Pacific Northwest National Scenic Trail: 2023 Trail Monitoring Report

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Introduction

In 2009, Congress designated the Pacific Northwest Trail as one of America's 11 National Scenic Trails. The Pacific Northwest National Scenic Trail (PNNST) offers outstanding opportunities for long-distance non-motorized recreation throughout its 1200-mile route. The PNNST crosses a diverse landscape, beginning at the Continental Divide at Chief Mountain Trailhead in Glacier National Park, Montana and finishing at the Pacific Ocean on Cape Alava in Olympic National Park, Washington. Approximately 70% of the PNNST spans throughout seven national forests and three national parks, and over 300 miles of the trail cross through six wilderness areas. Currently, 67% of the PNNST is covered via trails and 33% is on roads. One goal of the USFS is to work toward a continuous, non-motorized trail route, to meet the intent for National Scenic Trails in the National Trails System Act.

When the PNNST gained its National Scenic Trail status, Congress required the USFS to develop a comprehensive plan that would provide various land management agencies with a common vision for the long-term development and management of the trail. The required components of a comprehensive plan are 1) objectives and practices for the management of the trail, including an identified carrying capacity and a plan for its implementation, 2) an acquisition or protection plan for lands along the trail, and 3) general and site-specific development plans. The long-term monitoring of the PNNST provides critical information to inform the PNNST's carrying capacity and other management actions for the trail.

The 2023 field season data builds on previous monitoring since 2017 to identify trends and changes over time. Throughout the summer of 2023, the University of Montana (UM) conducted a visitor monitoring project to collect data on the number and timing of trail visits along various sections of the PNNST. In addition to monitoring five of the previously established Montana sites, three new monitoring sites in the Idaho Panhandle were added in 2021. The monitoring of these new sites was delayed from prior plans to begin their monitoring in 2020, which were impacted by the COVID-19 pandemic and associated travel restrictions. The sections of the PNNST that were monitored are located within Kootenai National Forest (KNF) in Montana and Idaho Panhandle National Forests in Idaho. ***Trail visits*** included trail use by people on foot, as well as people on horses or bicycles, who may be:

- thru hikers, who are completing an end-to-end hike of the PNNST in one season (in this report, these are included in counts for overnight hikers);
- section hikers, who are traversing the length of the PNNST as a series of shorter trips usually over a longer time frame (in this report, these are included in counts for overnight hikers);
- day hikers or horse/bike riders and overnight/multi-day hikers or horse/bike riders whose visits are not part of an attempt to complete the PNNST (sometimes called "local

users" to differentiate them from thru hikers or section hikers, though they may or may not be from the local area);

- trail crew members and other government employees and volunteers using trails to perform administrative duties such as maintenance, monitoring, patrols, and other work.

Trail visits are estimates based on a calibration of raw counter data when possible and on available camera data when counter data has been lost, as described in the methods section below. "Out-and-back" trips, wherein a trail user returns to the same trailhead from which they started using the same trail (and passing by the same trail counter twice) on either the same day or a different day, are counted as two trail visits.

Additionally, the research team was able to have cameras up at all sites throughout the 2023 season and analyze camera data for number of parties per week, party size, and type of recreational users. During 2023, party size was measured as the number of individuals that appeared to be traveling together (based on being the same type of users and traveling in the same direction) that passed by the camera within two minutes of each other, such that there was at least two minutes between one party and the next. This measurement differs from the way party size was measured during the 2020 season. During 2020's pilot effort to analyze this measure, party size was operationalized as the number of people of the same user type traveling in the same direction to pass a camera within 30 seconds of each other. Camera data from the 2019 field season was also analyzed noting party size and user type, although these cameras were only up for select times at each site.

This report details findings related to trail use during 2023 at the following locations: Whitefish Divide, Blue Sky Creek, Bluebird Lake, Boulder Lake, Midge Creek, Canuck Peak, Parker Ridge, and Brush Lake. These sites were prioritized for monitoring during this field season over some other locations that had been monitored before, including Pyramid-Ball Lakes, Garver Mountain, Green Mountain, Vinal Creek, and Gypsy Meadow.

Methods

This study has generally replicated the methodology used in the University of Montana's initial monitoring project from the summer of 2017, thus allowing for the comparison of trail use data between 2017 and 2023. However, when making these comparisons it is important to note that the calibration factors for 2017-2023 were calculated in somewhat different ways. Calibration factors for 2019 and 2020 accounted for all trail users (including overnight hikers, day hikers, horse riders, bike riders, and trail/administrative crew members). In contrast, 2018 data was calibrated only for day and overnight hikers (thus excluding trail/administrative crew members, horse riders, and bike riders). Moreover, because no calibration factors were available from 2017, the 2018 calibration factors were also applied to 2017 data. Therefore, while the percentage of trail users that were trail/administrative crew members, horse riders and bike riders is relatively small, comparisons between years are not entirely equivalent. Trail user estimates for 2017 and 2018 would likely be at least slightly higher than the reported hiking visit estimates.

Data collection took place from June 16, 2023, to September 17, 2023. During this time, the researchers made six trips into the field. Each trip lasted between three and four days. Eight sites (Whitefish Divide, Blue Sky Creek, Bluebird Lake, Boulder Lake, Midge Creek, Canuck Peak, Lower Parker Ridge, and Brush Lake) were monitored in 2023. The Montana sites included Whitefish Divide, Blue Sky Creek, Boulder Lake, Midge Creek, and Canuck Peak, and all these sites are located within Kootenai National Forest. The Idaho sites included Lower Parker Ridge and Brush Lake, which are all located within Idaho Panhandle National Forests. The decision to monitor a subsample of the Montana sites that have been monitored in previous years was determined due to limitations in the number of sites that can be monitored logistically and the prioritization of extending data collection into the Idaho Panhandle. Thus, sites that have been previously monitored, but were not monitored in 2023 include Garver Mountain, Green Mountain, Gypsy Meadow, and Vinal Creek.

Data was gathered using infrared trail counters and software from the company TRAFx. The trail counters were calibrated using infrared trail cameras that took photographs when a motion was detected.

Information from these infrared counters can help determine the level of use along the trails for the selected sites; however, there are standard limitations to how these counters record data that are typical to similar kinds of studies. The trail counters have infrared detectors that register a count each time an individual or animal passes by its receptive range. A trail counter reading alone cannot distinguish between a count for an animal and a count for a hiker. The use of trail camera photos helped us to differentiate people from wildlife and gain a sense of which trails might be frequented more by wildlife than others.

Most of the cameras and counters spent approximately ten to thirteen weeks at each site throughout the monitoring period. However, monitoring equipment at Whitefish Divide and Bluebird Lake were only present for about 10 and eight weeks respectively, due to these sites being less accessible due to snow until later in the season. At Brush Lake, stolen equipment shortened the weeks being monitored to only ten weeks.

Trail cameras ensured that the movement throughout the trail was captured from several directions, and the footage was later watched to calibrate the infrared counts. Footage did provide valuable information with which to adjust the infrared counts to improve accuracy of counts of trail visits. For example, Canuck Peak is frequented by wildlife, which get counted when walking on a trail past a counter. Similarly, a hiker walking with a dog would result in both the dog and the hiker being counted. In some cases, hikers walking side by side would only be counted as one hiker.

All available footage from cameras were used this year to determine calibration factors. While going through the camera data, researchers noted whether it was an animal, overnight or day hiker, bike rider, horse rider, trail crew, car, ATV, motorized bike/motorcycle rider, or phantom count that was registered by the counter as a count. Phantom counts can occur when infrared counters are triggered by extraneous factors (not people, animals, or vehicles), such as the movement of tree or plant branches in the wind. The observed count of trail users was then divided by all infrared counts in the calibration period to yield a calibration factor. If the calibration factor remains constant over time, then multiplying the calibration factor by the infrared counts yields the observed count of trail visits. This use of the calibration factors allows us to remove approximate erroneous measures of counts due to the infrared counters capturing movement from wind, wild animals, cattle, etc. These measures excluded dogs that may have been accompanying users and adjusted for how horses can often trigger two counts. From 2020 to 2023, newer cameras were used at three sites. These cameras had a shorter interval of 0 seconds, which may have been able to better capture hikers that were moving quickly than old cameras used at other sites and in past years. Older infrared cameras had a 5-second minimum interval, which might be too long to capture fast-moving hikers, bike riders, horse riders, animals, and motorized vehicles. This might have resulted in some counts being missed on the camera data and reduced accuracy for calibration factors.

The calibration factors in this study ranged from approximately 0.14 to 0.48 as shown in Table 1. Low hiker traffic and frequent wildlife on the trails could be factors contributing to lower calibration factors. Because the calibration factors are generated from a sample, we should formally refer to trail visits as estimated trail visits, but for brevity we will use the term trail visits in most places. Moreover, due to technical issues, raw counter data was lost for several days at two monitoring sites and three did not begin until July due to snowpack. For days where counter data was missing, trail visit estimates utilized camera data estimates instead. The limitations of comparing these methods of trail use estimates should be kept in mind when

interpreting findings, as camera data may be more likely to underestimate trail use compared to the calibrated counter data.

Table 1: Calibration Dates and Calculated Calibration Factors

Site	Calibration Dates	Calibration Factor
Whitefish Divide	7/24 - 9/17	0.198979592
Blue Sky Creek	6/18 - 9/16	0.197278912
Bluebird Lake	7/1 – 7/3; 7/24 – 9/16	0.289573204
Boulder Lake	6/17 – 9/16	0.358752166
Midge Creek	6/17 - 9/16	0.378151261
Canuck Peak	6/30 - 9/15	0.145251397
Lower Parker Ridge	6/16 - 9/15	0.353944563
Brush Lake	6/16 – 8/24	0.480519481

It is important to note that the infrared counters are not distinguishing between thru hikers, section hikers, day users, overnight/multi-day users, and trail crew/administrative users. Rather, the infrared counters are providing counts for overall use on the trail sections that are being monitored. Thus, camera data was used by researchers to determine trail user types through observed differences in gear (such as the size and type of backpack) and party composition (such as families with young children) that were suggestive of day-use versus overnight use. No information about direction of travel can be gleaned from the infrared counts. Therefore, a trail user on an out-and-back hike who passes the infrared camera on the way in and then again on the way out is counted as two trail visits. Qualitative data, like an electronic survey, or chronologically mapping hiker registrations, might help increase the accuracy in determining the number of thru hikers and section hikers versus other users, as well as westbound versus eastbound PNNST thru hikers.

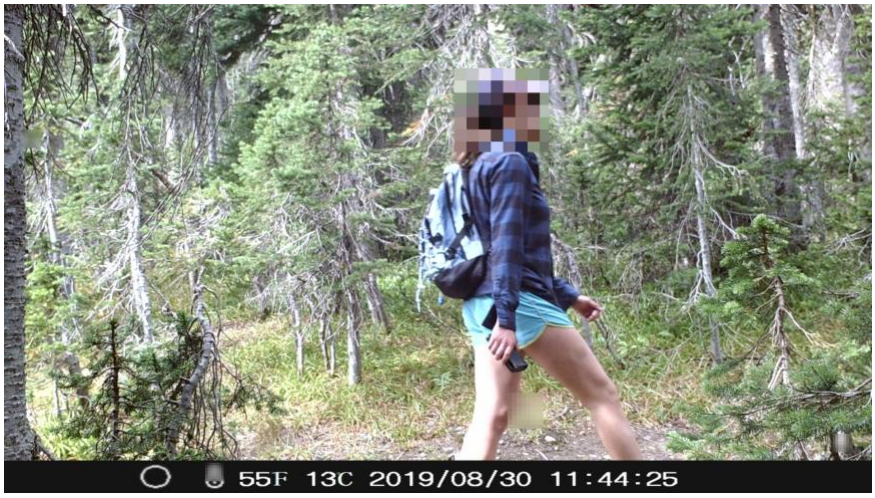
This year, the research study also addressed the distribution of user type, party size, and parties per week for each location. Party size was measured as the number of individuals that appeared to be traveling together (based on being the same type of users and traveling in the same direction) that passed by the camera within two minutes of each other, such that there was at least two minutes between one party and the next. Trail users were also categorized into overnight hikers, day hikers, horse riders, bike riders, and trail crew members. Additionally, some additional types of users were noted at Brush Lake, including ATVs, cars, and motorized bikes/motorcycle riders. Camera data helped researchers to distinguish between overnight

hikers, which could often be seen with larger backpacks and overnight equipment like sleeping pads (Image 1), compared to day hikers (Image 2). In these observations the overnight hikers category included overnight/multi-day backpackers as well as any PNNST thru hikers and/or section hikers, as it was not possible to reliably distinguish between these users from the camera data alone. Trail crew members were also determined via camera data and were often seen wearing hardhats and carrying equipment such as shovels.

In addition to hiker data, wildlife observations were recorded in the 2023 field season using only camera data. Species were recorded at all sites throughout the season, with notable species being recorded by observation count, while this is useful the true total count may be higher than the observed count with some species such as elk moving in groups that may include members outside of the camera frame. Notable species observed in 2023 include grizzly bear, black bear, grey wolf, red fox, bobcat, coyote, moose, elk, and mule deer.

Image 1: Overnight hiker

Image 2: Day use hiker

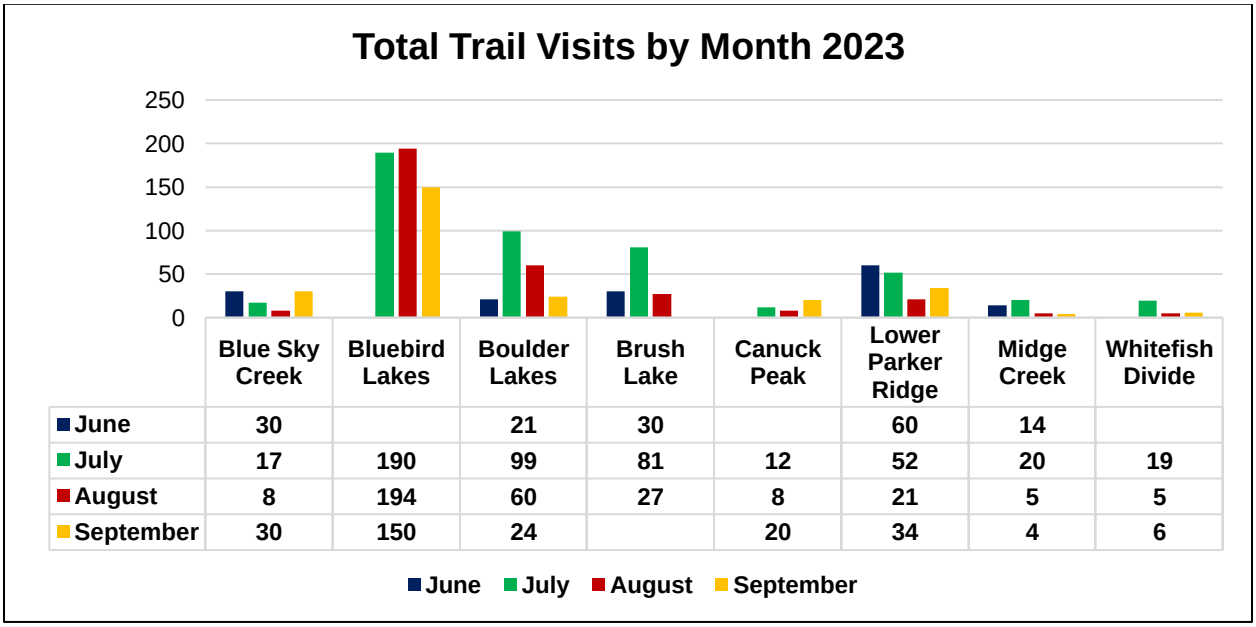


Comparison Across Sites

Locations monitored include, from east to west: Whitefish Divide, Blue Sky Creek, Bluebird Lake, Boulder Lake, Midge Creek, Canuck Peak, Lower Parker Ridge, and Brush Lake.

Figure 1.1 displays the total number of trail visits across all sites in July, August, and September. The sites appear in these graphs running from east to west which is the typical direction of thru hiker travel on the PNNST.

Figure 1.1: Comparison of use across all sites during June-September 2023



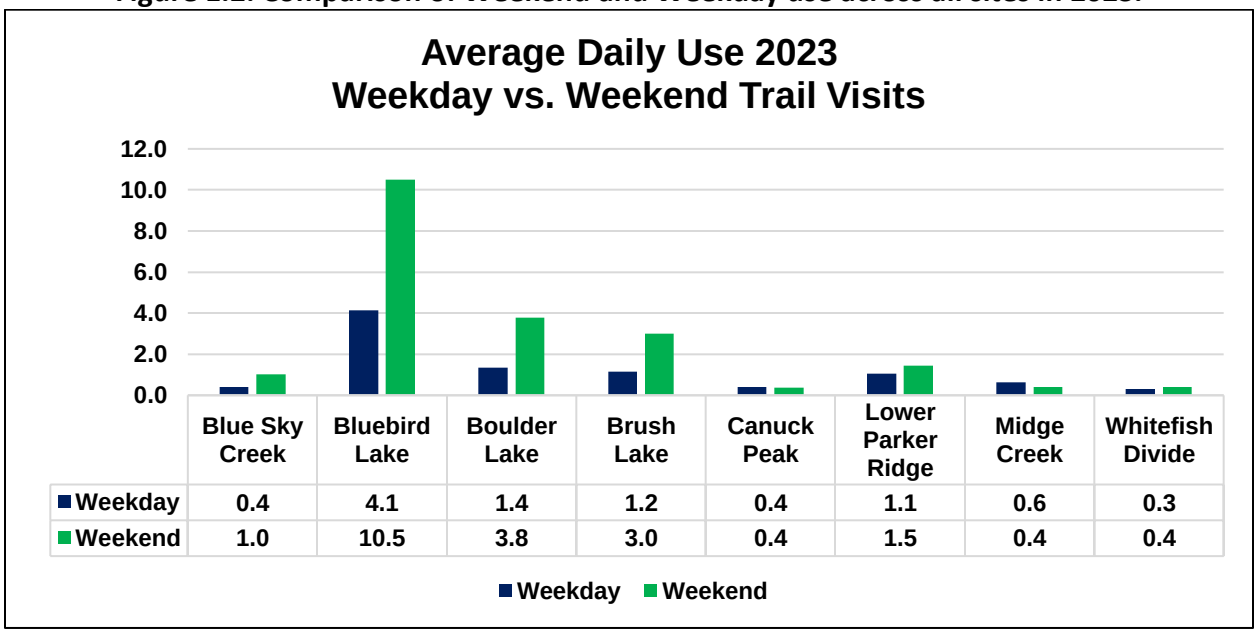
	Blue Sky Creek	Bluebird Lakes	Boulder Lakes	Brush Lake	Canuck Peak	Lower Parker Ridge	Midge Creek	Whitefish Divide
June	30		21	30		60	14	
July	17	190	99	81	12	52	20	19
August	8	194	60	27	8	21	5	5
September	30	150	24		20	34	4	6

For most sites, July and August 2023 had the most trail visits, with a smaller number of visits in June and September 2022. These use patterns are likely influenced in part by west-bound thru-hikers typically passing through these areas earlier in the season to complete their end-to-end hike of the PNNST during the window of time when trails are snow-free (from snowmelt in the high passes along the PNNST in Glacier National Park and before snow falls in the high passes along the PNNST in Olympic National Park). Throughout the time of observation, Bluebird Lake had the highest number of visits in each month. During July, Brush Lake and Boulder Lake also had a relatively high number of visits, with approximately 99 and 81 trail visits. In contrast, Blue Sky Creek, Canuck Peak, Midge Creek, and Whitefish divide had the lowest visits per month throughout the research reason. In September, all sites showed a significant drop off from their highest use.

Figure 1.2 shows a comparison of weekday and weekend use across each site. To stay consistent with the previous years' monitoring reports, Mondays, Tuesdays, Wednesdays, and

Thursdays were counted as weekdays and Fridays, Saturdays and Sundays were considered weekend days.

Figure 1.2: Comparison of Weekend and Weekday use across all sites in 2023.



	Blue Sky Creek	Bluebird Lake	Boulder Lake	Brush Lake	Canuck Peak	Lower Parker Ridge	Midge Creek	Whitefish Divide
Weekday	0.4	4.1	1.4	1.2	0.4	1.1	0.6	0.3
Weekend	1.0	10.5	3.8	3.0	0.4	1.5	0.4	0.4

Overall, Bluebird Lake had the greatest difference between weekday and weekend use. Across all sites except Midge Creek, the weekends were the time of greatest traffic. Weekdays still experienced traffic, but in significantly lower averages.

This lack of variation among the daily weekend and weekday averages, which suggests consistent use of the trails throughout the weeks, may indicate a primarily thru hiker presence or consistent day hiker use. For example, Whitefish Divide is not as easily accessible and takes more time to get to compared to some other sites. Thus, they may be largely used by thru-hikers on long-term trips or by retirees/people taking time off with more flexible schedules. These users may result in weekday and weekend use patterns that would not vary as widely.

The following figures show a comparison of the percentage of different types of users across each site for July and August. These graphs include overnight hikers, day hikers, and other types of users (which includes horseback riders, trail crew members, and mountain bikers). Graphs 1.3, and 1.5 distinguish between the percentage of different types of users at each site for each month, with observations at the party level. In contrast, graphs 4 and 6 show the percentage of different types of users for each site for each month when measured at the individual level. Differences in these types of measures may result from the extent to which different trails tend to be used by smaller versus larger groups of trail users. For example, thru-hikers may be more likely to travel solo or in small groups, while it may be easier and more common for day hikers and users to travel in larger parties (large families, school groups, tour groups, etc.).

Figure 1.3 shows that during July overnight hikers were the most common type of user for all sites when measured at the party level. During July, 90.9% of parties at Midge Creek were overnight hikers, as well as 89% at Canuck Peak. When compared by party, Midge Creel and Canuck Peak also had notably more overnight hikers than day hikers during July. At Bluebird Lake 59.2% of users were day hikers, with 38.8% of parties being made up of overnight hikers. Whitefish Divide, Blue Sky Creek, Boulder Lake, Brush Lake and Lower Parker Ridge recorded between 60-75% of parties being overnight hikers. "Other" types of users, besides overnight hikers and day hikers, were present at Whitefish Divide, Blue Sky Creek, Bluebird Lake, Boulder Lake, and Lower Parker Ridge. These parties are identified as mountain bikers, users on horseback, and trail crew.

Figure 1.3: Percentage of Types of Users by Party across all sites during July 2023

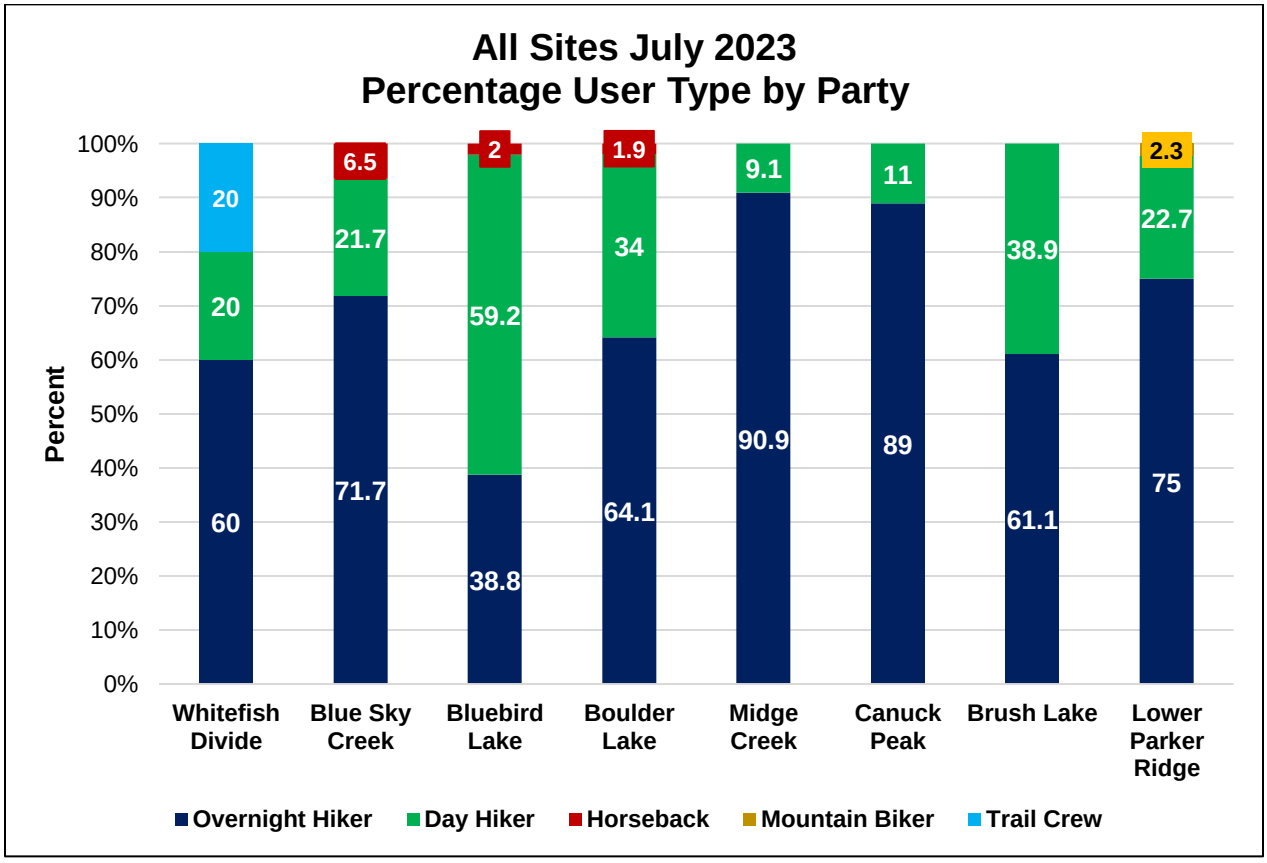


Figure 1.4 shows that, when measured by individual trail user, overnight hikers were the most common type of user for Blue Sky Creek, Midge Creek, Canuck Peak and Lower Parker Ridge during July. Day hikers were more common at Bluebird Lake, with 59.2% of individual users at this site being day hikers. "Other" users made up the smallest percentage of users at five sites they were present at and did not appear at three sites.

Figure 1.4: Percentage of Types of Users by Individual across all sites during July 2023

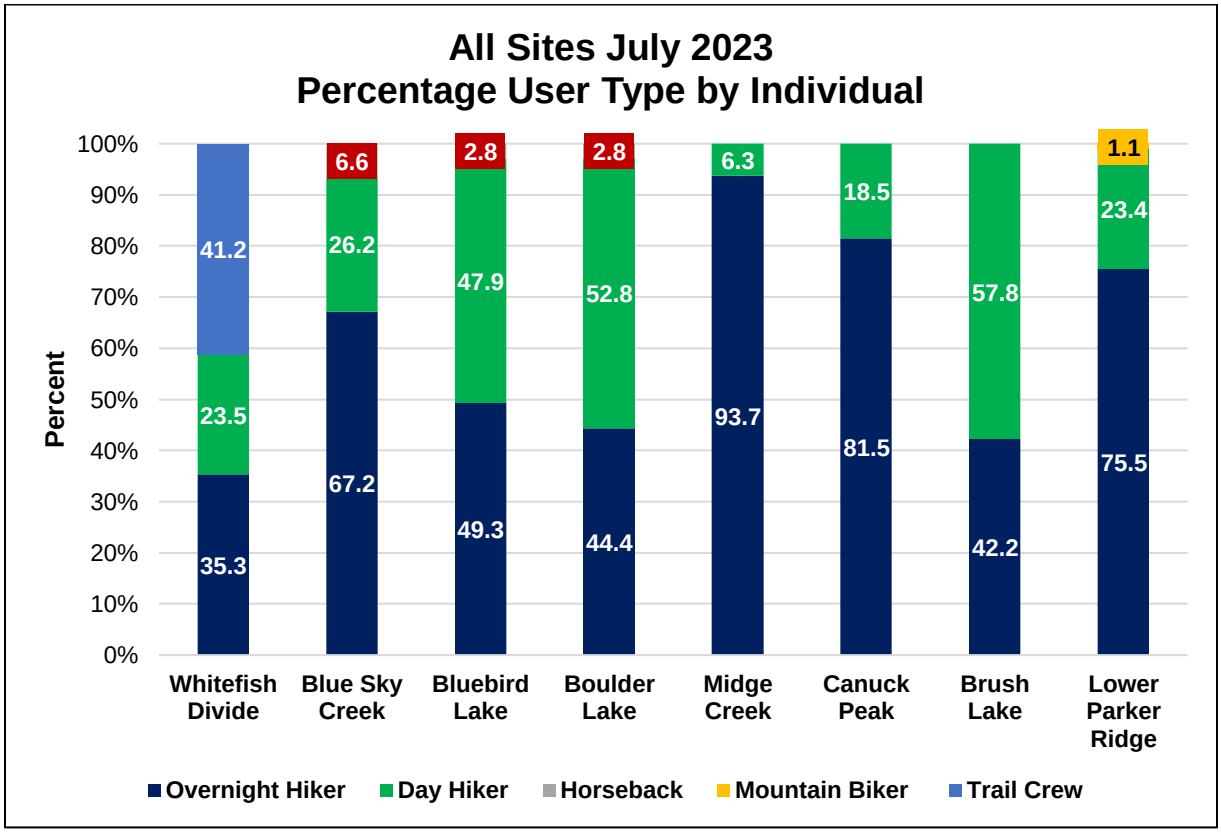


Figure 1.5 shows that day hikers were the most common type of user for five sites during August, when measured at the party level. During August, 57.1% of parties at Midge Creek and 58.3% of parties at Canuck Peak were composed of overnight hikers. “Other” users made up the smallest percentage of users at six sites they were present at and did not appear at two sites.

Figure 1.5: Percentage of Types of Users by Party across all sites during August 2023

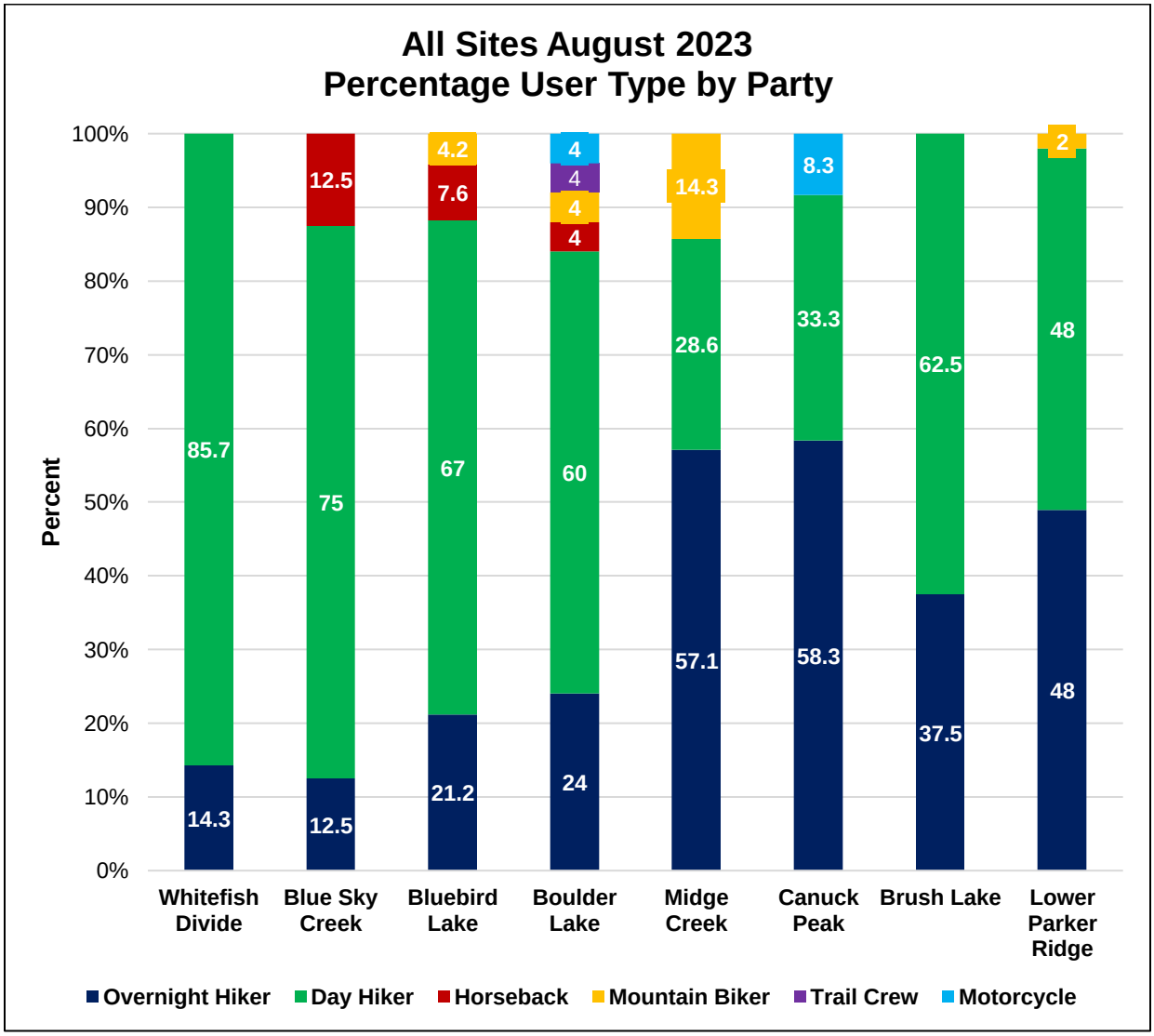


Figure 1.6 shows that the percentage distribution of user types for August analyzed at the individual level followed similar trends to those analyzed at the party level. Again, day hikers made up the majority of trail users at six sites, with overnight hikers making up the majority at only two sites.

Figure 1.6: Percentage of Types of Users by Individual across all sites during August 2023

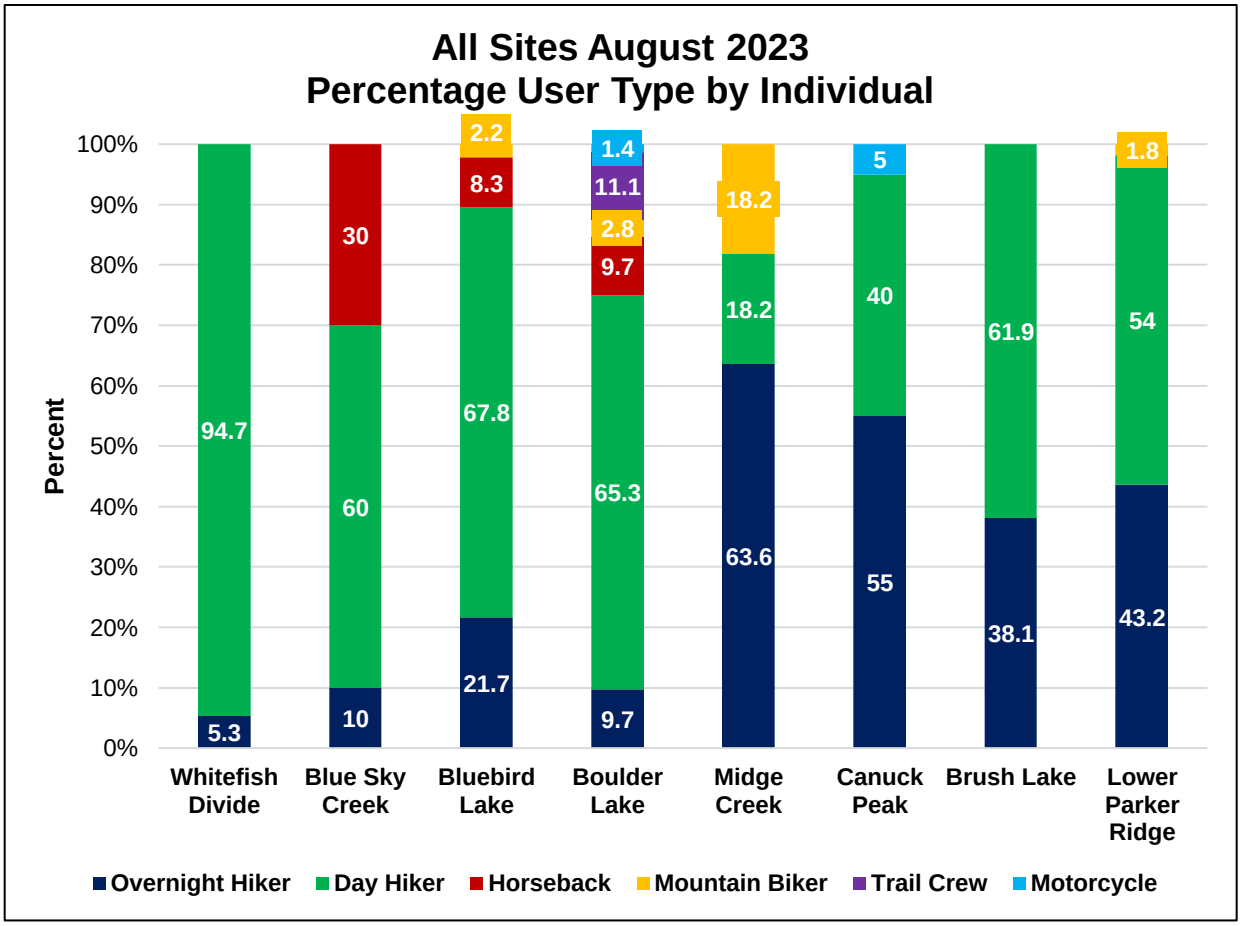


Table 2 provides the number of days monitored, monthly counts, daily averages, and maximum daily counts for each site for June-September 2023.

Table 2: Monitoring Data for June, July, August, and September 2023

Site	*Days Monitored (Monthly)*	*Count (Monthly)*	*Daily Average*	*Max (Daily)*
June				
Whitefish Divide Trail	-	-	-	-
Blue Sky Creek Trail	13	30	1	2
Bluebird Lake Trail	-	-	-	-
Boulder Lake Trail	13	21	0.7	2
Midge Creek Trail	13	0	0.5	3
Canuck Peak Trail	-	-	-	-
Brush Lake Trail	13	30	1	7
Lower Parker Ridge Trail	13	60	2	4
July				
Whitefish Divide Trail	8	19	0.6	2
Blue Sky Creek Trail	31	17	0.5	3
Bluebird Lake Trail	10	190	6.1	10
Boulder Lake Trail	31	99	3.2	23
Midge Creek Trail	31	20	0.6	3
Canuck Peak Trail	31	12	0.4	1
Brush Lake Trail	31	81	2.6	15
Lower Parker Ridge Trail	31	52	1.7	10
August				
Whitefish Divide Trail	31	6	0.2	3
Blue Sky Creek Trail	31	8	0.3	3
Bluebird Lake Trail	31	194	6.3	24
Boulder Lake Trail	31	60	1.9	19
Midge Creek Trail	31	5	0.2	
Canuck Peak Trail	31	8	0.3	1
Brush Lake Trail	24	27	0.9	8
Lower Parker Ridge Trail	31	21	0.7	8
September				
Whitefish Divide Trail	17	6	0.2	1
Blue Sky Creek Trail	16	30	1	2
Bluebird Lake Trail	16	150	5	17
Boulder Lake Trail	16	24	0.8	6
Midge Creek Trail	16	4	0.1	1
Canuck Peak Trail	15	20	0.7	2
Brush Lake Trail	-	-	-	-
Lower Parker Ridge Trail	15	34	1.1	10

Trail Use by Site

Bluebird Lake 2023

The Bluebird Lake Trail is located past the parking site for Blue Sky Creek. The trailhead can be found by continuing up Grave Creek Road to the final section, NF-319, where it ends in a parking area. Along the way there will be signs and branches off to Therriault Lakes and a horse camp. From the parking lot entrance, the trailhead is on the south side. From the trailhead, the Bluebird Lake monitoring site is approximately 2.1 miles up the trail. At about 2 miles up the trail there is an intersection. The camera and counter are situated on the righthand branch, toward the Bluebird Lake turnoff, and amongst a forested section between two clear openings. During 2023, the counter and camera were set up on the south side of the trail.

The data shows that Bluebird Lake is the most used trail within the summer hiking season out of all the trails monitored for this report. The trail's proximity to Eureka might be a factor in relatively high use numbers and patterns. It is also located relatively close to Whitefish and Kalispell, which have larger populations, and is utilized by Canadian travelers often. Moreover, Bluebird Lake is a scenic area at high elevation, which could make it a trail of high interest among users. Additionally, Bluebird Lake is near a campground that could account for increased trail visits. According to Kootenai National Forest recreation managers, Bluebird Lake was the only trail on Kootenai National Forest identified as "high use" in a 1978 trail inventory. In 2023, Bluebird Lake was the busiest trail monitored, with 307 trail visits total from July 24 – September 16.

Figure 2.1 shows the total weekly trail visits at the Bluebird Lake site. The weeks with the highest use were July 31 – August 6, and August 7-13, with these weeks having 72 and 65 trail visits respectively. A weekly average of 38.37 trail visits were recorded at the Bluebird Lake site during the weeks monitored.

Figure 2.1 Bluebird Lakes Weekly Counts

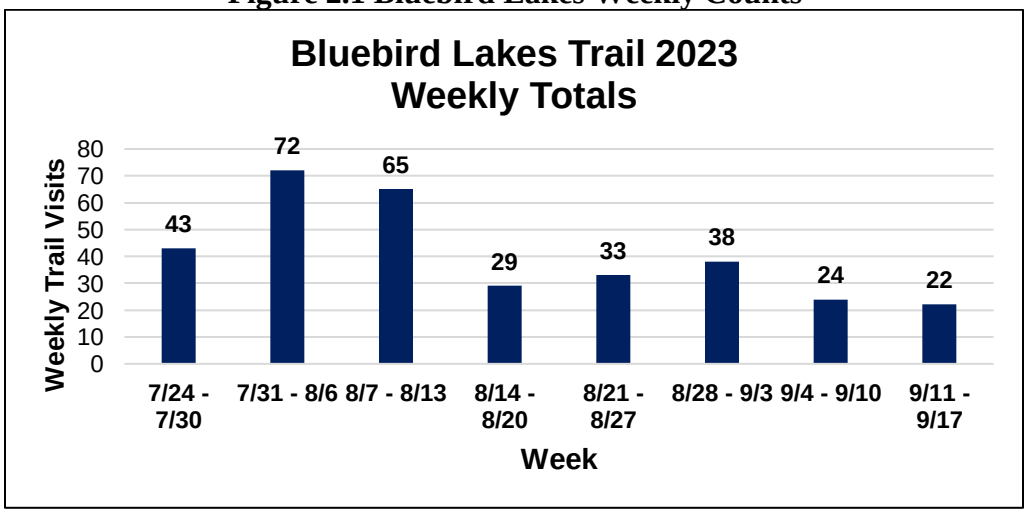


Figure 2.2 shows the parties per week at the Bluebird Lake monitoring site. Since this site was set up on July 1, a user moved the camera to face away from the trail on July 3, and thus usable observations did not begin until July 24. The week with the largest number of parties was July 31- August 6 with 46 parties passing by the camera. The two other highest weeks were July 24-30 and August 7-13 with 32 and 38 parties passing by the camera. All other weeks were consistently high when compared to other sites.

Figure 2.2 Bluebird Lakes Parties per Week

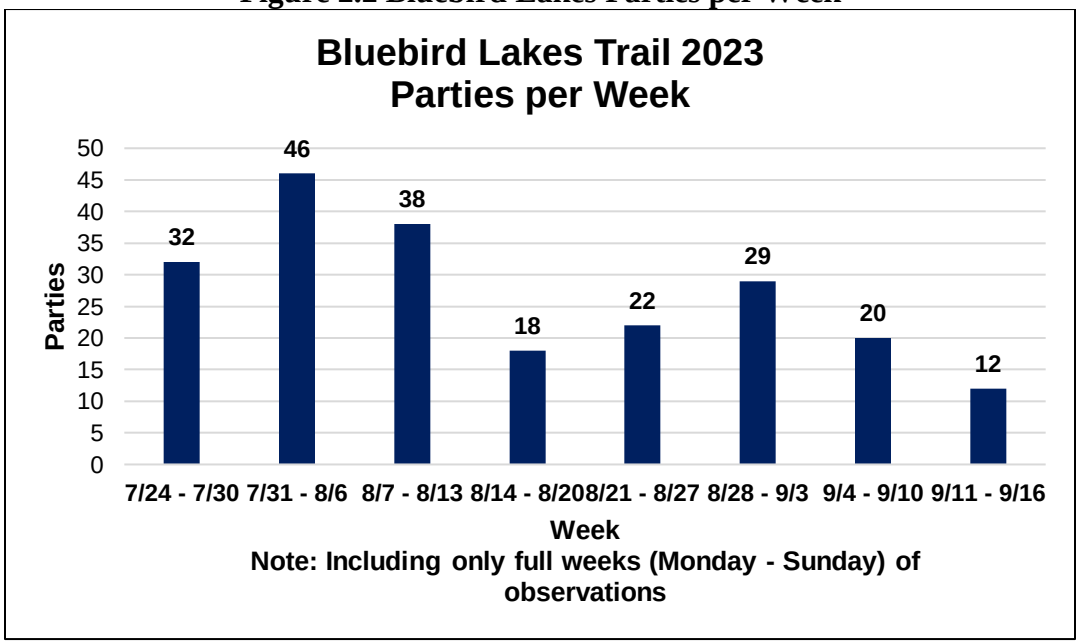


Figure 2.3 includes the daily average number of trail visits by the day of the week at the Bluebird Lake site. The highest use day was Saturday, which had an average of 11.1 visitors per day. The lowest use days were Mondays, Tuesdays, and Wednesdays, where the average daily use was below 2.8 visitors per day.

Figure 2.3 Bluebird Lakes Daily Averages by Day of the Week

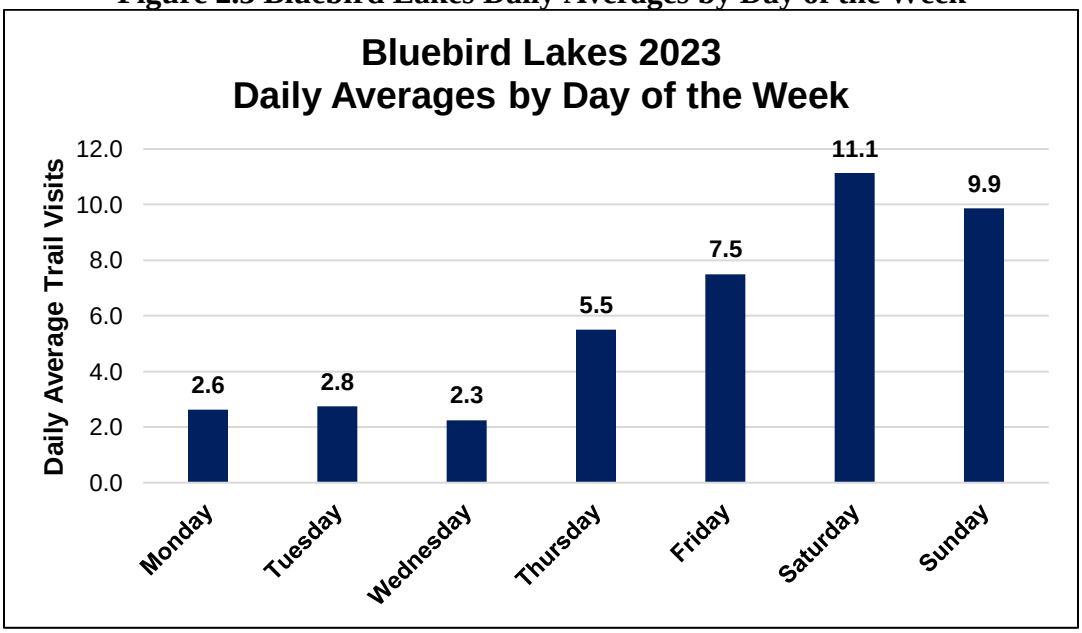


Figure 2.4 shows the percentage distribution of party sizes at Bluebird Lake. Party sizes varied widely at this site with parties being made up of 1-8 and 13 individuals. Solo and pairs of users had the highest percentages, with 28.1% of parties being solo users and 38.7% of parties being pairs of individuals.

Figure 2.4 Bluebird Lakes Percentage Distribution by Party Size

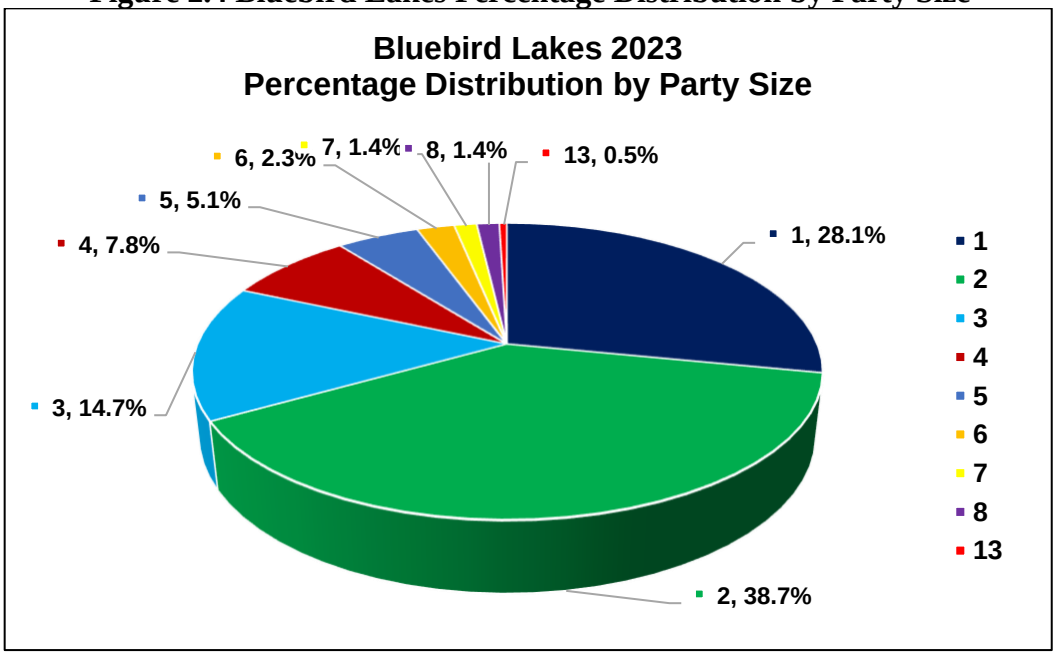


Figure 2.5 shows the distribution of user types at the party level at Bluebird Lake during 2023. The most common type of party was composed of day hikers, which composed about 66.8% of parties. This was followed by overnight hikers with 23%, horseback riders at 6.9%, and Mountain Bikers at 3.2%.

Figure 2.5 Bluebird Lakes Percentage Distribution of User Type by Party

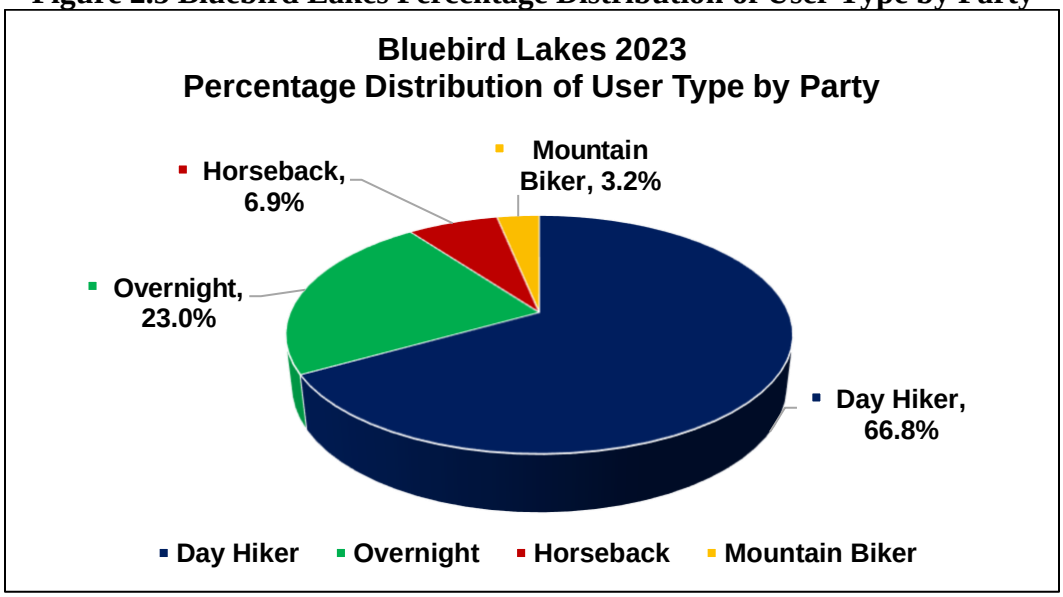
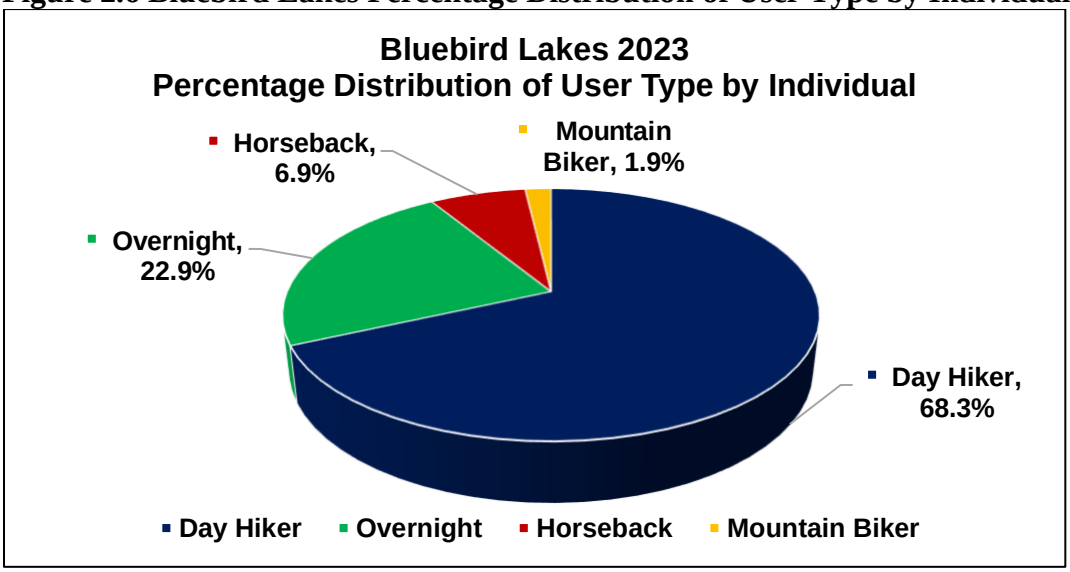


Figure 2.6 shows the distribution of user types at the individual level that were recorded at Bluebird Lake over 2023. This graph follows a similar trend to the distribution of users measured at the party level. The most common type of user was day hikers (68.3%) followed by overnight hikers (22.9%).

Figure 2.6 Bluebird Lakes Percentage Distribution of User Type by Individual



Blue Sky Creek 2023

Blue Sky Creek Trail (#174) can serve as a gateway trail between Flathead and Kootenai National Forests for overnight hikers. The Blue Sky Creek monitoring site is located about 1.0 miles from the trailhead, which begins on the east side of Grave Creek Rd/NF-114, where NF-7020 branches off. From the parking area, the trailhead can be found across a walking bridge. During 2023, the counter and camera were set up on the south side of the trail.

Figure 3.1 shows the total weekly trail visits at the Blue Sky Creek Site. The week with the highest use was September 11th- September 16th, with 12 trail visits. A weekly average of 4.2 trail visits were recorded at the Blue Sky Creek site during the weeks monitored.

Figure 3.1 Blue Sky Creek Weekly Counts

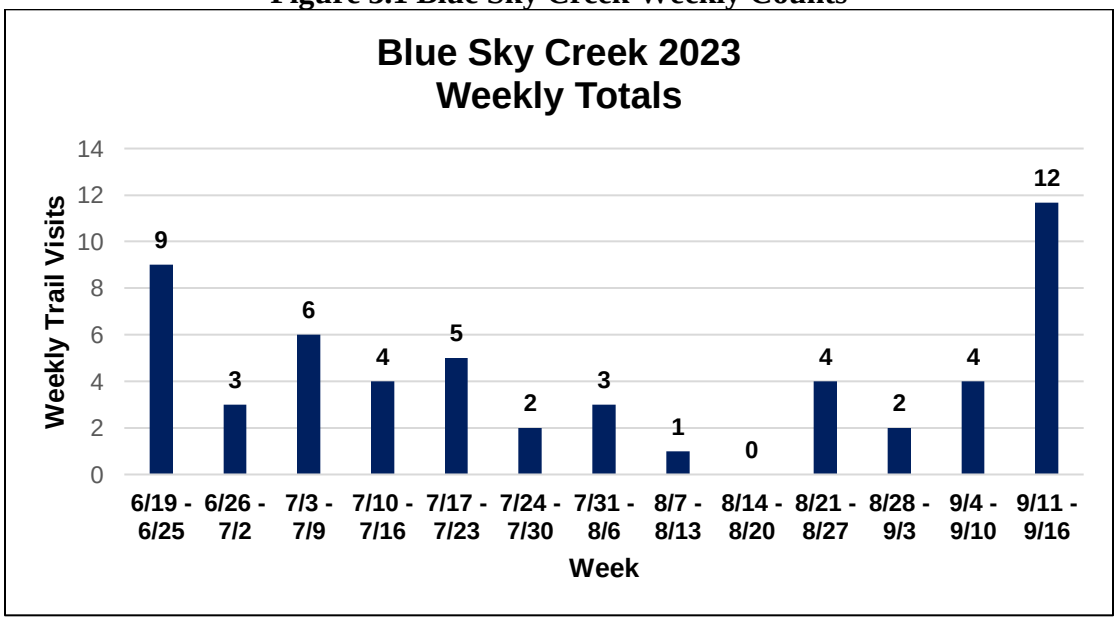


Figure 3.2 shows the parties per week at the Blue Sky Creek monitoring site. Since this site was set up on June 18th, the week of June 14th observations of hikers began on June 19th. The weeks with the largest number of parties were July 4th-9th and July 17th-13th, which both had 12 parties pass by during the week, and July 10th – July 16th with 13 parties passing by the camera.

Figure 3.2 Blue Sky Creek Parties per Week

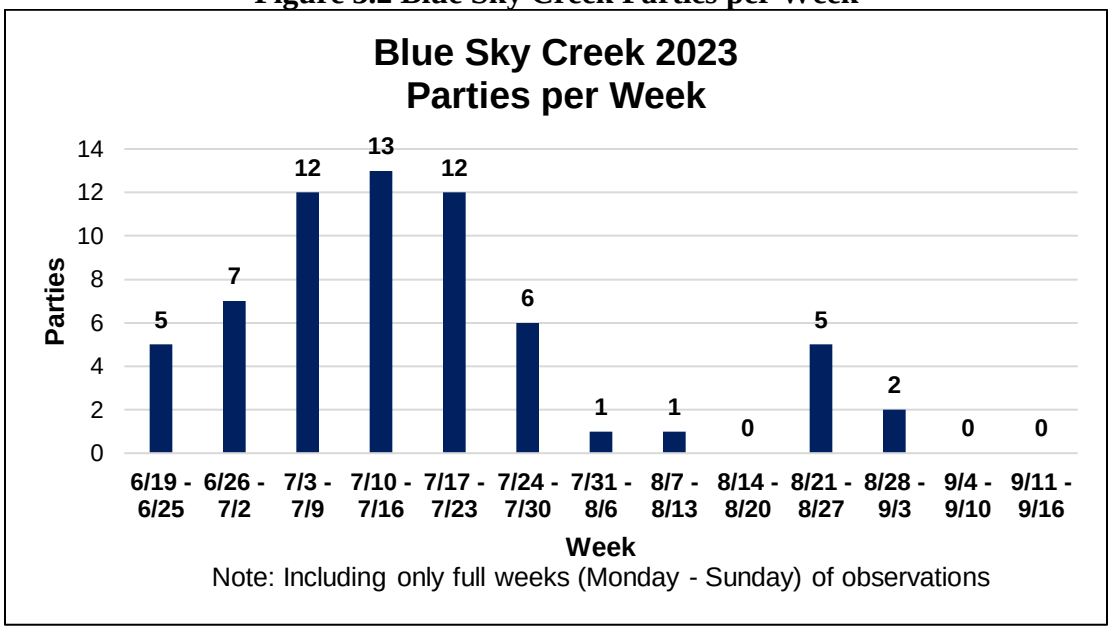


Figure 3.3 includes the daily average number of trail visits by the day of the week. The highest use day was Saturday, which had an average of 1.2 visitors per day. The lowest use day was Mondays and Fridays, where the average daily use was 0.2 visitors per day.

Figure 3.3 Blue Sky Creek Daily Averages by Day of the Week

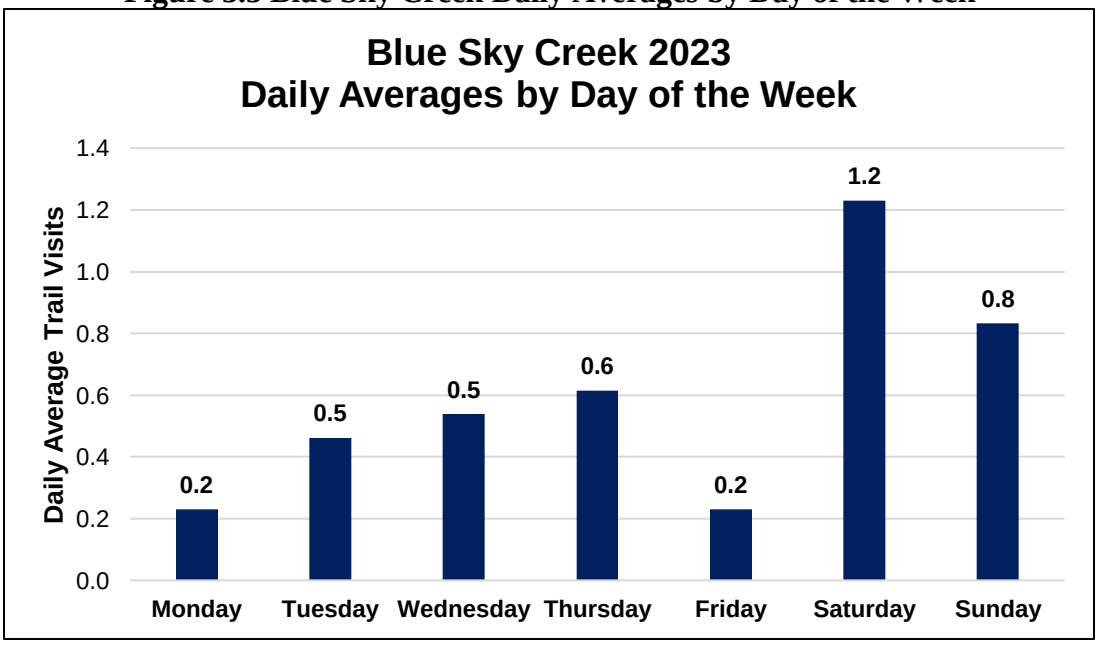


Figure 3.4 shows the percentage distribution of party sizes at Blue Sky Creek. Party sizes were relatively small at this site, with 71.9% of parties being solo users and 21.9% of parties being pairs of individuals.

Figure 3.4 Blue Sky Creek Percentage Distribution by Party Size

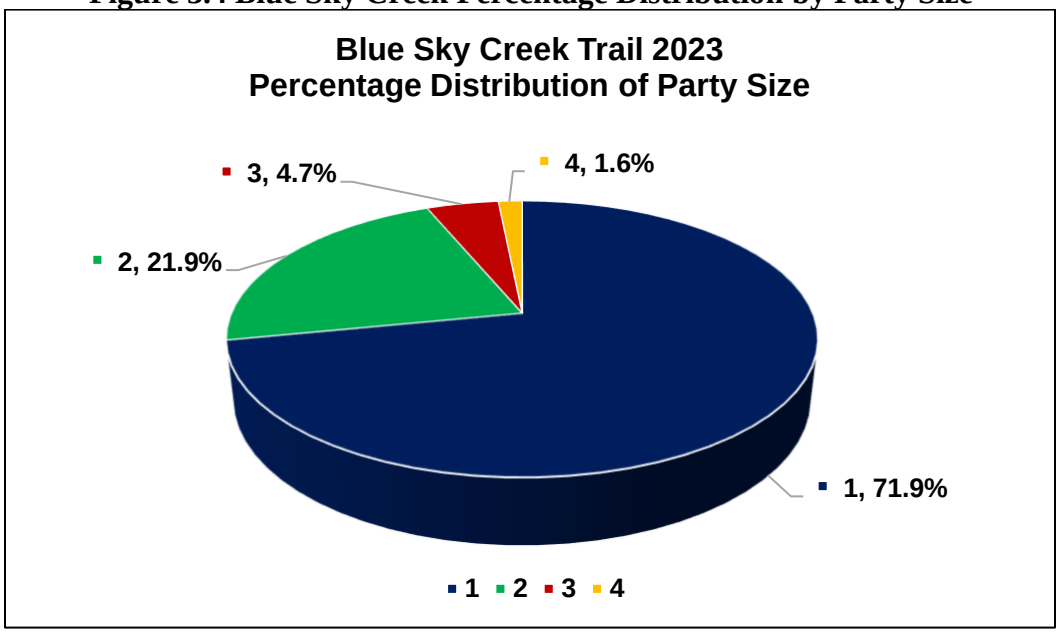


Figure 3.5 shows the distribution of user types at the party level at Blue Sky Creek during 2023. The most common type of party was composed of overnight hikers, which composed about 65.6% of parties. This was followed by day hikers with 26.6%, and horseback riders at 7.8%.

Figure 3.5 Blue Sky Creek Percentage Distribution of User Type by Party

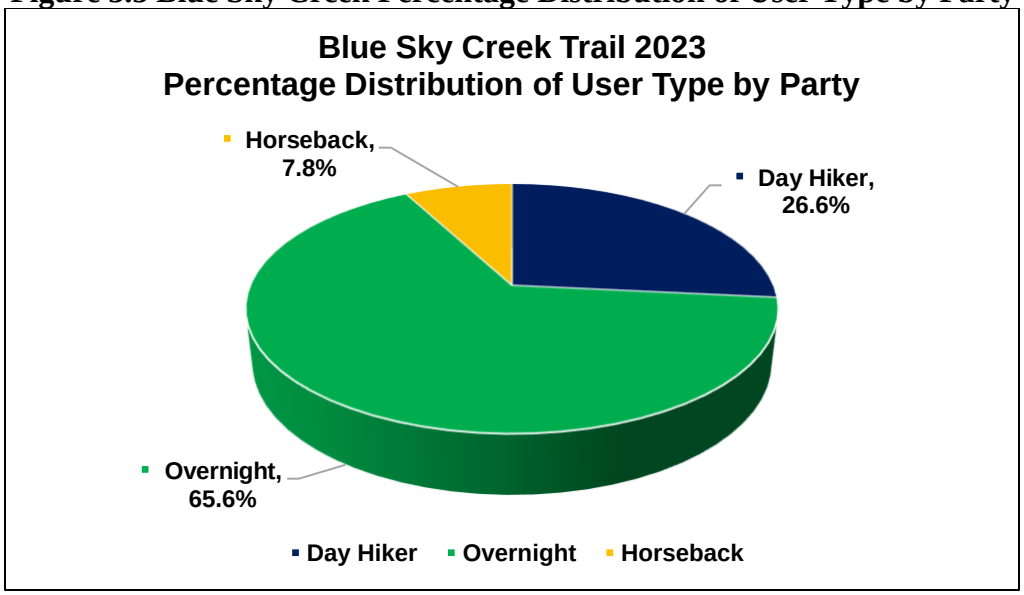
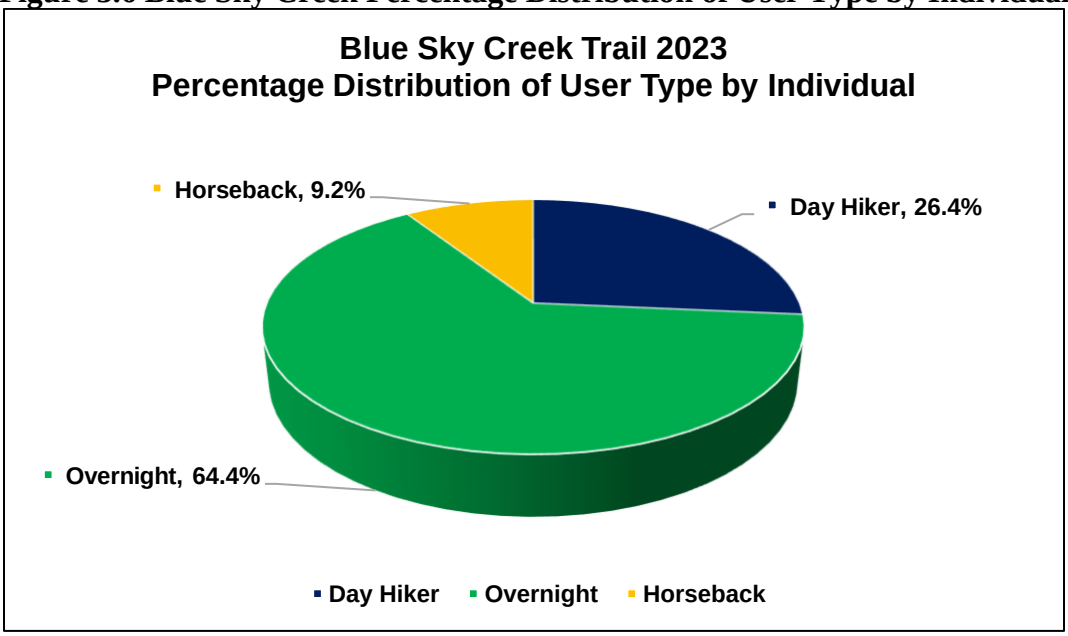


Figure 3.6 shows the distribution of user types at the individual level that were recorded at Blue Sky Creek over 2023. This graph follows a similar trend to the distribution of the percentage of users measured at the party level. The most common type of user was overnight hikers, which composed about 64.4% of users. This was followed by day hikers, which included 26.4% of the parties at Blue Sky Creek. The remaining users were horse riders at 9.2%.

Figure 3.6 Blue Sky Creek Percentage Distribution of User Type by Individual



Whitefish Divide 2023

Whitefish Divide Trail (#26) follows the western border of Glacier View Ranger District. The Whitefish Divide monitoring site trailhead can be found by taking Olney Crossover Rd (which turns into Red Meadow Rd/NF-115) off of US-93 N for about 17 miles to where it intersects with the PNNST on the left, and then following this road section of the PNNST another 1.5 miles. The monitoring site is then located about 0.5 miles from the trailhead, which begins on the west side of the road. During 2023, the counter and camera were set up on the north side of the trail. From July 24, 2023, through September 17, 2023, an estimated 13 trail visits were recorded on Whitefish Divide Trail. This may be due to the road to access this trail being significantly washed out compared to last year, and the distance of the trailhead from US-93.

Figure 4.1 shows the total weekly trail visits at the Whitefish Divide site. The week with the highest use was July 24th – July 30th, with 5 trail visits. A weekly average of 1.75 trail visits were recorded at the Whitefish Divide site during the weeks monitored.

Figure 4.1 Whitefish Divide Weekly Counts

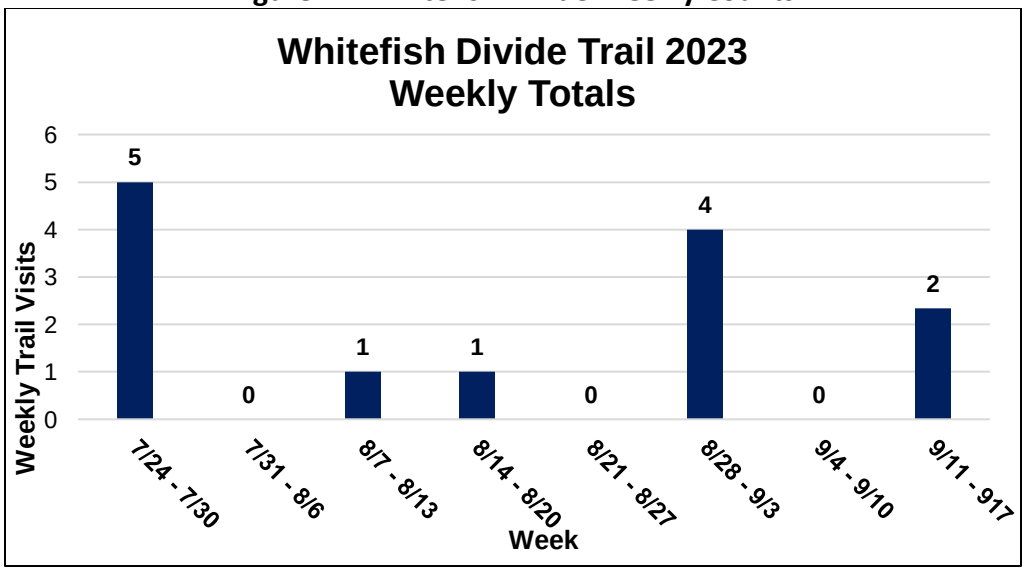


Figure 4.2 shows the parties per week at the Whitefish Divide monitoring site. Camera data was missing for this site between July 1 - 23, and only full weeks of data were assessed for party totals per week. Of the observable weeks, those with the largest number of parties were July 24-30, which had 5 parties pass by during the week.

Figure 4.2 Whitefish Divide Parties per Week

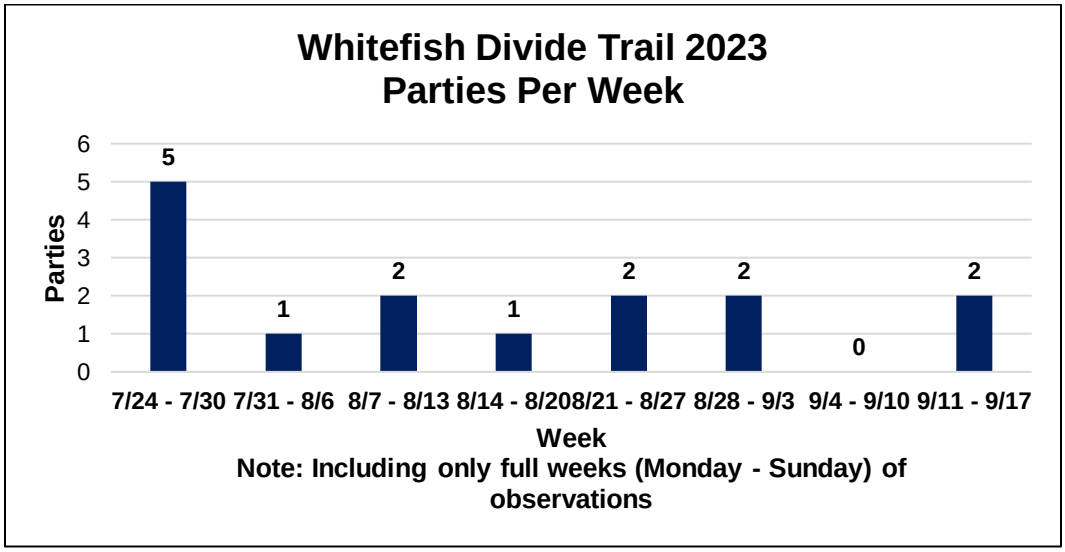


Figure 4.3 includes the daily average number of trail visits by the day of the week at the Whitefish Divide site. The highest use day was Thursday, with an average of 0.5 visitors per day. The lowest use days were Monday and Tuesday with an average of 0.0, and Wednesday with 0.1 visitors per day.

Figure 4.3 Whitefish Divide Daily Averages by Day of the Week

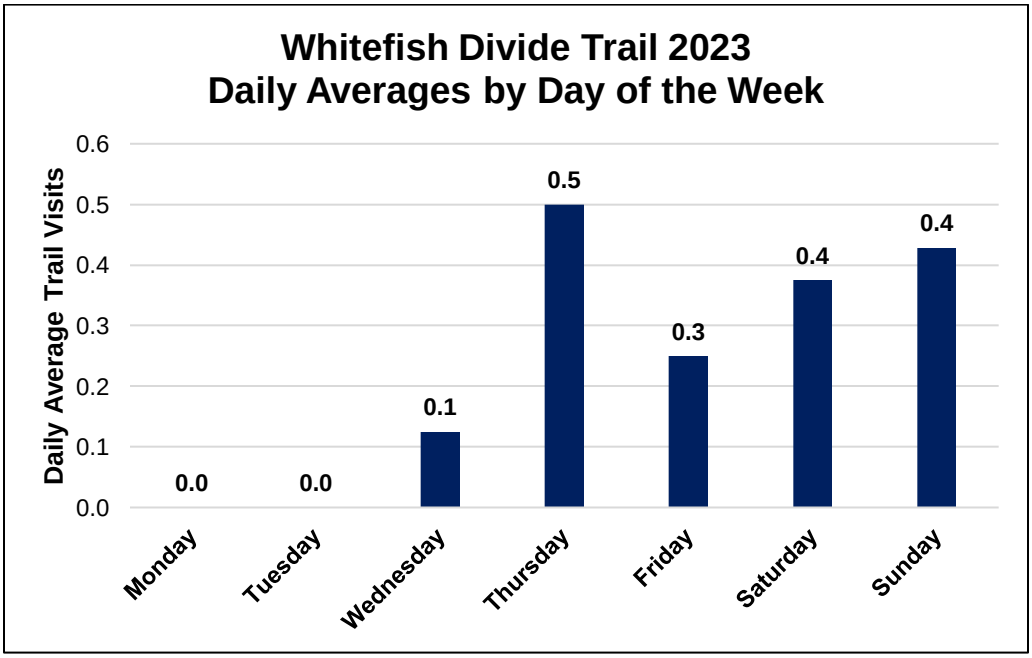


Figure 4.4 shows the percentage distribution of party sizes at Whitefish Divide. The graph shows that party sizes were relatively small, with 46.7% of parties involving pairs of individual users, 26.7% of parties being solo users, and 6.7% of parties containing 3, 4, 7, and 11 users.

Figure 4.4 Whitefish Divide Percentage Distribution of Party Size

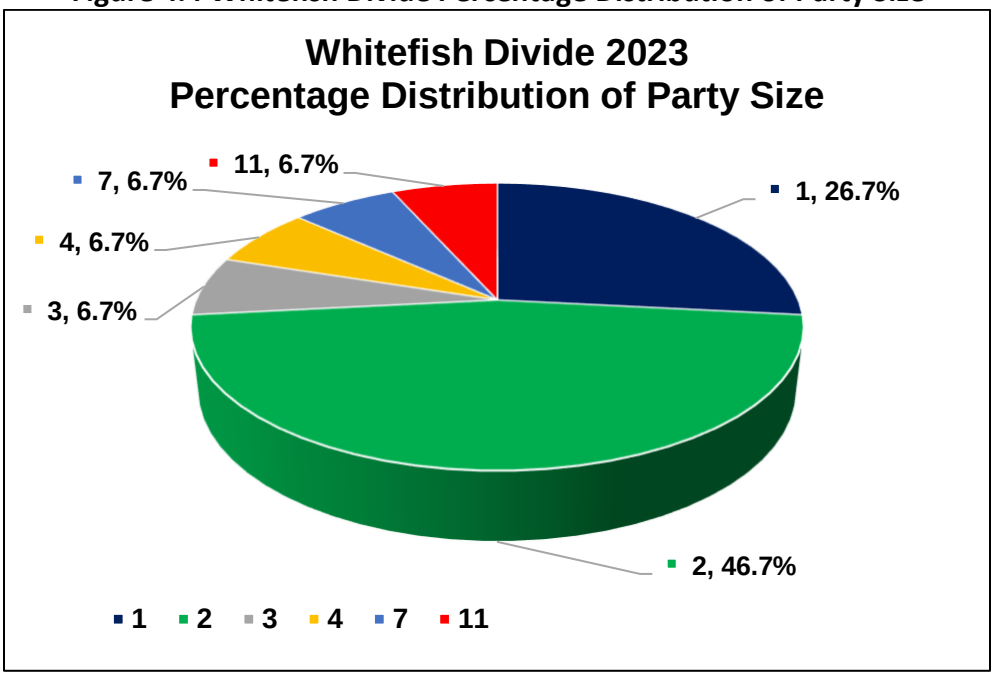


Figure 4.5 shows the distribution of user types at the party level observed at Whitefish Divide over 2023. The most common type of party included day hikers, which composed about 67% of parties. This was followed by overnight hikers (27%) and trail crew (6%).

Figure 4.5 Whitefish Divide Percentage Distribution of User Types by Party

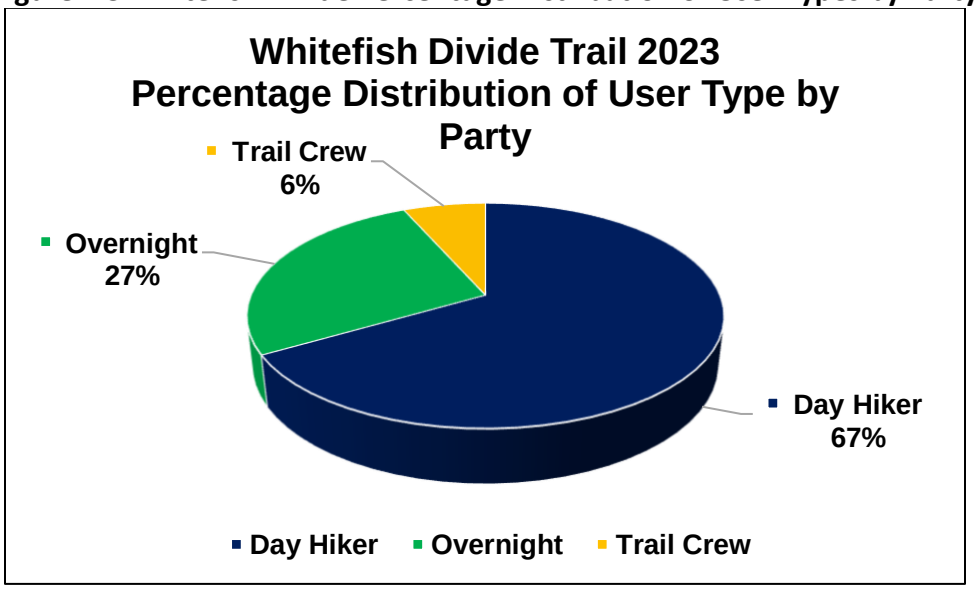
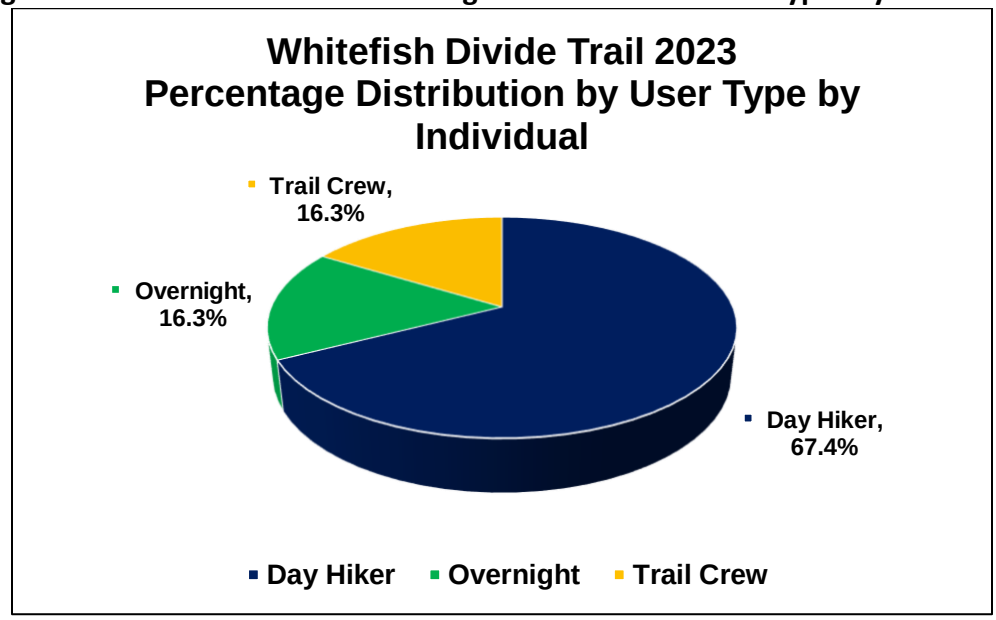


Figure 4.6 shows the distribution of user types at the individual level that were recorded at Whitefish Divide. This graph follows a similar trend to the distribution of the percentage of users measured at the party level. The most common type of user included day hikers, which composed about 67.4% of users. This was followed by overnight hikers and trail crew, which each accounted for 16.3% of the parties at Whitefish Divide.

Figure 4.6 Whitefish Divide Percentage Distribution of User Types by Individual



Boulder Lakes Trail 2023

Boulder Lake Trail (#62) can be found from Highway 37 by crossing Koocanusa Bridge and traveling north on FDR 470 for 2.3 miles, turning onto Boulder Creek Road 337 and following it 10 miles, before then turning onto Road 7229. The start of the trail can be found about 1.2 miles from this turnoff. The Boulder Lake monitoring site is located about 1.9 miles from the parking site. From June 16, 2023, through September 16, 2023, an estimated 180 trail visits were recorded on the Boulder Lake Trail.

Figure 5.1 shows the total weekly trail visits at the Boulder Lake site. The week with the highest use was July 3 - July 9, with 37 visits. The weeks of July 17-23, July 24-30, and August 14-20 also had relatively high use, with each of these weeks having between 23-32 trail visits. A weekly average of 13.8 trail visits were recorded at the Boulder Lake site during the weeks monitored.

Figure 5.1 Boulder Lakes Weekly Total Visits

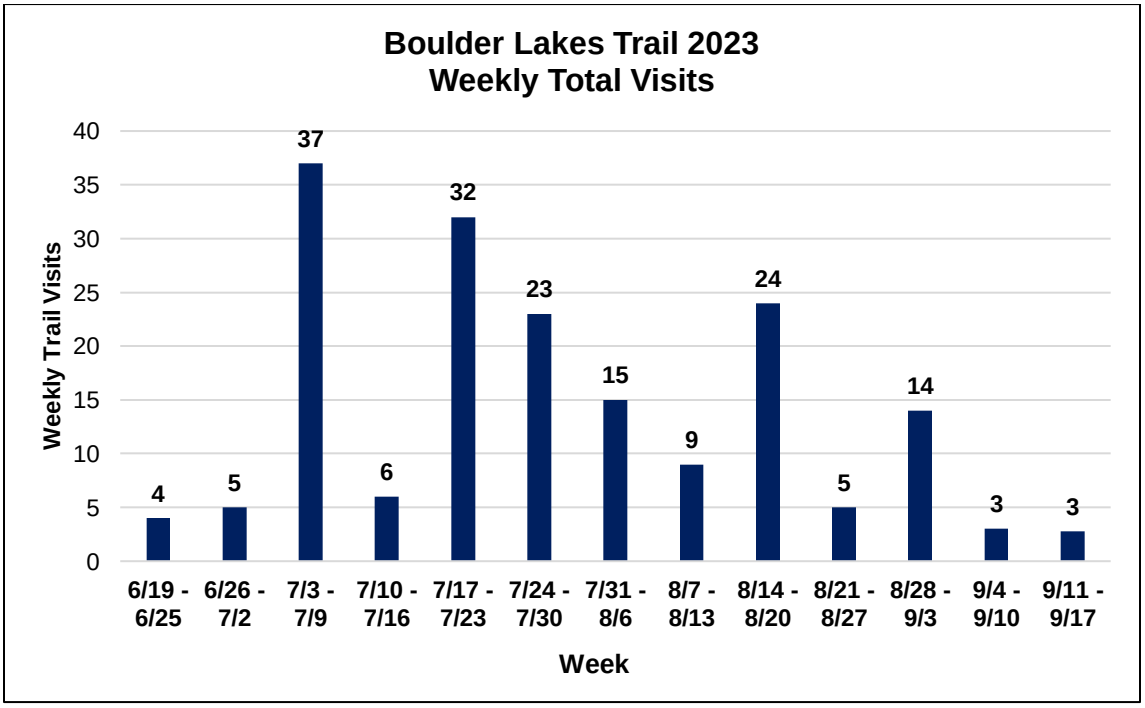


Figure 5.2 shows the parties per week at Boulder Lake, and only full weeks of data were assessed for party totals per week. The weeks observed to have the largest number of parties were July 3-9 during which 18 parties passed by.

Figure 5.2 Boulder Lakes Parties per Week

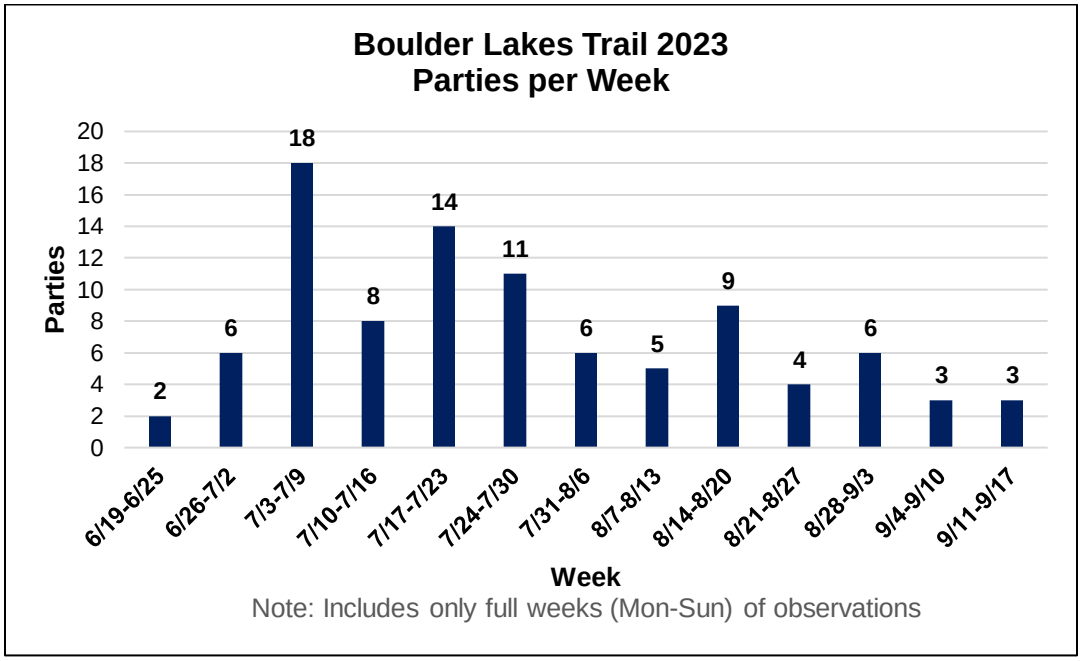


Figure 5.3 includes the daily average number of trail visits by the day of the week at the Boulder Lake site. The highest use day was Saturday, with an average of 6.5 visitors per day, with no other site having a daily average higher than 2.3 visitors per day.

Figure 5.3 Boulder Lakes Daily Averages by Day of the Week

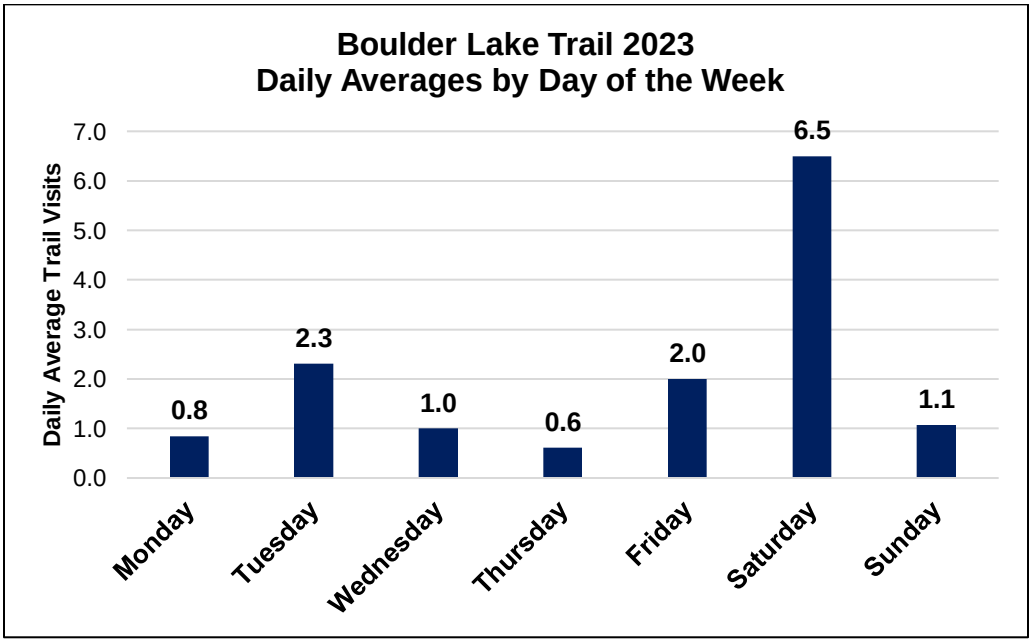


Figure 5.4 shows the percentage distribution of party sizes at Boulder Lake. Overall, the most common party sizes were solo users, making up 50% of parties, followed by pairs of trail users, which composed 30.2% of parties, and small numbers of 3-to-11-member party sizes.

Figure 5.4 Boulder Lake Percentage Distribution of Party Size

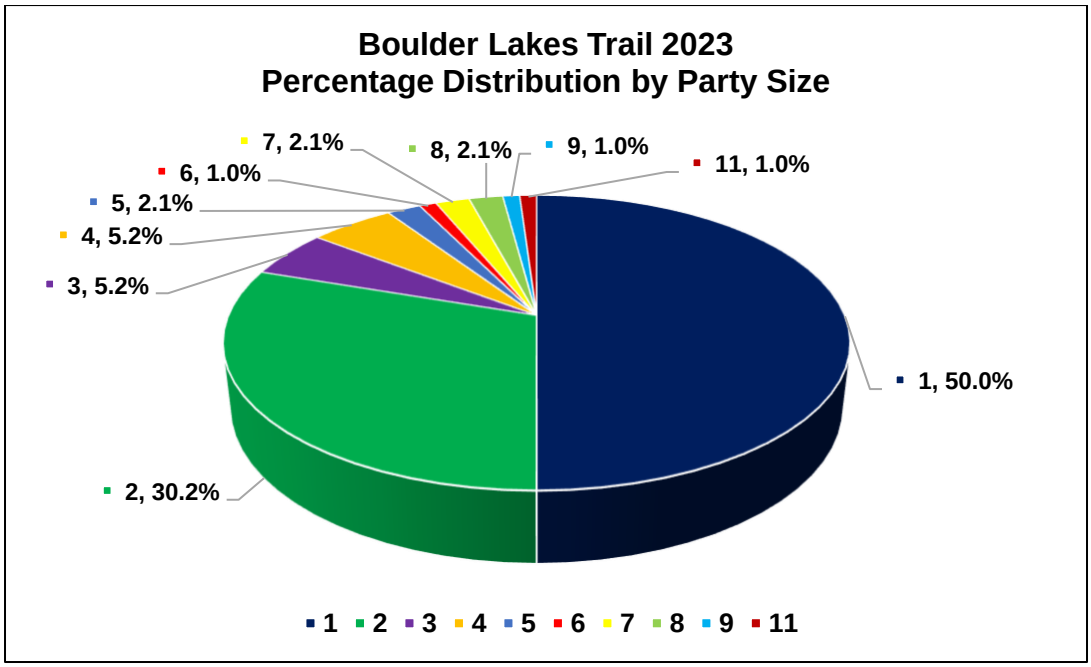


Figure 5.5 shows the distribution of user types observed at the party level at the Boulder Lake site. The most common type of party was composed of overnight hikers, which composed about 47.9% of parties. This was followed by day hikers which made up 46.9% of parties. A smaller number of mountain bikers, motorcyclists, trail crew, and users on horseback appeared on the trail.

Figure 5.5 Boulder Lakes Percentage Distribution of User Types by Party

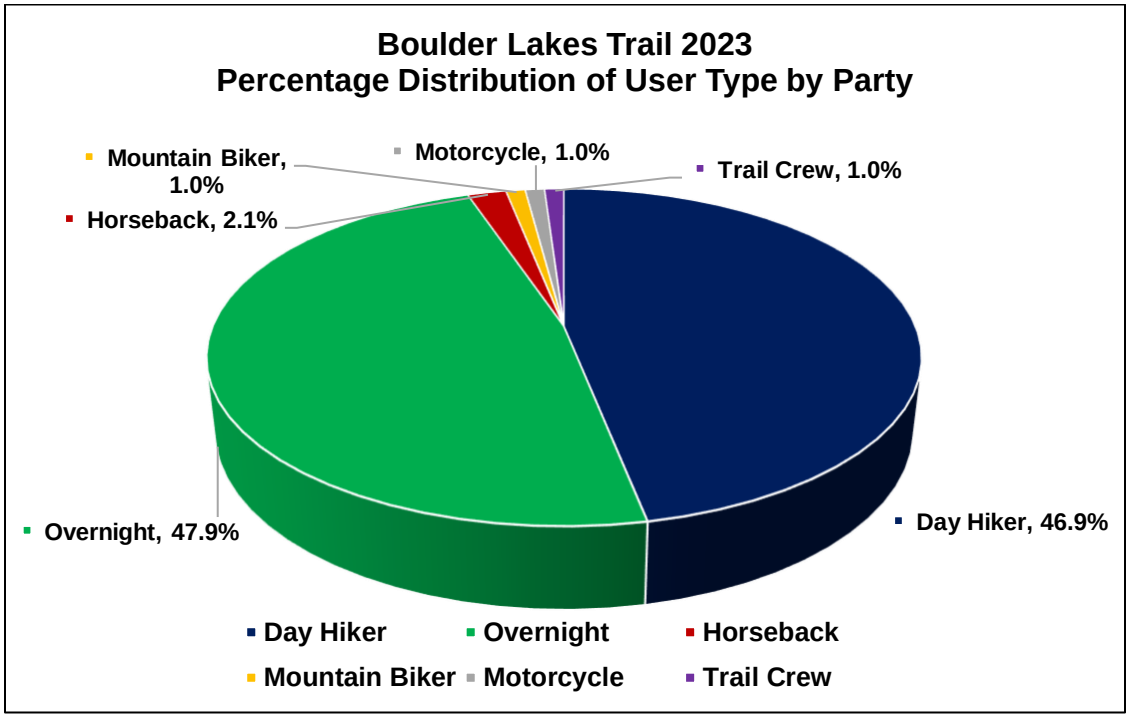
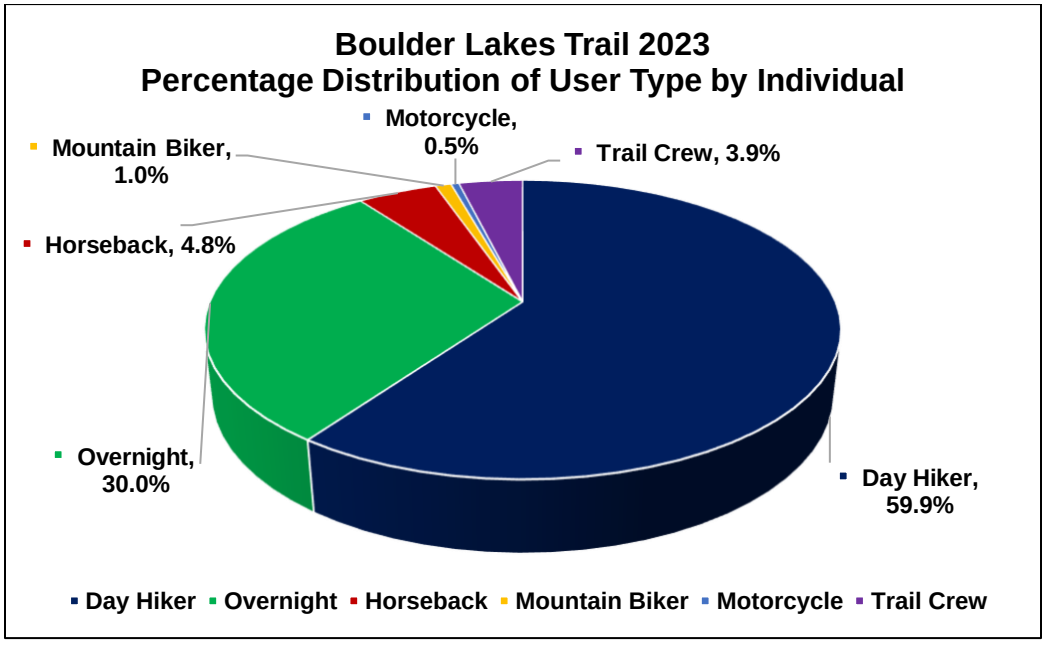


Figure 5.6 shows the distribution of user types at the individual level that were recorded at Boulder Lake. This graph follows a similar trend to the distribution of the percentage of users measured at the party level. The most common type of user at this site included day hikera (59.9%) followed by overnight hikers (29.9%).

Figure 5.6 Boulder Lakes Percentage Distribution of User Types by Individual



Midge Creek Trail 2023

Midge Creek Trail (#177) can be accessed from a trailhead found at the end of road NR-5902, on the south side. Being one of the most remote sites included in the research season, overnight hikers were more common than day hikers, and notably high numbers of wildlife and total species were observed. The Midge Creek site is about 0.6 miles from the start of the trail. From June 17, 2023, through September 16, 2023, an estimated 33 trail visits were recorded at the Midge Creek site.

Figure 6.1 shows the total weekly trail visits observed at the Midge Creek site. The week with the highest use was July 24-30, with this week having 7 trail visits. A weekly average of 2.54 trail visits were recorded at the Midge Creek site during the weeks monitored.

Figure 6.1 Midge Creek Weekly Counts

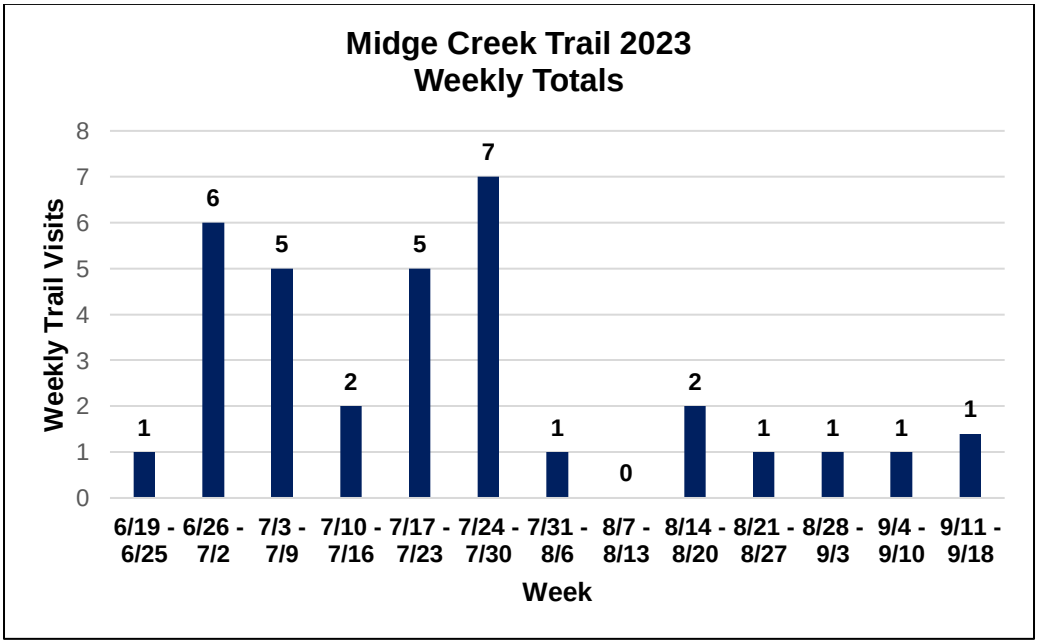


Figure 6.2 shows the parties per week observed at the Midge Creek site. The observed week with the largest number of parties was July 17-23, during which 8 parties passed by, with the next highest weeks being July 10-16 and July 24-30, with 5 observed parties. By August trail usage drops off dramatically.

Figure 6.2 Midge Creek Parties per Week

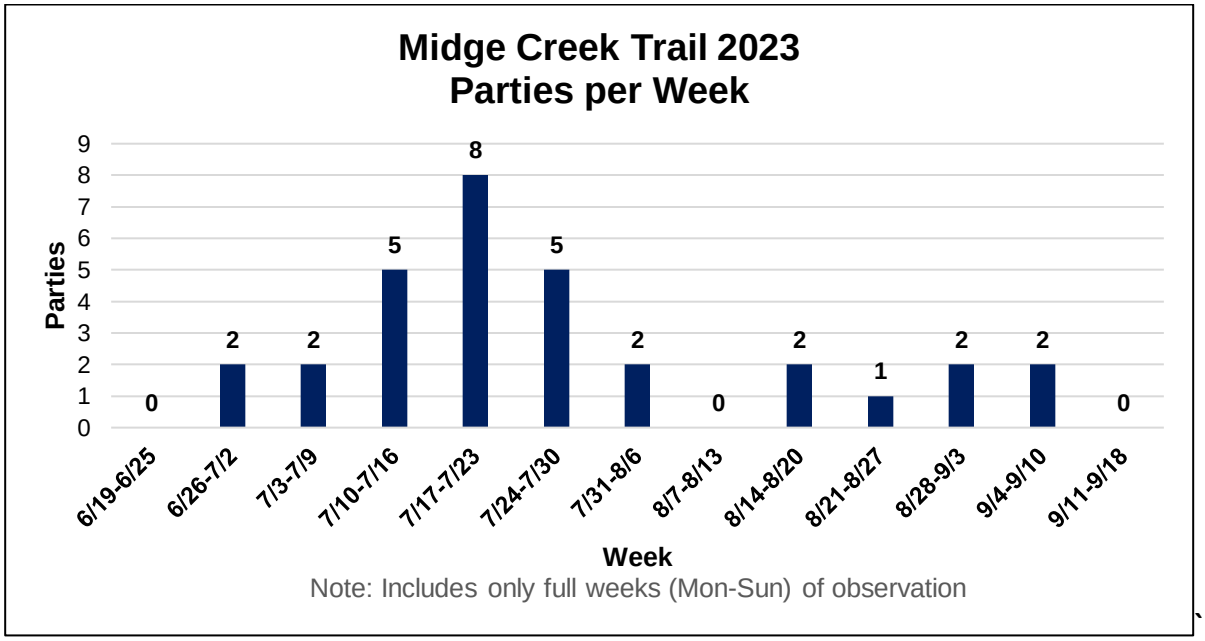


Figure 6.3 includes the daily averages number of trail visits by the day of the week at the Midge Creek site. The highest use day at this site was Saturday, with an average of 0.8 visitors per day and most other days having below 0.5 daily averages.

Figure 6.3 Midge Creek Daily Averages by Day of the Week

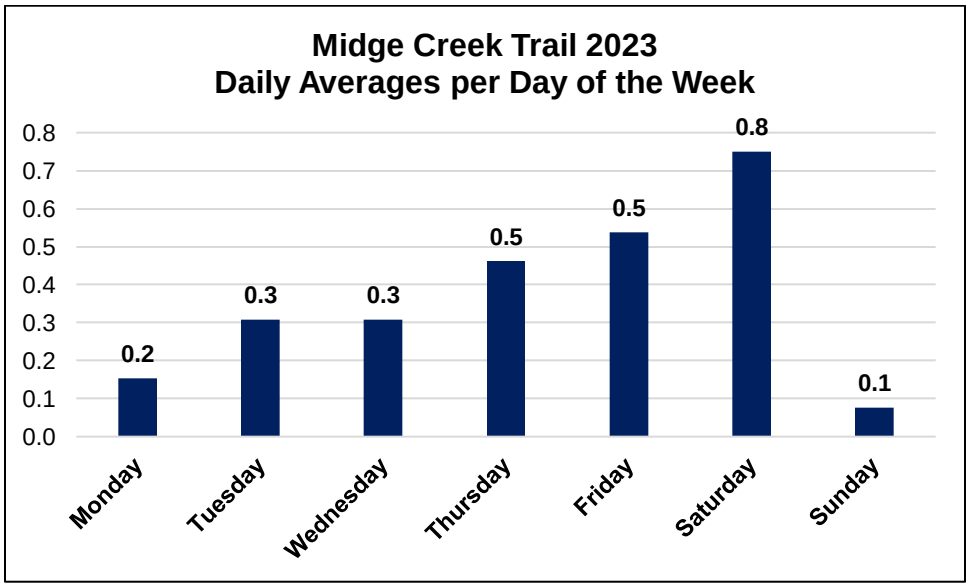


Figure 6.4 shows the percentage distribution of party sizes at the Midge Creek Site. Overall, the most common party sizes were solo users, which made up 61.3% of parties. The next most common party size was pairs of two users, which made up 32.3% of parties, and trios of users, which made up 6.5% of parties.

Figure 6.4 Midge Creek Percentage Distribution of Party Size

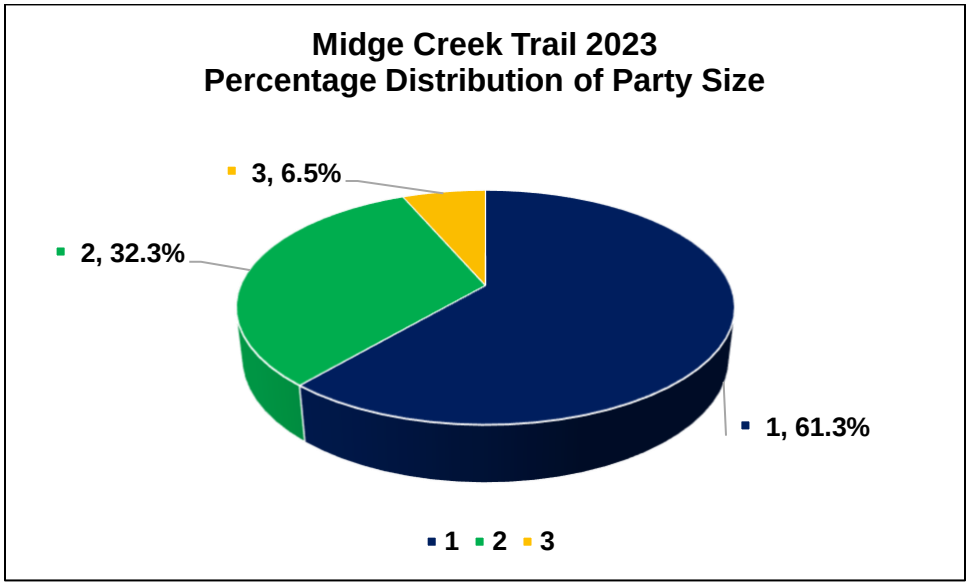


Figure 6.5 shows the distribution of user types observed at the party level at Midge Creek. Overnight hikers were by far most common, with 77.4% of parties, day hikers were the next most common with 19.4%, and a few mountain biking parties making up 3.2% of users.

Figure 13.5 Midge Creek Percentage Distribution of User Types by Party

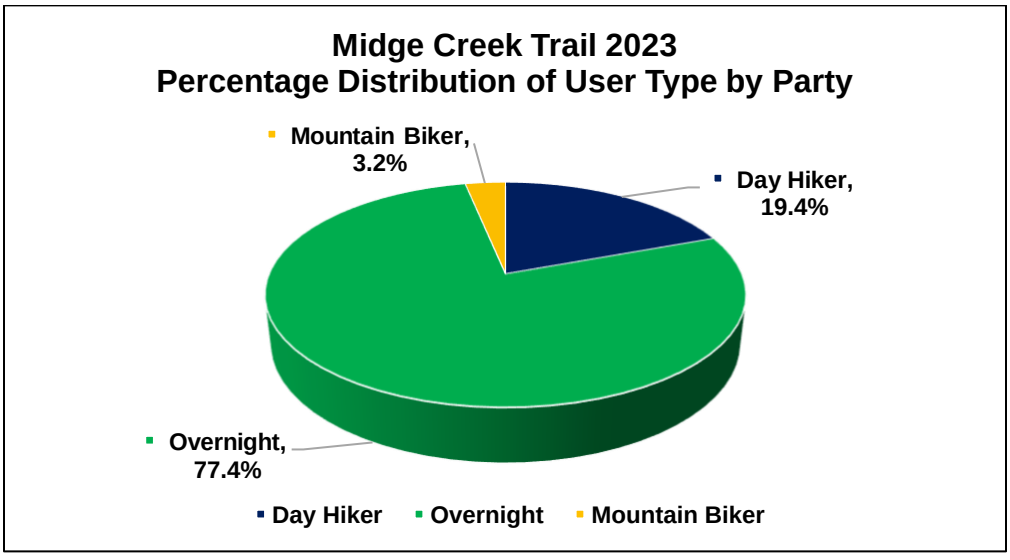
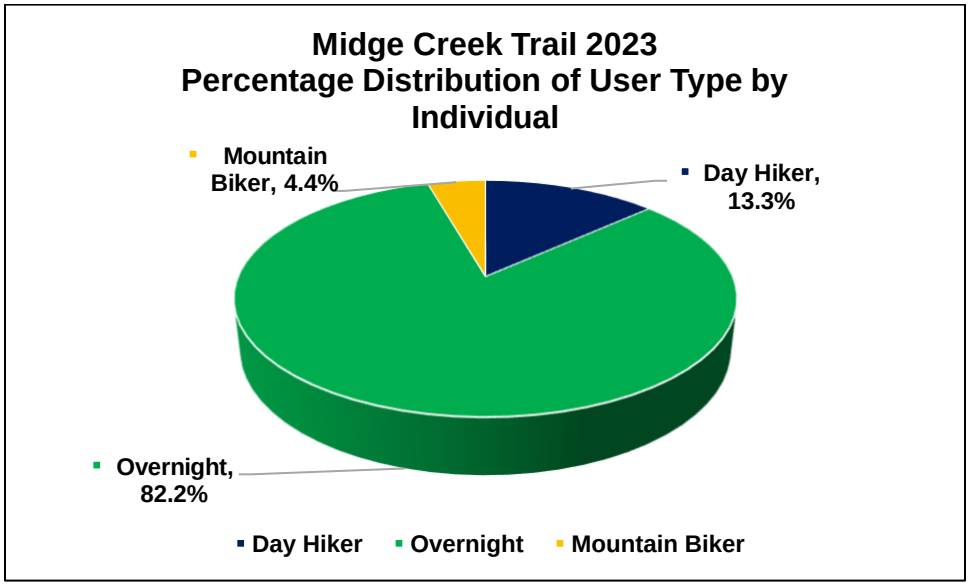


Figure 6.6 shows the distribution of user types at the individual level that were recorded at Midge Creek over 2023. Like the analysis for percentage distribution of user type by party, the percentage distribution of user type by individual showed overnight hikers being more common than day hikers. Overnight hikers made up 82.2% of trail visits, followed by day hikers at 13.3%, and mountain bikers at 4.4%.

Figure 6.6 Midge Creek Percentage Distribution of User Types by Individual



Canuck Peak Trail 2023

Canuck Peak Trail can be found by following Spread Creek Road (NF-4354 and 435) up to the summit, where the road then continues into Idaho. The trailhead is on the north side. The Canuck Peak monitoring site was located about 0.6 miles from the trailhead during 2023. From June 30, 2023, to September 15, 2023, an estimated 30 trail visits were recorded at the Canuck Peak site.

Figure 7.1 shows the total weekly trail visits at the Canuck Peak Site. The weeks with the highest use were June 30-July 2, July 10-16, and September 11-15 with 4 total trail visits. A weekly average of 2.5 trail visits were recorded at the Canuck Peak site during the 2023 weeks monitored.

Figure 7.1 Canuck Peak Weekly Visit Counts

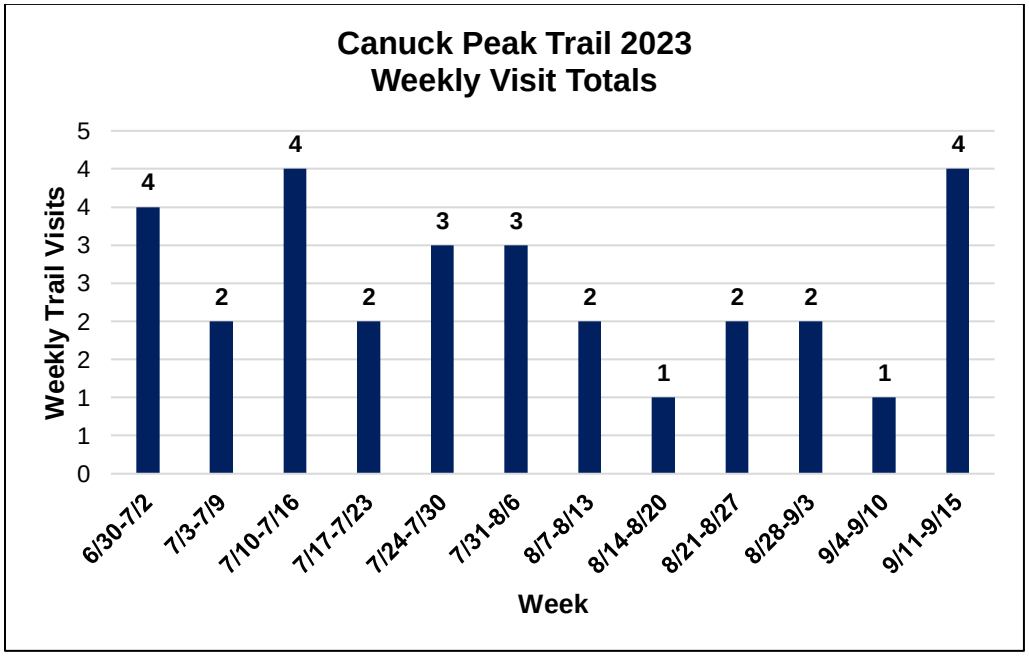
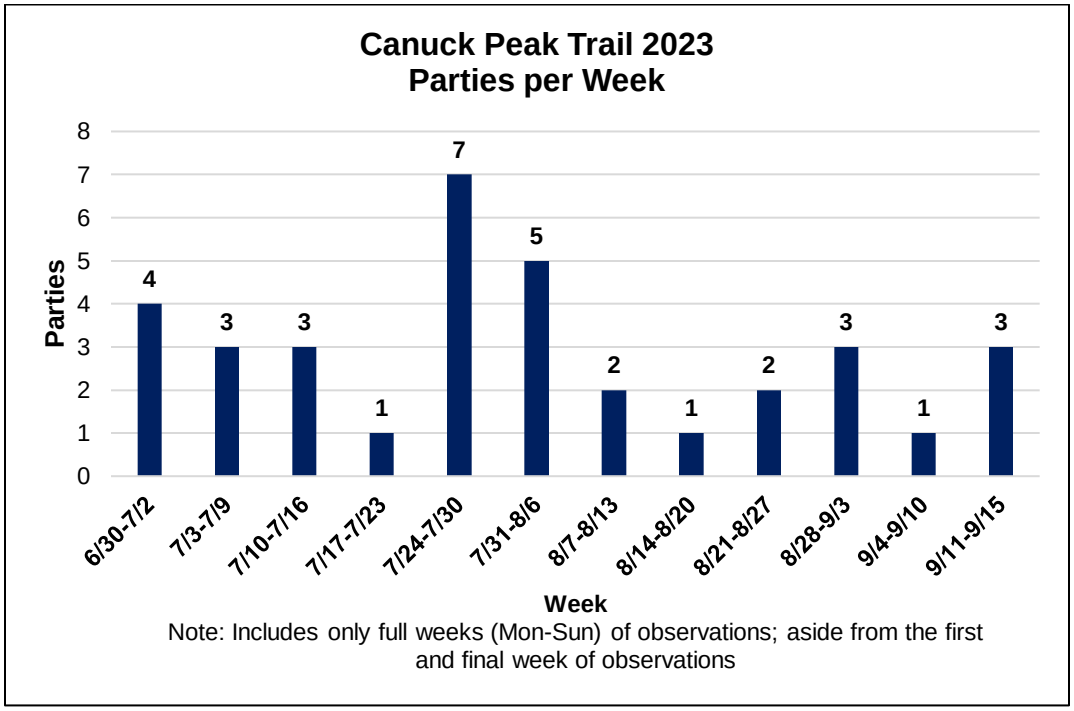


Figure 7.2 shows the parties per week that were observed at Canuck Peak. During 2023, the week with the largest number of parties at this site was July 24-30 with 7, the week of July 31 – August 6 also observed 5 parties.

Figure 7.2 Canuck Peak Parties per Week



Note: Includes only full weeks (Mon-Sun) of observations; aside from the first and final week of observations

Figure 7.3 compares the average number of trail visits by the day of the week at the Canuck Peak site. During 2023 the highest use day was Friday, with an average of 0.9 daily visitors, and all other days of the week averaging 0.5 or below daily visitors.

Figure 7.3 Canuck Peak Daily Averages by Day of the Week

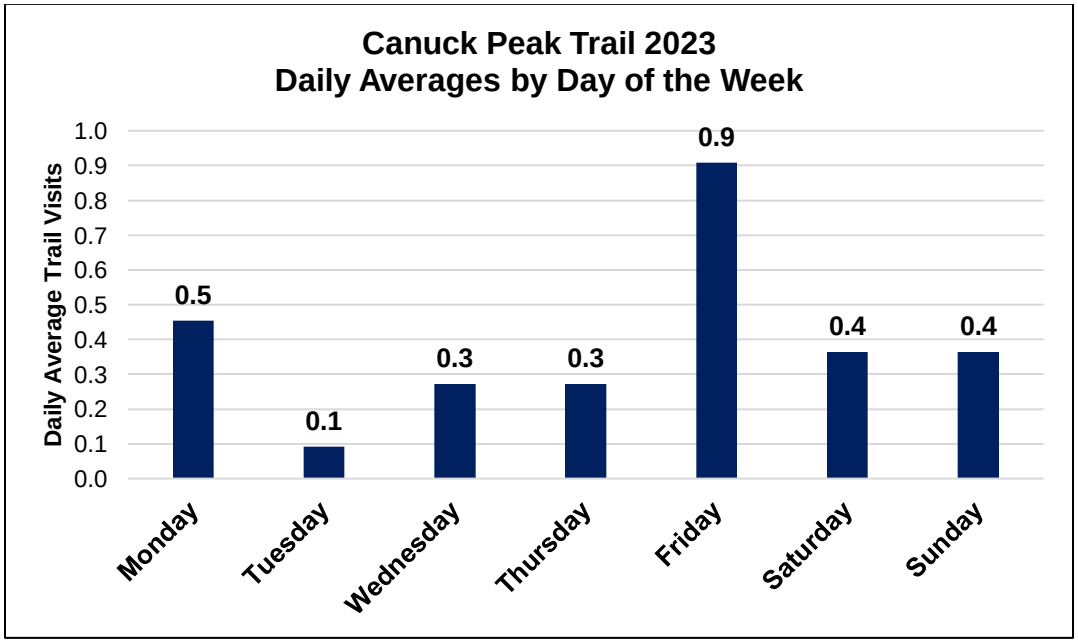


Figure 7.4 shows the percentage distribution of party sizes at the Canuck Peak monitoring site. Here, 57.1% of parties were composed of solo users, whereas the remaining 37.1% of parties were composed of pairs of individuals, and parties composed of trios made up only 5.7%.

Figure 7.4 Canuck Peak Percentage Distribution of Party Size

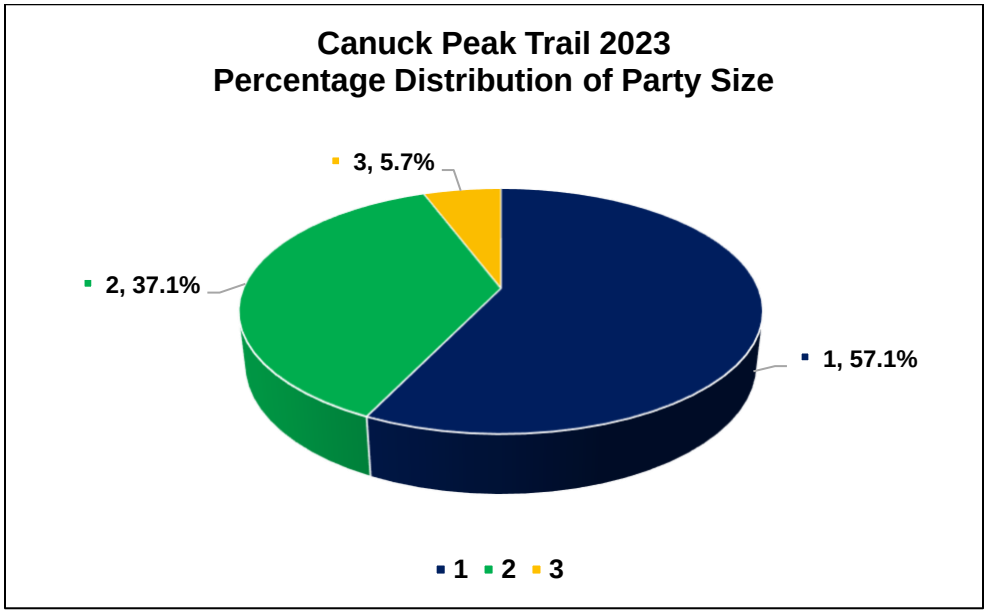


Figure 7.5 shows the distribution of user types observed at the party level for the Canuck Peak site. Canuck Peak mostly had hiker user types observed during the 2023 season. Overnight hikers were more common, with 65.7% of parties at this site, compared to 31.4% of parties being made of day hikers.

Figure 7.5 Canuck Peak Percentage Distribution of User Type by Party

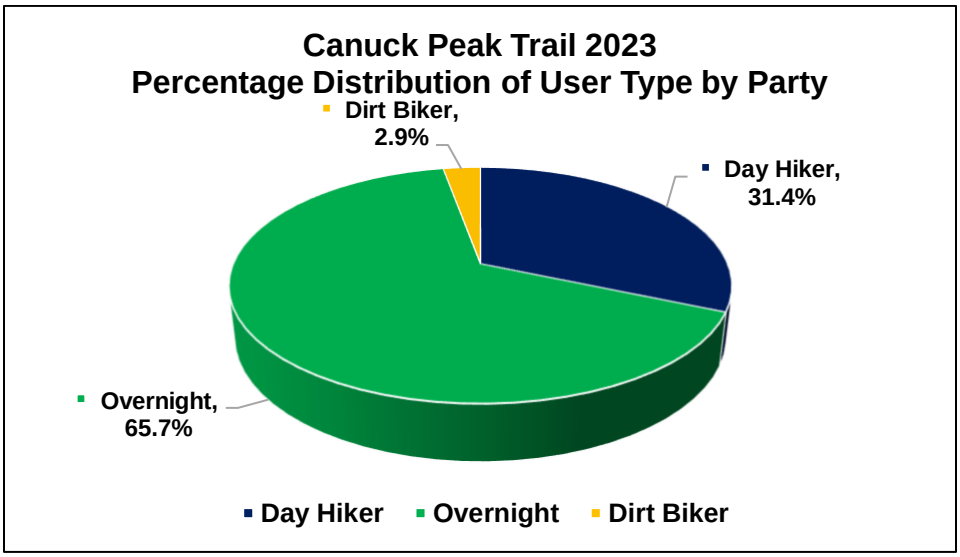
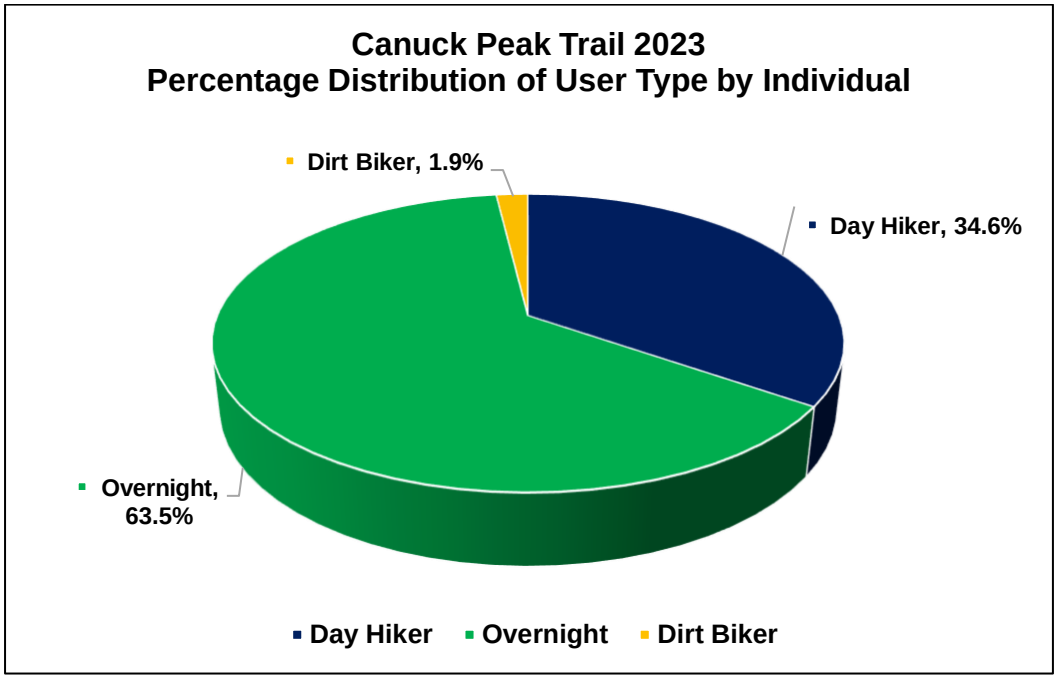


Figure 7.6 shows the distribution of user types at the individual level that were recorded at Canuck Peak during 2023. Similar to the percentage distribution by party, the percentage distribution of user type by individual showed that overnight hikers were more common than day hikers at Canuck Peak. Overnight hikers made up 63.5% of trail visits, compared to day hikers making up 34.6%.

Figure 7.6 Canuck Peak Percentage Distribution of User Types



Lower Parker Ridge Trail 2023

The Parker Ridge Trail (#221) is located off the Parker Ridge trailhead in Kaniksu National Forest and is one of the new PNNST monitoring sites added in the Idaho Panhandle. To get to this trailhead, turn west onto Copeland Rd from US-1 N and drive for about 4 miles, then merge onto Westside Rd #417 on the right and continue another 7 miles to a parking area on the left. The 2023 monitoring site was located about 0.5 miles from this trailhead. From June 30, 2023, through September 15, 2023, an estimated 93 trail visits were recorded at the Lower Parker Ridge monitoring site.

Figure 8.1 shows the total weekly trail visits for the Lower Parker Ridge monitoring site. The weeks with the highest use included July 24-30 with 24 trail visits, followed by June 30-July 2 with 14 trail visits, and August 7-13 with 13 trail visits. The average number of weekly trail visits for this site was 7.75 trail visits for the weeks monitored during 2023.

Figure 8.1 Lower Parker Ridge Weekly Counts

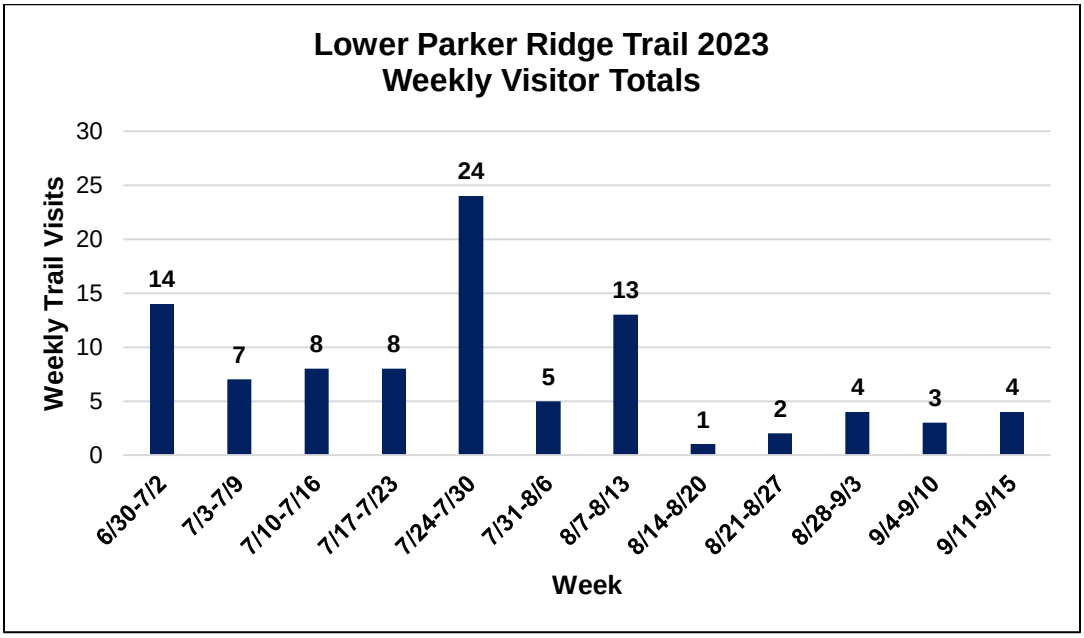


Figure 8.2 shows the parties per week that were observed at the Lower Parker Ridge site. The weeks noted to have the greatest number of parties observed at Lower Parker Ridge were July 17-23 with fourteen parties, July 24-30 with eleven parties, and July 31-August 6 with eleven parties. Though frequently used throughout the season, the numbers drop off significantly in mid-August.

Figure 8.2 Lower Parker Ridge Parties per Week

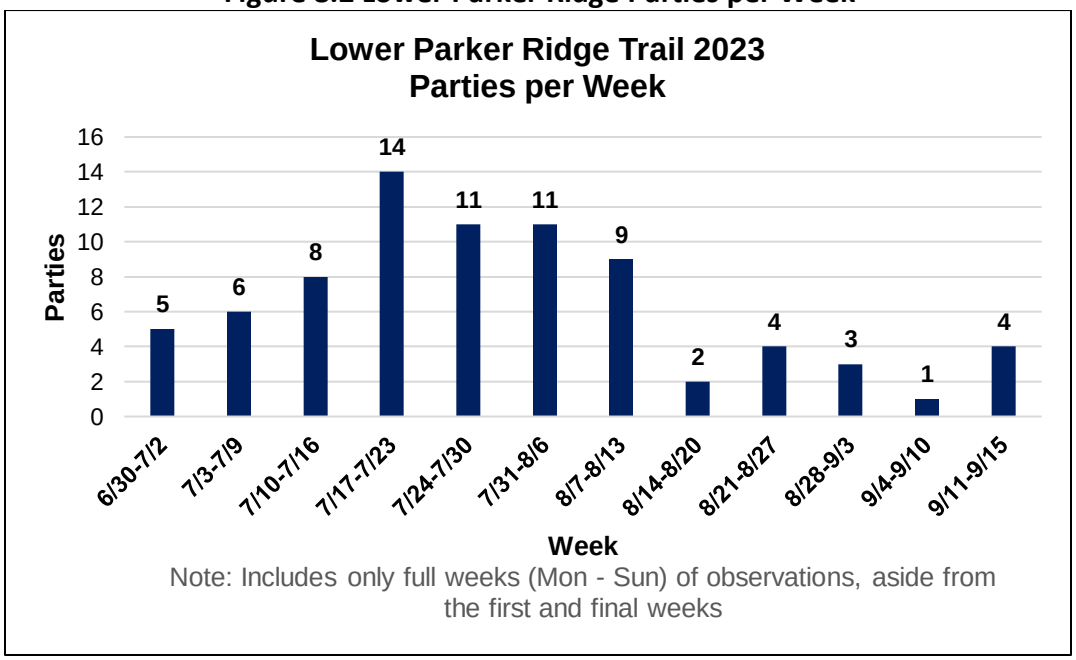


Figure 8.3 includes the daily average number of trail visits by the day of the week at the Lower Parker Ridge site. The highest use day for this site was Sunday, with an average of 1.7 visitors, and all other days of the week averaging around 1.0 visitors.

Figure 8.3 Parker Ridge Daily Averages by Day of the Week

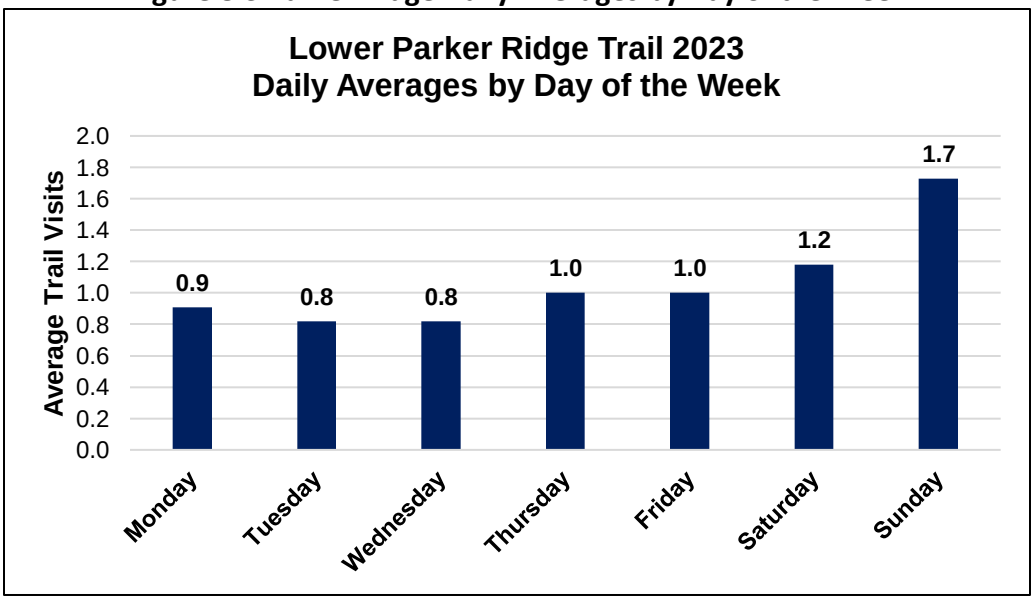


Figure 8.4 shows the percentage distribution of party sizes at the Lower Parker Ridge site. The most common party size at this site involved solo trail users, which composed 52.6% of parties, followed by pairs of users, which made up another 35.9% of parties. Most of the remaining parties were vary between 3-10, with some only appearing once.

Figure 8.4 Parker Ridge Percentage Distribution of Party Size

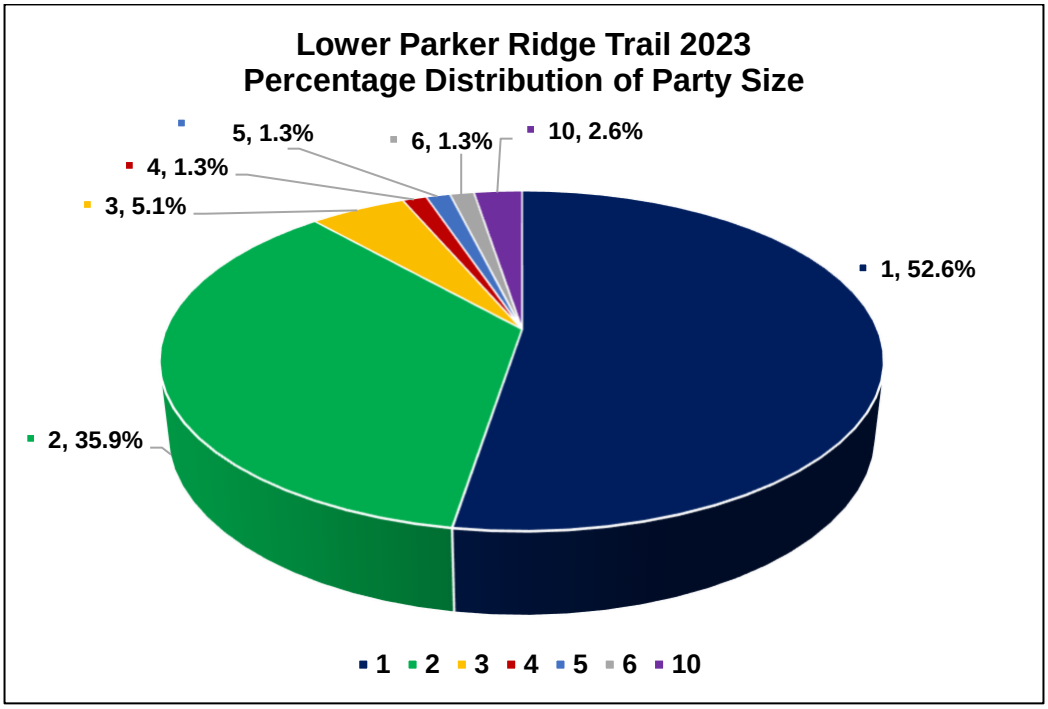


Figure 8.5 shows the distribution of user types observed at the party level for the Lower Parker Ridge site. Most parties at this site were overnight hikers, which composed 61.5% of parties at this site. The next most common type of user was day hikers, which composed 34.6% of parties. Additionally, a small number of parties of mountain bikers used the trail, accounting for only 3.8% of the parties observed.

Figure 8.5 Parker Ridge Percentage Distribution of User Types by Party

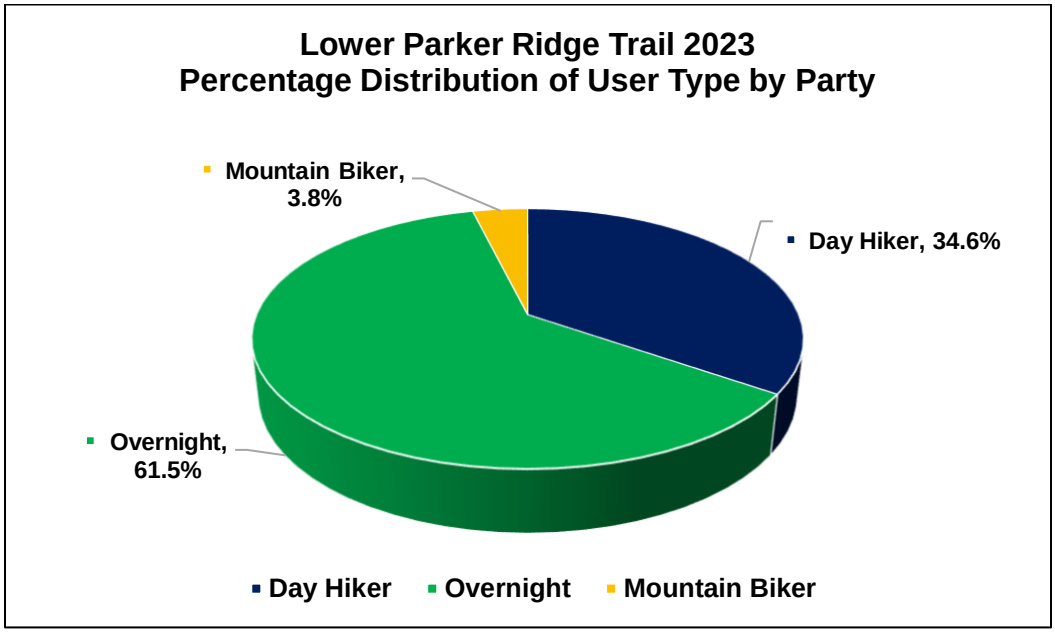
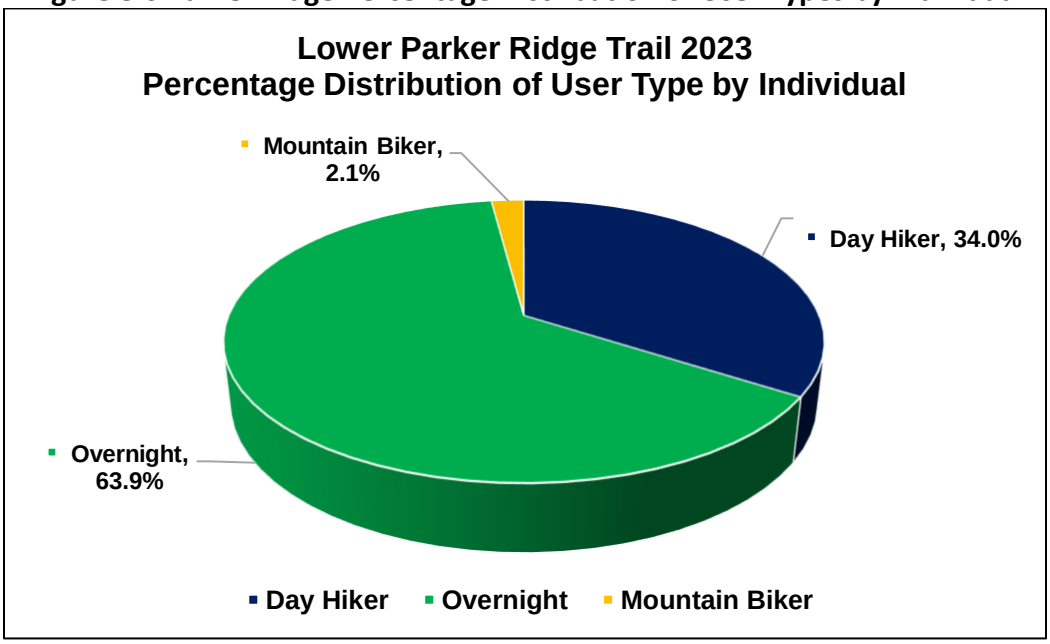


Figure 8.6 shows the distribution of user types at the individual level that were recorded at Lower Parker Ridge during 2023. Overnight hikers made up 63.9% of trail visits, compared to day hikers making up 34%, and mountain bikers making up the remaining 2.1% of users.

Figure 8.6 Parker Ridge Percentage Distribution of User Types by Individual



Brush Lake 2023

The Brush Lake monitoring site is located off the Bethlehem trailhead in Kaniksu National Forest. This site is also one of the new PNNST monitoring sites added in the Idaho Panhandle during 2021. To get to this trailhead, turn east onto Fawn Lane from US-95 N, then turn north onto Camp 9 Rd, then follow Camp 9 Rd for about five miles until it turns into Camp Bethlehem Mine Rd, and continue for another 2 miles to where the Bethlehem trailhead intersects with the road on the right. The 2023 monitoring site was located about 0.8 miles from this intersection.

From June 15, 2023 through September 15, 2023, an estimated 108 trail visits were recorded at the Brush Lake monitoring site. Unlike any of the other monitored sites, Brush Lake is on a trail where some motorized uses are allowed, and so it had additional types of users observed. During 2022 numerous ATV parties, additionally, Brush Lake had numerous parties of motor vehicles after a barrier at the trail head was removed. The number of individuals within these cars could not reliably be determined due to the interior cabin obstructing counts. Notably, this trail is only open to vehicles under 50” wide, so cars observed on this trail were entering illegally. Camera data showed that many of these car sightings appeared to be just a few of the same cars traveling up and down the trail for multiple days.

Figure 9.1 shows the total weekly trail visits for Brush Lake during 2023. The week with the highest use was July 17-23 with 27 trail visits, with the week of July 3-9 recording 20 trail visits. The average number of weekly trail visits for this site was 11.2 trail visits for the weeks monitored during 2023.

Figure 9.1 Brush Lake Weekly Counts

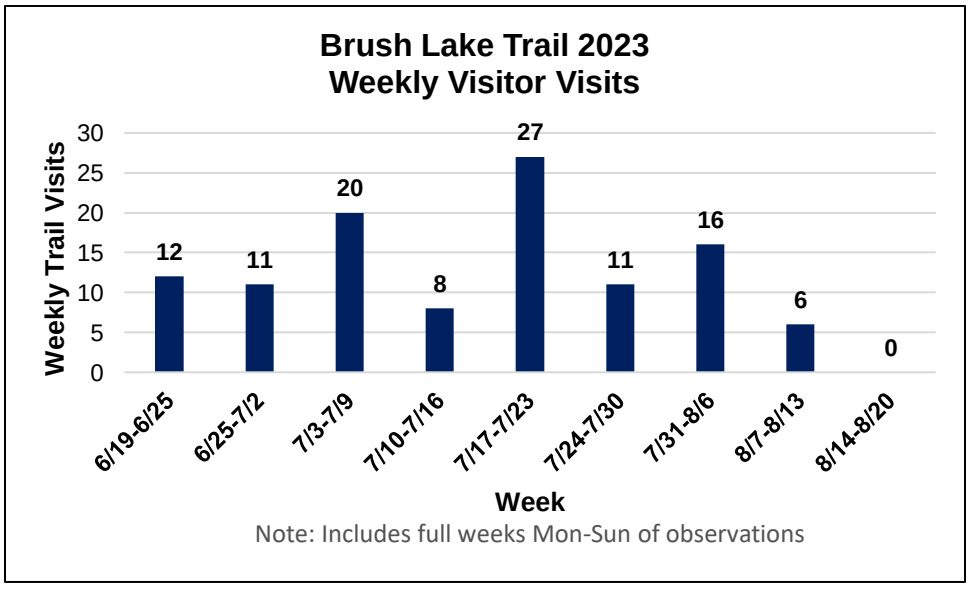


Figure 9.2 shows the parties per week at the Brush Lake site in 2023. The week with the most parties at Brush Lake was July 17-23, with 22 parties observed. The two weeks prior and after this week all had relatively consistent counts, parties per week were significantly lower at the beginning and end of the research season.

Figure 9.2 Brush Lake Parties per Week

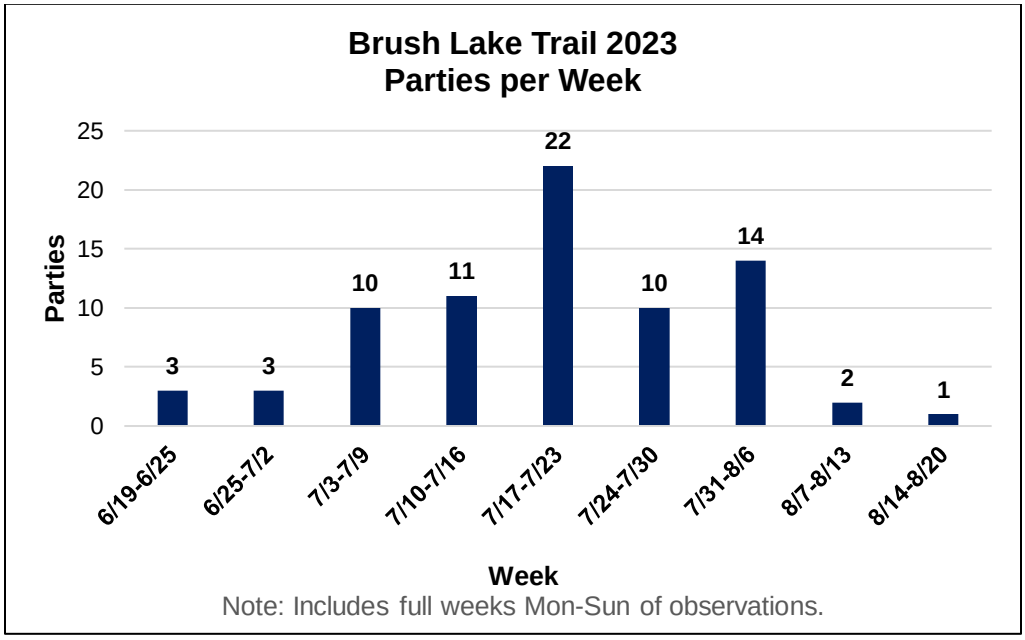


Figure 9.3 includes the average daily number of trail visits by the day of the week for Brush Lake. The highest use day for this site was Saturday, with an average of 4.0 visitors per day, followed by Sundays with 2.0 average visitors, and all other days averaging 1.6 or fewer.

Figure 9.3 Brush Lake Daily Averages by Day of the Week

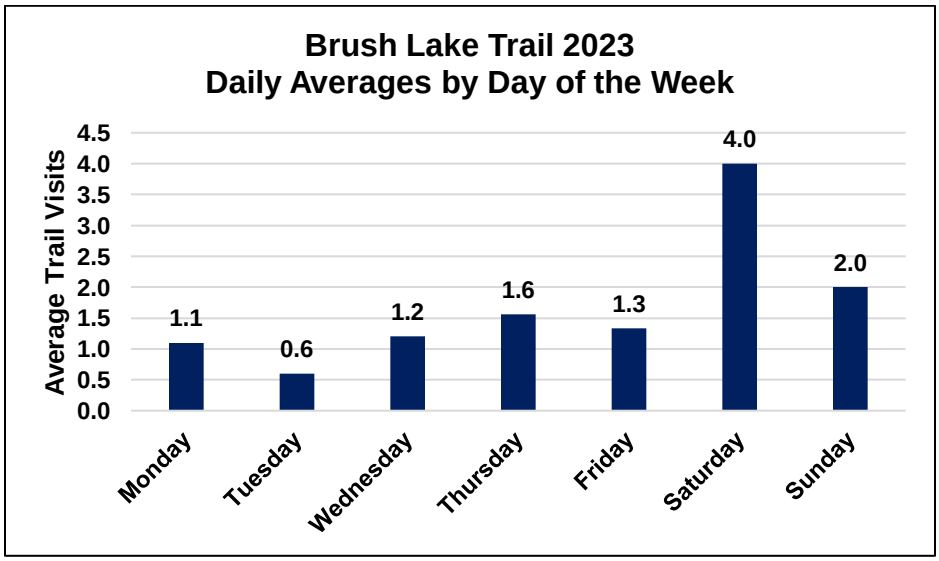


Figure 9.4 shows the percentage distribution of party size at the Brush Lake site. The most common party size at this site was made up of solo trail users, which composed 49.4% of parties, followed by pairs of users which made up 34.6% of parties. However, party sizes had a relatively wide range at this site, with parties of up to seven people observed.

Figure 9.4 Brush Lake Percentage Distribution of Party Size

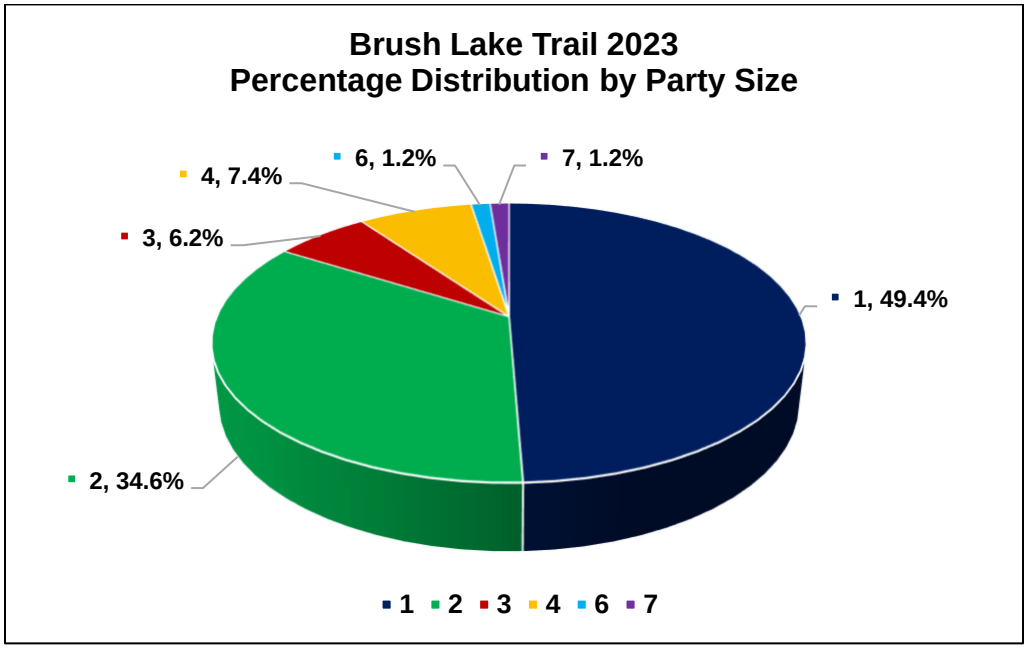


Figure 9.5 shows the distribution of user types observed at the party level for Brush Lake. Only day hikers and overnight hikers were observed this season, with a near even split in usage.

Figure 9.5 Brush Lake Percentage Distribution of User Types by Party

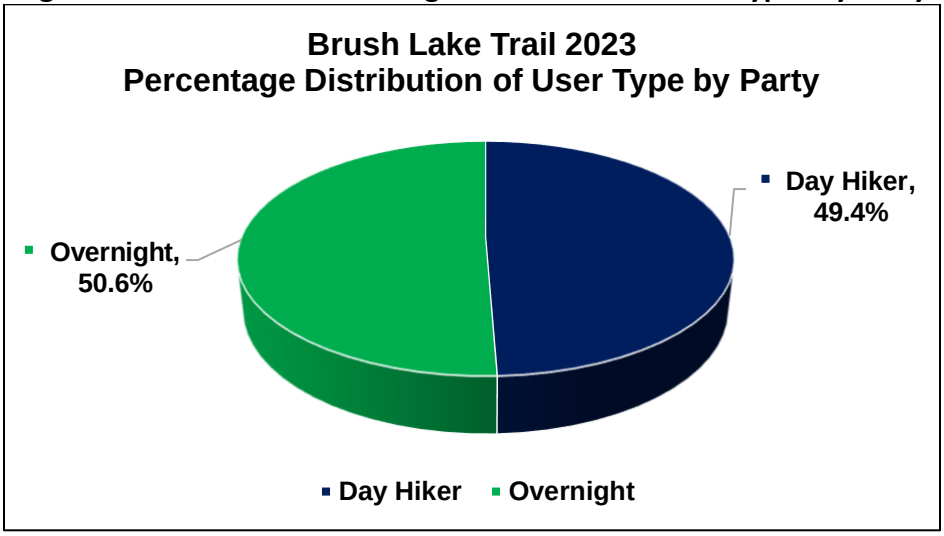
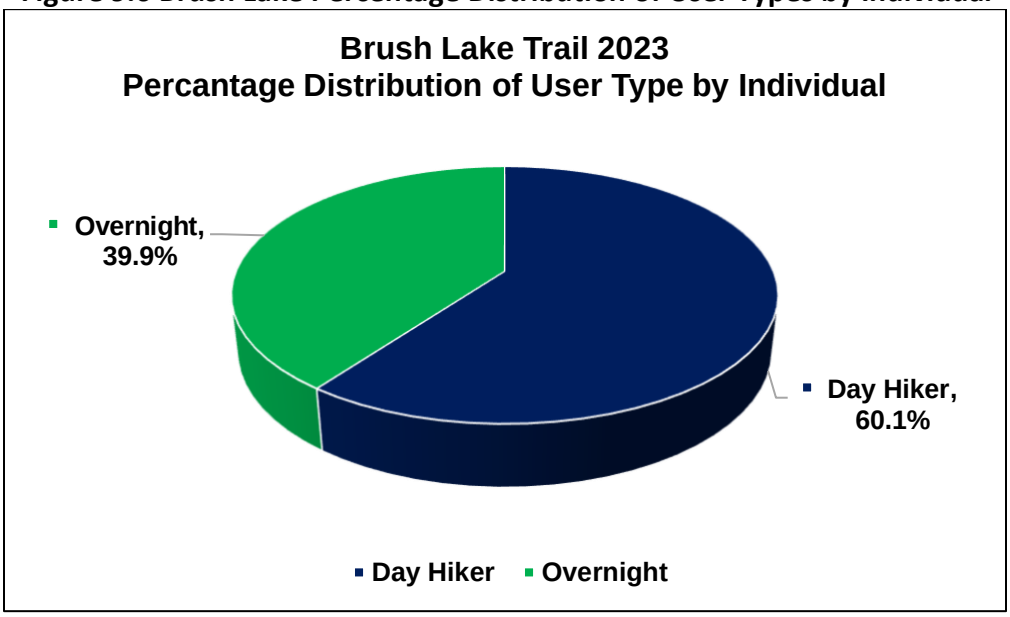


Figure 9.6 shows the distribution of user types at the individual level that were recorded at Brush Lake during 2023. Much like the percentage distribution of user type by party, individual showed that day and overnight hikers make up all trail visitors. Day hikers were more common than overnight hikers at Brush Lake, with 60.1% of users being day hikers compared to 39.9% being overnight hikers.

Figure 9.6 Brush Lake Percentage Distribution of User Types by Individual



Comparison of 2019 – 2023 Average Daily Trail Visits and Monthly Visits

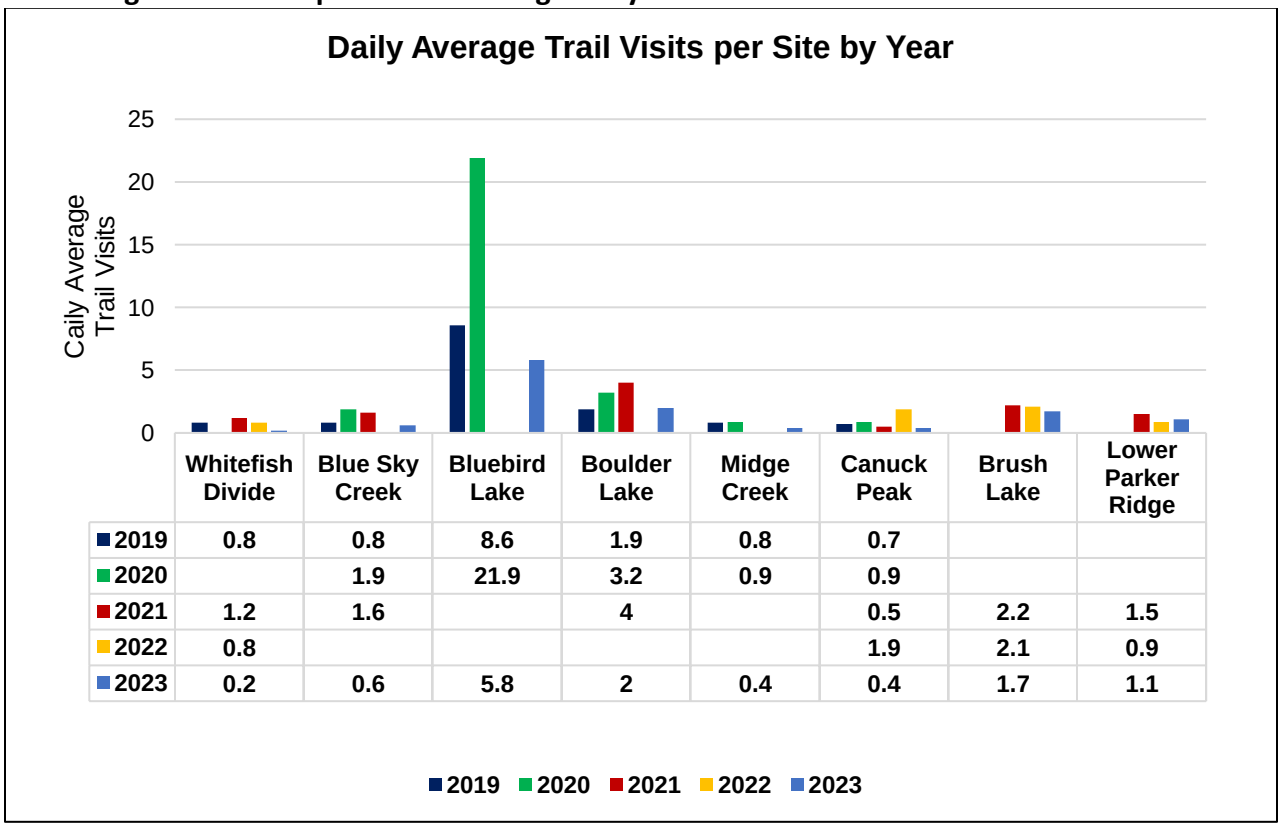
The following graphs compare use of trails between the past five monitoring seasons. The graphs separately depict the average daily trail visits for July, August, and September to allow for a more in-depth examination of use at each site per month, compared between the years. Average daily trail visits for each month were used instead of total counts per month to make better relative comparisons while considering that the different sites and years had different amounts of camera and counter data available. Daily averages were based on total monthly counts divided by observed days at each site for each year, with a minimum of ten days of observation needed for each daily average. Graphs with empty bars indicate when some years had insufficient data for certain sites.

New calibration factors were added to the 2019 to 2023 data. Comparison of daily averages should be made with caution due to variations in the ability to determine accurate calibration factors for each year and individual sites. For example, the accuracy of these factors may be influenced by the number of days monitored, cameras' minimal time intervals, researcher errors, etc. However, it remains useful to compare these trends for overall patterns of use and changes over time, even if individual counts and daily averages are estimates.

Calibration factors for the 2019 to 2023 accounted for all trail users (including overnight hikers, day hikers, horse riders, bike riders, trail/administrative crew members, ATVs, motorized bike/motorcycle riders, and cars). Therefore, while the percentage of trail users that were trail/administrative crew members, horse riders, bike riders, ATVs, motorized bike/motorcycle riders, and cars is relatively small.

Figures 10.1 compares average daily trail visits for each trail for July across 2019 to 2023. Brush Lake and Parker Ridge were added in 2021 and are each showing consistent usage. Canuck Peak remains relatively consistent for the low number of visitors. While Boulder Lake, Blue Sky Creek, and Whitefish Divide are consistent.

Figure 10.1 Comparison of Average Daily Trail Visits Between Sites: 2019 – 2023



	Whitefish Divide	Blue Sky Creek	Bluebird Lake	Boulder Lake	Midge Creek	Canuck Peak	Brush Lake	Lower Parker Ridge
2019	0.8	0.8	8.6	1.9	0.8	0.7		
2020		1.9	21.9	3.2	0.9	0.9		
2021	1.2	1.6		4		0.5	2.2	1.5
2022	0.8					1.9	2.1	0.9
2023	0.2	0.6	5.8	2	0.4	0.4	1.7	1.1

Table 3 compares average monthly trail visits across each site for July, August, and September during 2019, 2020, 2021, 2022, and 2023. Among these sites, July usage is the highest over the years, with mixed usage in August, and most years a steady drop off in trail visits beginning in September.

Table 3: Comparison of Average Monthly Trail Visits Between Sites: 2019 – 2023

Month - Year	Parker Ridge	Brush Lake	Canuck Peak	Midge Creek	Boulder Lake	Bluebird Lake	Blue Sky Creek	Whitefish Divide
July 2019			32.0	43.0	138.5	598.5	46.0	48.0
August 2019			28.0	33.0	59	472	25.0	16.0
September 2019			3.0	6.0	32	144	8.0	6.0
July 2020			50.7	55.0	125	890.1	74.0	
August 2020			25.0	18.0	148.1	694	48.0	
September 2020			11.1	4.3	20	445.9	47.7	
July 2021			21.9		171			50.6
August 2021	31.0		13.3		51.6		31.0	10.0
September 2021	46.7		3.0		108		68.1	65.5
July 2022	29.0	86	63.8					34.4
August 2022	32.0	45	79.7					38.0
September 2022	9.3	37.2	13.3					10.0
July 2023	52.0	30.0	12.0	20.0	99.0	189.8	17.0	19.4
August 2023	21.0	81.0	8.0	5.0	60.0	194.0	8.0	5.0
September 2023	34.0	27.0	20.0	4.0	24.0	150.0	30.0	5.6

Recommendations and Reflections

Field Work

- Cameras were visited every 2-3 weeks, with all eight sites active for most of the field research season and none experiencing impacts from fires. This was our first season including the Idaho sites that were not affected by fire closures, and a good opportunity to test the feasibility of the number of sites we can include. The geographic spread of the sites with two in Idaho, three in the Yaak area, and three in the Whitefish Range was reasonable for a four-day data collection trip to eight research sites. The number of sites could be increased due to the linear nature of the travel and diversity of sites in these three areas that the PNNST traverses.
- Most cameras were set up a few yards off the trail in a discreet position, two sites lost data due to camera disturbance from trail users. At Bluebird Lake camera data was lost from 7/3-7/23 due to a hiker moving the camera out of position and unable to record trail users. The final weeks of the Brush Lake trail data was lost because the camera and counter were stolen. This site has a significant number of motorized vehicles, which may impact day and overnight hikers, as well as wildlife.
- Wildlife observations were recorded from camera data and included in data collection this season, with exciting results. Many key species of the region were observed at multiple sites, including grizzly bear, black bear, elk, grey wolf, and moose, this is detailed in Appendix B. The Yaak area, Whitefish Divide and Lower Power Ridge sites all stand out in the wildlife data analysis.
- Additional practice with the camera equipment should be added prior to leaving for the first research trip. The only camera errors occur in the early week of the field research season. We were very close to achieving a complete season across all sites.
- Data analysis went smoothly this season, with all members of the research team involved throughout the project. Data collection has remained consistent in its methods since 2020 and this has improved analysis as well as efficiency.

Specific Sites

- Brush Lake has experienced significant disturbance from multiple types of motorized vehicles since the barrier was removed last season. This may be impacting overnight and day hiker usage, as well as the quality of data collected. In future seasons, the research should shift to a different site in Idaho for clearer counter and camera data with consultation with managers.

- Lower Parker Ridge, Canuck Peak, Midge Creek, and Boulder Lake all recorded complete seasons, with informative data collected for trail users and wildlife. Each site has ideal camera placement conditions and is isolated, but at times visited by day hikers, and overnight thru-hikers appear to be consistent in their path across these sites.
- The Whitefish Divide trail camera was not set up until June 30, and experienced a camera error until the next site visit on July 24. The low numbers of overnight hikers may be due to their progression along the PNNST trail already well beyond this point at that time in the year. It is still a very valuable site for trail use and wildlife. Visitor usage was lower than in previous years, this may be due to poor road conditions along Red Meadow Creek Road and Shorty Creek Road leading up the mountain to the trailhead.
- Bluebird Lake experienced significant usage from day hikers, trail ride groups on horseback, and various other overnight groups with horses for multiple days. This had an impact on counter data as many passed numerous times and inspected the camera often. It may be useful to shift to nearby Green Mountain where the main PNNST route and the alternate PNNST route converge.
- Blue Sky Creek is a useful site but has limitations due to traffic from trail ride groups on horseback and relatively low visitation. Camera location could be moved further along the trail to improve camera and counter data collection, as well as potentially mitigate these limitations.
- Overall, the sites performed well this season, a return to previously used sites or new sites may be helpful to improving research data and results.

Future Research

- To gain a better understanding of types of users, their travel patterns, and their experience, it is recommended that a short questionnaire be administered by part of the research team at certain locations in future field seasons. This could also be administered using a QSR code that is posted at select trailheads and ranger stations. Consultation with managers on key points of information and management needs can inform the questionnaire. This questionnaire could also be administered to thru-hikers through the social media pages dedicated to the hikers of the trail for that year. A GPS study of thru-hikers was conducted years ago and it may be helpful to implement a similar study to assess changes in hikers' spatial and temporal travel patterns.
- The recording of wildlife along the PNNST is an intriguing aspect of the research given the frequency of key species observed, particularly in the Yaak area. Guidance in the future as to how wildlife data could inform the work of management and planning to effectively employ this for the benefit of trail users and wildlife could be a useful starting point. There also could be more specific focus on key species linked to party size

like grizzly bears. Collaboration with wildlife managers in the various sites can help inform the utility of the data and create an opportunity for overlaying wildlife and trail data.

- The sites selected for this season were geographically easy to cover in a four-day research trip, but adjustments should be made based on the site-specific comments above. Bluebird Lake could be changed to Green Mountain to gain clearer data on PNNST specific users, other sites in the Yaak could be added for a greater emphasis on wildlife and the direct accessibility of most trails in the area. New sites should also be explored in Idaho for more accurate overnight hiker data. With the new comprehensive management trail completed, it is an ideal time to revisit the site selection and overall trends to align with the management directions of the trail across the jurisdictions.

Appendices

Appendix A. 2023 Missing Counter and Camera Data Summary

Due to technical issues during the 2023 field season, raw counter data was lost for a number of days at all of the monitoring sites except for Whitefish Divide. During analysis, counter data was prioritized when available to hopefully provide more accurate trail visit measurements once calibrated.

Table 4 shows the dates across each site for which calibrated counter data was used to calculate trail visits, dates for which camera data was substituted to estimate trail visits (when counter data was not available), and dates for which both counter and camera data was not available.

Table 4: Calibration Dates and Calculated Calibration Factors

Site	Counter Data Calibrated & Used	Both Camera & Counter Data Missing
Whitefish Divide	7/24 - 9/17	7/1 – 7/23 (camera error)
Blue Sky Creek	6/17 - 9/16	
Bluebird Lake	7/1-7/3; 7/24-9/16	7/3-7/23 (hiker interfered with equipment)
Boulder Lake	6/16 – 9/16	
Midge Creek	6/16 – 9/16	
Canuck Peak	6/30 - 9/15	6/15 – 6/29 (camera and counter stolen)
Parker Ridge	6/15 - 9/15	
Brush Lake	6/15 - 9/15	

Appendix B. 2022 Wildlife Data by Site and Photos

In 2023, wildlife observations were recorded using camera data only. Significant variance in the appearance of wildlife at each site can be seen in Table 5. Species observed include grizzly bear, black bear, grey wolf, bobcat, red fox, coyote, moose, elk, and mule deer. Whitetail deer were observed across all sights in high frequency but were omitted from this count. In only one observation at Canuck Peak did it appear that the animal observed (black bear) was disturbed by the presence of trail visitors.

The three sites in the Yaak area (Boulder Lake, Midge Creek, and Canuck Peak) all documented more species total and higher observation counts. Visitor use is low in this area and much of the wildlife population is isolated from the Whitefish range. At Midge Creek, an individual grey wolf passed in front of the camera multiple times, with one appearance in June and returning for multiple passes in August. The final observation grey wolves at Midge Creek were of a pack of five grey wolves passing in front of the camera together. Grizzly bear and black bear observations were made at Midge Creek and Canuck Peak.

The site closest to Glacier National Park, Whitefish Divide, recorded a high count of grizzly bear observations with two adults and a pair of grizzly bear cubs using the trail in August of 2023 when visitor use was low. Blue Sky Creek recorded one grizzly bear observation, while Bluebird Lake had very low wildlife observations and all occurring at night or the early morning hours, this may be due to the high number of trail visitors and the regular use of horses on these trails.

Wildlife observed at the two Idaho sites (Brush Lake and Lower Parker Ridge) reflect the trail visitor use. The low counts at Brush Lake may be due to the high number of trail visitors using the trail with motorized vehicles. While one black bear and one coyote were observed at Brush Lake, the frequency of cars, side-by-side four-wheel drive vehicles, four wheelers, and motorcycles appearing on the trail create a significant disturbance to wildlife in the area. At Lower Parker Ridge, grizzly bear, elk, and mule deer were all observed, with most elk moving up and down the mountain periodically.

Table 5: Wildlife Species Observations by Site

Species	Whitefish Divide	Blue Sky Creek	Bluebird Lake	Boulder Lake	Midge Creek	Canuck Peak	Brush Lake	Lower Parker Ridge
Grizzly Bear	4	1			1	1		2
Black Bear					2	2	1	
Grey Wolf					12			
Bobcat	3				4			
Red Fox			1					
Coyote	2						1	
Moose				1	1			
Elk					8	4		7
Mule Deer			3			17		2

Wildlife Observations

Image 1: Grizzly Bear on the Whitefish Divide Trail 8/25

Image 2: Bobcat on the Whitefish Divide Trail 9/6

Image 3: Black Bear on the Midge Creek Trail 8/18

Image 4: A Pack of 5 Grey Wolves on the Midge Creek Trail 8/23

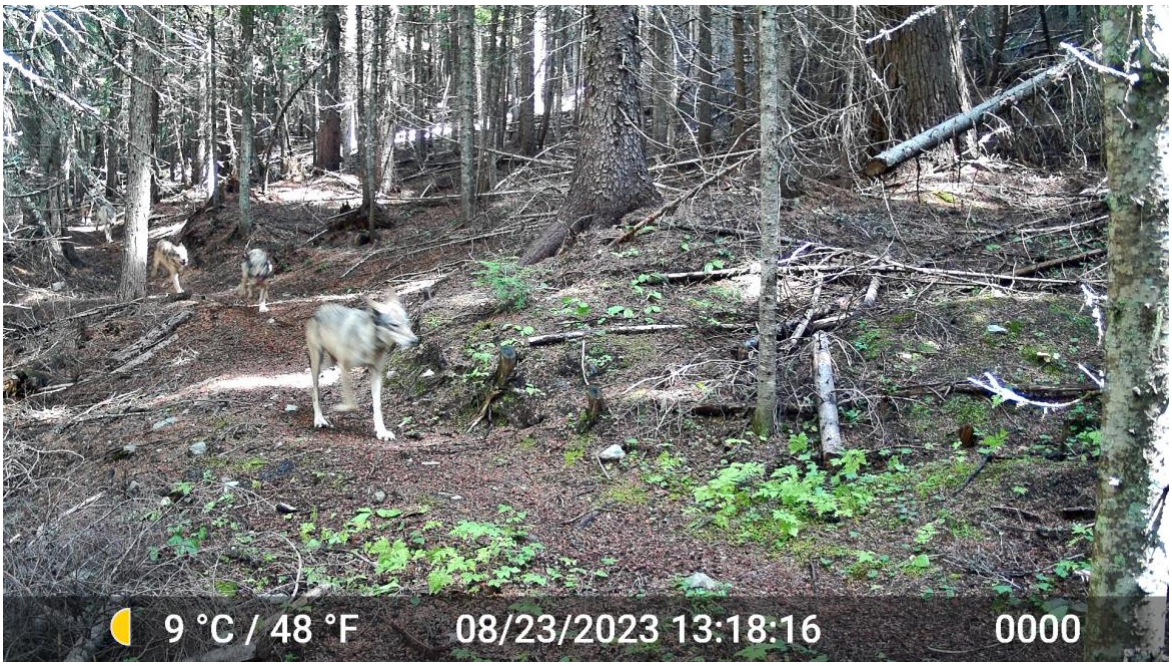


Image 5: Grizzly Bear on the Midge Creek Trail 8/10

Image 6: Grizzly Bear on the Lower Park Ridge Trail 8/16

Image 7: Bull Elk bugling on the Lower Parker Ridge Trail 7/25

Image 8: Grizzly Bear on the Canuck Peak Trail 9/11

Image 9: Bull Elk on the Canuck Peak Trail 9/5

Image 10: Young Bull Moose on the Boulder Lake Trail 7/9

Image 11: Red Fox on the Bluebird Lake Trail 8/27