Amphibians Observed: Columbia spotted frog (adults) – rare

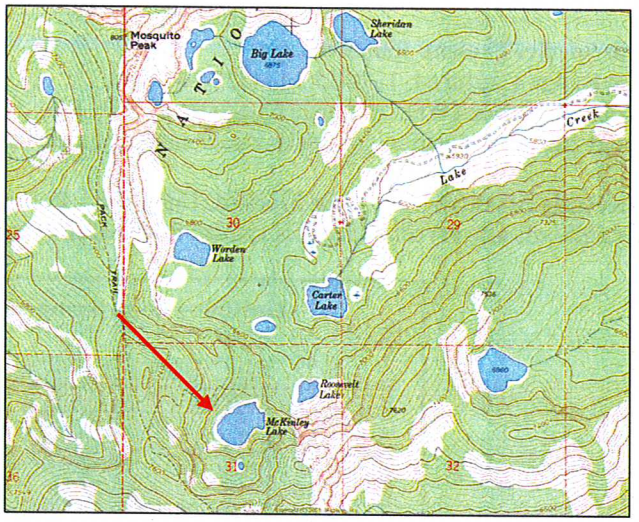


Elevation: 6,425 ft **Surface Area**: 13.9 acres (low pool) **Volume**: 51.7 acre-ft (low pool) **Max Depth**: 51 ft
Secchi Depth: 30 ft **PH**: 7.5-7.8 **Conductivity**: 4-5 uS **TDS**: 2 ppm **Aspect**: ENE



McKinley Lake





Description: McKinley Lake is a moderate-sized (15.8 acres), remote glacial cirque lake located within designated Wilderness in the Rattlesnake Creek drainage near Missoula at ~ 6,860 ft elevation. In order to increase storage volume, the lake has been artificially impounded by a dam at the outlet. This structure elevates the normal surface water elevation, but may also increase annual water level fluctuations.

Location: T15N, R18W, Section 31; Latitude N47.0177°, Longitude W113.9210°; Nearest Town: Missoula, MT Surrounding land ownership: Lolo National Forest (Missoula Ranger District). McKinley Lake lies in the southern portion of the Rattlesnake Wilderness Area at the head of Lake Creek.

Access: Although this lake is geographically close to the city of Missoula, access is difficult. There are several USFS routes from which to choose. Route distance and difficulty vary, but all require non-motorized travel. Common starting points are the trailheads at West Fork Gold Creek (Trail # 52), Ravine Creek in lower Grant Creek (Trail # 34), or in lower Rattlesnake Creek at the main Rattlesnake National Recreation Area trailhead (Gated Road #99). Please refer to USFS maps for specific travel routes and connecting trail numbers. Total travel distance from trailheads to lake ranges from 8-16 miles.

Camp Sites and Use: McKinley Lake lies in a remote setting that receives light use. There is an established trail to the lake and two campsites; one on each end of the dam embankment. 'Leave no trace' camping and recreating is essential, as this lake lies within designated Wilderness.

Angling Opportunity: McKinley Lake supports a wild rainbow trout population with limited natural reproduction. Shoreline topography and access lend well to shoreline angling from most of the lake perimeter.

Stocking History: McKinley Lake was historically stocked with rainbow trout and has not been planted in recent decades. There are no plans to stock in the future as the rainbow trout population is self-sustaining.

Angling Pressure: Estimated angling pressure from Montana state-wide mail surveys in 2005-2009 was low and averaged < 25 angler-days per year.

Other Nearby Lakes: There are seven lakes (> 1 acre) within a mile of McKinley Lake and three of these are fish-bearing. Carter Lake (~ 0.6 mi to the northeast on USFS Trail #534), Worden Lake (~ 0.8 mi to the north on USFS Trail #534 and spur), and Cliff Lake (~ 1 mi to the southeast on USFS Trails #534,#517, and #330) can all be accessed via established USFS trails from McKinley Lake.

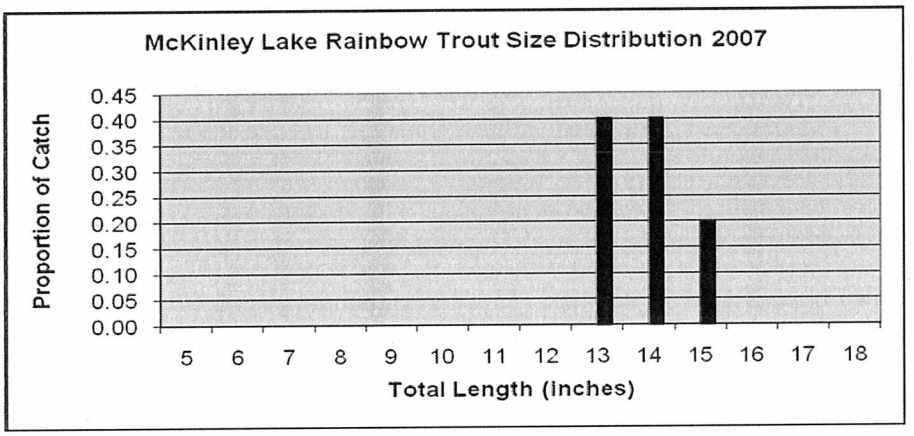
McKinley Lake - Biological & Physical Information

Date Sampled: 7/13/2007

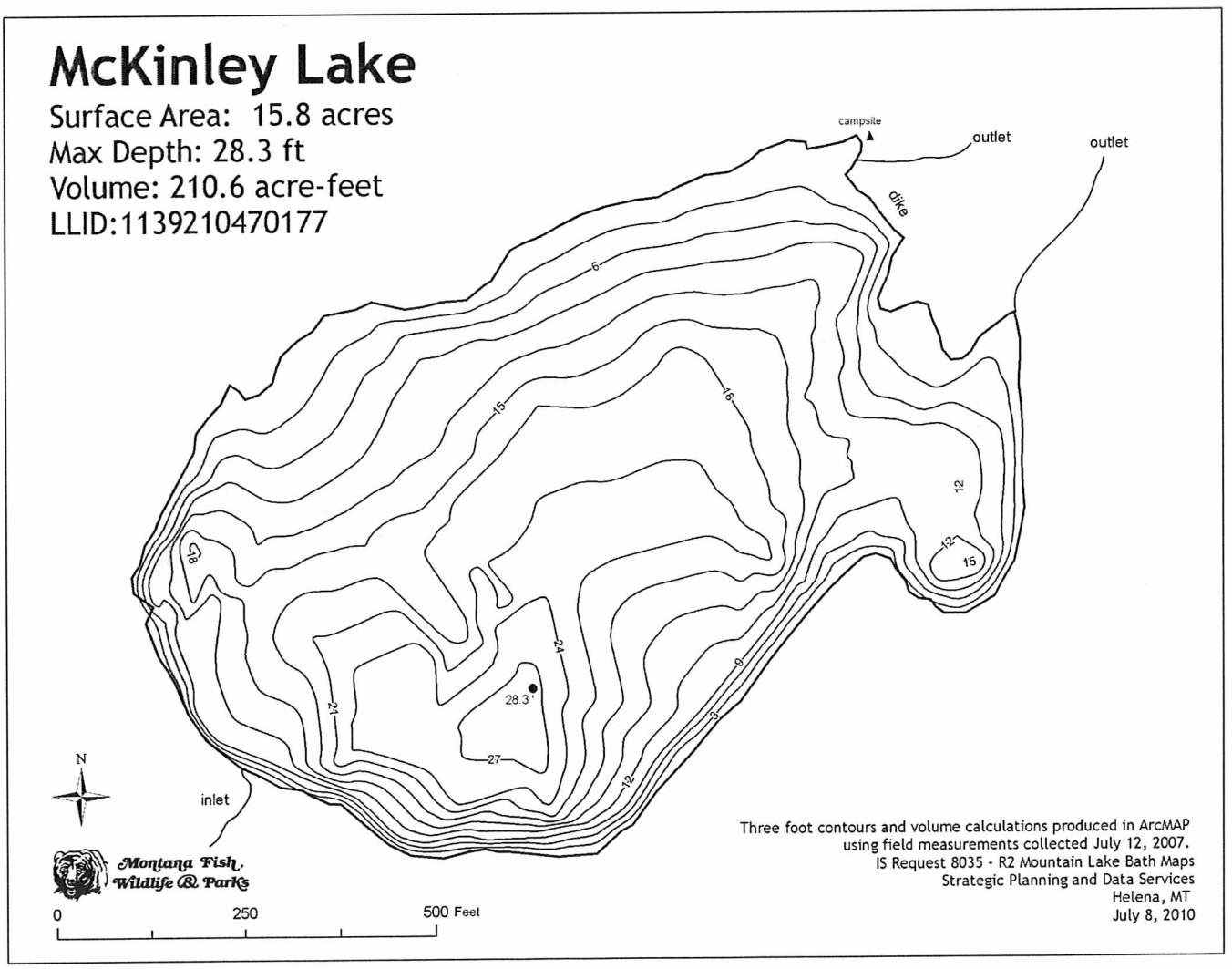
Fish Species Present: Rainbow trout
Size Range Captured: 13.0–15.3 in (331-388 mm)
Trout Condition (Wr): 76 (range 68-85) (low)
Trout Diet Composition (7/13/07): Zooplankton, aquatic insects, leeches

Sampling Methods: Sinking Gill Net & Angling
Gill Net Catch Rate: 0.23 trout/net/hr (low)
Natural Recruitment: Present (limited)

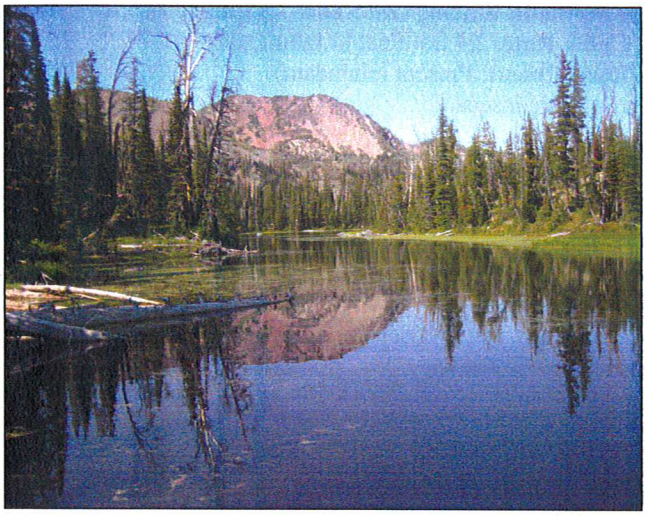
Currently Stocked: No **Last Stocked**: Unknown – Prior to 1988 **Species**: RBT **Recommended Frequency**: None
Amphibians Observed: Columbia spotted frogs (adult) - common

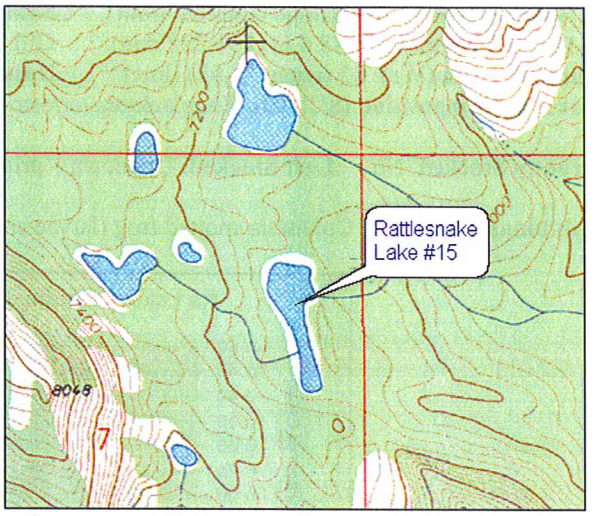


Elevation: 6,860 ft **Surface Area**: 15.8 acres **Volume**: 211 acre-ft **Max Depth**: 28.3 ft
Secchi Depth: >28.3 ft (max depth) **PH**: 7.3-8.8 **Conductivity**: 4-7 uS **TDS**: 2 ppm **Aspect**: Northeast



Rattlesnake Lake #15





Description: Rattlesnake Lake #15 is a small (5.6 acres), very remote, sub-alpine lake located within designated Wilderness in the Rattlesnake Creek drainage near Missoula at 7,102 ft elevation.

Location: T15N, R18W, Section 7; Latitude N47.0764°, Longitude W113.9156°; Nearest Town: Missoula, MT Surrounding land ownership: Lolo National Forest (Missoula Ranger District). Rattlesnake Lake #15 lies within the "Five Lakes Basin" portion of the Rattlesnake Wilderness Area.

Access: Although the lake is geographically close to the city of Missoula, access is very difficult and requires substantial off-trail travel through steep terrain. There are several USFS routes from which to choose. Route distance and difficulty vary, but all require non-motorized travel. Common starting points are the trailheads at West Fork Gold Creek (Trail # 52), Ravine Creek in lower Grant Creek (Trail # 34), or in lower Rattlesnake Creek at the main Rattlesnake National Recreation Area trailhead (Gated Road #99). Please refer to USFS maps for specific travel routes and connecting trail numbers to reach the upper Rattlesnake basin on USFS Trail #515. From the end of this trail, access will require a ~ 2.5 mi off-trail climb of ~ 1,100 ft to reach the lake. Total travel distance from USFS trailheads ranges from 9-17 miles. There may also be shorter, alternative routes to this lake through the Flathead Indian Reservation from the northwest.

Camp Sites and Use: Rattlesnake Lake #15 lies in a remote setting that receives very light use. There are no established trails to the lake and no campsites. 'Leave no trace' camping and recreating is essential, as this lake lies within designated Wilderness.

Angling Opportunity: Rattlesnake Lake #15 supports an abundant westslope cutthroat trout population with consistent natural reproduction. Shoreline topography allows for angling along most of the lake perimeter.

Stocking History: This lake was historically stocked with westslope cutthroat trout, but has not been planted in recent decades. The lake supports an abundant, self-sustaining trout population, so no future stocking is planned.

Angling Pressure: Due to difficult access, angling pressure is very light (likely < 20 angler-days per year).

Other Nearby Lakes: There are five other lakes (> 1 acre) within 0.75 mile in the "Five Lakes Basin" area where Rattlesnake Lake #15 lies. One of these, Rattlesnake Lake #17, supports a fish population. McLeod Lake (Rattlesnake Lake #22) also supports fish and lies ~ 1 mile to the north. Travel to all of these lakes will require off-trail hiking in steep terrain.

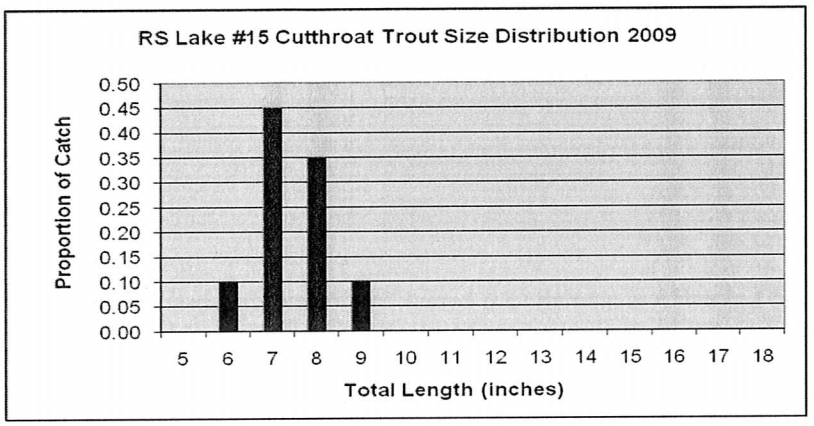
Rattlesnake Lake #15 - Biological & Physical Information

Date Sampled: 8/28/2009

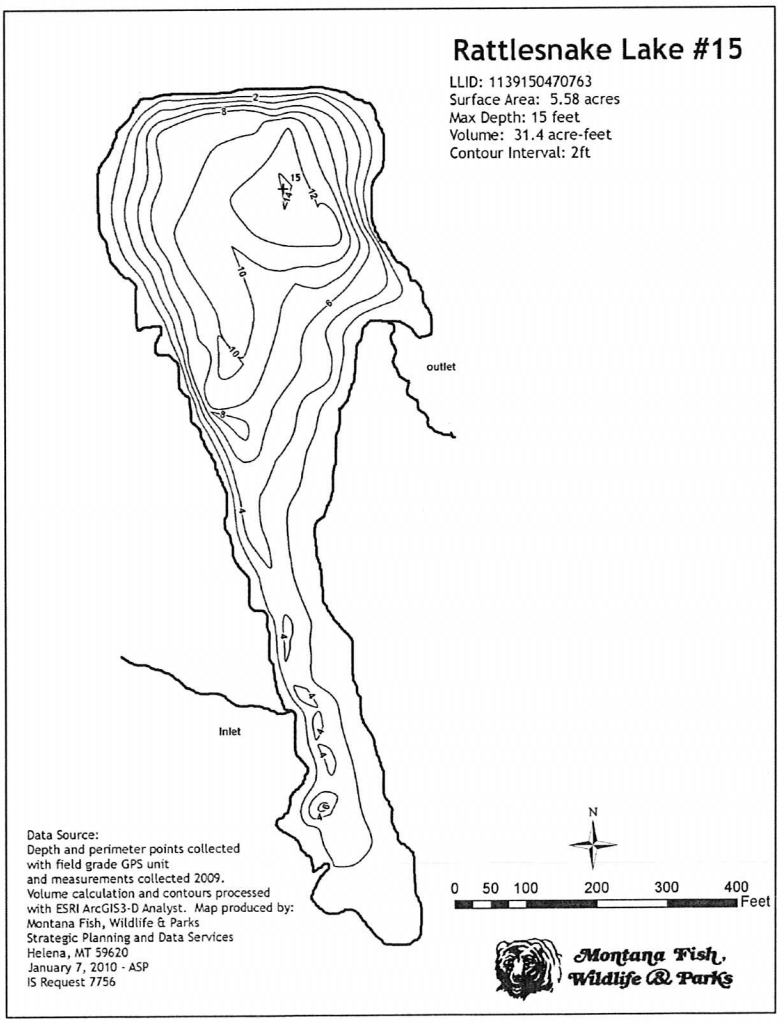
Fish Species Present: Westslope cutthroat trout
Size Range Captured: 6.4-8.6 in (164-220 mm)
Trout Condition (Wr): 82 (range 72-97) (low)
Sampling Methods: Sinking Gill Net & Angling
Gill Net Catch Rate: 2.4 trout/net/hr (abundant)
Natural Recruitment: Present (abundant)
Trout Diet Composition (8/28/09): Zooplankton, terrestrial and aquatic insects

Currently Stocked: No **Last Stocked**: Unknown – prior to 1988 **Species**: WCT **Recommended Frequency**: None

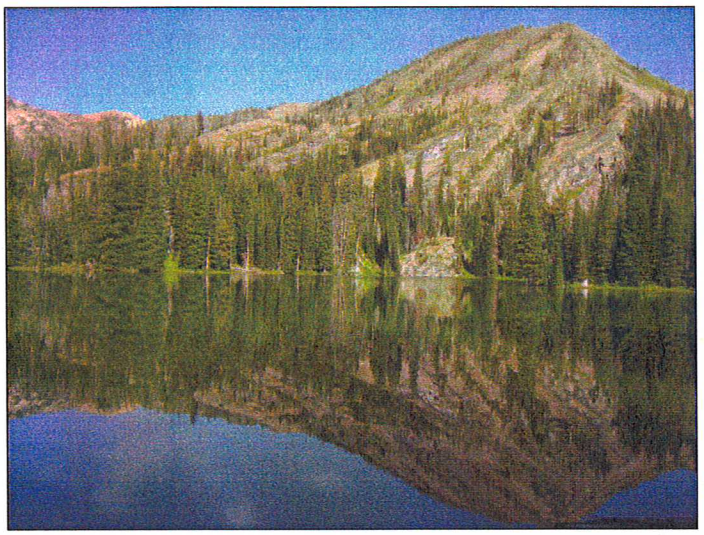
Amphibians Observed: Columbia spotted frog (larvae and adults) - common

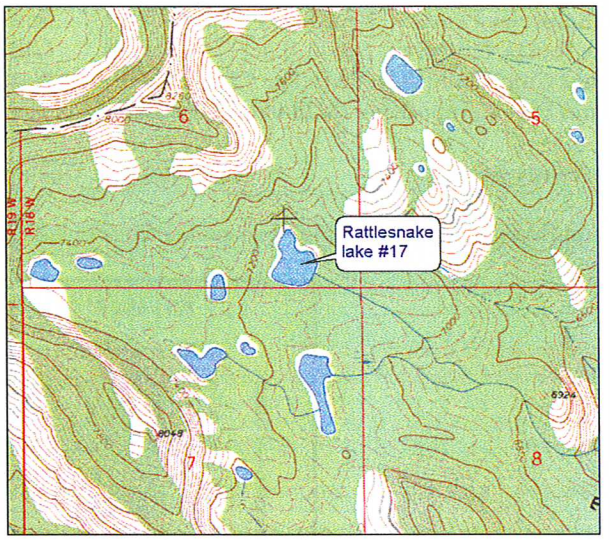


Elevation: 7,102 ft **Surface Area**: 5.6 acres **Volume**: 31.4 acre-ft **Max Depth**: 15 ft **Aspect**: South
Secchi Depth: 13 ft **PH**: No Data **Conductivity**: No Data **TDS**: No Data **Dissolved Oxygen**: 7.2-8.2 ppm



Rattlesnake Lake #17





Description: Rattlesnake Lake #17 is a small (7.8 acres), very remote, sub-alpine lake located within designated Wilderness in the Rattlesnake Creek drainage near Missoula at 7,112 ft elevation.

Location: T15N, R18W, Section 6; Latitude N47.0809°, Longitude W113.9169; Nearest Town: Missoula, MT Surrounding land ownership: Lolo National Forest (Missoula Ranger District). Rattlesnake Lake #17 lies within the "Five Lakes Basin" portion of the Rattlesnake Wilderness Area.

Access: Although the lake is geographically close to the city of Missoula, access is very difficult and requires substantial off-trail travel through steep terrain. There are several USFS routes from which to choose. Route distance and difficulty vary, but all require non-motorized travel. Common starting points are the trailheads at West Fork Gold Creek (Trail # 52), Ravine Creek in lower Grant Creek (Trail # 34), or in lower Rattlesnake Creek at the main Rattlesnake National Recreation Area trailhead (Gated Road #99). Please refer to USFS maps for specific travel routes and connecting trail numbers to reach the upper Rattlesnake basin on USFS Trail #515. From the end of this trail, access will require a ~ 1.5 mile off-trail climb of ~ 1,100 ft to reach the lake. Total travel distance from USFS trailheads ranges from 9-17 miles. There may also be shorter, alternative routes through the Flathead Indian Reservation from the northwest.

Camp Sites and Use: Rattlesnake Lake #17 lies in a remote setting that receives very light use. There are no established trails to the lake and no campsites. 'Leave no trace' camping and recreating is essential, as this lake lies within designated Wilderness.

Angling Opportunity: Rattlesnake Lake #17 supports an abundant westslope cutthroat trout population with consistent natural reproduction. Shoreline topography allows for angling along most of the lake perimeter.

Stocking History: This lake was historically stocked with westslope cutthroat trout, but has not been planted in recent decades. The lake supports an abundant, self-sustaining trout population, so no future stocking is planned.

Angling Pressure: Due to difficult access, angling pressure is very light (likely < 20 angler-days per year).

Other Nearby Lakes: There are five other lakes (> 1 acre) within 0.75 mile in the "Five Lakes Basin" area where Rattlesnake Lake #17 lies. One of these, Rattlesnake Lake #15, supports a fish population. McLeod Lake (Rattlesnake Lake #22) also supports fish and lies ~ 1 mile to the north. Travel to all of these lakes will require off-trail hiking in steep terrain.

Montana Fish, Wildlife & Parks

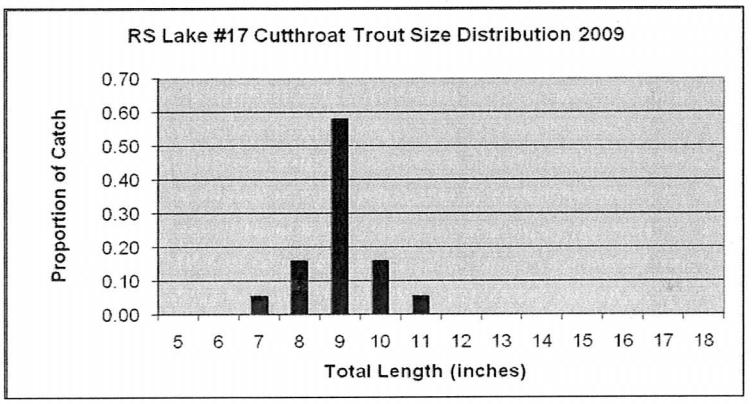
Rattlesnake Lake #17 - Biological & Physical Information

Date Sampled: 8/28/2009

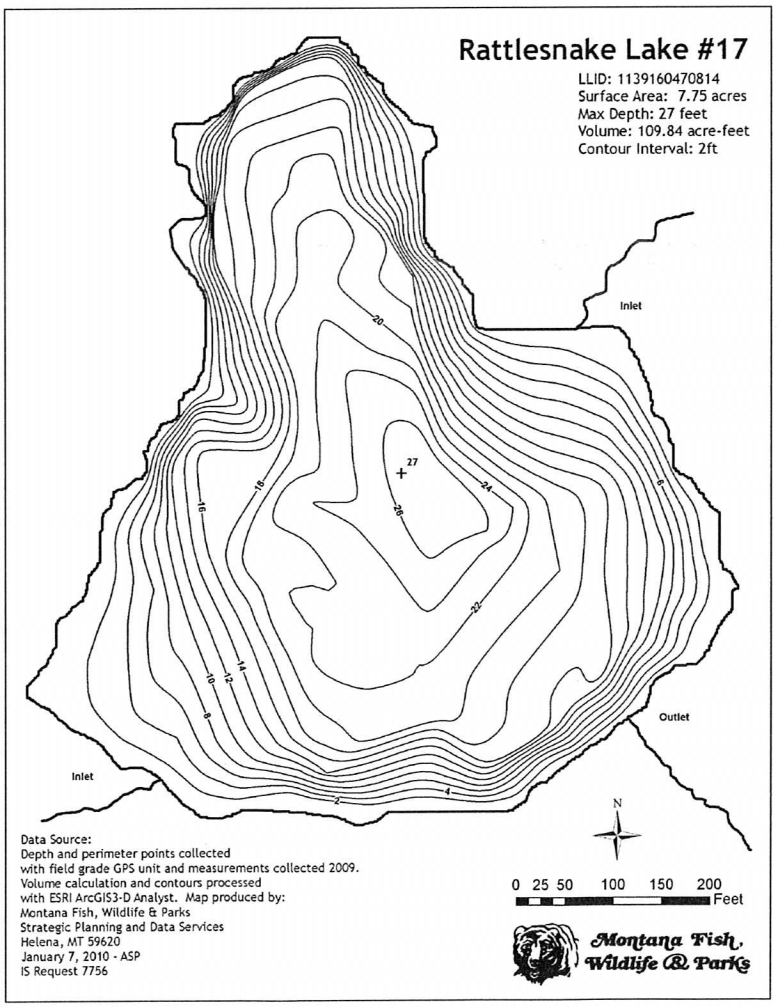
Fish Species Present: Westslope cutthroat trout
Size Range Captured: 6.8-11.0 in (175-281mm)
Trout Condition (Wr): 86 (range 72-97) (low)
Sampling Methods: Sinking Gill Net & Angling
Gill Net Catch Rate: 3.2 trout/net/hr (abundant)
Natural Recruitment: Present (abundant)
Trout Diet Composition (8/28/09): Zooplankton and aquatic insects

Currently Stocked: No **Last Stocked**: Unknown **Species**: WCT **Recommended Frequency**: None

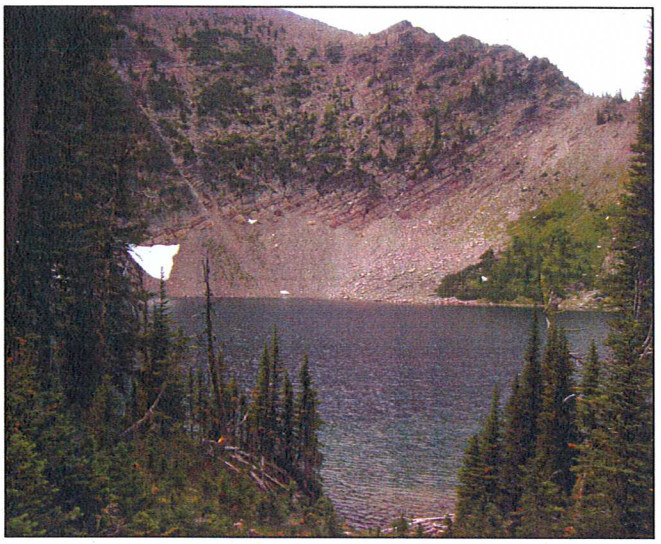
Amphibians Observed: Columbia spotted frogs (adults only) - common

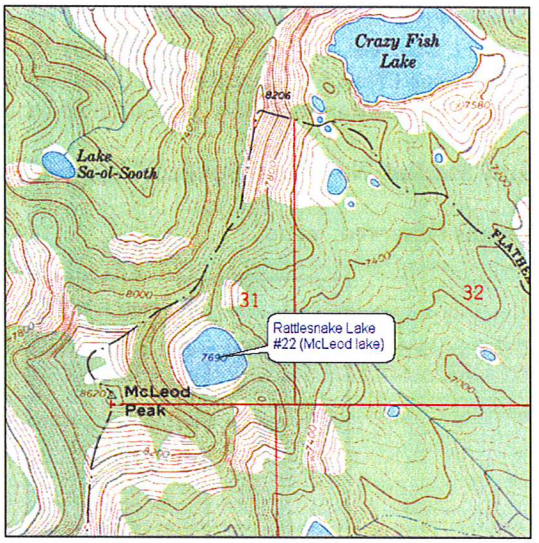


Elevation: 7,112 ft **Surface Area**: 7.8 acres **Volume**: 109.8 acre-ft **Max Depth**: 27 ft **Aspect**: Southeast
Secchi Depth: 5.5 ft **PH**: No Data **Conductivity**: No Data **TDS**: No Data **Dissolved Oxygen**: 7.5-9.2 ppm



Rattlesnake Lake #22 (McLeod Lake)





Description: McLeod Lake (Rattlesnake Lake #22) is a moderate-sized (13 acres), very remote glacial cirque lake located within designated Wilderness in the Rattlesnake Creek drainage near Missoula at 7,690 ft elevation. This is highest fish-bearing lake in the Rattlesnake Wilderness Area.

Location: T16N, R18W, Section 31; Latitude N47.0965°, Longitude W113.9174°; Nearest Town: Missoula, MT Surrounding land ownership: Lolo National Forest (Missoula Ranger District). McLeod Lake lies on the north end of the Rattlesnake Wilderness Area below McLeod Peak.

Access: Although the lake is geographically close to the city of Missoula, access is very difficult and requires substantial off-trail travel through steep terrain. There are several USFS routes from which to choose. Route distance and difficulty vary, but all require non-motorized travel. Common starting points are the trailheads at West Fork Gold Creek (Trail # 52), Ravine Creek in lower Grant Creek (Trail # 34), or in lower Rattlesnake Creek at the main Rattlesnake National Recreation Area trailhead (Gated Road #99). Please refer to USFS maps for specific travel routes and connecting trail numbers to reach the upper Rattlesnake basin on USFS Trail #515. From the end of this trail, access will require a ~ 2.5 mi off-trail climb of ~ 1,700 ft to reach the lake. Total travel distance from USFS trailheads ranges from 10-18 miles. There may also be shorter, alternative routes through the Flathead Indian Reservation from the northwest.

Camp Sites and Use: McLeod Lake lies in a remote setting that receives very light use. There are no established trails to the lake and no campsites. Other than some remnant plane wreckage, there are no obvious signs of human use. 'Leave no trace' camping and recreating is essential, as the lake lies within designated Wilderness.

Angling Opportunity: McLeod Lake supports an abundant westslope cutthroat trout population with consistent natural reproduction. Shoreline topography and access allow for angling along about half of the lake perimeter.

Stocking History: McLeod Lake was historically stocked with westslope cutthroat trout, but has not been planted in recent decades. The lake supports an abundant, self-sustaining trout population, so no future stocking is planned.

Angling Pressure: Due to difficult access, angling pressure is very light (likely < 20 angler-days per year).

Other Nearby Lakes: There are at least eight small lakes within 1.4 miles of McLeod Lake, and all require off-trail hiking in steep terrain. Most nearby lakes lie in the Five lakes Basin area located ~ 1 mile to the south of McLeod Lake. Two of these lakes are fish-bearing (Rattlesnake Lakes #15 & #17).

Montana Fish, Wildlife & Parks

Rattlesnake Lake #22 (McLeod Lake) - Biological & Physical Information

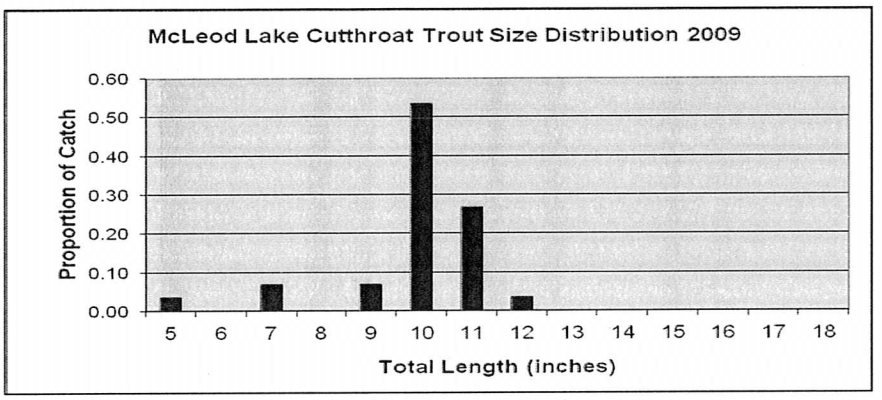
Date Sampled: 8/29/2009

Fish Species Present: Westslope cutthroat trout
Size Range Captured: 4.8-11.5 in (124-294 mm)
Trout Condition (Wr): 85 (range 64-106) (low)
Trout Diet Composition (8/29/09): Terrestrial and aquatic insects

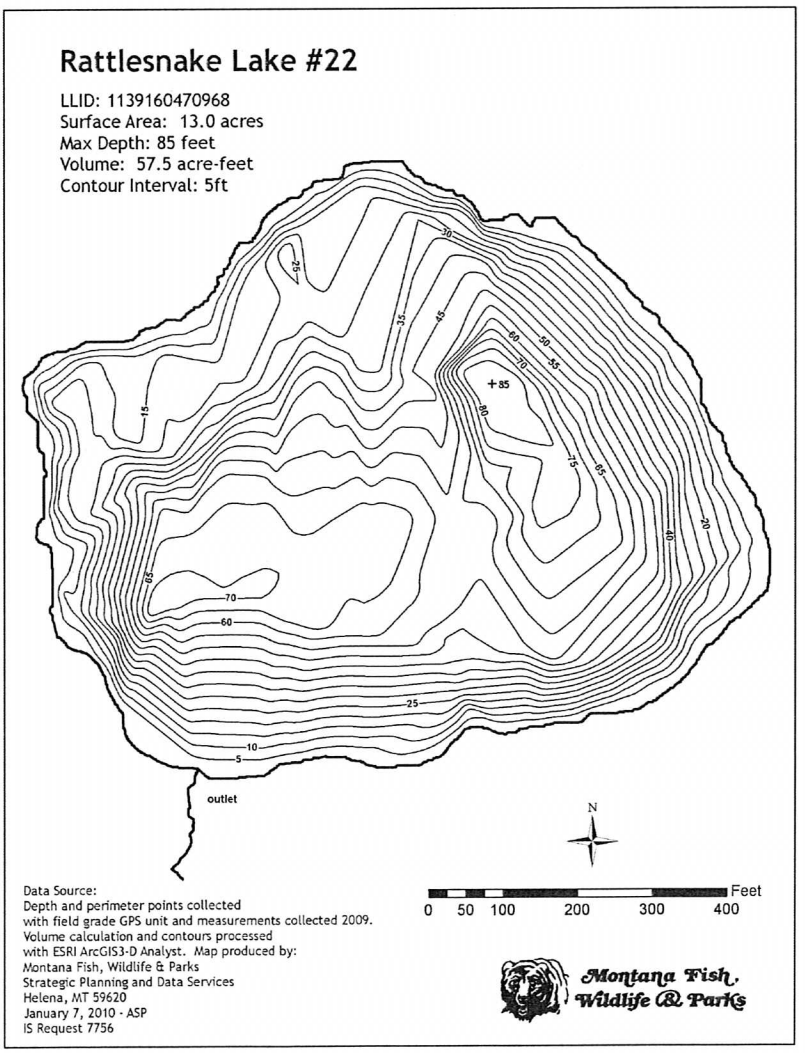
Sampling Methods: Sinking Gill Net
Gill Net Catch Rate: 12.0 trout/net/hr (abundant)
Natural Recruitment: Present (abundant)

Currently Stocked: No **Last Stocked**: Unknown **Species**: WCT **Recommended Frequency**: None

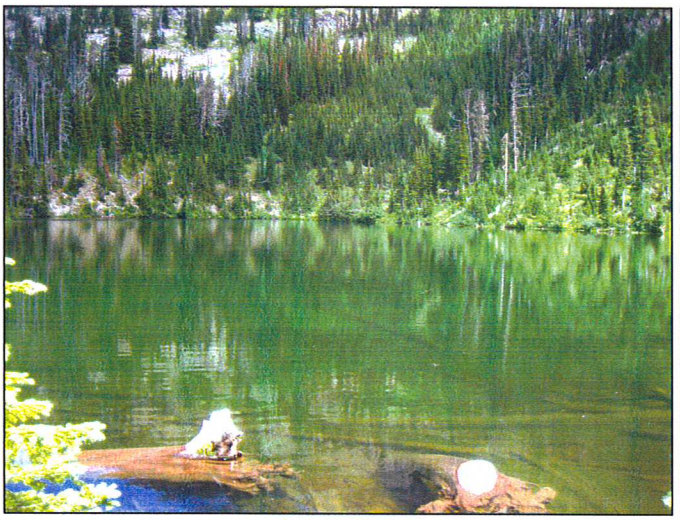
Amphibians Observed: none

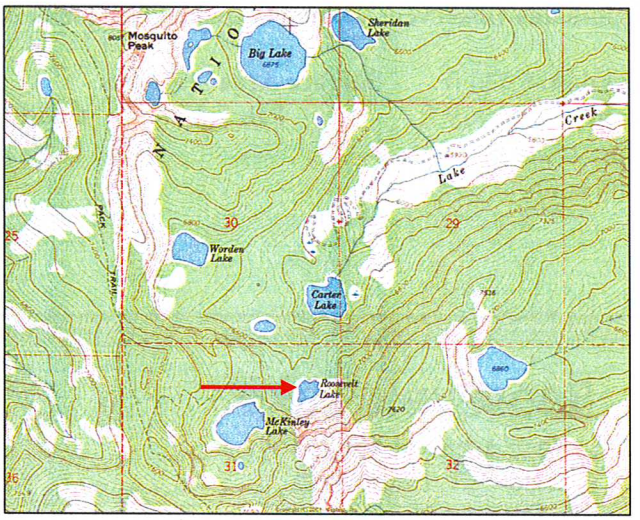


Elevation: 7,690 ft **Surface Area**: 13.0 acres **Volume**: 57.5 acre-ft **Max Depth**: 85 ft **Aspect**: Southeast
Secchi Depth: 19 ft **PH**: No Data **Conductivity**: No Data **TDS**: No Data **Dissolved oxygen:** 8.5 (8.3-9.2ppm)



Roosevelt Lake





Description: Roosevelt Lake is a small (4.4 acres), glacial cirque lake located at the head of the Lake Creek drainage (Rattlesnake Creek tributary) at ~ 6,630 ft elevation. Roosevelt Lake is likely capable of supporting fish, but none are currently present.

Location: T15N, R18W, Section 31; Latitude N47.0198°, Longitude W113.9150°; Nearest Town: Missoula, MT Surrounding land ownership: Lolo National Forest (Missoula Ranger District). Roosevelt Lake lies within the Rattlesnake Wilderness Area.

Access: Although this lake is geographically very close to the city of Missoula, access is difficult. There are several USFS routes from which to choose. Route distance and difficulty varies, but all require non-motorized travel. The most common route involves travel to the Lake Creek trailhead near the Wilderness boundary (USFS Trail #534) and climbing for ~ 2.5 miles past Carter Lake. Roosevelt Lake lies ~ 300 yards to the east of the trail just below McKinley Lake. Total travel distance from trailheads to lake ranges from 8-15 miles.

Camp Sites and Use: Roosevelt Lake lies in a remote setting that receives light use. There is no established trail to the lake, and no obvious campsites or fire-rings. 'Leave no trace' camping and recreating is essential, as the lake lies within designated Wilderness.

Angling Opportunity: None. No fish were observed or captured at the time of sampling in 2007.

Stocking History: There are no records of stocking in Roosevelt Lake and no plans to stock it in the future.

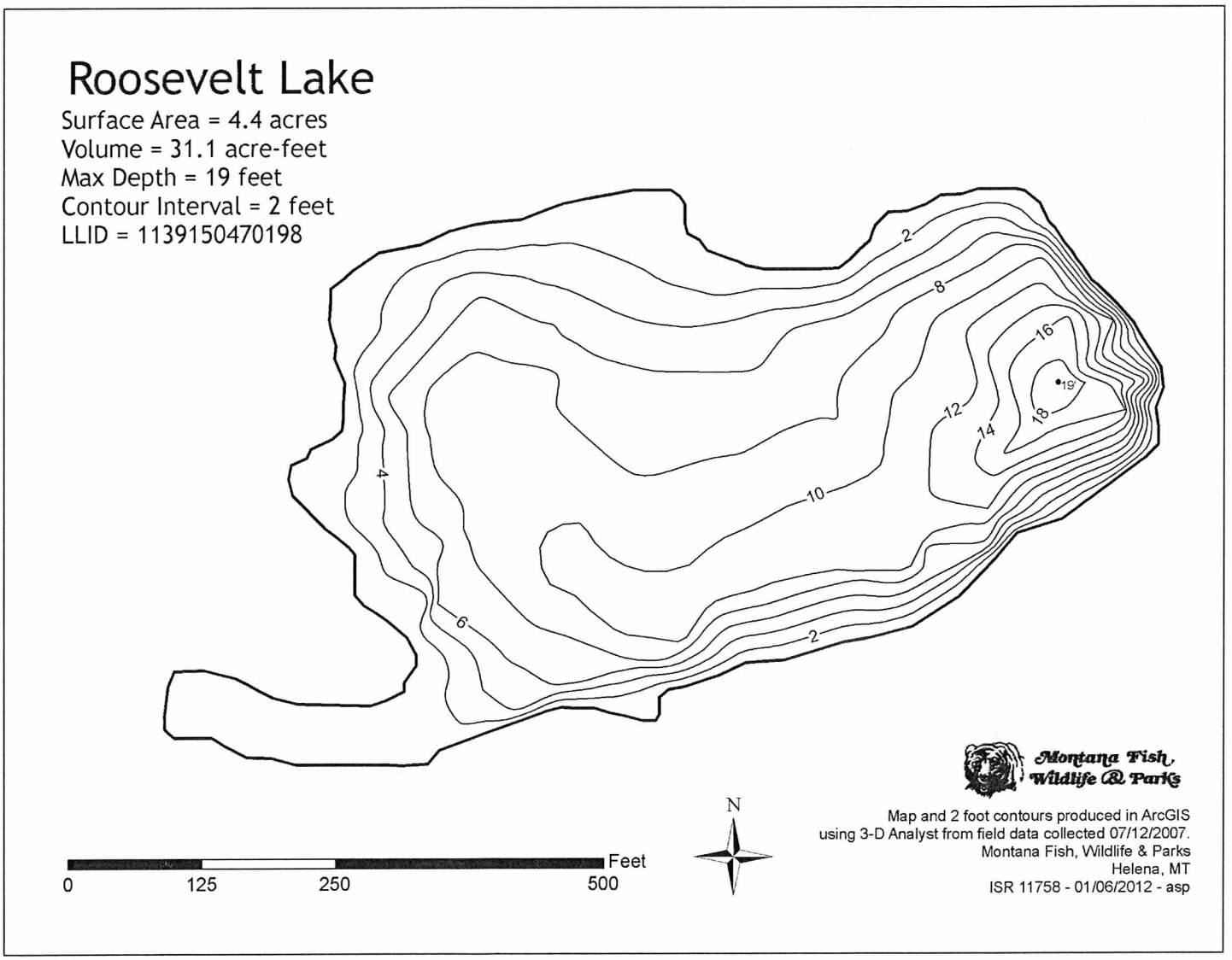
Other Nearby Lakes: There are four other lakes in the immediate vicinity of area of Roosevelt Lake. McKinley Lake lies just above Roosevelt Lake, less than 0.25 miles to the southwest on USFS Trail #534T. Rattlesnake Lake #6, Worden Lake, and Carter Lake also lie within one mile to the north and northwest. All are directly accessible from the designated USFS trail system.

Roosevelt Lake - Biological & Physical Information

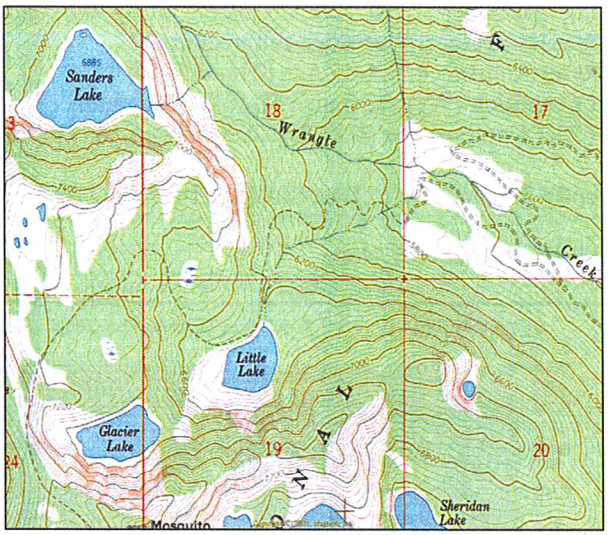
Date Sampled: 7/12/2007 **Fish Species Present**: None **Sampling Methods**: Sinking Gill Net

Amphibians Observed: Columbia spotted frog (adult & larvae), tree frog (adult) – Abundant

Elevation: 6,630 ft **Surface Area**: 4.4 acres **Volume**: 31.1 acre-ft **Max Depth**: 19 ft
Secchi Depth: >19 ft **PH**: 7.3 **Conductivity**: 3 uS **TDS**: 1 ppm **Aspect**: North



Sanders Lake



Description: Sanders Lake is a large (~ 48 acres), remote glacial cirque lake, located within designated Wilderness in the Rattlesnake Creek drainage near Missoula at ~ 6,885 ft elevation. In order to increase storage volume, the lake has been artificially impounded by a dam at the outlet. This structure elevates the normal surface water elevation, but may also contribute to greater annual water level fluctuations.

Location: T15N, R19W, Section 13; Latitude N47.0592°, Longitude W113.9365°; Nearest Town: Missoula, MT Surrounding land ownership: Lolo National Forest (Missoula Ranger District). Sanders Lake is the second largest sub-alpine lake in the Rattlesnake Wilderness Area.

Access: Although Sanders Lake is geographically close to the city of Missoula, access is difficult. There are several USFS routes from which to choose. Route distance and difficulty vary, but all require non-motorized travel. Common starting points are the trailheads at West Fork Gold Creek (Trail # 52), Ravine Creek in lower Grant Creek (Trail # 34), or in lower Rattlesnake Creek at the main Rattlesnake National Recreation Area trailhead (Gated Road #99). Please refer to USFS maps for specific travel routes and connecting trail numbers. Total travel distance from trailheads to lake ranges from 9-17 miles.

Camp Sites and Use: Sanders Lake lies in a remote setting that receives light use. There is an established trail to the lake (USFS Trail #517) and one primitive campsite. 'Leave no trace' camping and recreating is essential, as the lake lies within the Rattlesnake Wilderness.

Angling Opportunity: Sanders Lake supports a wild westslope cutthroat trout population that has moderate natural reproduction. Shoreline topography and access allow for shoreline angling along about half of the lake perimeter.

Stocking History: Stocking records indicate that Sanders Lake has been stocked several times with westslope cutthroat trout, but not since 1977. No future stocking is planned as the cutthroat trout population is self-sustaining.

Angling Pressure: Estimated angling pressure from Montana state-wide mail surveys in 2005-2009 was low and averaged less than 50 angler-days per year.

Other Nearby Lakes: There are two other lakes in the immediate vicinity of Sanders Lake. Little Lake is ~0.8 mi southeast and Glacier Lake lies ~ 0.9 mi to the south. Both lakes are easily accessible via established trails from Sanders Lake (USFS Trails #502 & #517). Big Lake and Sheridan Lake are also less than 1.5 miles southeast of Sanders Lake, but accessing them directly would be difficult as they lie on the opposite side of a steep ridge.

Montana Fish, Wildlife & Parks

Sanders Lake - Biological & Physical Information

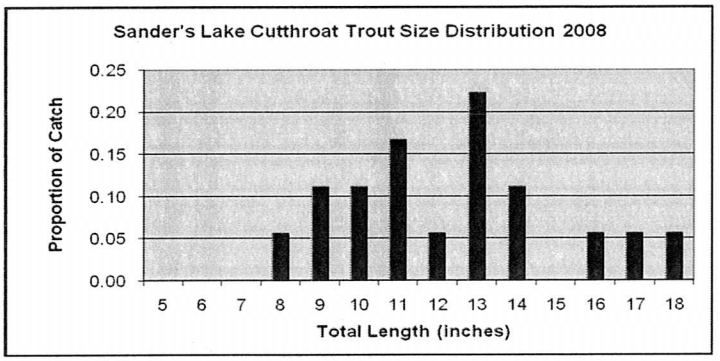
Date Sampled: 8/13/2008

Fish Species Present: Westslope cutthroat trout
Size Range Captured: 9.3–17.6 in (236-447mm)
Trout Condition (Wr): 92 (range 77-107) (moderate)
Trout Diet Composition (8/13/08): Zooplankton, terrestrial insects

Sampling Methods: Sinking Gill Net & Angling
Gill Net Catch Rate: 0.64 trout/net/hr (moderate)
Natural Recruitment: Present (moderate)

Currently Stocked: No **Last Stocked**: 1977 **Species**: WCT **Recommended Frequency**: None

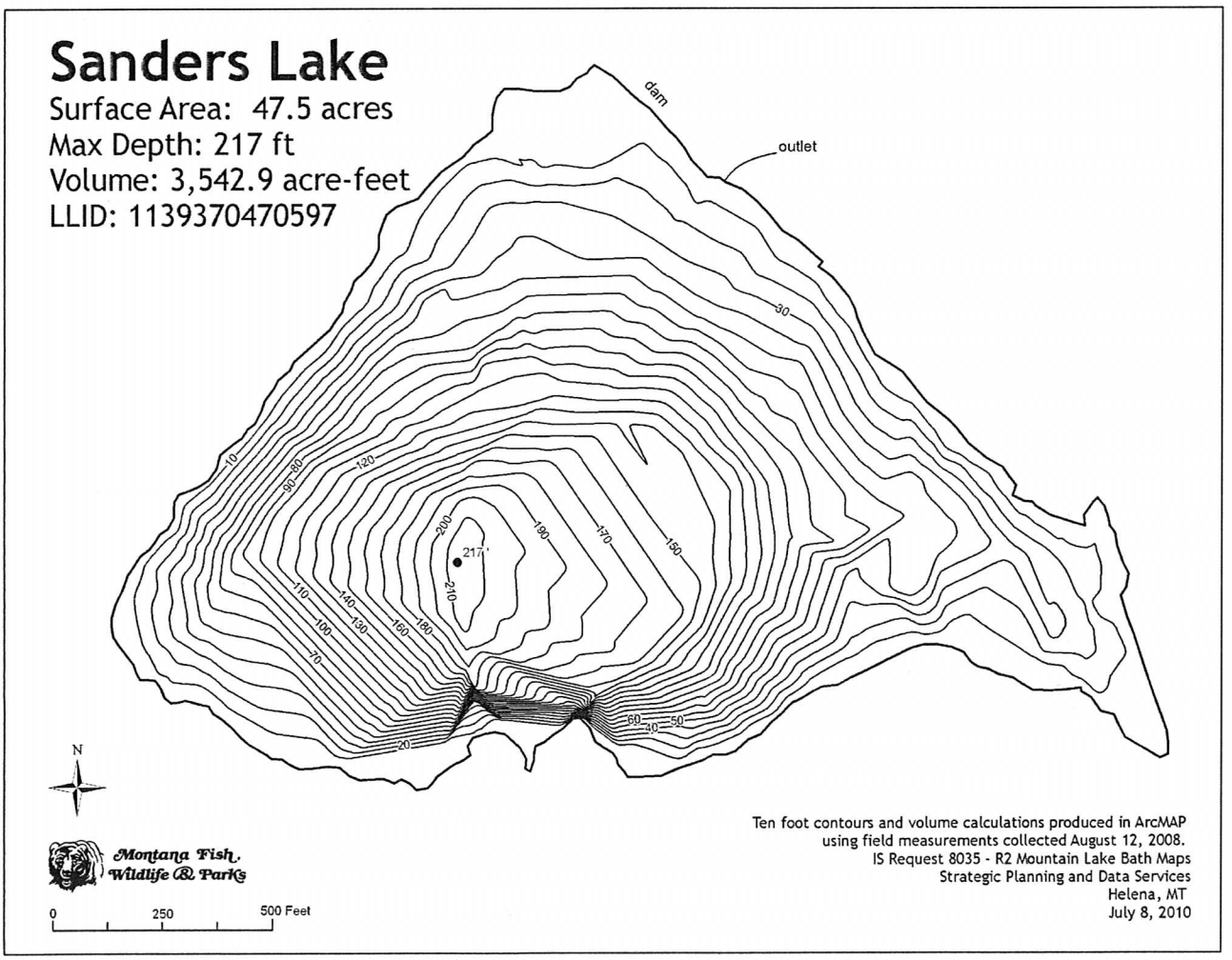
Amphibians Observed: None



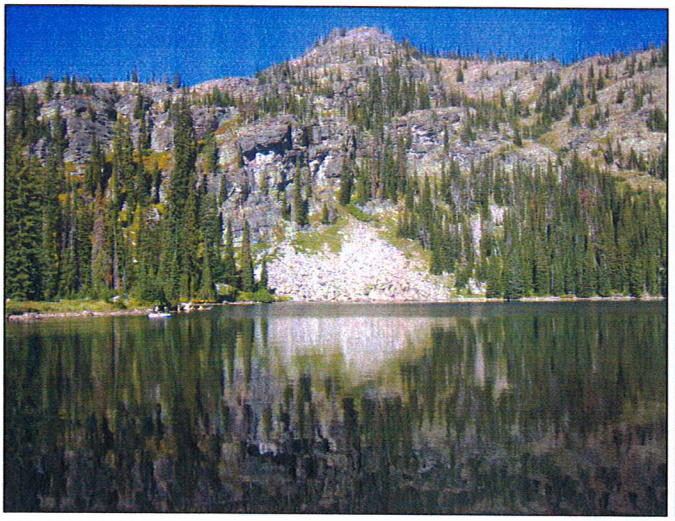
Stocking History

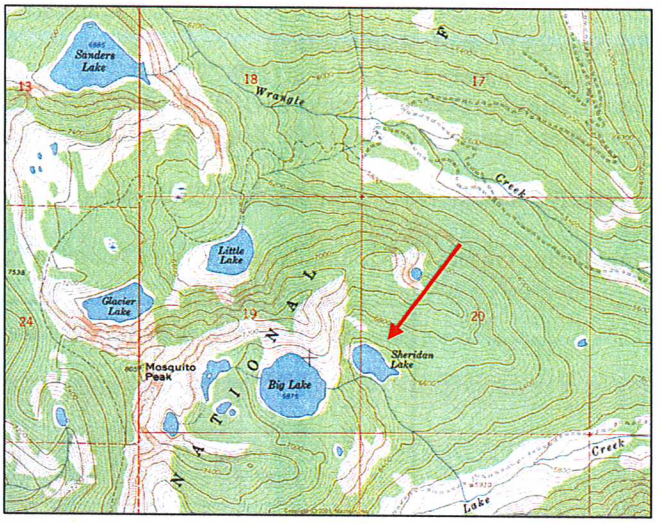
Year	Species	#
1971	WCT	5,208
1974	WCT	500
1977	WCT	5,238

Elevation: 6,885 ft **Surface Area**: 47.5 acres **Volume**: 3,543 acre-ft **Max Depth**: 217 ft
Secchi Depth: Est 30-35 ft **PH**: No Data **Conductivity**: No Data **TDS**: No Data **Aspect**: East



Sheridan Lake





Description: Sheridan Lake is a moderate-sized (9.8 acres), remote glacial cirque lake located within designated Wilderness in the Rattlesnake Creek drainage near Missoula at ~6,535 ft elevation. In order to increase storage volume, the lake has been artificially impounded by a dam at the outlet. This structure elevates the normal surface water elevation, but may also increase annual water level fluctuations.

Location: 15N, R18W, Section 19/20; Latitude N47.0414°, Longitude W113.9110°; Nearest Town: Missoula, MT Surrounding land ownership: Lolo National Forest (Missoula Ranger District). Sheridan Lake lies in the upper Lake Creek drainage within the Rattlesnake Wilderness Area.

Access: Although this lake is geographically close to the city of Missoula, access is difficult. There are several USFS routes from which to choose. Route distance and difficulty vary, but all require non-motorized travel. Common starting points are the trailheads at West Fork Gold Creek (Trail # 52), Ravine Creek in lower Grant Creek (Trail # 34), or in lower Rattlesnake Creek at the main Rattlesnake National Recreation Area trailhead (Gated Road #99). Please refer to USFS maps for specific travel routes and connecting trail numbers. Total travel distance from trailheads to the lake ranges from 9-17 miles. The trail adjacent to the lake is not maintained (grown-in).

Camp Sites and Use: Sheridan Lake lies in a remote setting that receives light use. There is no maintained trail to the lake (remnant trail is distinguishable in some places), and there are no established campsites. 'Leave no trace' camping and recreating is essential, as this lake lies within designated Wilderness.

Angling Opportunity: Sheridan Lake supports a wild rainbow trout population that has abundant natural reproduction. Shoreline topography and access lend well to shoreline angling from ~ 40% of the lake perimeter.

Stocking History: Sheridan Lake was historically stocked with rainbow trout and has not been planted in recent decades. There are no plans to stock in the future as the rainbow trout population is self-sustaining.

Angling Pressure: Estimated angling pressure from Montana state-wide mail surveys in 2005-2009 was low and averaged < 25 angler-days per year.

Other Nearby Lakes: There are several other lakes in the vicinity of Sheridan Lake. Big Lake lies less than 0.25 mile to the west and can easily be accessed on USFS Trail #1265. Worden Lake lies ~ 1 mile to the south and can easily be reached off of USFS Trails #1265 and #534. There are also several fishless lakes just to the west of Big Lake (Rattlesnake Lakes #9, #10 and #11) below Mosquito Peak that can easily be reached via off-trail hiking.

Montana Fish, Wildlife & Parks

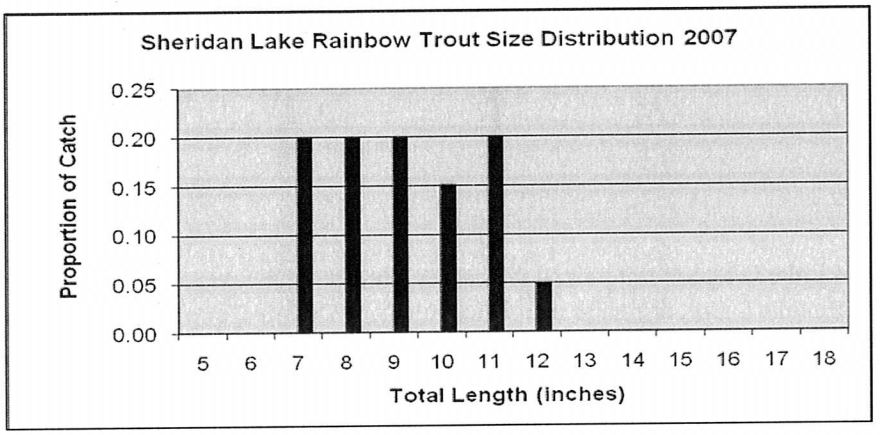
Sheridan Lake - Biological & Physical Information

Date Sampled: 9/13/2007

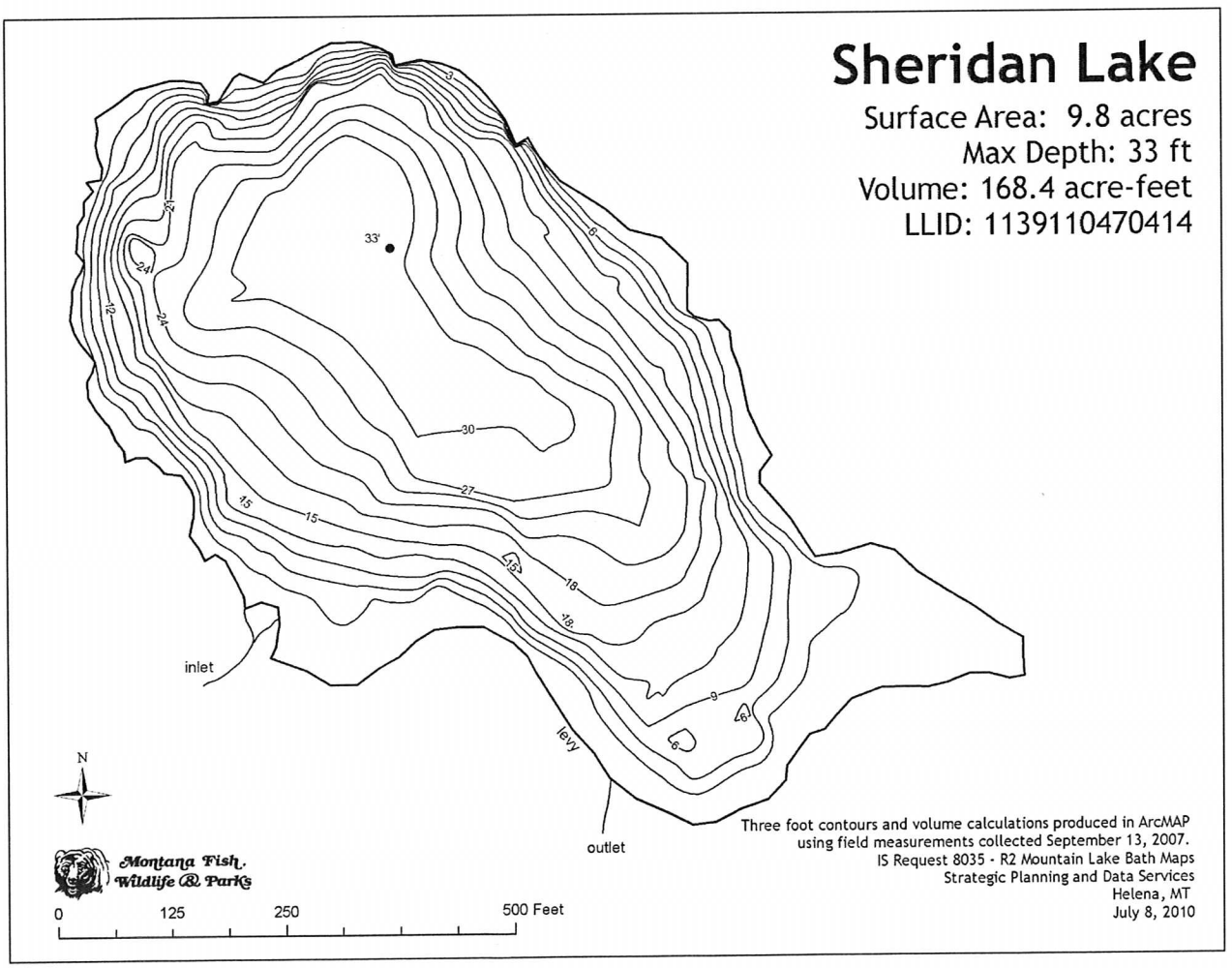
Fish Species Present: Rainbow trout
Size Range Captured: 6.7–11.6 in (169-295mm)
Trout Condition (Wr): 74 (range 53-100) (low)
Sampling Methods: Sinking Gill Net & Angling
Gill Net Catch Rate: 0.71 trout/net/hr (moderate)
Natural Recruitment: Present (moderate)
Trout Diet Composition (9/13/07): Zooplankton, aquatic insects, terrestrial insects.

Currently Stocked: No **Last Stocked**: Unknown –Prior to 1982 **Species**: RBT **Recommended Frequency**: None

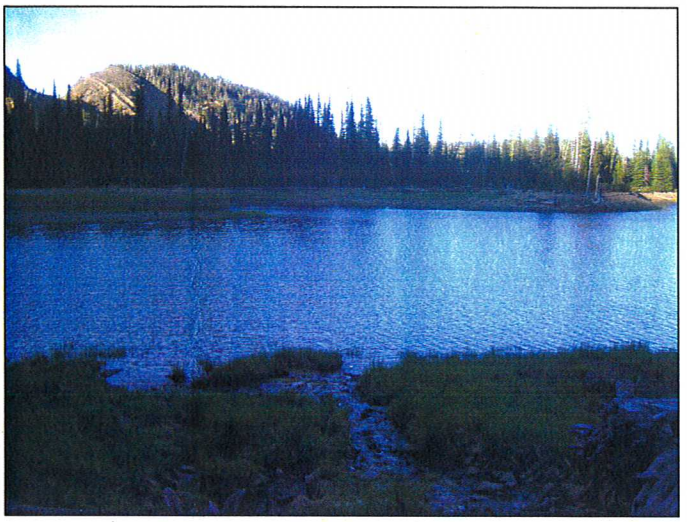
Amphibians Observed: Columbia spotted frogs (larval) – rare

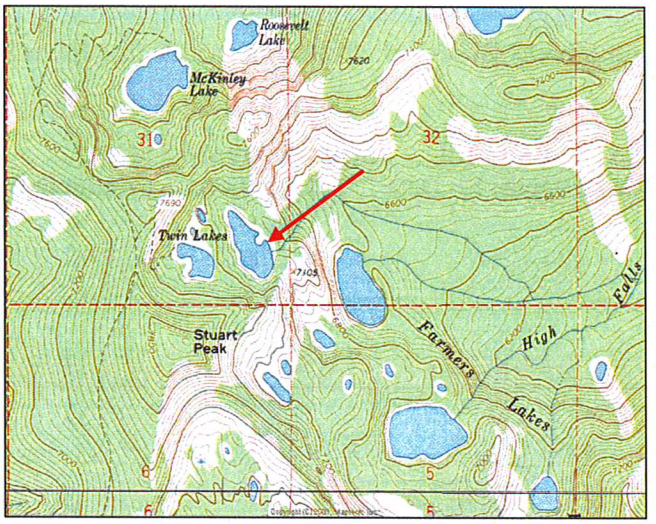


Elevation: 6,535 ft **Surface Area**: 9.8 acres **Volume**: 168 acre-ft **Max Depth**: 33 ft
Secchi Depth: 23 ft **PH**: 8.0 **Conductivity**: 1-3 uS **TDS**: 0-1 ppm **Aspect**: Southeast



Lower Twin Lake





Description: Lower Twin Lake is a moderate-sized (6.8 acres), glacial cirque lake located at the head of the High Falls Creek drainage (Rattlesnake Creek tributary) at ~ 7,065 ft elevation. In order to increase storage volume, the lake was artificially impounded by a dam at the outlet. The dam is no longer maintained. This structure elevates the normal surface water elevation, but also contribute to greater annual water level fluctuations. Lower Twin Lake is capable of supporting fish, but none are currently present.

Location: T15N, R18W, Section 31; Latitude N47.0106°, Longitude W113.9140°; Nearest Town: Missoula, MT Surrounding land ownership: Lolo National Forest (Missoula Ranger District). Lower Twin Lake lies within the Rattlesnake Wilderness Area.

Access: Although this lake is geographically very close to the city of Missoula, access is difficult. There are several USFS routes from which to choose. Route distance and difficulty varies, but all require non-motorized travel. Common starting points are the trailheads at West Fork Gold Creek (Trail # 52), Ravine Creek in lower Grant Creek (Trail # 34), or in lower Rattlesnake Creek at the main Rattlesnake National Recreation Area trailhead (Gated Road #99). Please refer to USFS maps for specific travel routes and connecting trail numbers. Regardless of which route is chosen, the final trail segment will be USFS Trail #330. Total travel distance from trailheads to lake ranges from 9-17 miles.

Camp Sites and Use: Lower Twin Lake lies in a remote setting that receives light use. There is an established trail to the lake, and two campsites. 'Leave no trace' camping and recreating is essential, as this lake lies within the Rattlesnake Wilderness.

Angling Opportunity: None. No fish were observed or captured at the time of sampling in 2008.

Stocking History: The Twin Lakes were historically stocked with cutthroat trout, rainbow trout, and arctic grayling. However, there are no records of stocking since 1951. There are no plans to stock Lower Twin Lake in the future.

Other Nearby Lakes: There are two other lakes in the immediate vicinity of Lower Twin Lake. Upper Twin Lake is less than 0.25 mile to the southwest and can be reached via an established trail (USFS Trail #330). This same trail leads past Farmers Lake #6, located ~ 0.5 mile to the east. Several pothole lakes and wetlands are also found within a mile of Lower Twin Lake.

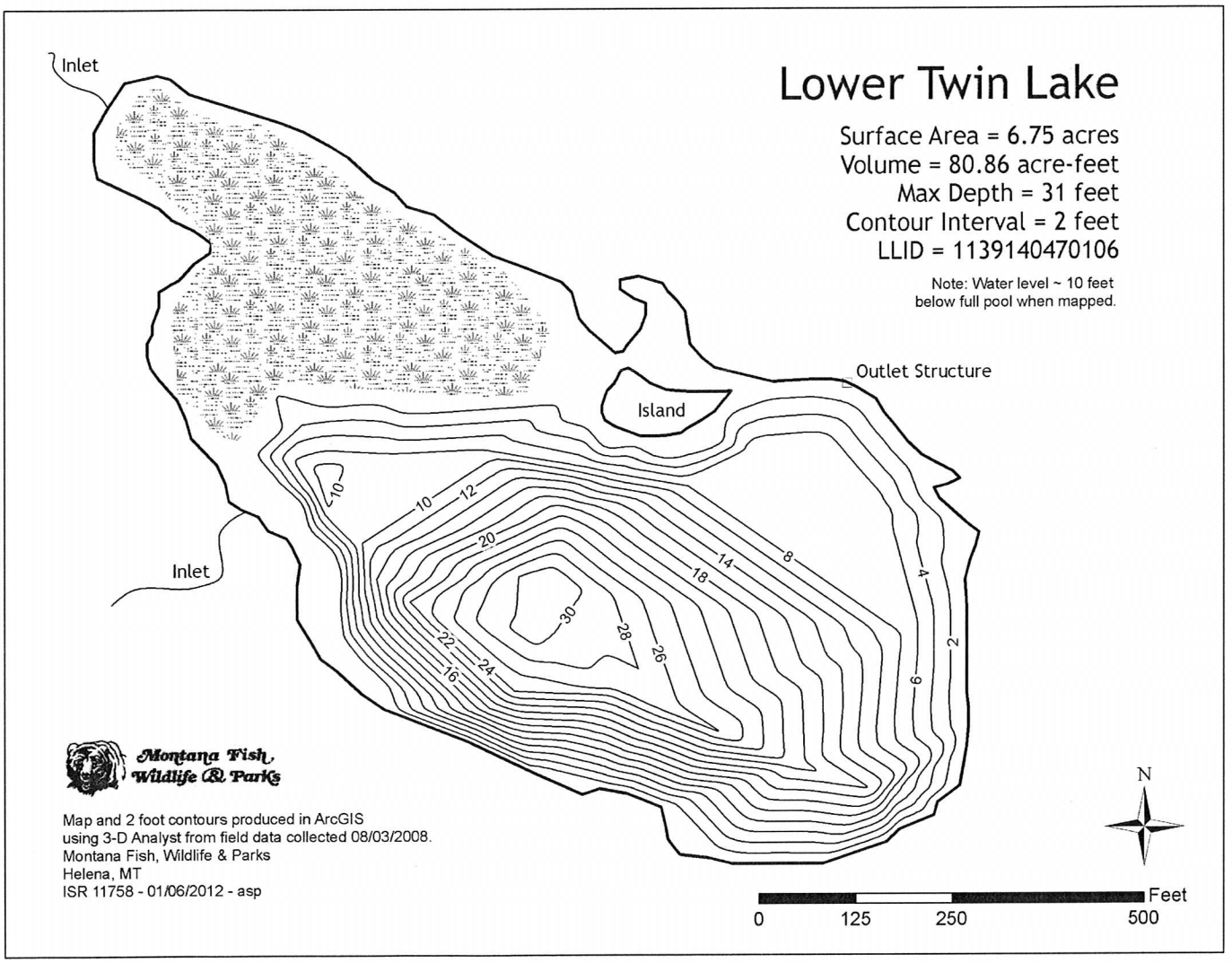
Montana Fish, Wildlife & Parks

Lower Twin Lake - Biological & Physical Information

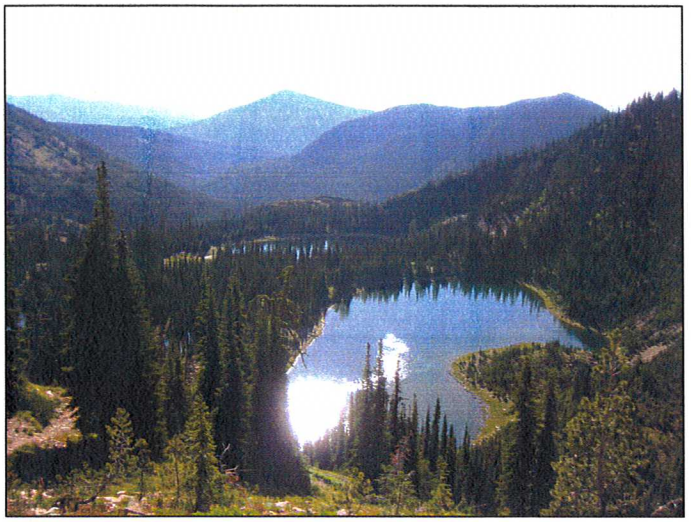
Date Sampled: 8/4/2008 **Fish Species Present**: None **Sampling Methods**: Sinking Experimental Gill Net

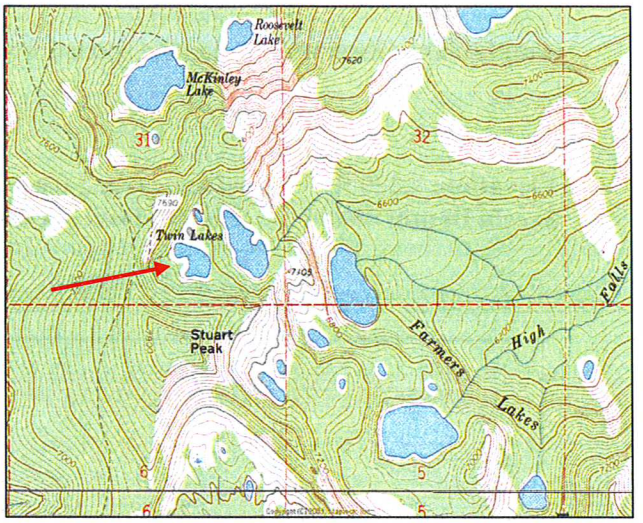
Amphibians Observed: Columbia spotted frog (juvenile), long-toed salamander (juvenile) – low densities

Elevation: 7,065 ft **Surface Area**: 6.8 acres **Volume**: 80.9 acre-ft **Max Depth**: 41 ft (@ full pool)
Secchi Depth: No Data **PH**: No Data **Conductivity**: No Data **TDS**: No Data **Aspect**: Northeast



Upper Twin Lake





Description: Upper Twin Lake is a small (5.0 acres), glacial cirque lake located at the head of the High Falls Creek drainage (Rattlesnake Creek tributary) at ~ 7,220 ft elevation. In order to increase storage volume, the lake was artificially impounded by a dam at the outlet. The dam is no longer maintained. This structure elevates the normal surface water elevation, but also contributes to greater annual water level fluctuations. Upper Twin Lake is likely too shallow to support a viable fishery.

Location: T15N, R18W, Section 31; Latitude N47.0102°, Longitude W113.9190°; Nearest Town: Missoula, MT Surrounding land ownership: Lolo National Forest (Missoula Ranger District). Upper Twin Lake lies within the Rattlesnake Wilderness Area.

Access: Although this lake is geographically very close to the city of Missoula, access is difficult. There are several USFS routes from which to choose. Route distance and difficulty varies, but all require non-motorized travel. Common starting points are the trailheads at West Fork Gold Creek (Trail # 52), Ravine Creek in lower Grant Creek (Trail # 34), or in lower Rattlesnake Creek at the main Rattlesnake National Recreation Area trailhead (Gated Road #99). Please refer to USFS maps for specific travel routes and connecting trail numbers. Regardless of which route is chosen, the final trail segment will be USFS Trail #330. Total travel distance from trailheads to lake ranges from 9-17 miles.

Camp Sites and Use: Upper Twin Lake lies in a remote setting that receives light use. There is an established trail to the lake, and two campsites. 'Leave no trace' camping and recreating is essential, as this lake lies within the Rattlesnake Wilderness.

Angling Opportunity: None. No fish were observed or captured at the time of sampling in 2008.

Stocking History: The Twin Lakes were historically stocked with cutthroat trout, rainbow trout, and arctic grayling. However, there are no records of stocking since 1951. Upper Twin Lake will not likely be stocked in the future, as it is shallow and unlikely to overwinter fish consistently.

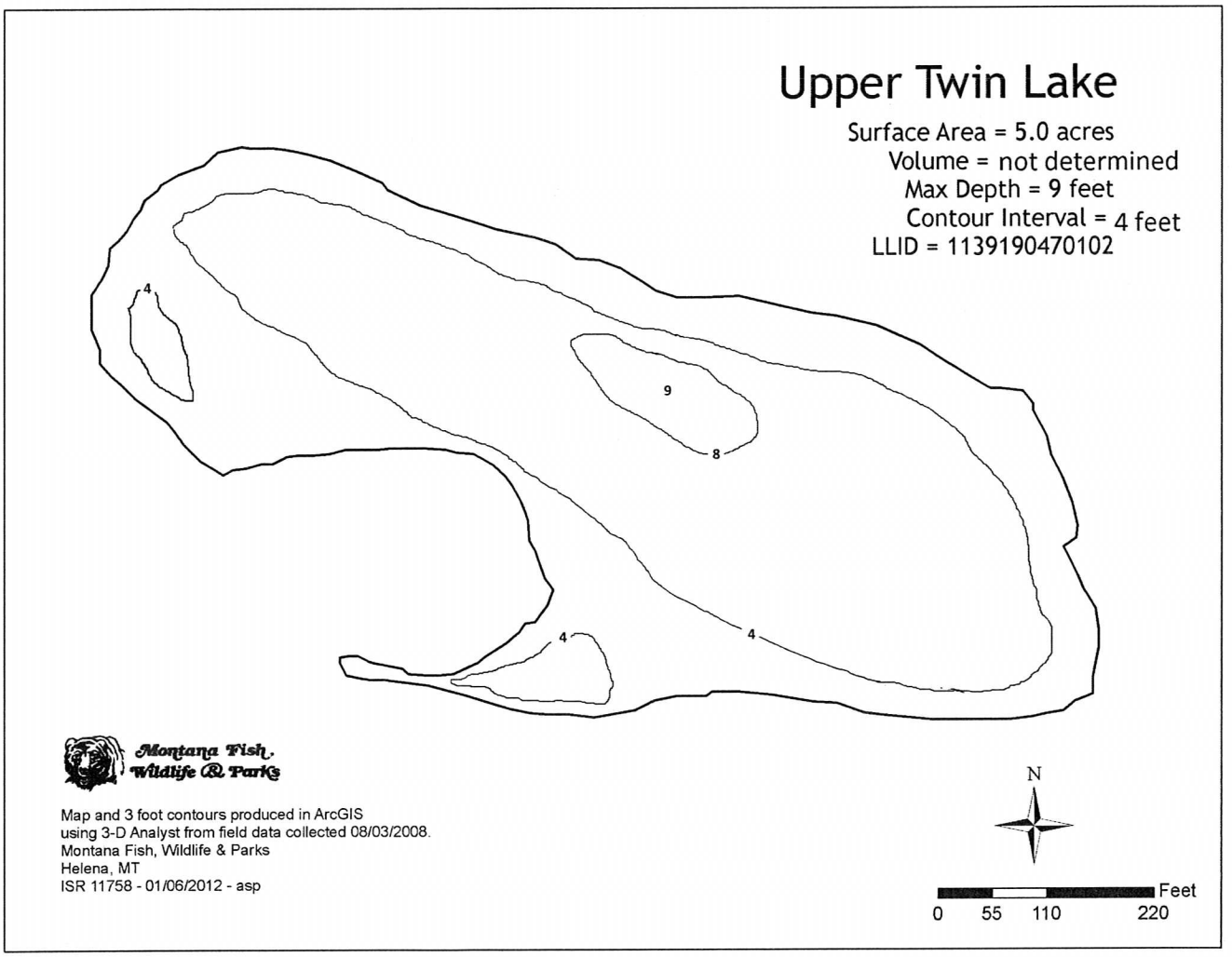
Other Nearby Lakes: There are several other lakes in the immediate vicinity of Upper Twin Lake. Lower Twin Lake lies just below, <0.25 to the northeast. Farmers Lake #6 is past Lower Twin Lake, ~ 0.5 mile east on FS Trail #330. McKinley Lake lies ~0.5 mi to the north and can also be reached most easily on the established FS trail system. Numerous other small lakes are also within one mile of Upper Twin Lake.

Upper Twin Lake - Biological & Physical Information

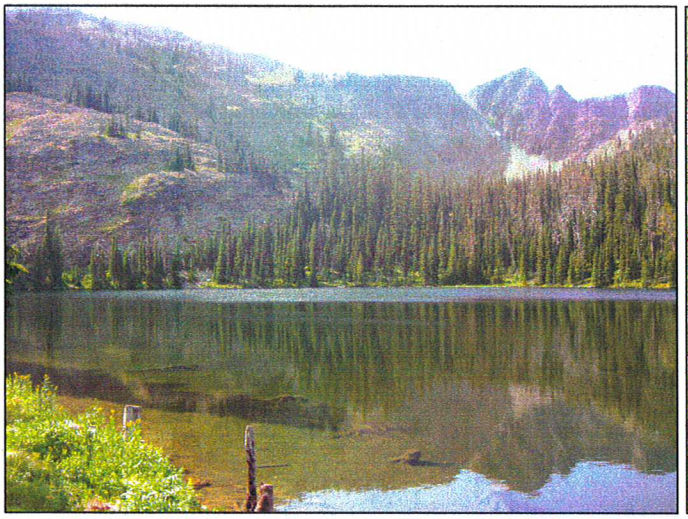
Date Sampled: 8/3/2008 **Fish Species Present**: None **Sampling Methods**: Sinking Gill Net

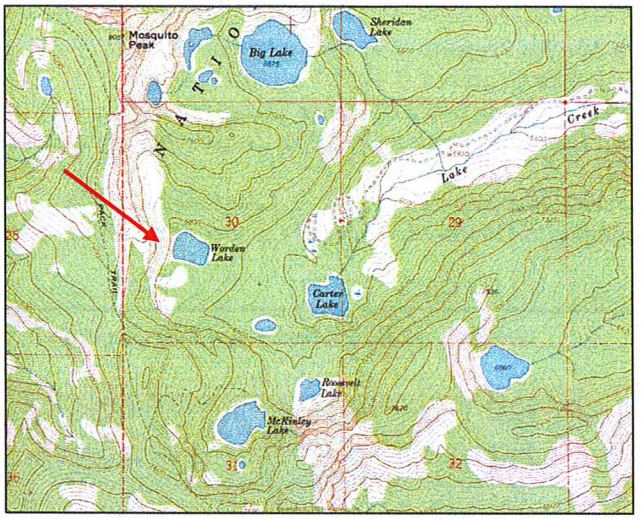
Amphibians Observed: Columbia spotted frog (adults) - rare

Elevation: 7,220 ft **Surface Area**: 5.0 acres **Volume**: not calculated **Max Depth**: 9.0 ft
Secchi Depth: >9.0 ft **PH**: No Data **Conductivity**: No Data **TDS**: No Data **Aspect**: Northeast



Worden Lake





Description: Worden Lake is a small (9.1 acres), remote glacial cirque lake, located within designated Wilderness in the Rattlesnake Creek drainage near Missoula at ~ 6,700 ft elevation. In order to increase storage volume, the lake has been artificially impounded by a dam at the outlet. This structure elevates the normal surface water elevation, but may also increase annual water level fluctuations.

Location: T15N, R18W, Section 30; Latitude N47.0282°, Longitude W113.9260°; Nearest Town: Missoula, MT Surrounding land ownership: Lolo National Forest (Missoula Ranger District). Worden Lake lies near the center of the Rattlesnake Wilderness Area at the head of Lake Creek.

Access: Although this lake is geographically close to the city of Missoula, access is difficult. There are several USFS routes from which to choose. Route distance and difficulty vary, but all require non-motorized travel. Common starting points are the trailheads at West Fork Gold Creek (Trail # 52), Ravine Creek in lower Grant Creek (Trail # 34), or in lower Rattlesnake Creek at the main Rattlesnake National Recreation Area trailhead (Gated Road #99). Please refer to USFS maps for specific travel routes and connecting trail numbers. Total travel distance from trailheads to lake ranges from 8-16 miles.

Camp Sites and Use: Worden Lake lies in a remote setting that receives light use. There is an established trail to the lake, a trail around about half of the lake, and two fire-rings. 'Leave no trace' camping and recreating is essential, as this lake lies within designated Wilderness.

Angling Opportunity: Worden Lake supports a westslope cutthroat trout population that has abundant natural reproduction. Shoreline topography and access lend well to shoreline angling along most of the lake perimeter.

Stocking History: Worden Lake has been stocked several times with westslope cutthroat trout. The most recent plant was in 1978. Since the population is apparently self-sustaining, no future stocking is planned.

Angling Pressure: Estimated angling pressure from Montana state-wide mail surveys in 2005-2009 was low and is estimated to be < 50 angler-days per year.

Other Nearby Lakes: There are four lakes in the immediate vicinity of Worden Lake. Carter Lake (~ 0.6 mi east) and McKinley Lake (~ 0.8 mi south) are both fish-bearing and can be reached via USFS Trail #534. Roosevelt Lake (~ 0.8 mi southeast) and Rattlesnake Lake #6 (~ 0.4 mi southeast) are both fishless. Rattlesnake Lake #6 lies just off of USFS Trail #534, but access to Roosevelt Lake requires a ~0.2 mi, steep off-trail hike from this trail.

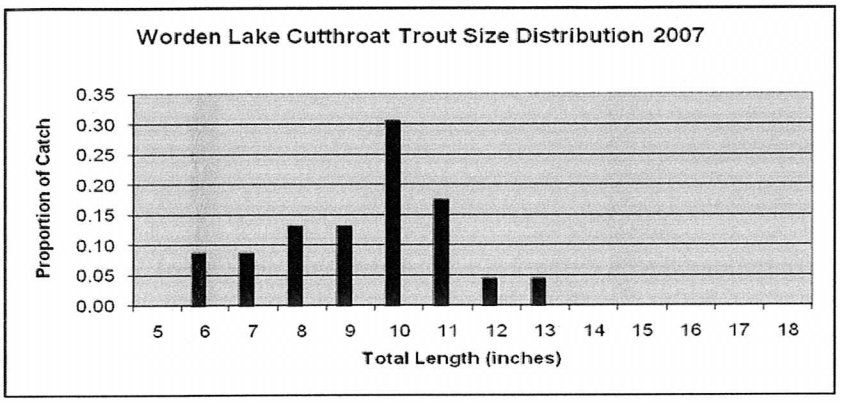
Montana Fish, Wildlife & Parks

Worden Lake - Biological & Physical Information

Date Sampled: 7/13/2007

Fish Species Present: Westslope cutthroat trout
Size Range Captured: 5.9–12.7 in (151-323 mm)
Trout Condition (Wr): 87 (range 75-109) (low)
Sampling Methods: Sinking Gill Net & Angling
Gill Net Catch Rate: 1.76 trout/net/hr (moderate)
Natural Recruitment: Present (abundant)
Trout Diet Composition (7/13/07): Zooplankton, aquatic insects, terrestrial insects.

Currently Stocked: No **Last Stocked**: 1978 **Species**: WCT **Recommended Frequency**: None
Amphibians Observed: Columbia spotted frog (adult) - common



Stocking History

Year	Species	#
1978	WCT	2,016
1975	WCT	2,000
1972	WCT	2,000

Elevation: 6,700 ft **Surface Area**: 9.1 acres **Volume**: 112 acre-ft **Max Depth**: 23 ft
Secchi Depth: > 23 ft (max depth) **PH**: No Data **Conductivity**: 4 uS **TDS**: 2-3 ppm **Aspect**: Northeast