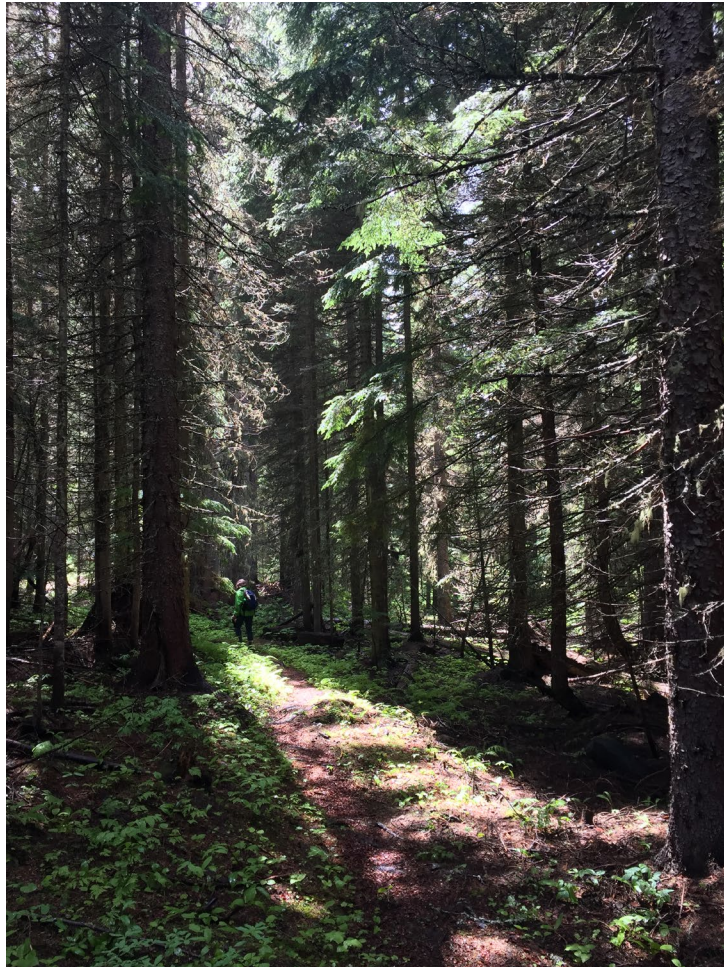


# Pacific Northwest National Scenic Trail: 2021 Trail Monitoring Report



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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 2021 field season data builds on previous monitoring since 2017 to identify trends and changes over time. Throughout the summer of 2021, 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 2021 season and analyze camera data for number of parties per week, party size, and type of recreational users. During 2021, 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 2021 at the following locations: Whitefish Divide, Blue Sky Creek, Boulder Lake, Vinal Creek<sup>1</sup>, Canuck Peak, Pyramid-Ball Lakes, 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 Bluebird Lake, Green Mountain, Gypsy Meadow, Midge Creek, and Garver Mountain. Pyramid-Ball Lakes, Parker Ridge, and Brush Lake are three new sites that are along sections of the PNNST in Idaho and added this season. More information about the monitored sites, including the corresponding trail name and number, appear in Appendix A.

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<sup>1</sup> The Vinal Creek monitoring site is not located on the PNNST and data is not PNNST use. See pp. 41-46.



## 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, 2018, 2019, 2020, and 2021. However, when making these comparisons it is important to note that the calibration factors for 2017, 2018, 2019, 2020, and 2021 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 2017, 2018, 2019, 2020, and 2021 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 14, 2021 to September 12, 2021. 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, Boulder Lake, Vinal Creek<sup>2</sup>, Canuck Peak, Pyramid-Ball Lakes, Parker Ridge, and Brush Lake) were monitored in 2021. The Montana sites included Whitefish Divide, Blue Sky Creek, Boulder Lake, and Vinal Creek<sup>2</sup>, and all of these sites are located within Kootenai National Forest. The Idaho sites included Pyramid-Ball Lakes, 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 2021 include Bluebird Lake, Green Mountain, Gypsy Meadow, Midge Creek, and Garver Mountain.

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

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<sup>2</sup> The Vinal Creek monitoring site is not located on the PNNST and data is not PNNST use. See pp. 41-46.

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 thirteen weeks at each site throughout the monitoring period. However, monitoring equipment at Whitefish Divide and Canuck Peak were only present for about 10 and 11 weeks respectively, due to these sites being less accessible due to snow until later in the season. Logistical difficulties during the first trip and memory card issues also limited Vinal Creek<sup>3</sup> to being monitored for only 11 weeks. Additionally, a loss of counter and camera data affected Pyramid-Ball Lakes monitoring for about two weeks in early July, resulting in only 11 weeks of monitoring for this site.

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. 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. During 2020 and 2021, 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 0.07 to 0.94 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

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<sup>3</sup> The Vinal Creek monitoring site is not located on the PNNST and data is not PNNST use. See pp. 41-46.

visits in most places. Moreover, due to technical issues, raw counter data was lost for a number of days at all of the monitoring sites except for Whitefish Divide. 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. More information about what 2021 counter and camera data was missing can be found in Appendix B.

**Table 1 Calibration Dates and Calculated Calibration Factors**

<b>Site</b>	<b>Calibration Dates</b>	<b>Calibration Factor</b>
Whitefish Divide	7/2-7/7; 7/21-9/11	0.255507
Blue Sky Creek	8/26-9/11	0.410959
Boulder Lake	6/17-6/29; 7/20-8/6; 8/26-9/11	0.807292
Vinal Creek <sup>4</sup>	6/30-7/17; 8/7-9/10	0.907895
Canuck Peak	6/30-7/17; 8/25-9/10	0.065385
Pyramid-Ball Lakes	8/6-9/9	0.936019
Parker Ridge	6/15-6/21; 8/24-9/2	0.479167
Brush Lake	6/15-6/21; 8/24-9/9	0.551724

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

<sup>4</sup> The Vinal Creek monitoring site is not located on the PNNST and data is not PNNST use. See pp. 41-46.

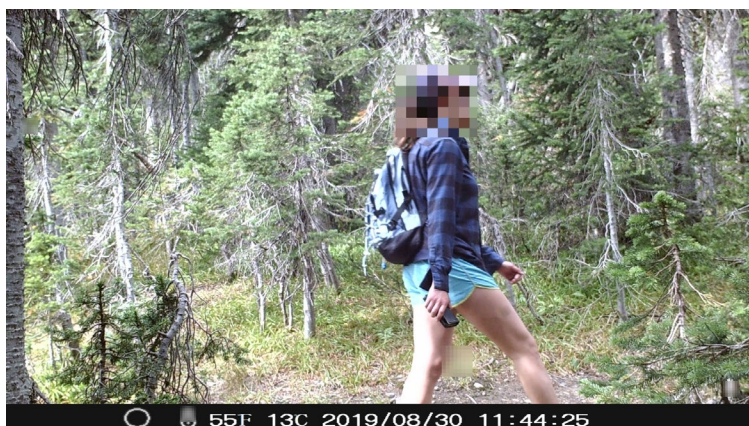
accuracy in determining the number of thru hikers and section hikers versus other users, as well as westbound versus eastbound PNNST thru hikers.

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.

**Image 1: Overnight hiker**



**Image 2: Day use hiker**



## Impacts of the COVID-19 Pandemic on Outdoor Recreation Participation

The COVID-19 pandemic has affected the country significantly, especially after March 11<sup>th</sup>, 2020, when the World Health Organization officially declared a global pandemic. COVID-19 has had a variety of influences on individuals both domestically and around the world. For example, the pandemic has affected the economy, caused job losses and creation, increased rates of remote work and learning, and led to various travel restrictions and quarantine policies. These influences, and many more, are likely to have impacted recreational activity trends. For example, a nationwide survey conducted in late July of 2020 assessed rates of outdoor recreation pre- and post-COVID-19 and showed a 26% reduction in trips per participant to public outdoor recreation sites post-COVID-19 compared to prior to the pandemic (Landry et al., 2020; Rice et al., 2020a). Similarly, the distance traveled to engage in outdoor recreation and levels of backcountry recreation decreased as well (Rice et al., 2020). Moreover, it was found that recreation behaviors were more severely impacted among individuals living in urban areas than those in residential areas (Rice, 2020a). These impacts may have been influenced by a variety of restrictions, including stay at home orders, as well as closing or limiting the capacity of some campgrounds and day use areas, hotels and lodging options, visitor centers, hiking trails, and attractions like National Parks (Landry et al., 2020).

Additionally, research regarding outdoor recreation trends have shown that despite some pandemic-related closures of recreation areas, outdoor recreation spiked significantly in some settings, such as U.S. national parks (Kupfer et al., 2021). Research has shown walking, running, and hiking are considered the safest COVID-19 recreational activities, and that during April, May, and June of 2020, participation rates for day hiking rose by 8.4% compared to 2019 (Outdoor Industry Association, 2020). The number of hikers in the U.S. has also increased approximately 135% from 2019 to 2020 (Ronto, 2021). A U.S national panel study found that while 13.5% of participants that were regular outdoor recreationists prior to the pandemic were no longer regular recreationists, 20% of participants that did not participate regularly in outdoor recreation prior to the pandemic now identified as outdoor recreationists (Taff et al., 2021). Rice et al. (2020b) showed that the COVID-19 pandemic has led to some potential long-term impacts on recreational behavior. The study found that 37.7% of individuals thought their outdoor behavior would change in the future, with the most highly rated changes including utilizing local public lands more often, participating in more types of outdoor recreation, and participating in more fitness-based outdoor recreation activities (2020b).

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## Comparison Across Sites

Locations monitored include, from east to west: Whitefish Divide, Blue Sky Creek, Boulder Lake, Vinal Creek<sup>5</sup>, Canuck Peak, Pyramid-Ball Lakes, Parker Ridge, and Brush Lake. More information about these sites, including the corresponding trail name and number, are in Appendix A.

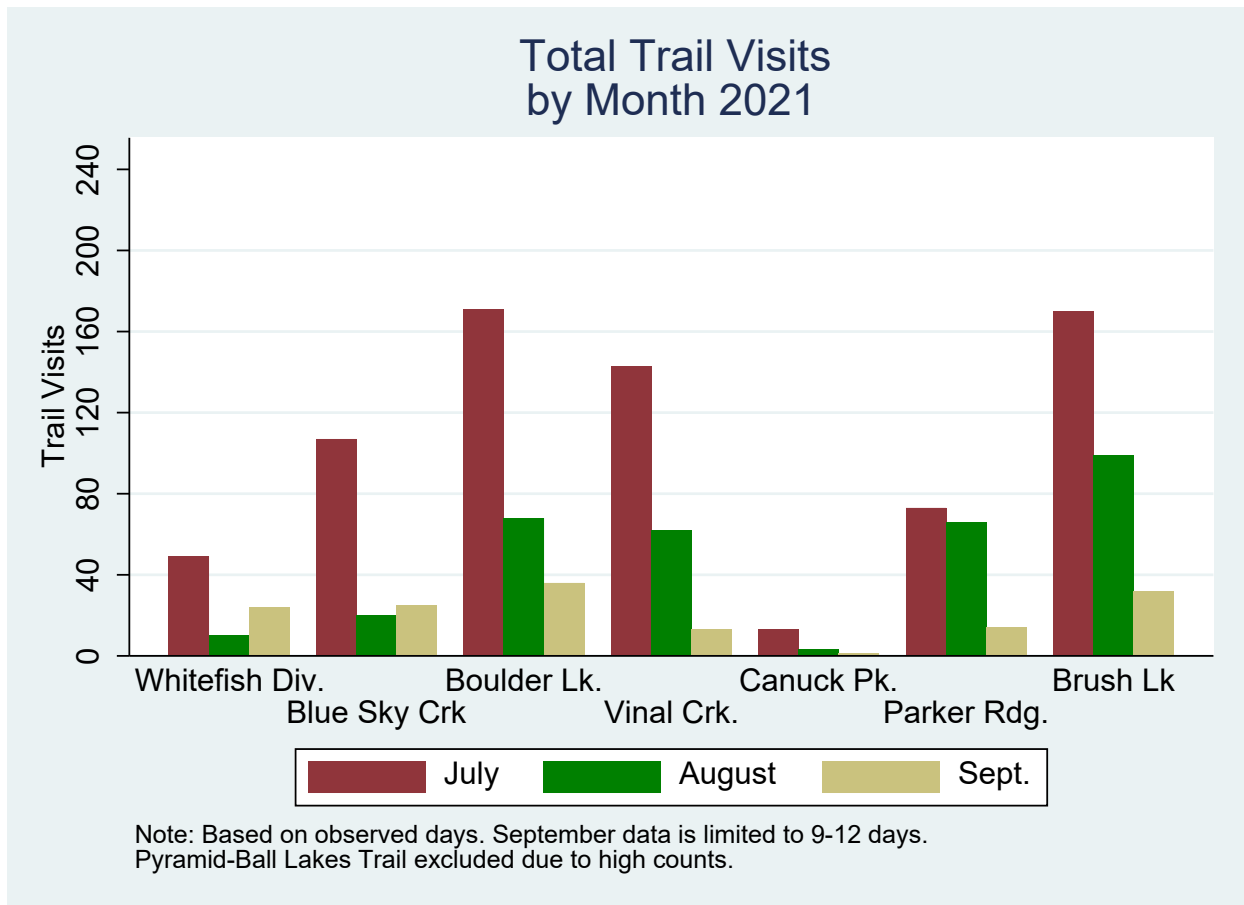
Figure 1 displays the total number of trail visits across all sites in July, August, and September. Pyramid-Ball Lakes was not included in these graphs because it demonstrated a trail count that was substantially higher than the rest of the monitored sites. The use of Pyramid-Ball Lakes did not scale with the other sites, warranting its own graph of daily counts. The sites appear in these graphs running from east to west which is the typical direction of thru hiker travel on the PNNST.

For all sites, July 2021 had the most trail visits, compared to August and September 2021. These use patterns are likely influenced in part by west-bound thru-hikers typically passing through these areas earlier in the season in order 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). In July 2021, Boulder Lake and Brush Lake had the highest use among the sites (excluding Pyramid-Ball Lakes, as mentioned above), with over 160 trail visits each. Vinal Creek<sup>5</sup> also had a relatively high number of visits, with approximately 140 trail visits. In contrast, Canuck Peak had the lowest use during July, with under 20 trail visits. During August, Brush Lake had the highest use of these trails, with about 100 trail visits during the month. Whitefish Divide, Blue Sky Creek, and Canuck Peak all had relatively low visitor use, with about 20 or fewer trail visits at each. Whitefish Divide may have had an especially low number of travel visits during August due to wildfires and road closures in the area. In September, Boulder Lake and Brush Lake had the highest use among these trails, with nearly 40 trail visits. In contrast, Canuck Peak had very low relative use during September compared to the other sites, with under 10 trail visits.

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<sup>5</sup> The Vinal Creek monitoring site is not located on the PNNST and data is not PNNST use. See pp. 41-46.

Figure 1: Comparison of use across all sites during July-September 2021<sup>6</sup>



<sup>6</sup> The Vinal Creek monitoring site is not located on the PNNST and data is not PNNST use. See pp. 41-46.

Figure 2 shows a comparison of weekday and weekend use across each site, excluding Pyramid-Ball Lakes because visits to this site took place on a much larger scale than the rest of our sites. If we included Pyramid-Ball Lakes in the same figure, it would be more difficult to see the differences between the individual sites. Figure 3 shows the comparison of weekday and weekend use at Pyramid-Ball Lakes. 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.

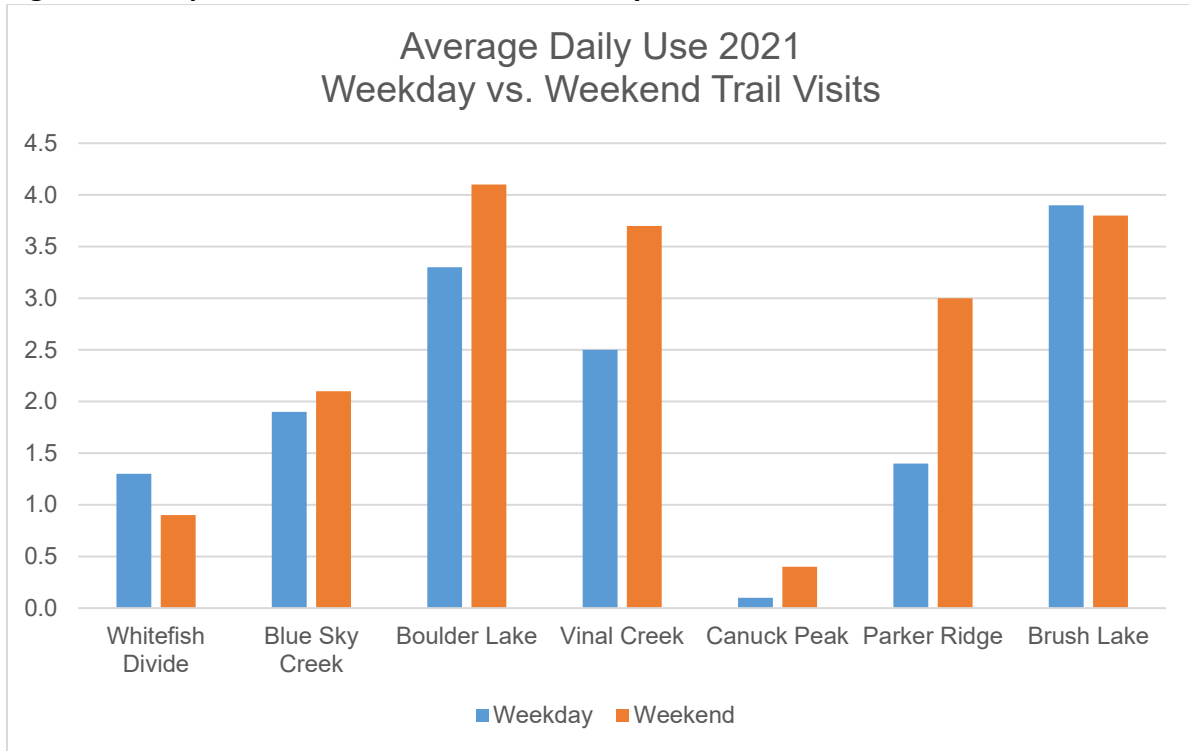
Overall, Canuck Peak had the greatest difference between weekday and weekend use. Weekends accounted for about 76% of traffic at Canuck Peak, whereas only 24% of traffic occurred during the weekdays. Notably, however, Canuck Peak had the lowest trail use of all the sites, with under 20 trail visits estimated throughout the season. Thus, Canuck Peak trail use averaged 0.1 daily trail visits during weekdays, versus an average of 0.4 daily trail visits on weekends during 2021. Similarly, Pyramid-Ball Lakes and Parker Ridge saw a notably higher percentage of users on weekends compared to weekdays as well, with about 60% of traffic at both of these sites using the trail during the weekend versus only 40% during weekdays. At Pyramid-Ball Lakes, average daily trail visits increased from 16.3 on weekdays to 33.7 daily trail visits on weekends. Whereas at Parker Ridge, the daily average use on weekdays was 1.4, and the daily average trail use on weekends was 3.0. Daily weekend use was also higher for Blue Sky, Boulder Lake, and Vinal Creek<sup>7</sup> than weekday use. Notable increases in use on weekends suggests that these sites were very popular for day hikers. Higher weekend use may also indicate trails being a more easily accessible with higher trail use by working folks that have more free time on the weekends.

Alternatively, there seemed to be little difference in use between weekend days and weekdays for the Whitefish Divide and Brush Lake sites. At Whitefish Divide daily weekend use averaged 0.9 trail visits compared to a weekday daily use of 1.3. The average number of daily trail visits during weekdays at Brush Lake was 3.9 and the average number of daily trail visits during weekends at this site was 3.8. 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. Conversely, the Vinal Creek<sup>7</sup> site's trail is more accessible and convenient for short-term trips. It has shown to have more use by groups and organizations (ex. school groups) that may utilize it during the week, thus balancing weekday versus weekend use patterns.

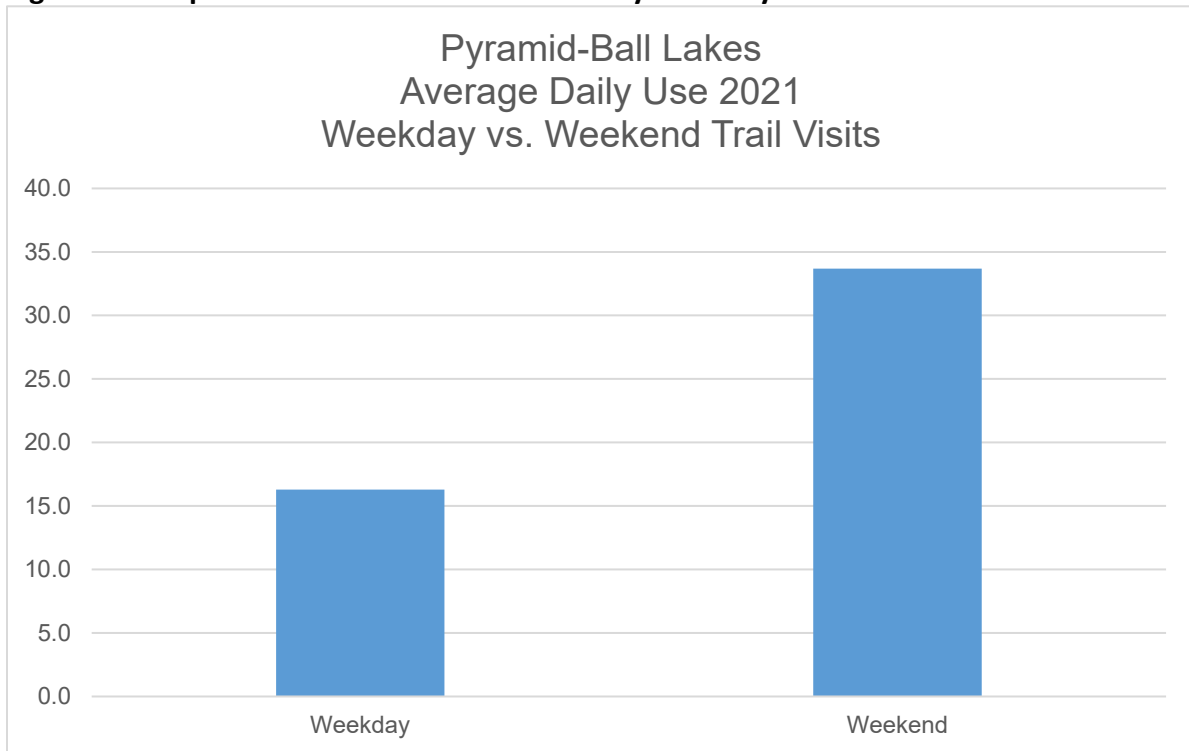
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<sup>7</sup> The Vinal Creek monitoring site is not located on the PNNST and data is not PNNST use. See pp. 41-46.

**Figure 2: Comparison of Weekend and Weekday use across all sites in 2021<sup>8</sup>**



**Figure 3: Comparison of Weekend and Weekday use at Pyramid-Ball Lakes in 2021**



<sup>8</sup> The Vinal Creek monitoring site is not located on the PNNST and data is not PNNST use. See pp. 41-46.

Figures 4, 5, 6, 7, 8, and 9 show a comparison of the percentage of different types of users across each site for July, August, and September. The Pyramid-Ball Lakes monitoring site was excluded from July graphs due to a lack of camera data for analysis. These graphs include overnight hikers, day hikers, and other types of users (which includes horse riders, crew members, and bike riders). Graphs 4, 6 and 8 distinguish between the percentage of different types of users at each site for each month, with observations at the party level. In contrast, graphs 5, 7, and 9 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 4 shows that during July overnight hikers were the most common type of user for nearly all sites when measured at the party level, except for at Vinal Creek<sup>9</sup> which mostly had parties composed of day hikers. During July, 100% of parties at Canuck Peak were overnight hikers, though notably there were only five parties recorded. When compared by party, Blue Sky Creek, Boulder Lake, Parker Ridge, and Brush Lake also had notably more overnight hikers than day hikers during July, with about 60% of parties at each of these sites being composed of overnight hikers. Whitefish had a similar percentage of parties being composed of overnight hikers and day hikers, with both groups composing a little under 50% of the observed parties. In contrast, nearly 60% of parties at Vinal Creek<sup>9</sup> were composed of day hikers, with the other approximately 40% including overnight hikers. “Other” types of users, besides overnight hikers and day hikers, were present at Whitefish Divide, Blue Sky Creek, and Brush Lake during July, but composed a relatively small percentage of parties at these sites. Brush Lake had the greatest percentage of parties composed of “other” types of users, with nearly 20%.

Figure 5 shows that, when measured by individual trail user, overnight hikers were the most common type of user for Blue Sky Creek, Canuck Peak, Parker Ridge, and Brush Lake during July. For example, 100% of observed users at Canuck Peak were overnight hikers, though there were only eight users observed at this site during the month. Blue Sky Creek, Parker Ridge, and Brush Lake were also mostly visited by overnight hikers, with around 60% of users at each of these sites being overnight hikers. Whitefish Divide had relatively similar percentages of overnight hikers and day hikers, with each composing over 40% of users, though with slightly more day hikers. Vinal Creek<sup>9</sup> was visited notably more by day hikers than overnight hikers, which day hikers making up over 60% of users at this site. Day hikers were also slightly more common than overnight hikers at Boulder Lake, with a little over 50% of individual users at this site being day hikers. This differed from the Boulder Lake user distribution pattern when measured at the party level (where more parties were composed of overnight hikers than day hikers), due to Boulder Lake being visited by some larger parties of day hikers. “Other” users made up the

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<sup>9</sup> The Vinal Creek monitoring site is not located on the PNNST and data is not PNNST use. See pp. 41-46.

smallest percentage of users at the three sites they were present at, with Brush Lake having the most “other” users at around 20%.

Figure 6 shows that day hikers were the most common type of user for nearly all sites during August, when measured at the party level. During August, 100% of parties at Canuck Peak were composed of overnight hikers. Notably, however, there were only two observed parties at Canuck Peak during August. When compared by party, Boulder Lake had the greatest percentage of day hikers, with over 80% of parties at this site being composed of day hikers. Whitefish Divide, Blue Sky Creek, Pyramid-Ball Lake, and Parker Ridge also had between 60-80% of their parties being composed of day hikers. Vinal Creek<sup>10</sup> also had more parties of day hikers than overnight hikers, though each type composed closer to 50%. In contrast, most of the parties at Brush Lake were composed of “other” users, followed by overnight hikers and then day hikers, which each composed around 20% of parties at the site.

Figure 7 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, 100% of Canuck Peak trail users were overnight hikers, though there were just three users noted at this site during August. Boulder Lake had the highest percentage of day hikers among sites, with around 90% of users being day hikers. Whitefish Divide, Blue Sky Creek, Vinal Creek<sup>10</sup>, Pyramid-Ball Lakes, and Parker Ridge also had notably more day hikers than overnight hikers. Whitefish Divide, Blue Sky Creek, and Pyramid-Ball Lakes each had around 80% of users being day hikers. Vinal Creek<sup>10</sup> and Parker Ridge also each had around 60% of users that were day hikers. Brush Lake had the most even distribution of users, with a little over 40% of users being “other” users, a little under 40% being day hikers, and a little under 20% being overnight hikers.

Figure 8 shows that during September day hikers were the most common type of user when measured at the party level for many of the sites. While 100% of parties at Parker Ridge were composed of overnight hikers during September, notably only one party was recorded at this site during the month. When user type was compared at the party level, Vinal Creek<sup>10</sup> and Pyramid-Ball Lakes had the greatest percentage of day hikers, with each having over 80% of their parties including day hikers. Similarly, about 70% of parties at Boulder Lake and Canuck Peak included day hikers, with the remaining parties at each being composed of overnight hikers. Whitefish Divide and Blue Sky Creek also had mostly day hiker parties, with about 60% of their parties being made up of day hikers, but with their remaining parties bring about 20% overnight hikers and 20% “other” users. In contrast, during September Brush Lake had no noted overnight hikers, and a near equal distribution of day hiker parties and “other” user parties.

Figure 9 shows that the percentage distribution of user types for September analyzed at the individual level mostly followed similar trends to those analyzed at the party level. 100% of Parker Ridge users were overnight hikers. However, only two users were observed at this site during September. Boulder Lake, Vinal Creek<sup>10</sup>, and Pyramid-Ball Lakes had the highest

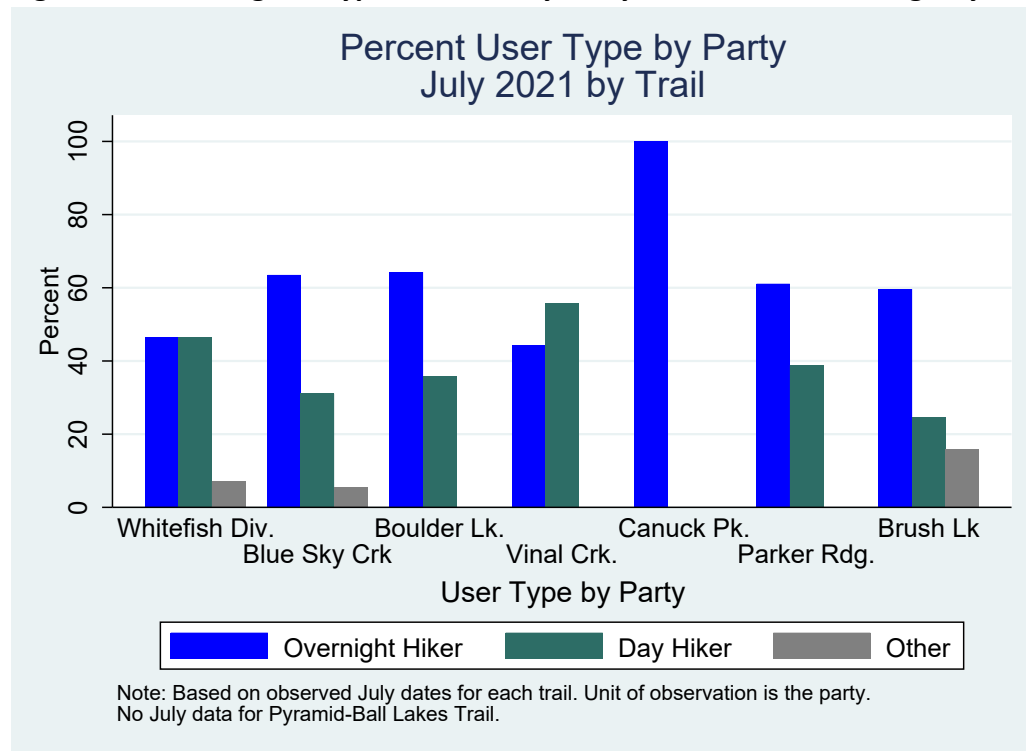
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<sup>10</sup> The Vinal Creek monitoring site is not located on the PNNST and data is not PNNST use. See pp. 41-46.

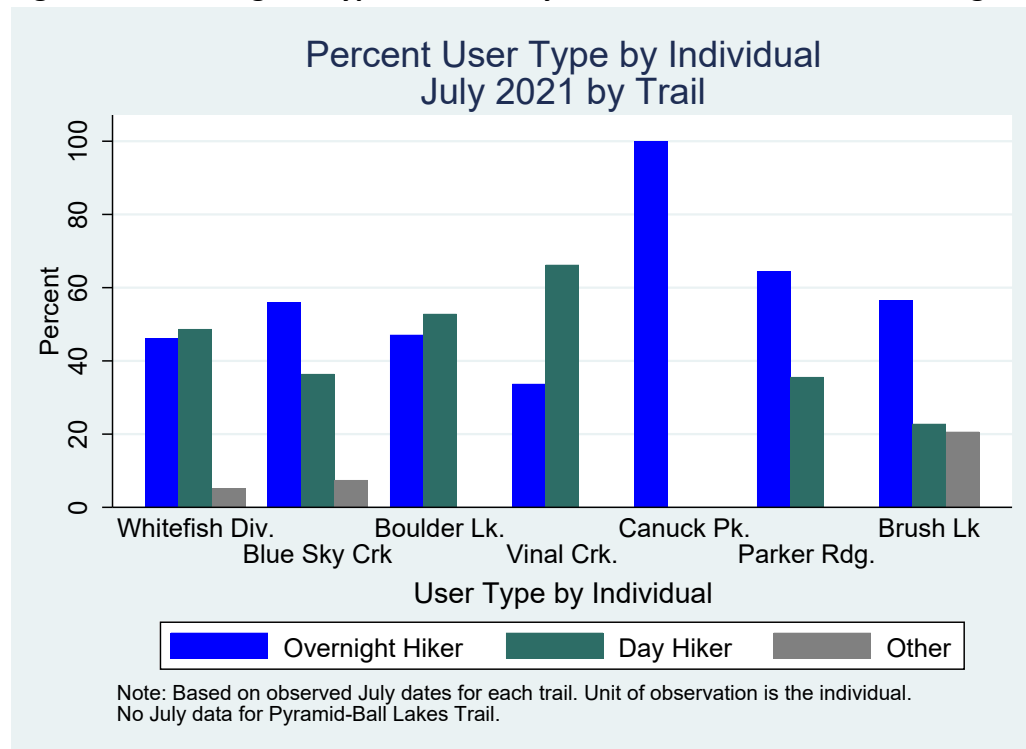


percentages of day hikers among sites, each with over 80% of users being day hikers. Canuck Peak and Brush Lake were also mostly used by day hikers, with each site having around 60% of users being day hikers. However, the remaining users at Canuck were all overnight users, while the remaining users at Brush Lake were all “other” users. About 50% of users at Whitefish Divide were day hikers, followed by about 30% being “other” users, and about 20% being overnight users. Lastly, during September, a little over 40% of users at Blue Sky Creek were day hikers, a little over 40% were “other” users, and the remaining users were overnight hikers.

**Figure 4: Percentage of Types of Users by Party across all sites during July 2021<sup>11</sup>**



**Figure 5: Percentage of Types of Users by Individual across all sites during July 2021**



<sup>11</sup> The Vinal Creek monitoring site is not located on the PNNST and data is not PNNST use. See pp. 41-46.

Figure 6: Percentage of Types of Users by Party across all sites during August 2021<sup>12</sup>

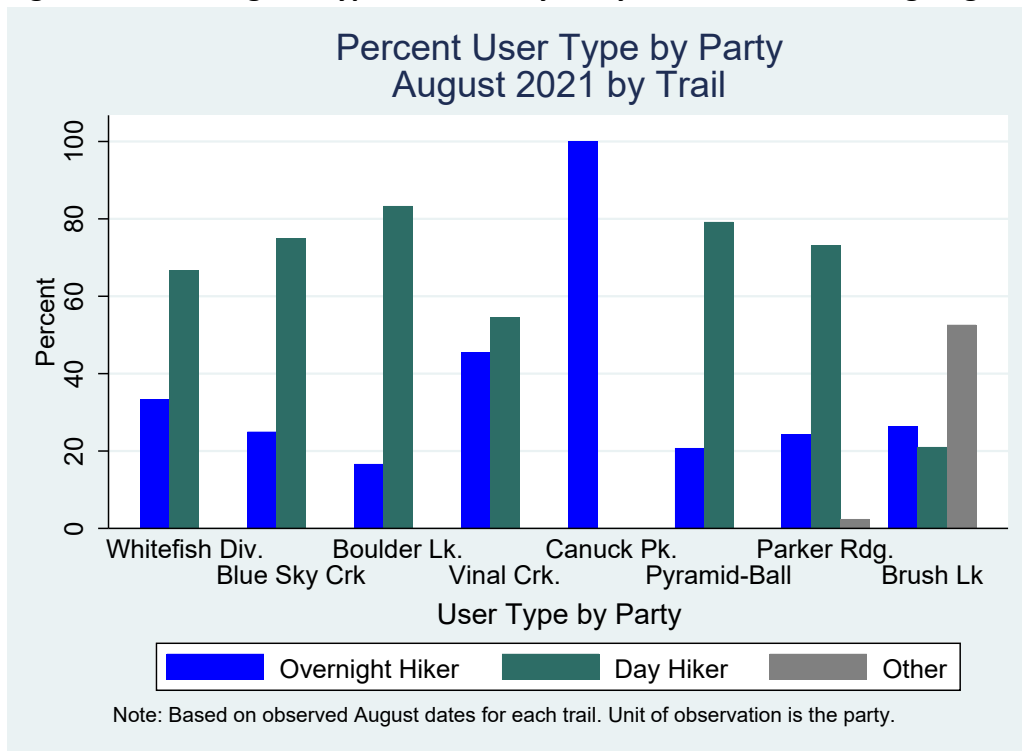
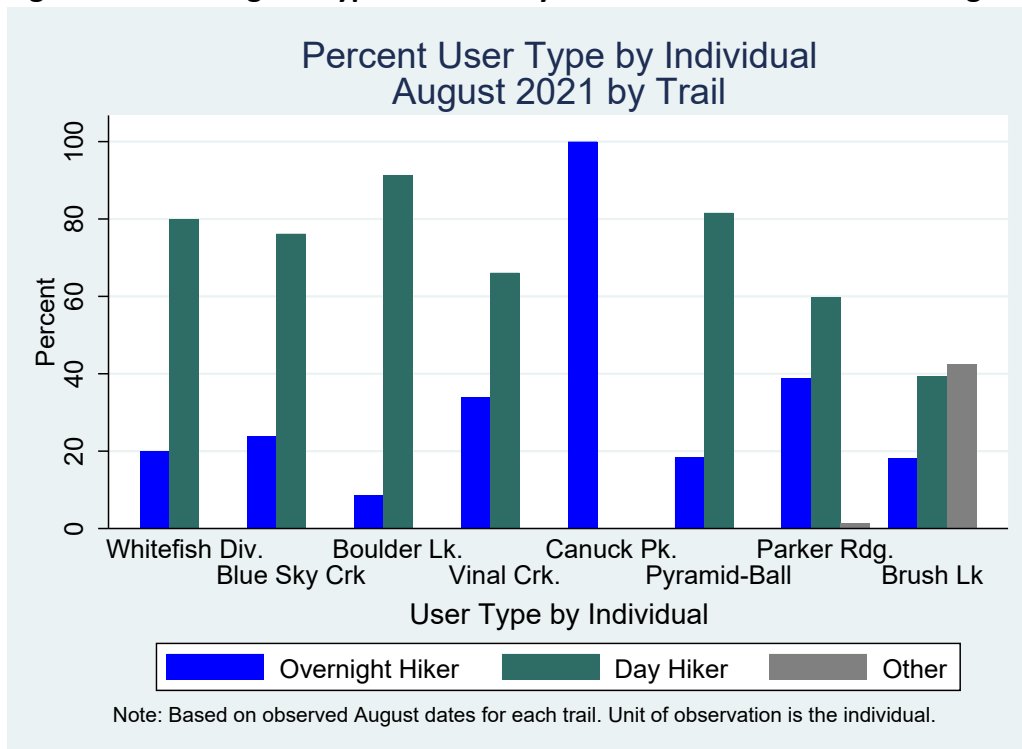
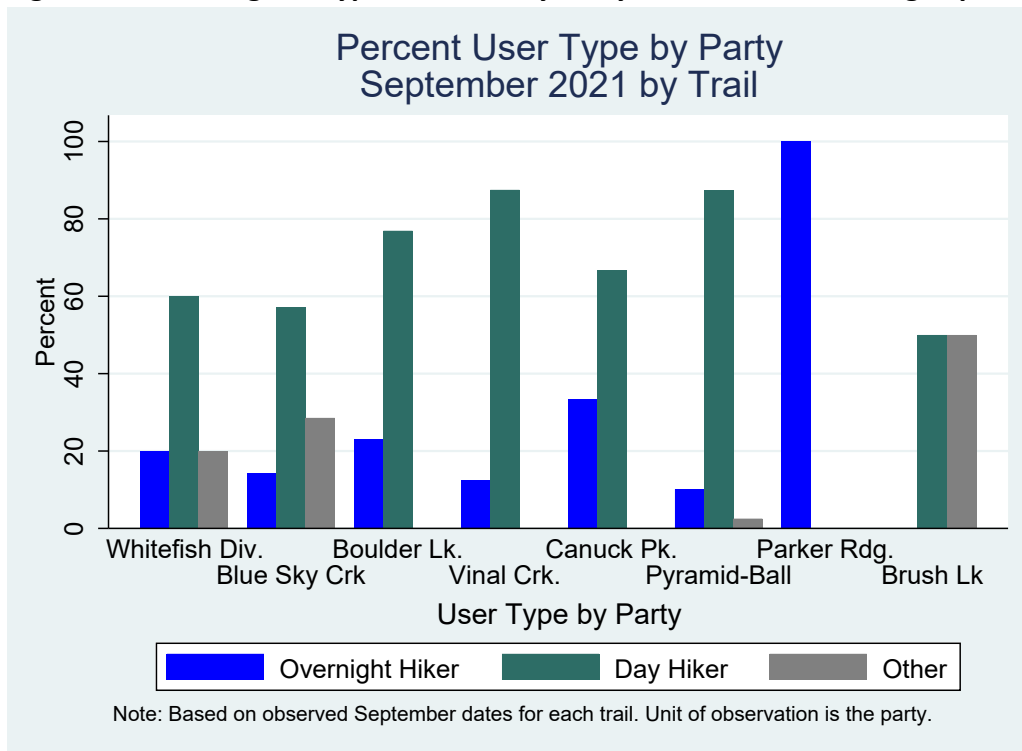


Figure 7: Percentage of Types of Users by Individual across all sites during August 2021

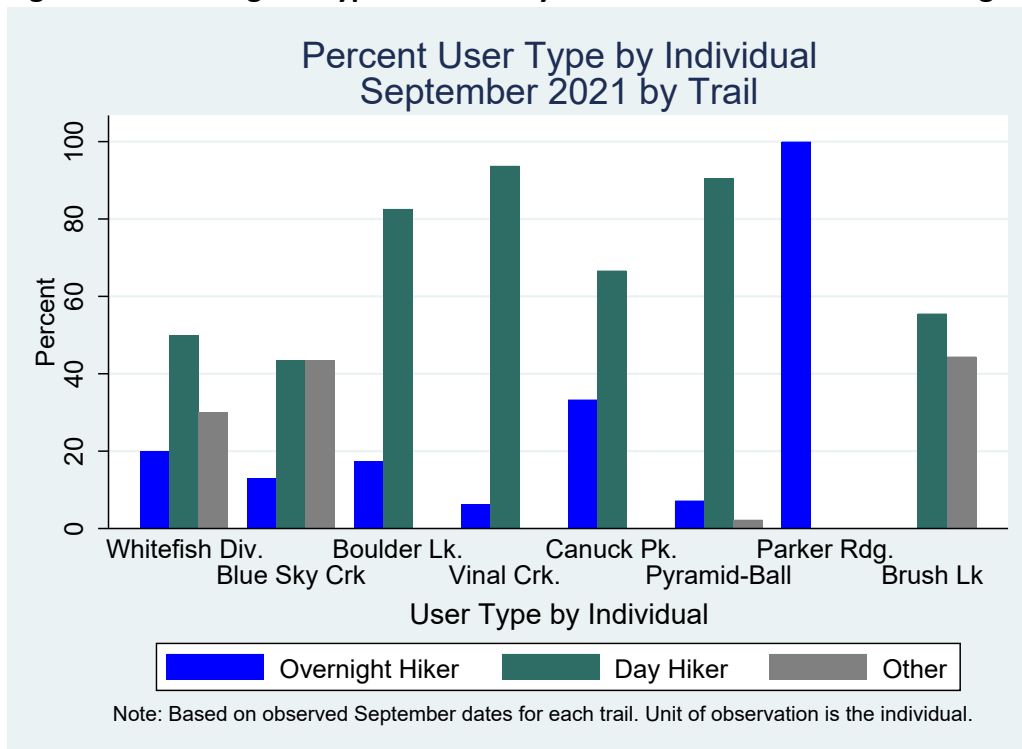


<sup>12</sup> The Vinal Creek monitoring site is not located on the PNNST and data is not PNNST use. See pp. 41-46.

**Figure 8: Percentage of Types of Users by Party across all sites during September 2021<sup>13</sup>**



**Figure 9: Percentage of Types of Users by Individuals across all sites during September 2021**



<sup>13</sup> The Vinal Creek monitoring site is not located on the PNNST and data is not PNNST use. See pp. 41-46.

Table 2 provides the number of days monitored, monthly counts, daily averages, and maximum daily counts for each site for June-September 2021. Data for June 28<sup>th</sup> to July 17<sup>th</sup> was excluded for Pyramid-Ball Lakes due to a loss of camera data for the site during these dates.

Table 2 Monitoring Data for June, July, August, and September 2021

<i>Site<sup>1</sup></i>	<i>Days Monitored (Monthly)</i>	<i>Count (Monthly)</i>	<i>Daily Average</i>	<i>Max (Daily)</i>
<b><u>June</u></b>				
Whitefish Divide Trail	0	0	.	.
Blue Sky Creek Trail	14	23	2	5
Boulder Lake Trail	15	45	3	9
Vinal Creek Trail <sup>2</sup>	1	0	0	0
Canuck Peak Trail	1	0	0	0
Pyramid-Ball Lakes Trail	13	351	27	110
Parker Ridge Trail	16	24	2	7
Brush Lake Trail	16	34	2	12
<b><u>July</u></b>				
Whitefish Divide Trail	30	49	2	9
Blue Sky Creek Trail	31	107	3	11
Boulder Lake Trail	31	171	6	18
Vinal Creek Trail <sup>2</sup>	31	143	5	29
Canuck Peak Trail	31	13	0	3
Pyramid-Ball Lakes Trail	14	404	29	51
Parker Ridge Trail	31	73	2	14
Brush Lake Trail	31	170	5	18
<b><u>August</u></b>				
Whitefish Divide Trail	31	10	0	3
Blue Sky Creek Trail	31	20	1	6
Boulder Lake Trail	31	68	2	16
Vinal Creek Trail <sup>2</sup>	31	62	2	19
Canuck Peak Trail	31	3	0	1
Pyramid-Ball Lakes Trail	31	566	18	111
Parker Ridge Trail	31	66	2	20
Brush Lake Trail	31	99	3	24
<b><u>September</u></b>				
Whitefish Divide Trail	11	24	2	13
Blue Sky Creek Trail	11	25	2	8
Boulder Lake Trail	10	36	4	13
Vinal Creek Trail <sup>2</sup>	10	13	1	4
Canuck Peak Trail	10	1	0	1
Pyramid-Ball Lakes Trail	9	257	29	81
Parker Ridge Trail	9	14	2	8
Brush Lake Trail	9	32	4	9

<sup>1</sup> Official Trail designations appear in Appendix A. <sup>2</sup> Vinal Creek Trail is not part of the PNNST.



## Trail Use by Site

### Whitefish Divide 2021

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 2021, the counter and camera were set up on the north side of the trail.



**2021 counter location.**  
**Counter to climber's left.**



**2021 camera location.**  
**Camera to climber's right.**

From July 1, 2021 through September 12, 2021, an estimated 83 trail visits were recorded on Whitefish Divide Trail. Figure 10.1 displays the daily trail visit counts for the Whitefish Divide site, as well as the corresponding air quality in Kalispell. Wildfires during July and August 2021 may have contributed to lower numbers of trail visits during these months.

Figure 10.2 shows the total weekly trail visits at the Whitefish Divide site. The week with the highest use was September 6<sup>th</sup>-12<sup>th</sup>, with 21 trail visits. A weekly average of 8.6 trail visits were recorded at the Whitefish Divide site during the weeks monitored.

Figure 10.3 shows the parties per week at the Whitefish Divide monitoring site. Camera data was missing for this site between July 8<sup>th</sup>-20<sup>th</sup>, 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 August 2<sup>nd</sup>-8<sup>th</sup> and September 6<sup>th</sup>-12<sup>th</sup>, which both had 4 parties pass by during the week.

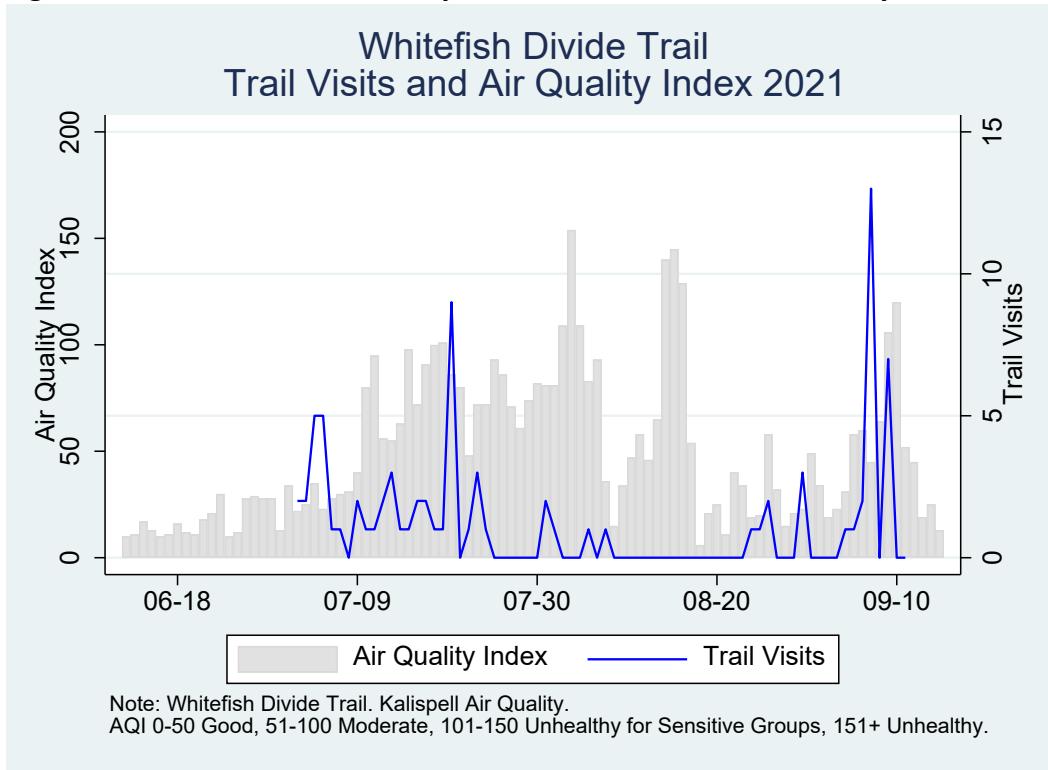
Figure 10.4 includes the daily average number of trail visits by the day of the week at the Whitefish Divide site. The highest use day was Tuesday, with an average of 2.7 visitors per day. The lowest use day was Wednesday with an average of 0.3 visitors per day. The remaining days of the week were all averaged relatively close to 1 visitor per day.

Figure 10.5 shows the percentage distribution of party sizes at Whitefish Divide during 2021. The graph shows that party sizes were relatively small, with 53.8% of parties involving solo users, 41.0% of parties being pairs of individuals, and 5.1% of parties containing trios.

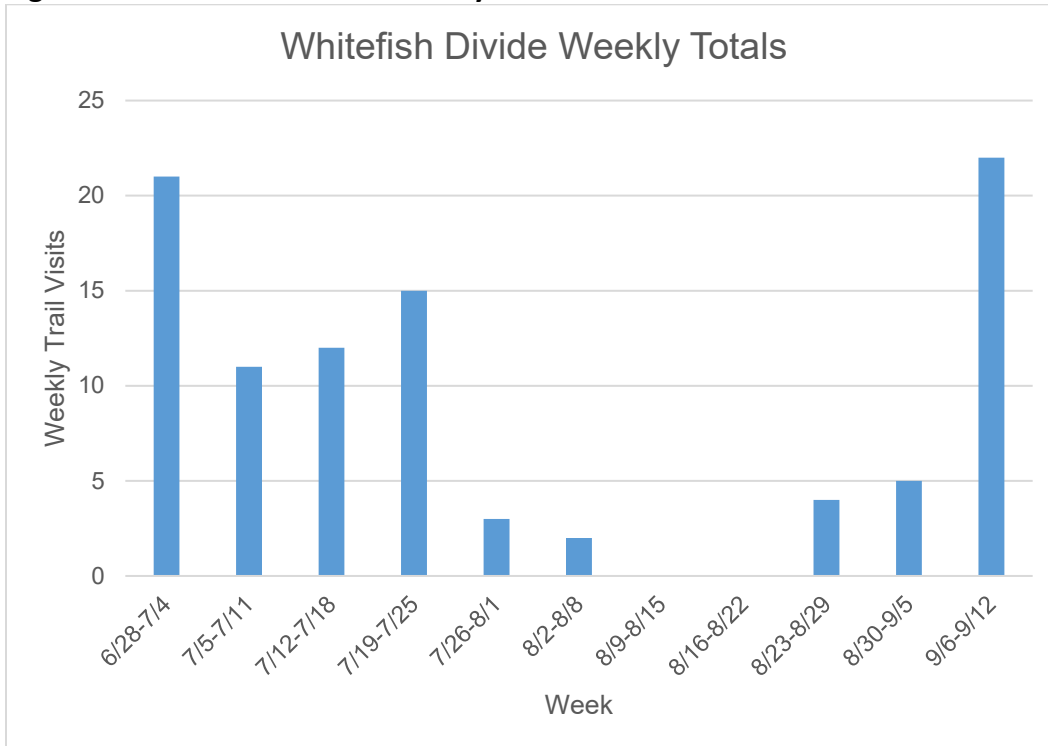
Figure 10.6 shows the distribution of user types at the party level observed at Whitefish Divide over 2021. The most common type of party included day hikers, which composed about 51.3% of parties. This was followed by overnight hikers, which made up 41.0% of the parties at this site. Bike riders composed the remaining 7.7% of parties at this site.

Figure 10.7 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 54.2% of users. This was followed by overnight hikers, which included 37.3% of the parties at Whitefish Divide. Lastly, bike riders composed 8.5% of trail users.

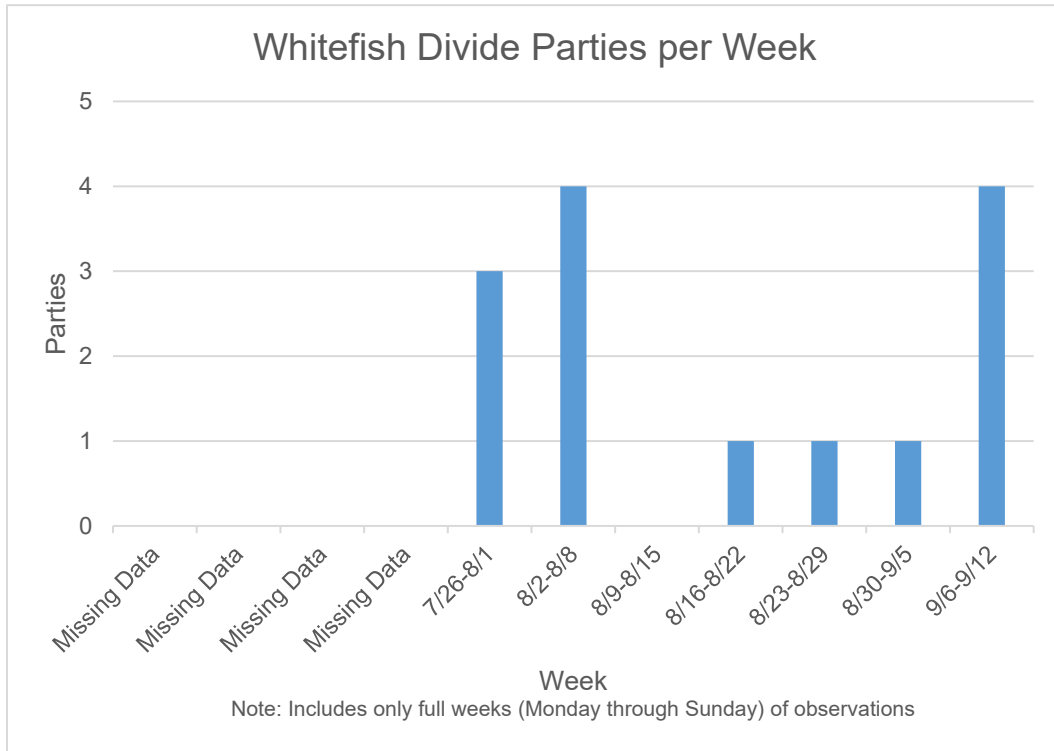
**Figure 10.1 Whitefish Divide Daily Trail Visit Counts and Air Quality**



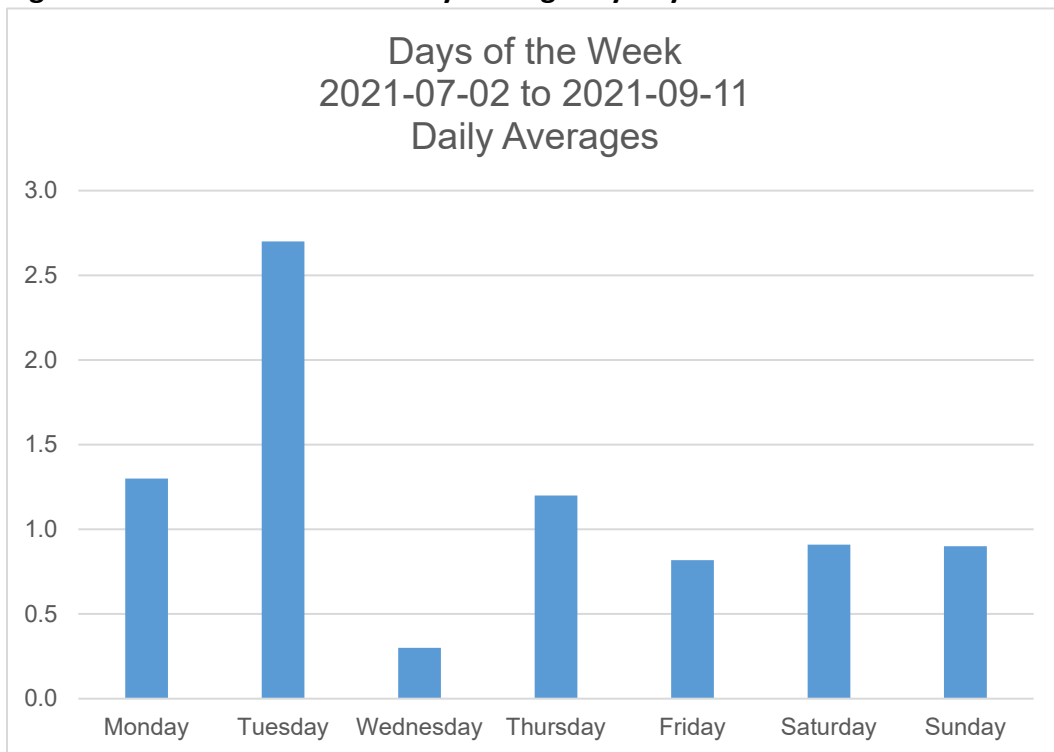
**Figure 10.2 Whitefish Divide Weekly Counts**



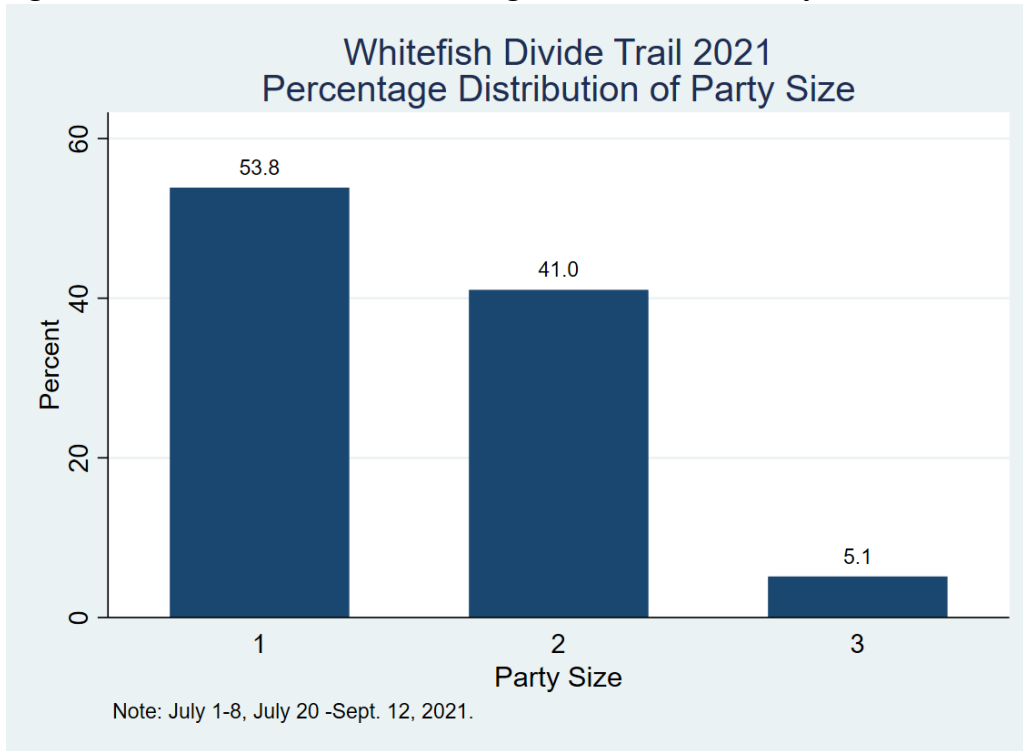
**Figure 10.3 Whitefish Divide Parties per Week**



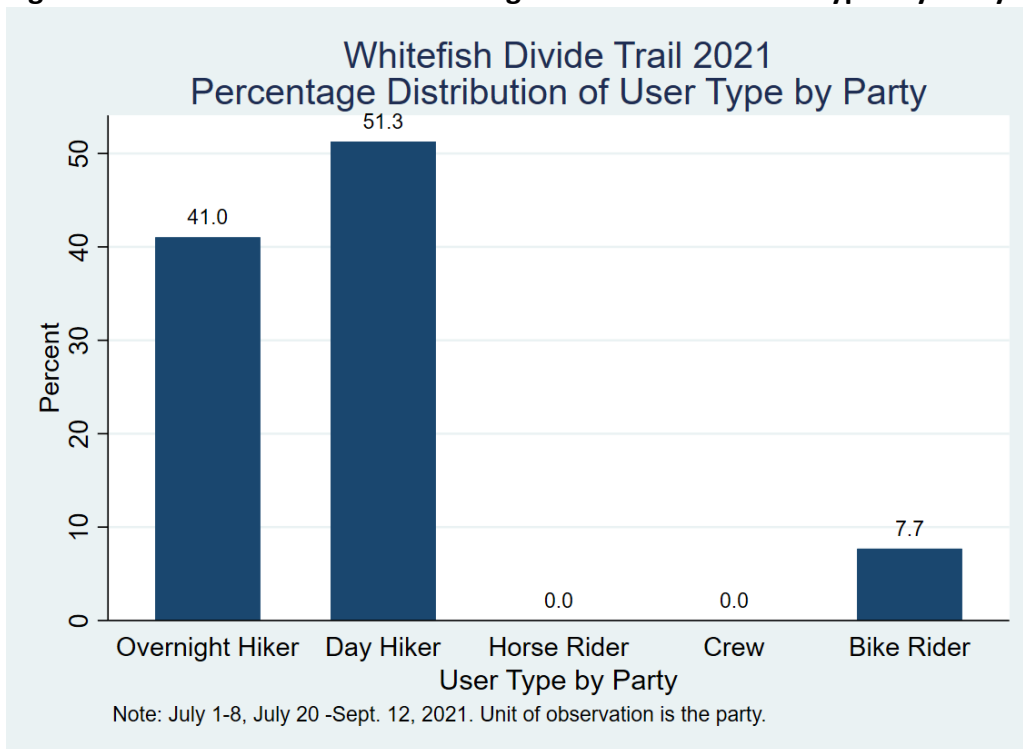
**Figure 10.4 Whitefish Divide Daily Averages by Day of the Week**



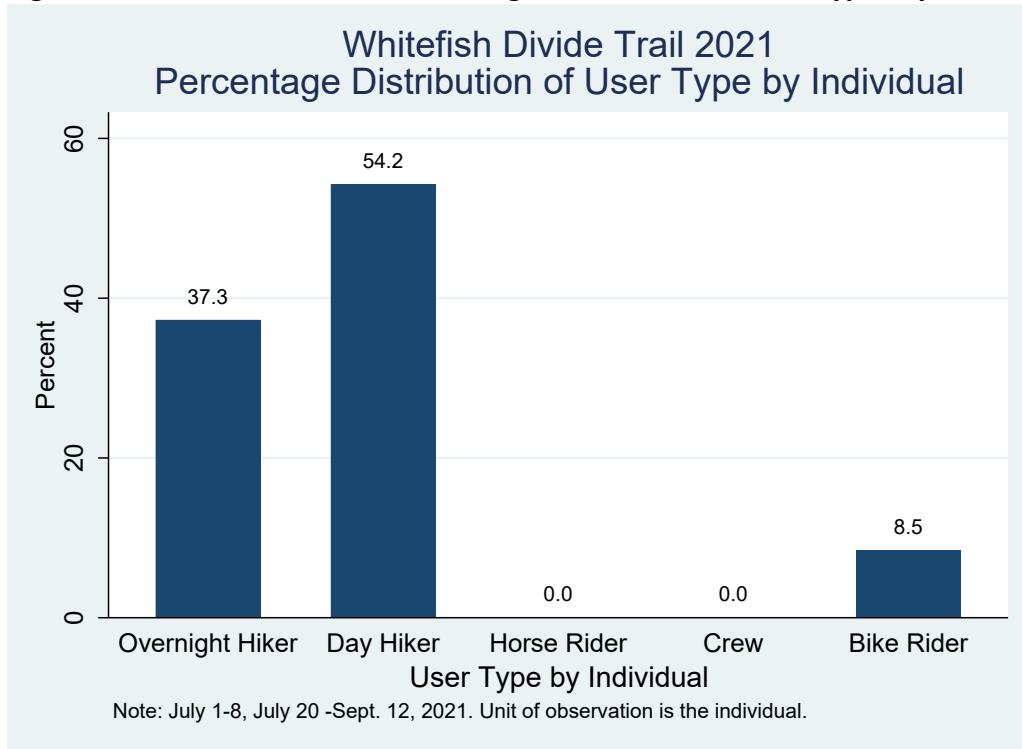
**Figure 10.5 Whitefish Divide Percentage Distribution of Party Size**



**Figure 10.6 Whitefish Divide Percentage Distribution of User Types by Party**



**Figure 10.7 Whitefish Divide Percentage Distribution of User Types by Individual**





## Blue Sky Creek 2021

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 2021, the counter and camera were set up on the north side of the trail.

### Looking northeast. Blue Sky trailhead parking



**2021 counter location.**  
Counter to climber's left.



**2021 camera location.**  
Counter to climber's left.

From June 16, 2021 through September 12, 2021, an estimated 175 trail visits were recorded on Blue Sky Creek Trail. Figure 11.1 displays the daily trail visit counts for the Blue Sky Creek site as well as the relative air quality in Kalispell. Higher AQI due to wildfires may have impacted trail use during July, and particularly early August for this trail.

Figure 11.2 shows the total weekly trail visits at the Blue Sky Creek Site. The week with the highest use was July 5<sup>th</sup>-July 11<sup>th</sup>, with 36 trail visits. A weekly average of 13.9 trail visits were recorded at the Blue Sky Creek site during the weeks monitored.

Figure 11.3 shows the parties per week at the Blue Sky Creek monitoring site. Since this site was set up on June 16<sup>th</sup>, the week of June 14<sup>th</sup> was lacking in data needed to calculate parties per week. The weeks with the largest number of parties were July 5<sup>th</sup>-11<sup>th</sup> and July 12<sup>th</sup>-18<sup>th</sup>, which both had 24 parties pass by during the week.

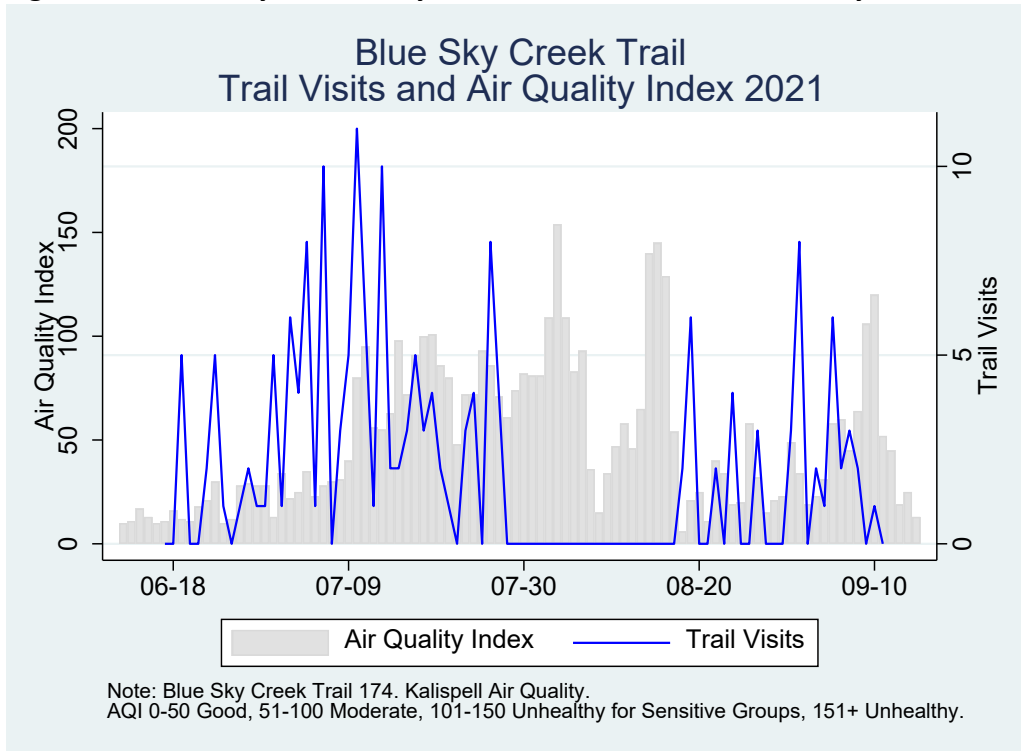
Figure 11.4 includes the daily average number of trail visits by the day of the week at the Blue Sky Creek site. The highest use day was Tuesday, which had an average of 3.3 visitors per day. The lowest use day was Thursdays, wherein the average daily use was 1.0 visitors per day.

Figure 11.5 shows the percentage distribution of party sizes at Blue Sky Creek. Party sizes were relatively small at this site, with 63.2% of parties being solo users and 31.2% of parties being pairs of individuals.

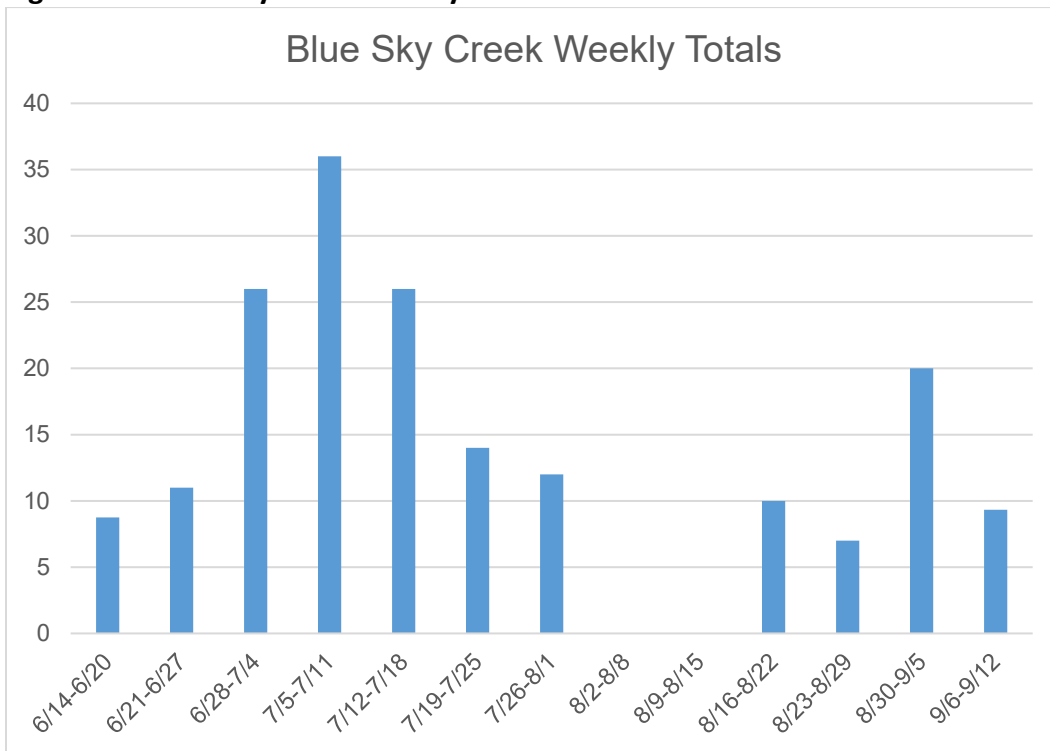
Figure 11.6 shows the distribution of user types at the party level at Blue Sky Creek during 2021. The most common type of party was composed of overnight hikers, which composed about 56.0% of parties. This was followed by day hikers with 35.2%, horse riders at 4.8%, crew at 2.4%, and bike riders at 1.6%.

Figure 11.7 shows the distribution of user types at the individual level that were recorded at Blue Sky Creek over 2021. 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 50.8% of users. This was followed by day hikers, which included 36.6% of the parties at Blue Sky Creek. The remaining users were horse riders at 8.7%, crew at 2.7%, and bike riders at 1.1%.

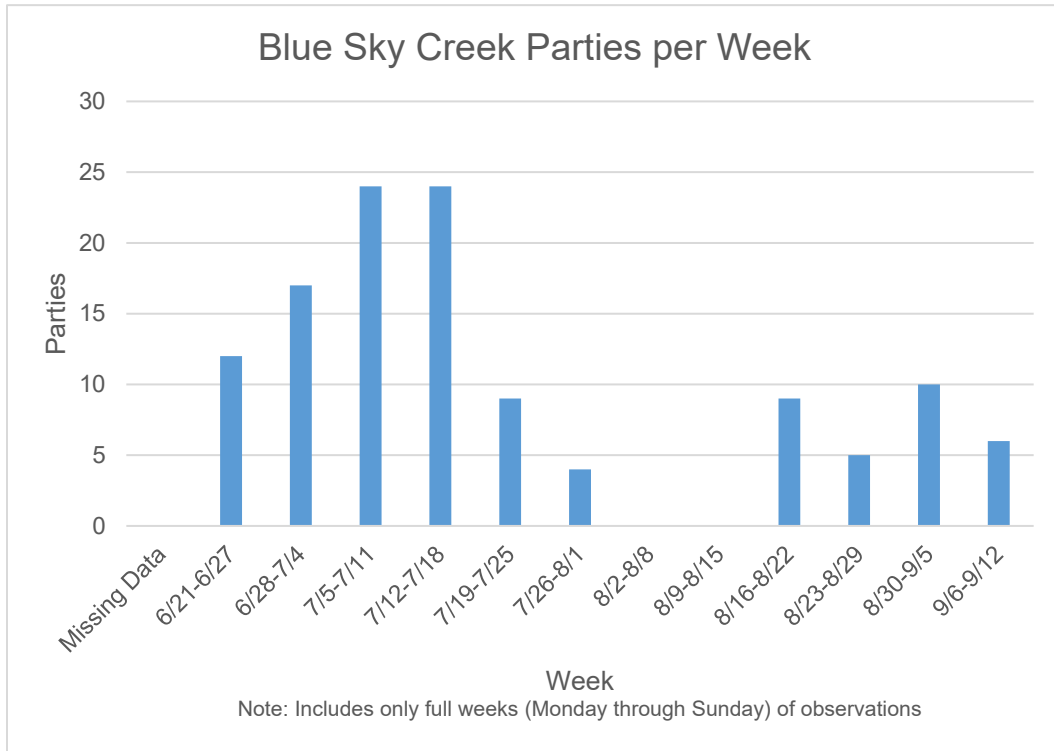
**Figure 11.1 Blue Sky Creek Daily Trail Visit Counts and Air Quality**



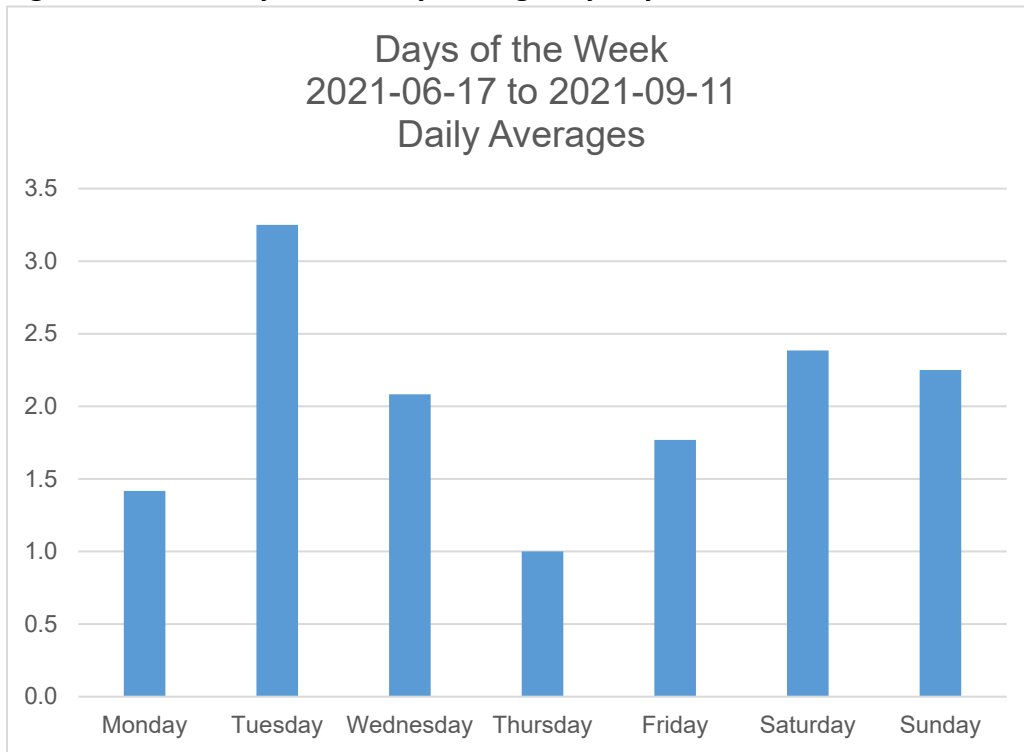
**Figure 11.2 Blue Sky Creek Weekly Counts**



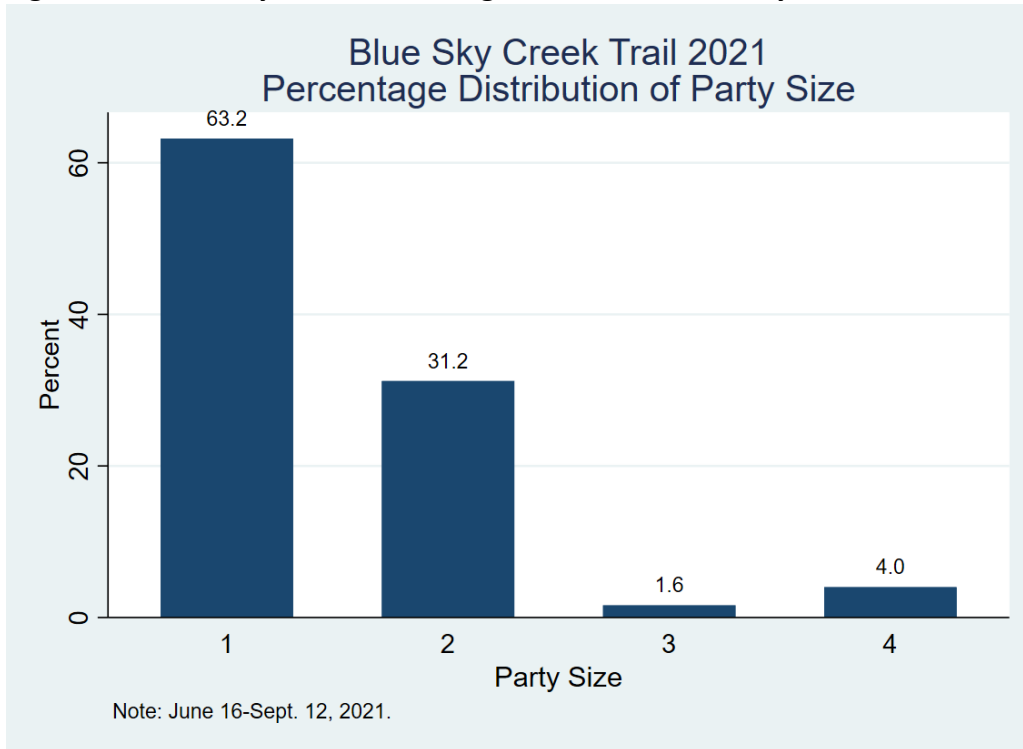
**Figure 11.3 Blue Sky Creek Parties per Week**



**Figure 11.4 Blue Sky Creek Daily Averages by Day of the Week**



**Figure 11.5 Blue Sky Creek Percentage Distribution of Party Size**



**Figure 11.6 Blue Sky Creek Percentage Distribution of User Types by Party**

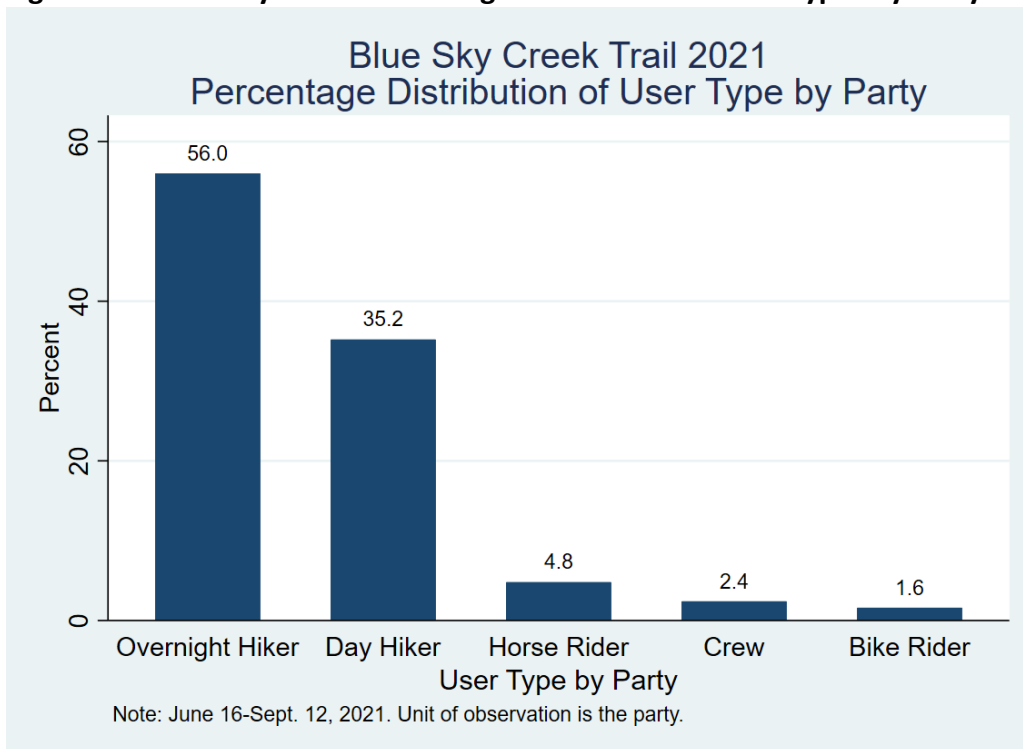
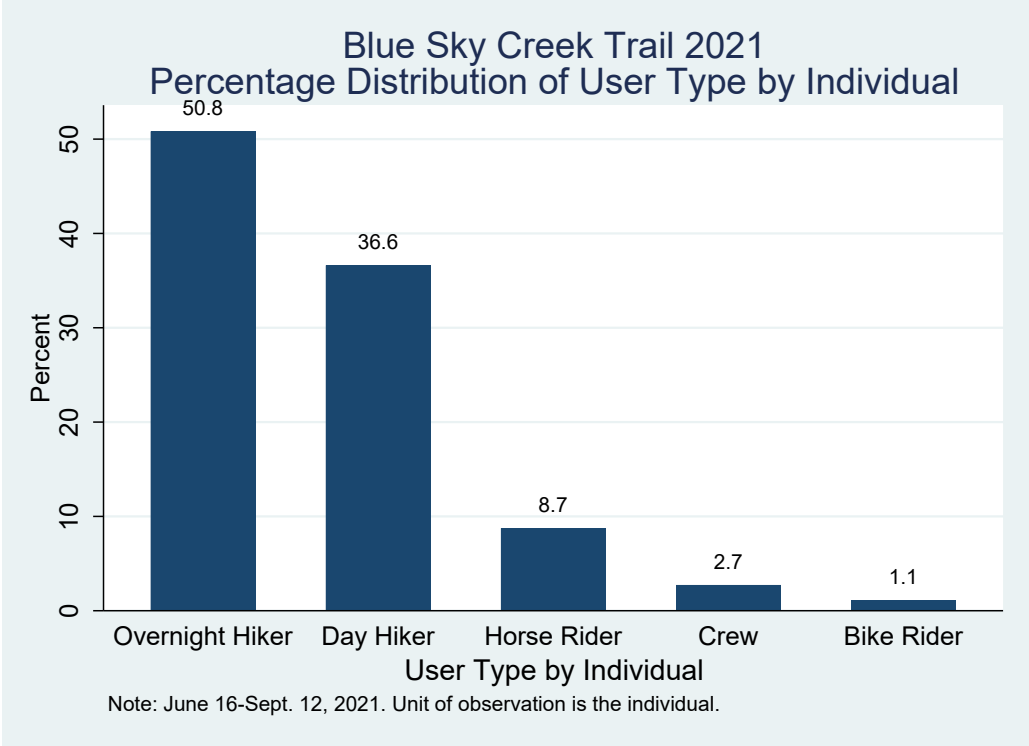


Figure 11.7 Blue Sky Creek Percentage Distribution of User Types by Individual





## Boulder Lake 2021

Boulder Lake Trail (#62) can be found from Highway 37 by crossing Kooconusa 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.

### Boulder Lake site parking



**2021 counter location.**  
Counter to climber's right.



**2021 camera location.**  
Camera to climber's left.

From June 15, 2021 through September 11, 2021 an estimated 320 trail visits were recorded on the Boulder Lake Trail. Figure 12.1 shows the estimated daily trail visit counts for the Boulder Lake site and the relative air quality in Kalispell. Low air quality may have affected trail use for part of early August, where use was lower during one set of high AQI recordings. However, there was still relatively high use during a second peak in AQI during mid-August.

Figure 12.2 shows the total weekly trail visits at the Boulder Lake site. The week with the highest use was July 12<sup>th</sup>-18<sup>th</sup>, with 51 visits. The weeks of July 5<sup>th</sup>-11<sup>th</sup>, July 19<sup>th</sup>-25<sup>th</sup>, and August 9<sup>th</sup>-15<sup>th</sup> also had relatively high use, with each of these weeks having 48 trail visits. A weekly average of 25.8 trail visits were recorded at the Boulder Lake site during the weeks monitored.

Figure 12.3 shows the parties per week at Boulder Lake. Camera data was missing for this site between June 30<sup>th</sup> and July 19<sup>th</sup>, 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 19<sup>th</sup>-26<sup>th</sup> and August 9<sup>th</sup>-15<sup>th</sup>, during which both had 18 parties pass by.

Figure 12.4 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 6.1 visitors per day. Based on camera data, this trail was frequented by day hikers on the weekends, which could account for the higher weekend traffic which is typical of day use patterns. Based on the camera data, the trail was frequented by day use hikers with dogs.

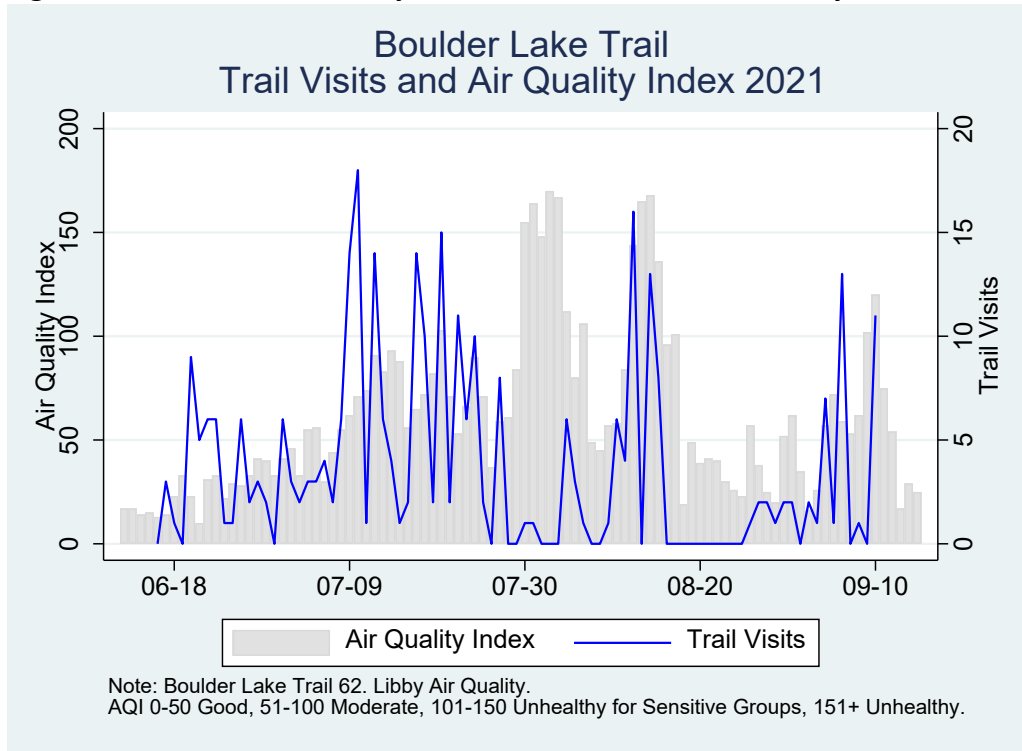
Figure 12.5 shows the percentage distribution of party sizes at Boulder Lake. Overall, the most common party sizes were solo users, making up 38.6% of parties, followed by pairs of trail users, which composed 36.4% of parties. However, party sizes had a relatively wide range at this site, with parties of up to eight people observed. For example, groups of four made up 11.4% of parties at the Boulder Lake site.

Figure 12.6 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 day hikers, which composed about 59.1% of parties. This was followed by overnight hikers which made up 38.6% of parties. A smaller number of bike riders made up 2.3% of parties at Boulder Lake during 2021.

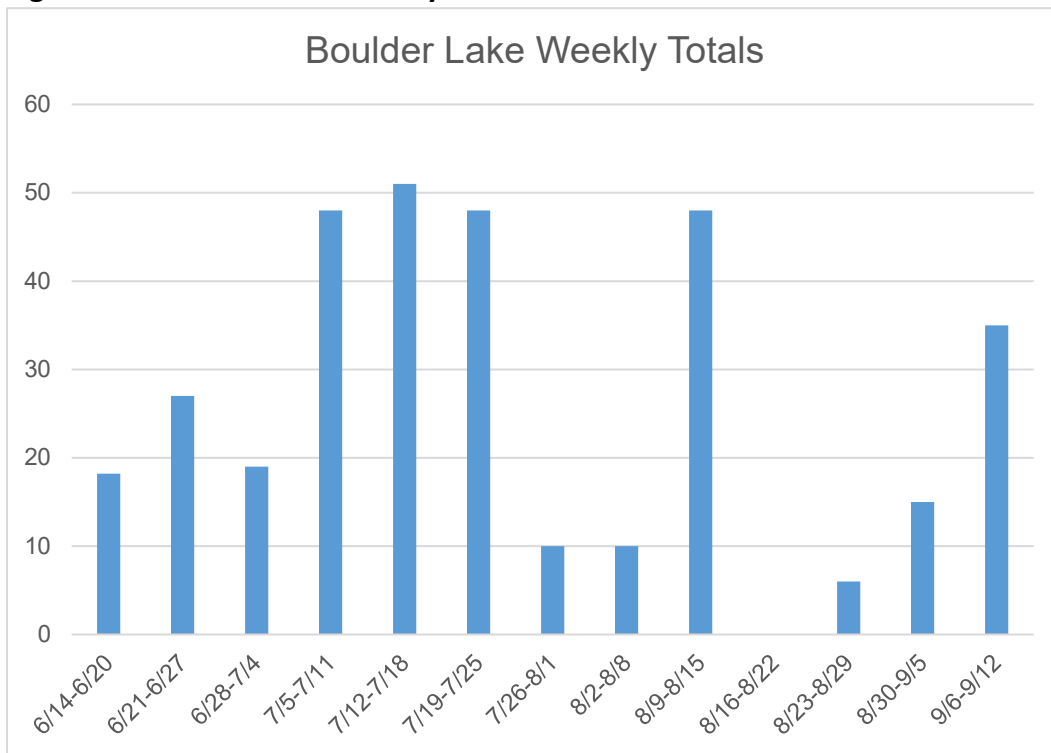
Figure 12.7 shows the distribution of user types at the individual level that were recorded at Boulder Lake over 2021. This graph follows a similar trend to the distribution of the percentage of users measured at the party level. The most common type of user at this site included day hikers, which made up 70.1% of trail visits, followed by overnight hikers at 28.9%, and the remaining 1.0% being bike riders.



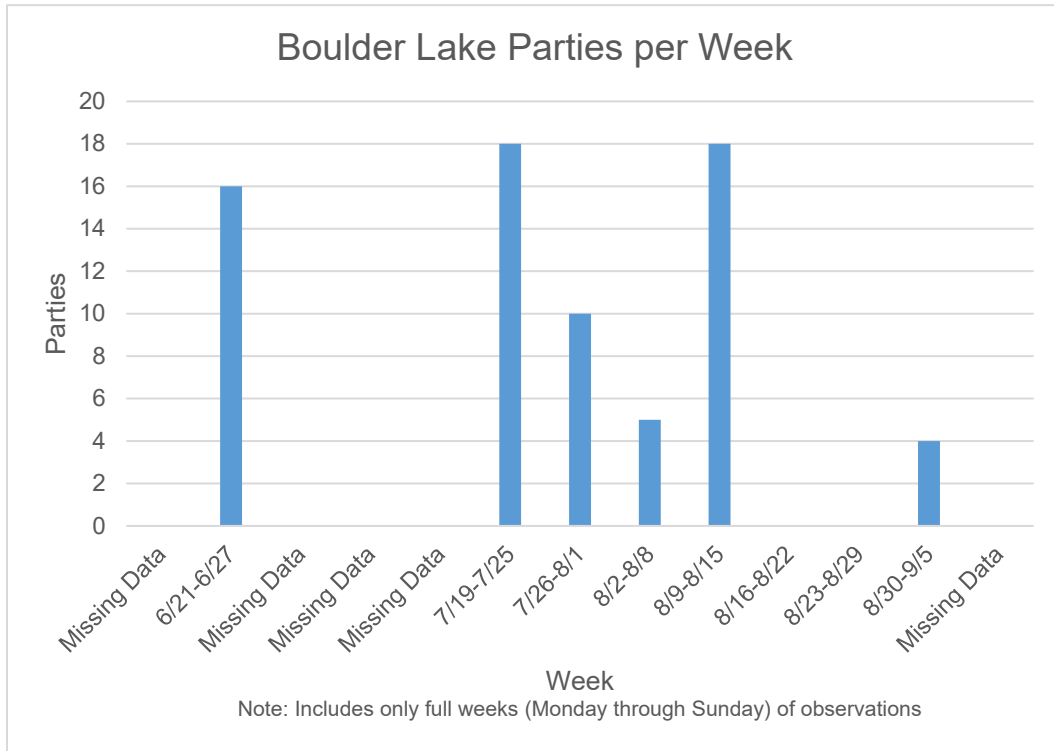
**Figure 12.1 Boulder Lake Daily Trail Visit Counts and Air Quality**



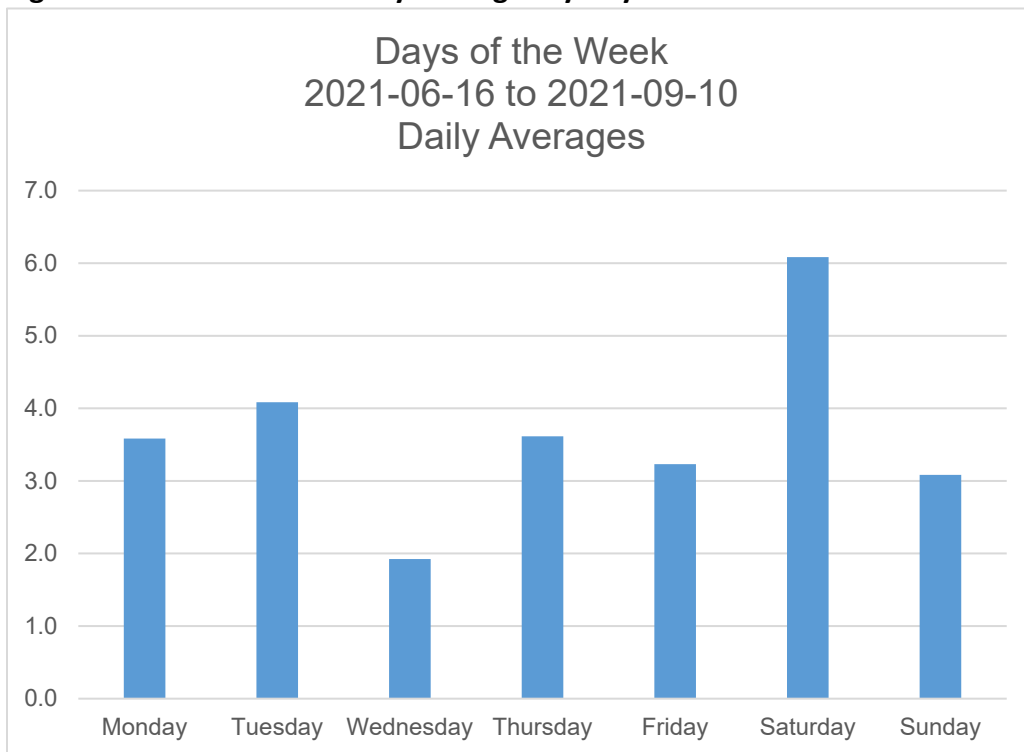
**Figure 12.2 Boulder Lake Weekly Counts**



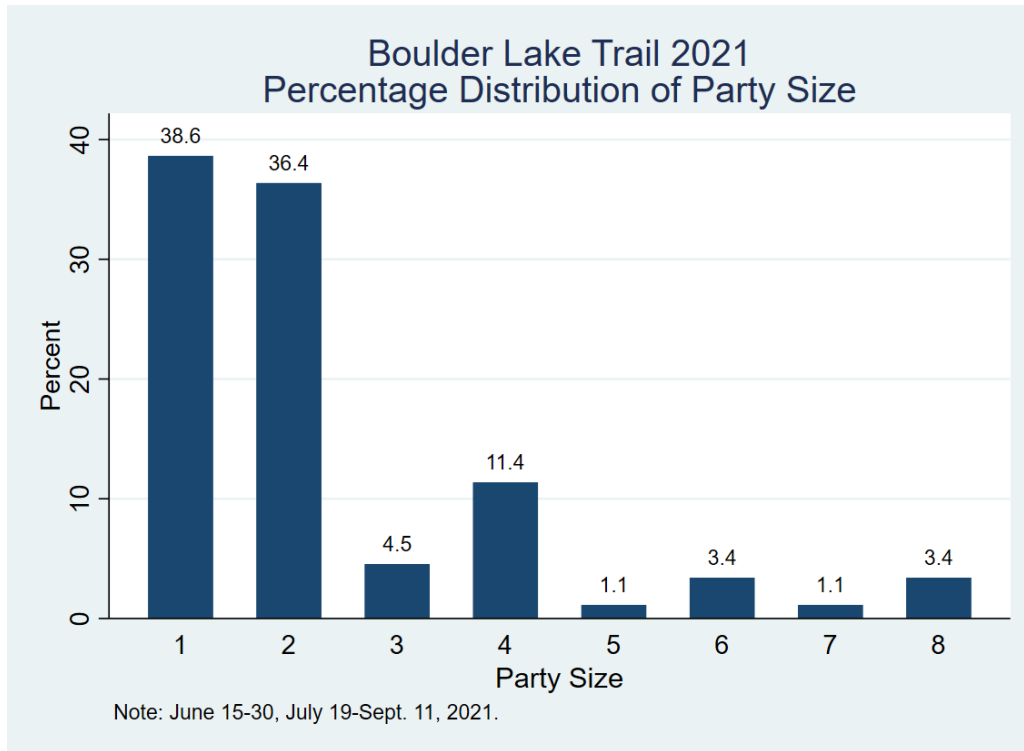
**Figure 12.3 Boulder Lake Parties per Week**



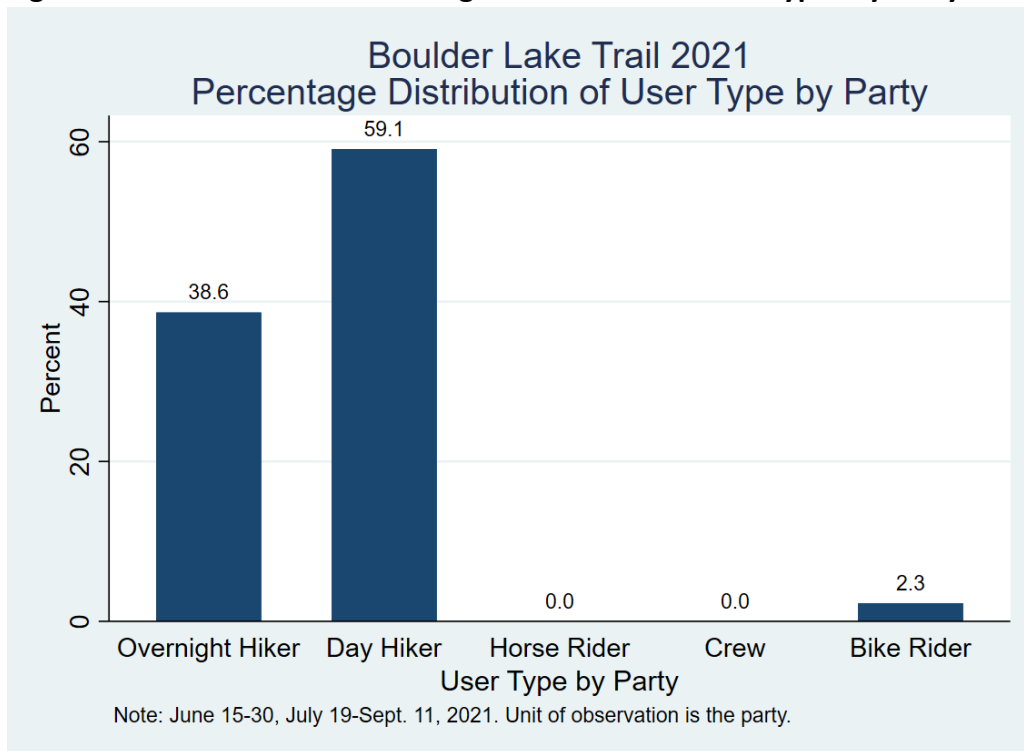
**Figure 12.4 Boulder Lake Daily Averages by Day of the Week**



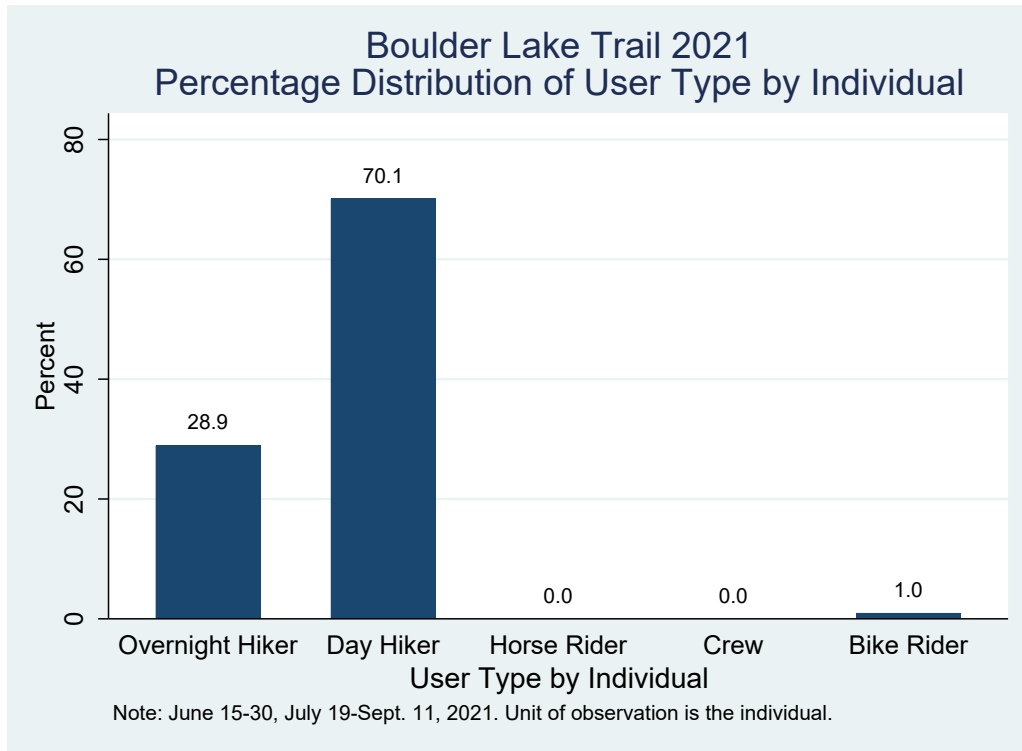
**Figure 12.5 Boulder Lake Percentage Distribution of Party Size**



**Figure 12.6 Boulder Lake Percentage Distribution of User Types by Party**



**Figure 12.7 Boulder Lake Percentage Distribution of User Types by Individual**



## Vinal Creek 2021

**The Vinal Creek monitoring site is not on the PNNST.** The monitoring site is located on Vinal Creek Trail #9 and to the west of where the PNNST is co-located on this trail. Data presented for the Vinal Creek site is not PNNST use data.

Vinal Creek Trail #9 is part of the Vinal Creek/Mt. Henry National Recreation Trail. A portion of PNNST hikers may utilize the monitored section of the Vinal Creek #9 trail en route to stock up on supplies in Yaak, Montana, or to circumvent a section of the PNNST on Trail #41 between Fish Lakes and the Yaak River that climbs in elevation. Thus, the monitoring site may still provide useful information on some trail use patterns that are relevant to the PNNST. Additionally, Vinal Lake Trail #9 trail use from the trailhead to Fish Lakes is important to monitor for the Kootenai National Forest's grizzly bear management.

The start of Vinal Creek Trail #9 can be found on the east side of NF-746, off of CR 508. It is about 8 miles south of the Canadian border. The Vinal Creek monitoring site was located about 0.5 miles up from the trailhead during 2021. During 2021, the counter and camera were set up on the north side of the trail.

### Vinal Creek Trailhead Parking



**2021 counter location.**  
Counter to climber's right.



**2021 camera location.**  
Camera to climber's left.

From June 29, 2021 through September 11, 2021, an estimated 218 trail visits were recorded at the Vinal Creek site<sup>14</sup>. Figure 13.1 displays the daily trail visit counts for this site as well as the corresponding air quality measured in Libby. Higher AQI from lower air quality due to wildfires may have impacted trail use during July and August 2021 as trail visits appear to have dipped during periods of higher AQI for this site.

Figure 13.2 shows the total weekly trail visits observed at the Vinal Creek site. The week with the highest use was July 19<sup>th</sup>-25<sup>th</sup>, with this week having 50 trail visits. A weekly average of 20.1 trail visits were recorded at the Vinal Creek site during the weeks monitored.

Figure 13.3 shows the parties per week observed at the Vinal Creek site. This season's Vinal Creek camera data both started and ended in the middle of the corresponding "Monday to Sunday" weeks. Thus, the weeks starting June 28<sup>th</sup> and September 6<sup>th</sup> were not included in the parties per week estimates. The observed week with the largest number of parties was July 12<sup>th</sup>-18<sup>th</sup>, during which 23 parties passed by.

Figure 13.4 includes the daily averages number of trail visits by the day of the week at the Vinal Creek site. The highest use day at this site was Saturday, with an average of 5.3 visitors per day.

Figure 13.5 shows the percentage distribution of party sizes at the Vinal Creek Site. Overall, the most common party sizes were solo users, which made up 44.0% of parties. The next most common party size was pairs of two users, which made up 34.9% of parties. Party sizes did have a relatively wide range at this site, with parties of over ten people observed. For example, groups of four made up 6.4% of parties, and groups of three and six each made up another 4.6% of parties.

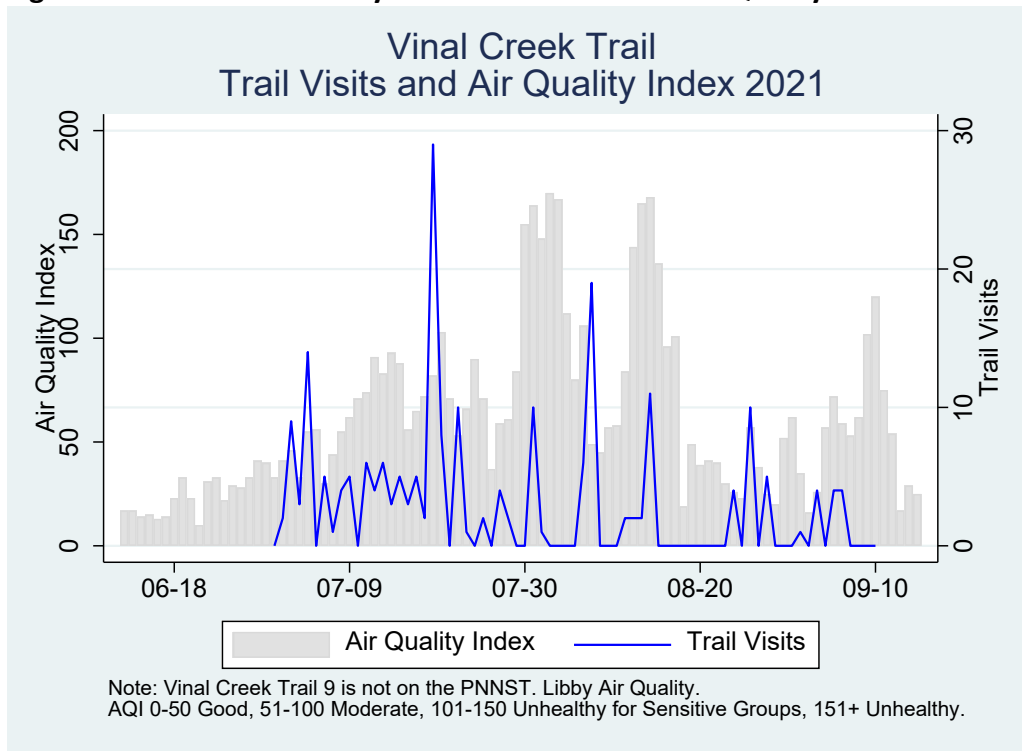
Figure 13.6 shows the distribution of user types observed at the party level at Vinal Creek. This site only had hikers observed during the 2021 season. Day hikers were more common, with 57.8% of parties including day hikers, compared to 42.2% of parties being made of overnight hikers.

Figure 13.7 shows the distribution of user types at the individual level that were recorded at Vinal Creek over 2021. Like the analysis for percentage distribution of user type by party, the percentage distribution of user type by individual showed day hikers being more common than overnight hikers. Day hikers made up 68.1% of trail visits, followed by overnight hikers at 31.9%.

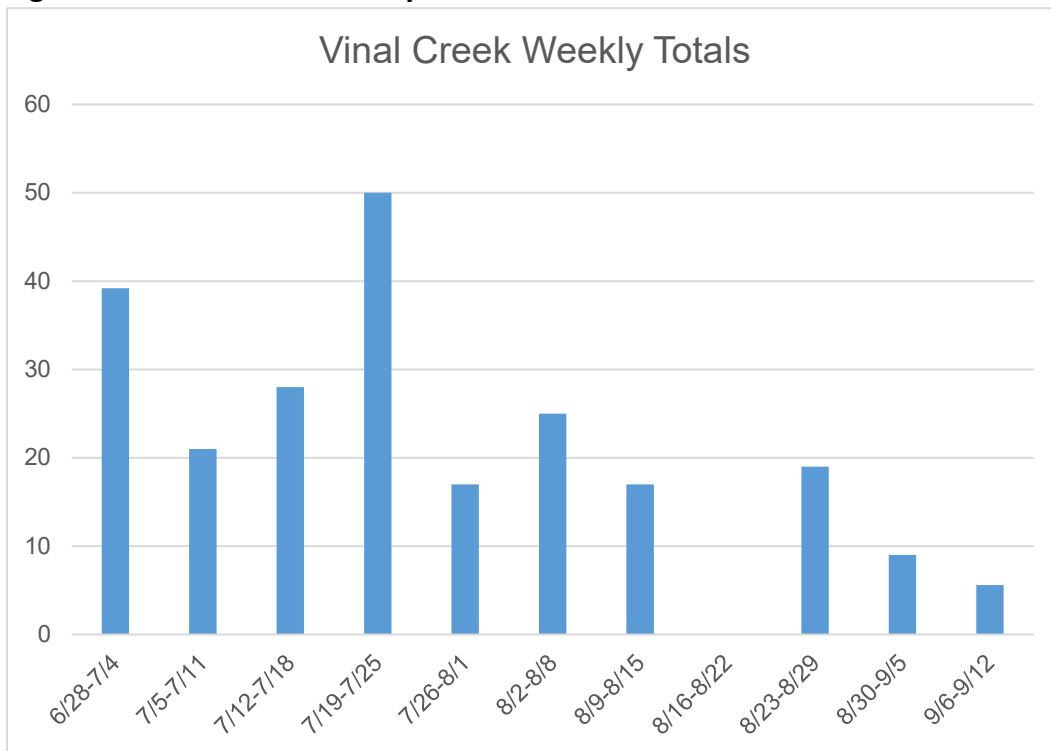
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<sup>14</sup> The Vinal Creek monitoring site is not located on the PNNST and data is not PNNST use. See pp. 41-46.

**Figure 13.1 Vinal Creek Daily Trail Visit Counts and Air Quality<sup>15</sup>**

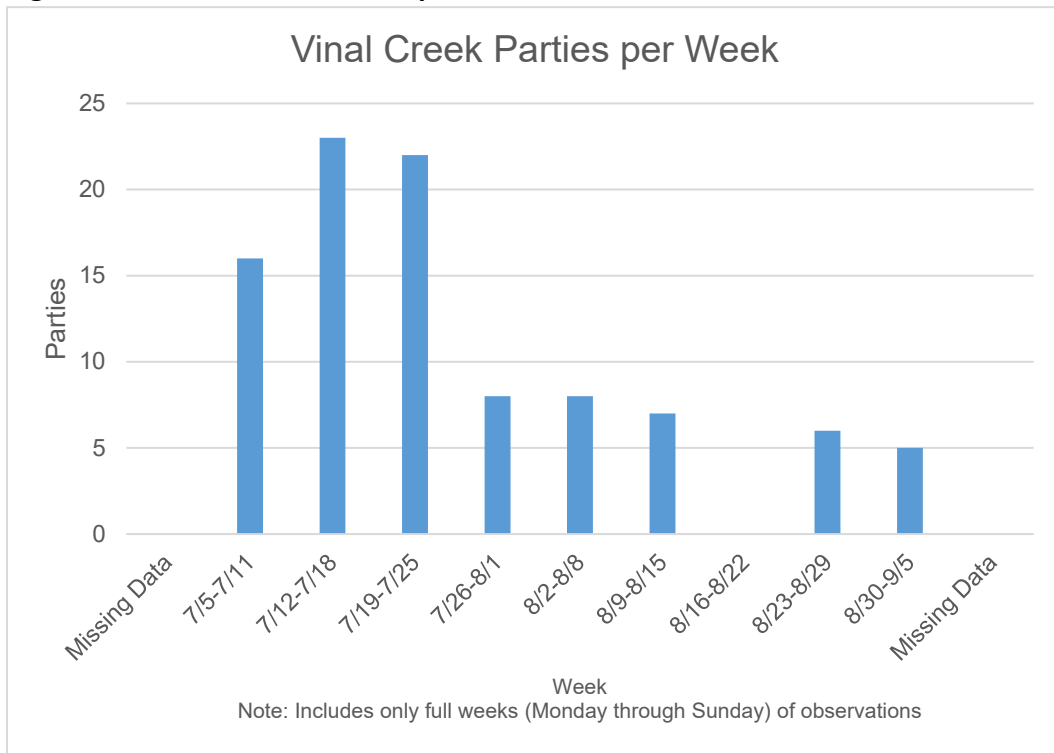


**Figure 13.2 Vinal Creek Weekly Counts**

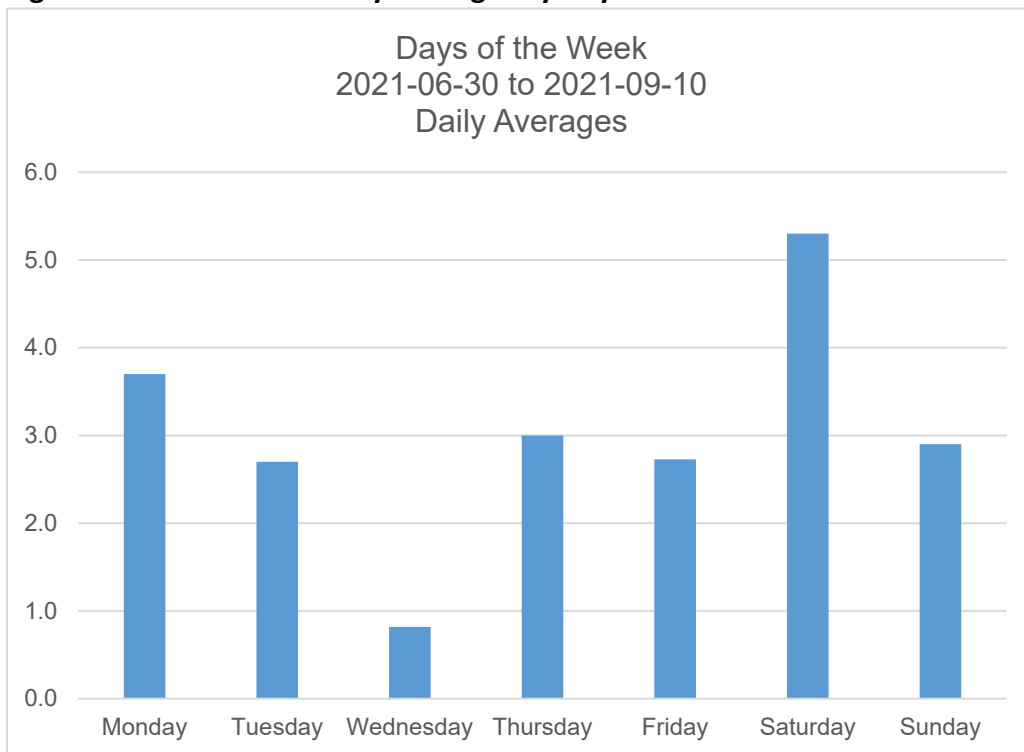


<sup>15</sup> The Vinal Creek monitoring site is not located on the PNNST and data is not PNNST use. See pp. 41-46.

**Figure 13.3 Vinal Creek Parties per Week<sup>16</sup>**



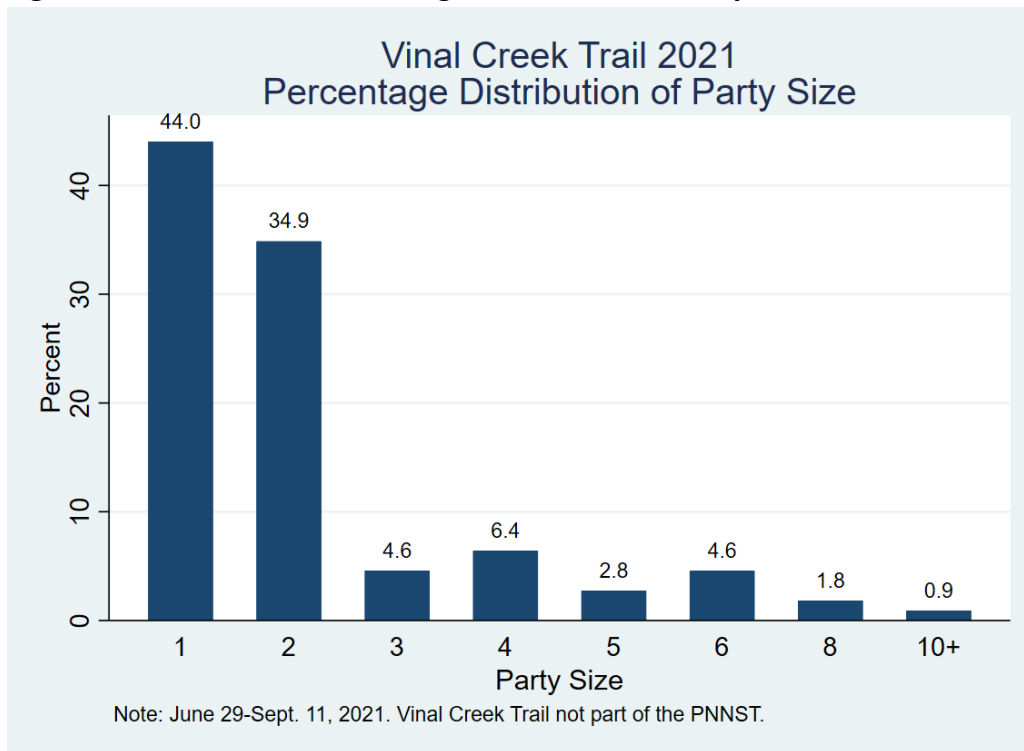
**Figure 13.4 Vinal Creek Daily Averages by Day of the Week**



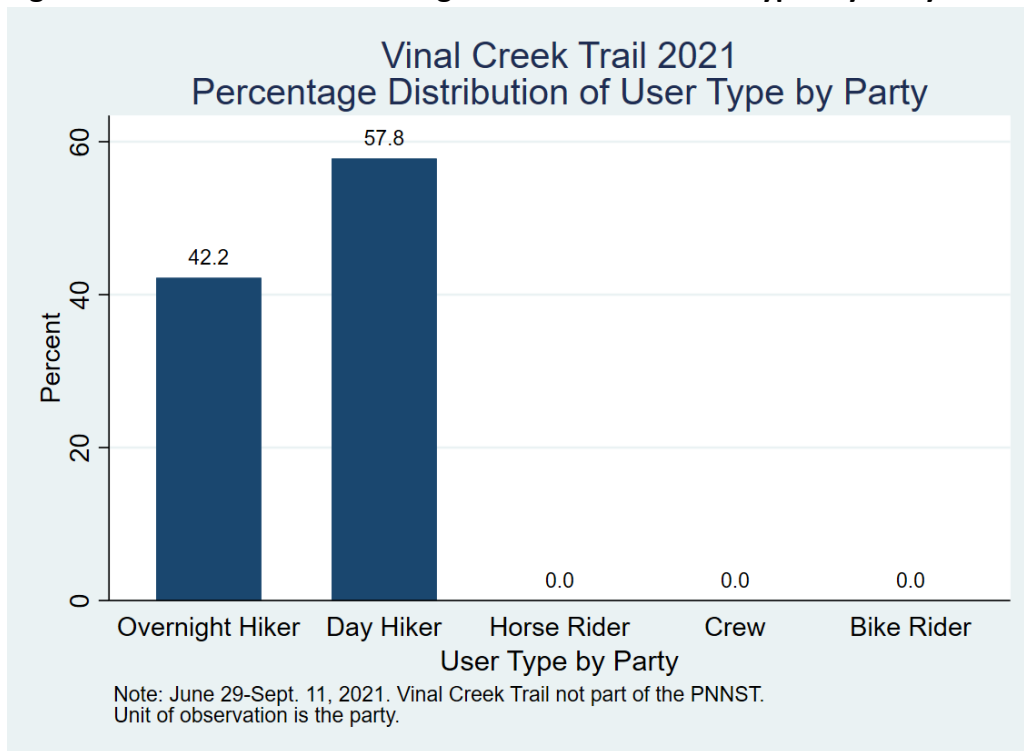
<sup>16</sup> The Vinal Creek monitoring site is not located on the PNNST and data is not PNNST use. See pp. 41-46.



**Figure 13.5 Vinal Creek Percentage Distribution of Party Size<sup>17</sup>**

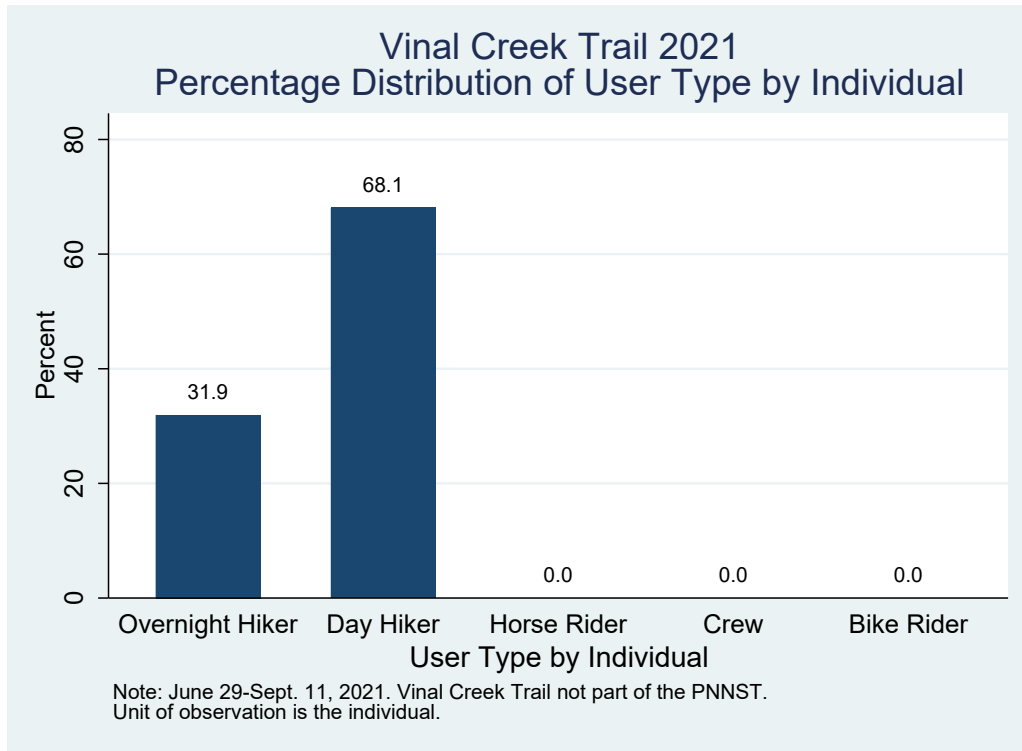


**Figure 13.6 Vinal Creek Percentage Distribution of User Types by Party**



<sup>17</sup> The Vinal Creek monitoring site is not located on the PNNST and data is not PNNST use. See pp. 41-46.

**Figure 13.7 Vinal Creek Percentage Distribution of User Types by Individual<sup>18</sup>**

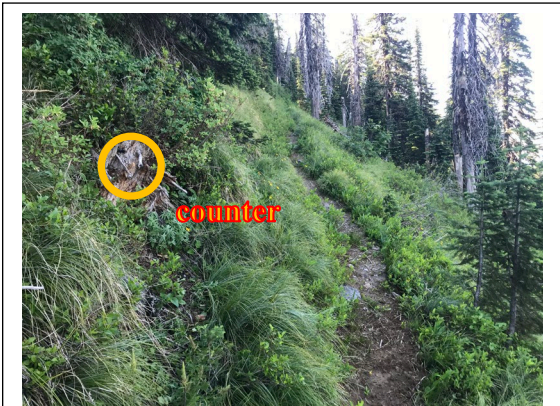


<sup>18</sup> The Vinal Creek monitoring site is not located on the PNNST and data is not PNNST use. See pp. 41-46.

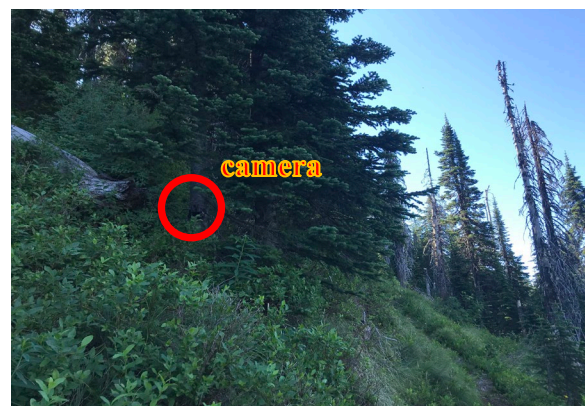
## Canuck Peak 2021

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 2021.

### Looking west. Canuck Peak Trailhead Parking



**2021 counter location.**  
Counter to climber's left.



**2021 camera location.**  
Camera to climber's left.

From June 29, 2021 through September 11, 2021, an estimated 17 trail visits were recorded at the Canuck Peak site. Figure 14.1 displays the daily trail visit counts for the Canuck Peak site as well as the corresponding air quality measures from Libby. Canuck Peak visitation was relatively low during this season, and the lack of use during July and August may have been related to poor air quality from wildfires in the area. Canuck Peak is one of the sites that tends to be farther out of the way for users, and hazy skies may have made it less desirable to visit during 2021, especially considering one of its draws is the peak's scenic views when the sky is clearer.

Figure 14.2 shows the total weekly trail visits at the Canuck Peak Site. The week with the highest use was July 5<sup>th</sup>-11<sup>th</sup>, with 6 trail visits. A weekly average of 1.7 trail visits were recorded at the Canuck Peak site during the 2021 weeks monitored.

Figure 14.3 shows the parties per week that were observed at Canuck Peak. This season's Canuck Peak camera data both started and ended in the middle of the corresponding "Monday to Sunday" weeks. Thus, the weeks starting June 28<sup>th</sup> and September 6<sup>th</sup> were not included in the parties per week estimates. During 2021, the week with the largest number of parties at this site was August 30<sup>th</sup>-September 5<sup>th</sup>, wherein 6 parties passed by.

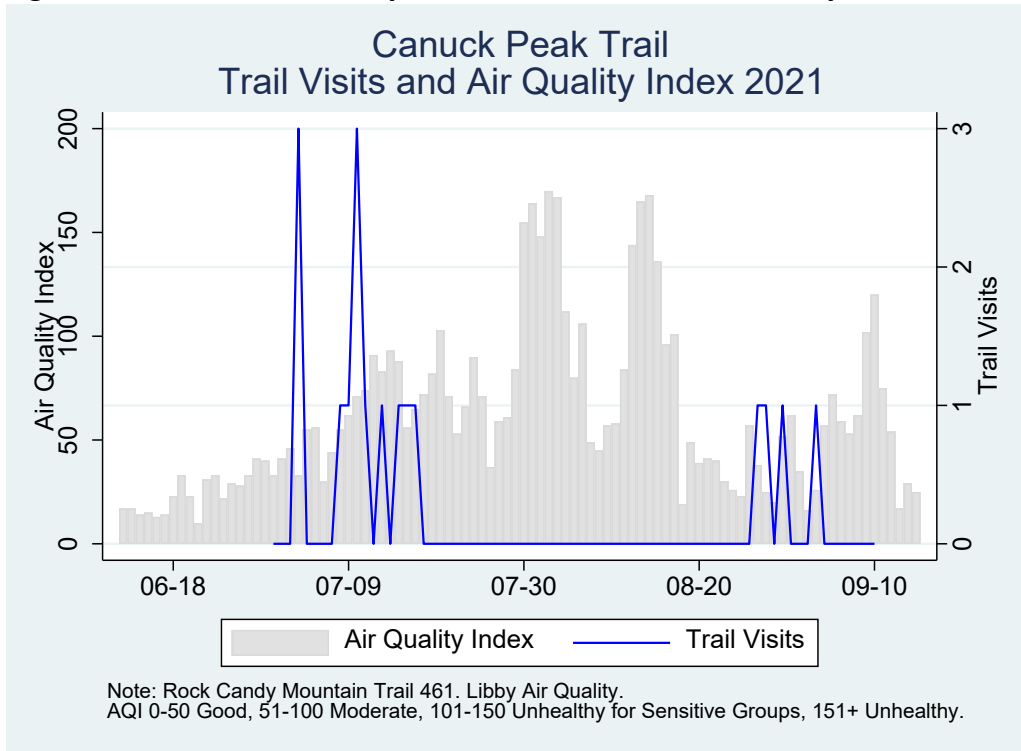
Figure 14.4 compares the average number of trail visits by the day of the week at the Canuck Peak site. During 2021 the highest use day was Saturday, with an average of 0.8 daily visitors.

Figure 14.5 shows the percentage distribution of party sizes at the Canuck Peak monitoring site. Here, 64.3% of parties were composed of solo users, whereas the remaining 35.6% of parties were composed of pairs of individuals.

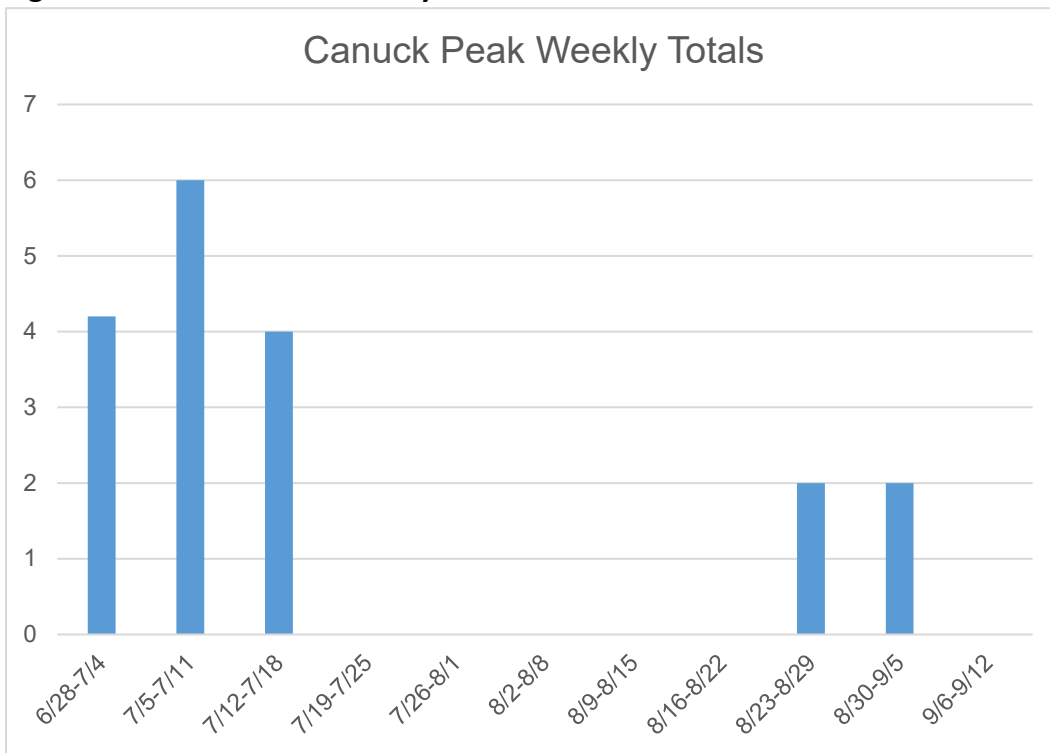
Figure 14.6 shows the distribution of user types observed at the party level for the Canuck Peak site. Canuck Peak only had hiker user types observed during the 2021 season. Overnight hikers were more common, with 71.4% of parties at this site including day hikers, compared to 28.6% of parties being made of day hikers. This distribution may have been impacted by the poor air quality during the 2021 season, as thru-hikers may have been more motivated to pass through the area.

Figure 14.7 shows the distribution of user types at the individual level that were recorded at Canuck Peak during 2021. 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 78.9% of trail visits, compared to day hikers making up 21.1%.

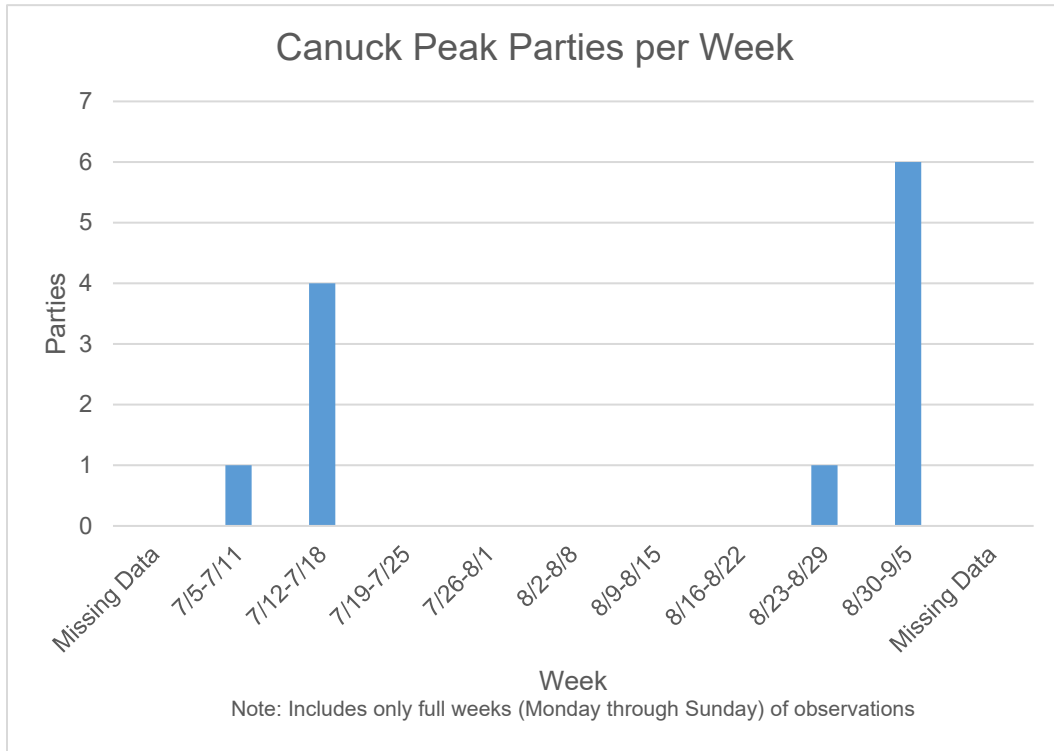
**Figure 14.1 Canuck Peak Daily Trail Visit Counts and Air Quality**



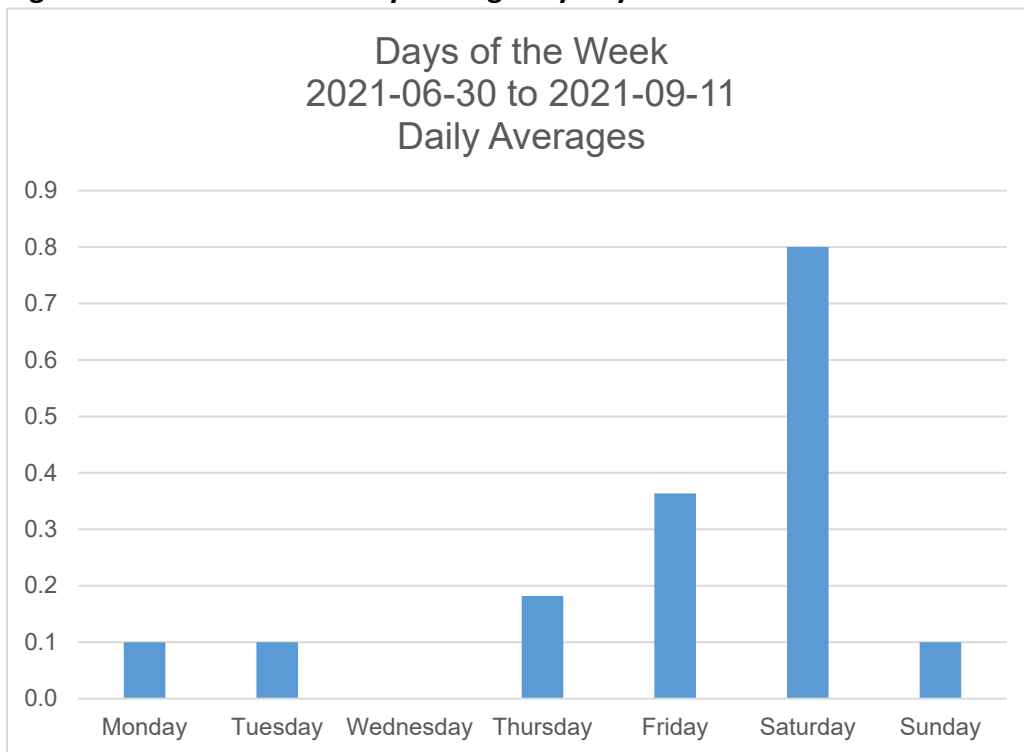
**Figure 14.2 Canuck Peak Weekly Counts**



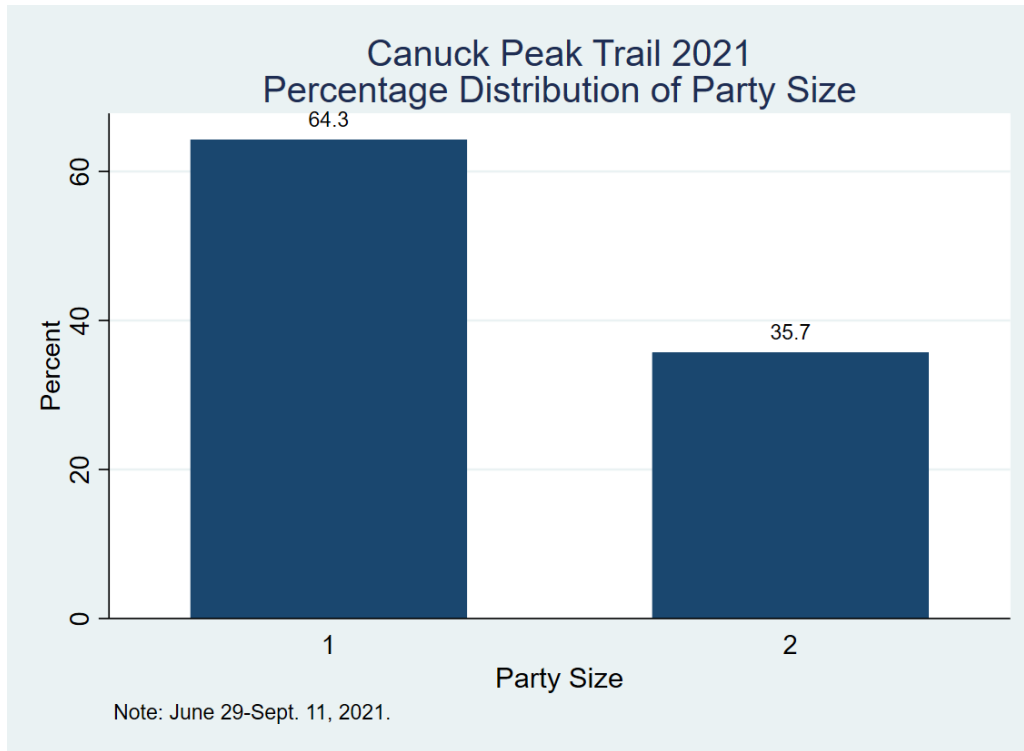
**Figure 14.3 Canuck Peak Parties per Week**



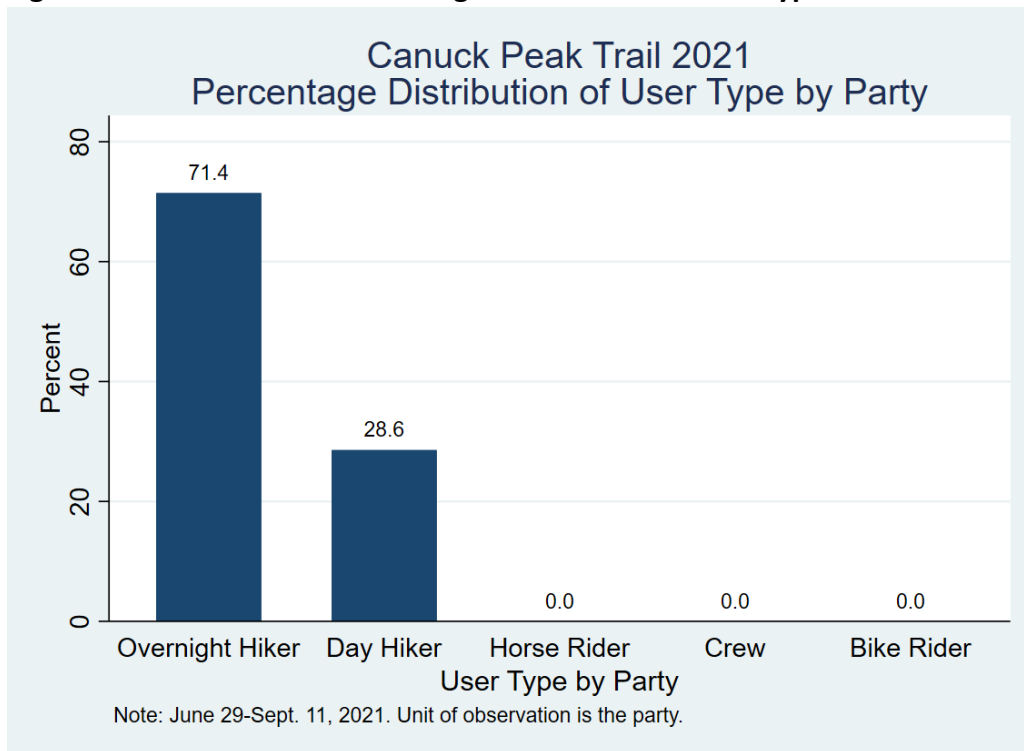
**Figure 14.4 Canuck Peak Daily Averages by Day of the Week**



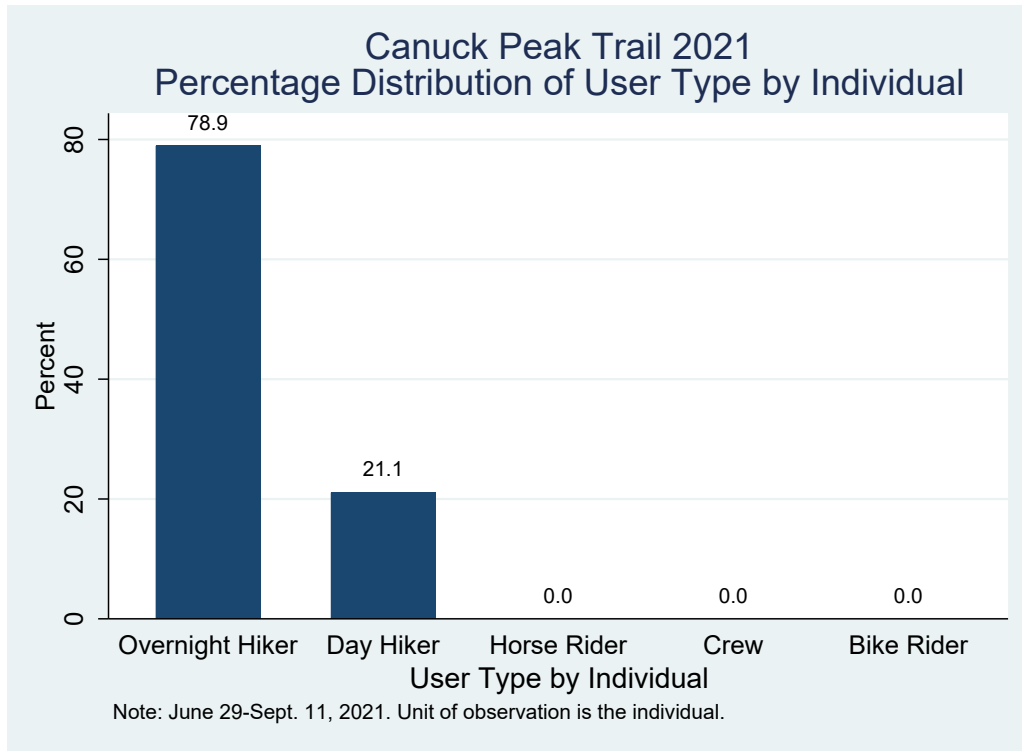
**Figure 14.5 Canuck Peak Percentage Distribution of Party Size**



**Figure 14.6 Canuck Peak Percentage Distribution of User Types**



**Figure 14.7 Canuck Peak Percentage Distribution of User Types**





## Pyramid-Ball Lakes 2021

The Pyramid-Ball Lakes Trail (#13) is a new monitoring site located off the Trout Creek trailhead in Kaniksu National Forest. To get to this trailhead, turn west onto Riverside Road/Country Road 18A from US-95, then take West Side Road north for 10 miles before taking Trout Creek Road #634 another 9 miles to reach the #13 trailhead and parking area. To get to the trail monitoring site hike trail #13 for about 1.4 miles, turning onto trail #43 at the junction about a mile in. The camera and counter were placed a bit past Pyramid Lake and before Ball Lake.



**2021 counter location.**  
Counter to climber's left.



**2021 camera location.**  
Camera to climber's left.

From June 15, 2021 through September 11, 2021 (but excluding June 28-July 17, due to a lack of data), an estimated 1578 trail visits were recorded at the Pyramid-Ball Lakes site. Figure 15.1 displays the daily trail visit counts for this site along with the corresponding air quality measured in Libby. As mentioned above in the “Comparison Across Sites” section of the report, Pyramid-Ball Lakes exhibited much higher use than the other trails, even with the missing data that primarily affected early July measures for the site. The days of highest recorded use within the 2021 field season were Saturday, June 26<sup>th</sup> and Saturday, August 7<sup>th</sup>, which had 110 and 111 trail visits respectively. It’s possible that even higher use occurred during the missing time frame (though this cannot be confirmed), as July can tend to be busy for PNNST use overall.

Pyramid-Ball Lakes was the most used trail within the summer hiking season out of all the trails monitored for this report, even with some missing data. The trail’s proximity to Bonners Ferry and Coeur d’Alene might be a factor in its relatively high use. It is also located relatively close to the Canadian border and may be utilized by Canadian travelers fairly often. Moreover, this trail passes both Pyramid and Ball Lakes, which are scenic areas at high elevation, which could make it a trail of high interest among users. Additionally, the lakes along this trail are near a campground that could account for increased trail visits. After Pyramid-Ball Lakes, the next busiest trail monitored in 2021 was Brush Lake, with 335 trail visits throughout the season.

Figure 15.2 shows the total weekly trail visits at the Pyramid-Ball Lakes site. The week with the highest use recorded was June 21<sup>st</sup>-27<sup>th</sup> with 263 trail visits. A weekly average of 166.1 trail visits were recorded at the Pyramid-Ball Lakes site during the weeks monitored.

Figure 15.3 shows the parties per week that were observed at the Pyramid-Ball Lakes site. Camera data was missing for this site between June 14<sup>th</sup> and August 5<sup>th</sup>, and only full weeks of data were assessed for party totals per week. Thus, during 2021, the week with the largest number of parties observed at this site was August 30<sup>th</sup>-September 5<sup>th</sup>, wherein 59 parties were noted to pass by during the week.

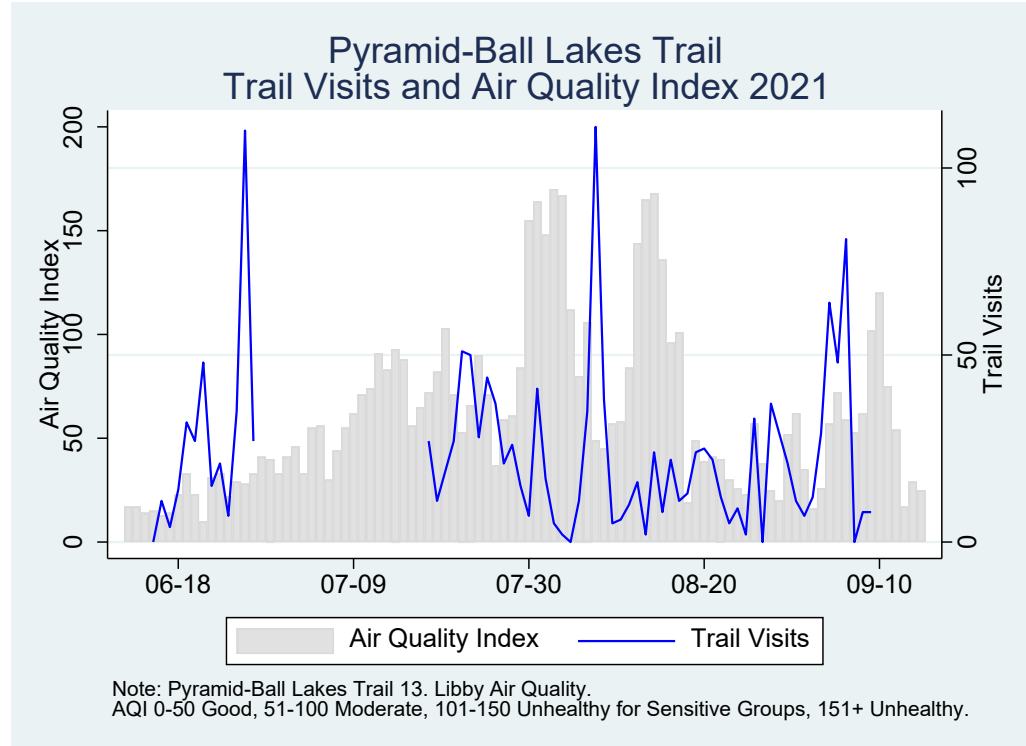
Figure 15.4 includes the daily averages number of trail visits by the day of the week at the Pyramid-Ball Lakes site. The highest use day for this site was Saturday, with an average of 52.1 visitors per day.

Figure 15.5 shows the percentage distribution of party sizes at the Pyramid-Ball Lakes site. The most common party size at this site included pairs of users, which made up 40.1% of parties. Following this party size, trios were next common at 17.1%, followed by solo users at 14.8%, groups of four at 12.1% and groups of five at 9.3%. Overall, party sizes ranged more widely at this site, with parties of over ten people observed.

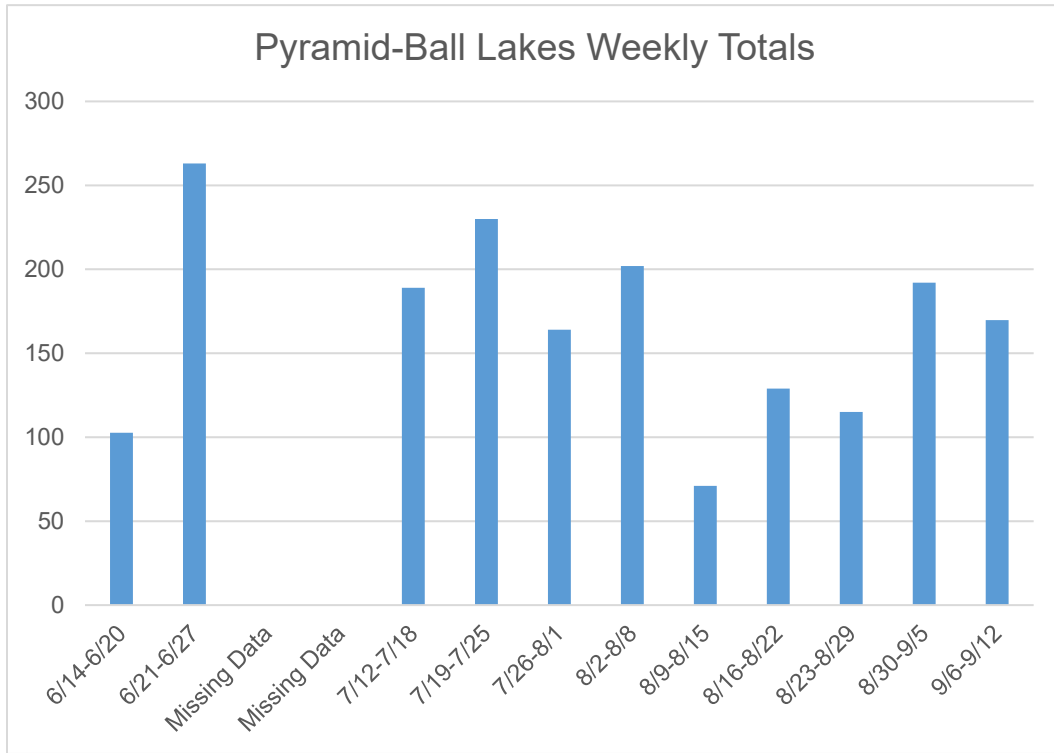
Figure 15.6 shows the distribution of user types observed at the party level for the Pyramid-Ball Lakes site. Most parties at this site were day hikers, with 81.7% of parties being composed of day hikers. The next 17.5% of parties included overnight hikers, and a small 0.8% of parties at this site were horse riders.

Figure 15.7 shows the distribution of user types at the individual level that were recorded at Pyramid-Ball Lakes during 2021. Similar to the percentage distribution by party, the percentage distribution of user type by individual showed that day hikers were more common than overnight hikers at this site. Day hikers made up 84.6% of trail visits, compared to overnight hikers making up 14.7%.

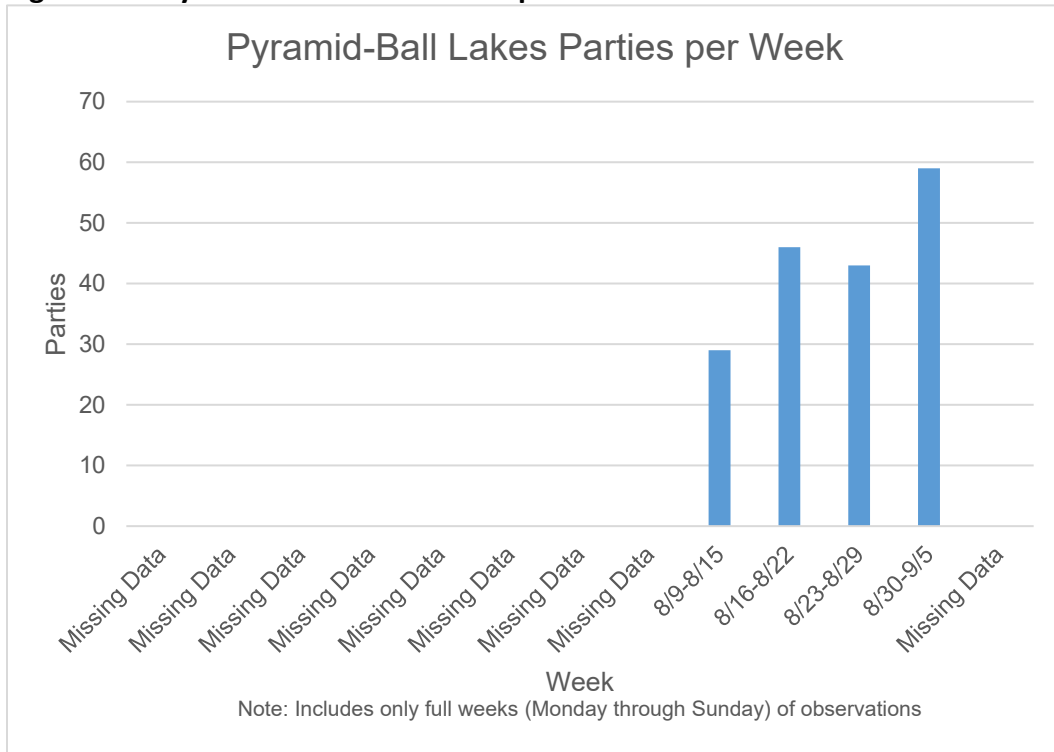
**Figure 15.1 Pyramid-Ball Lakes Daily Counts and Air Quality**



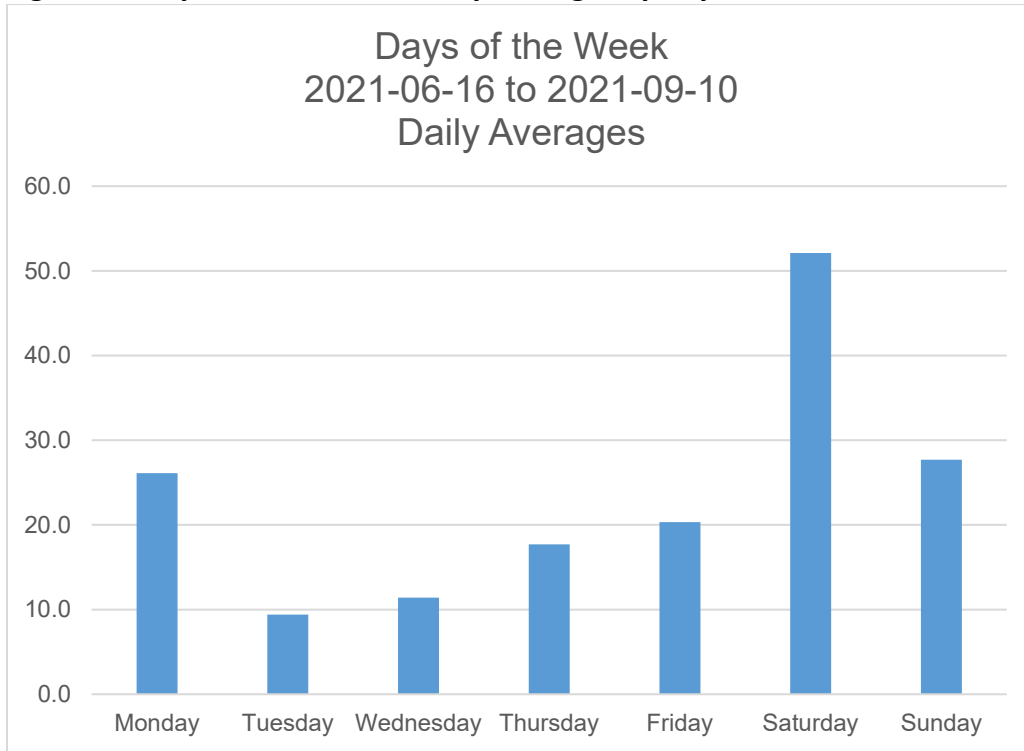
**Figure 15.2 Pyramid-Ball Lakes Weekly Counts**



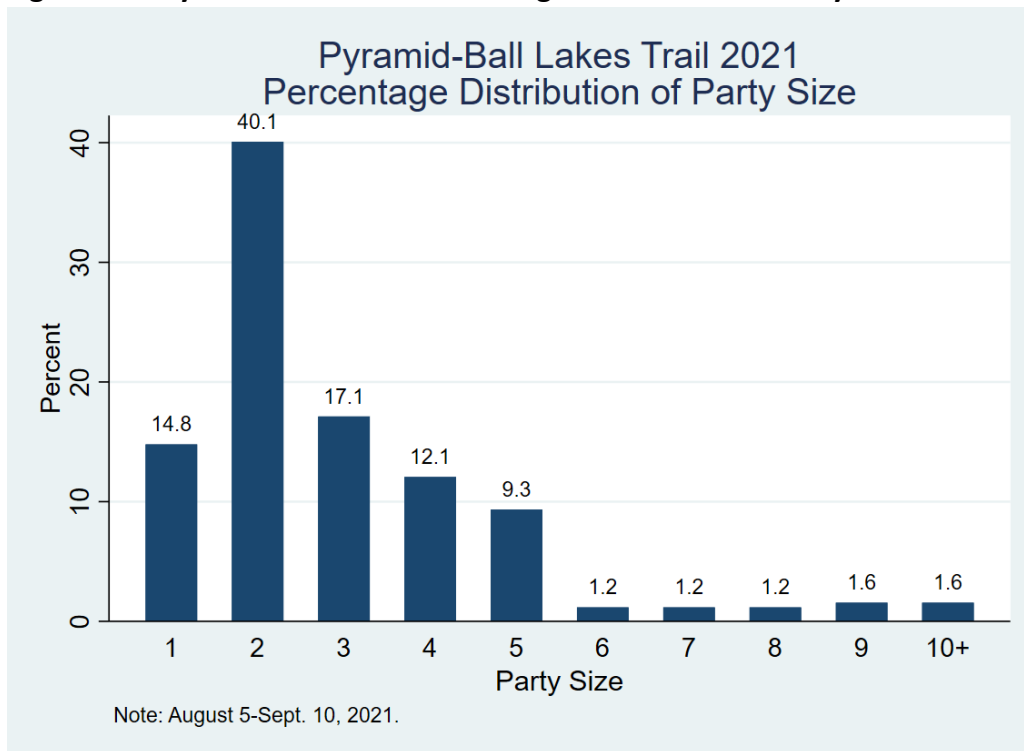
**Figure 15.3 Pyramid-Ball Lakes Parties per Week**



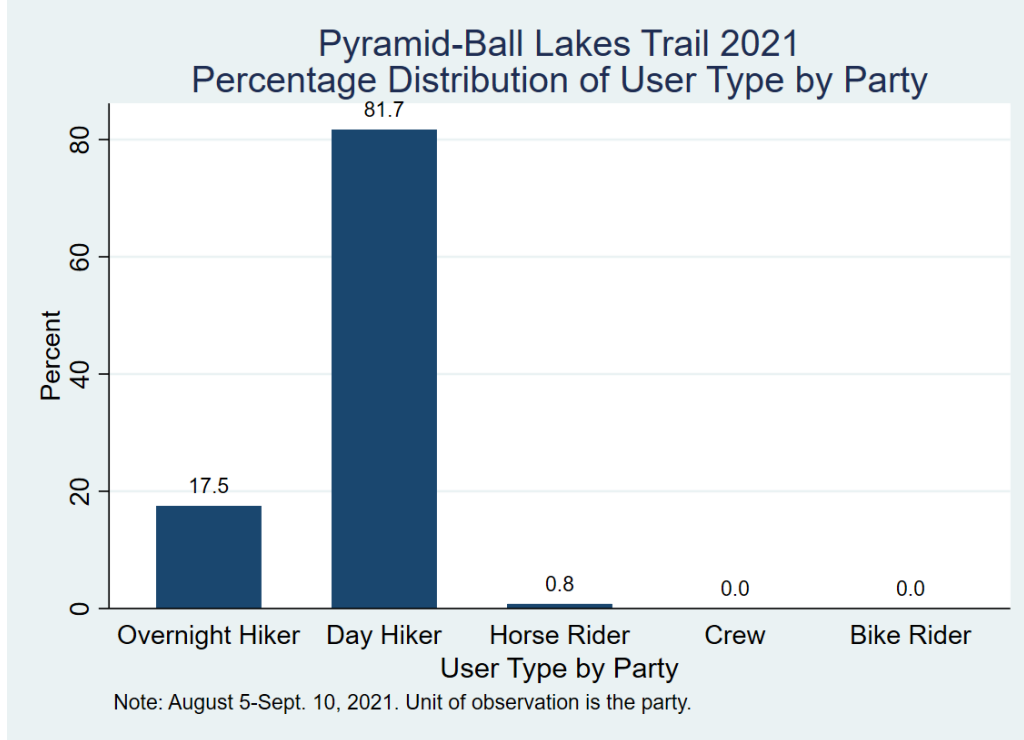
**Figure 15.4 Pyramid-Ball Lakes Daily Averages by Day of the Week**



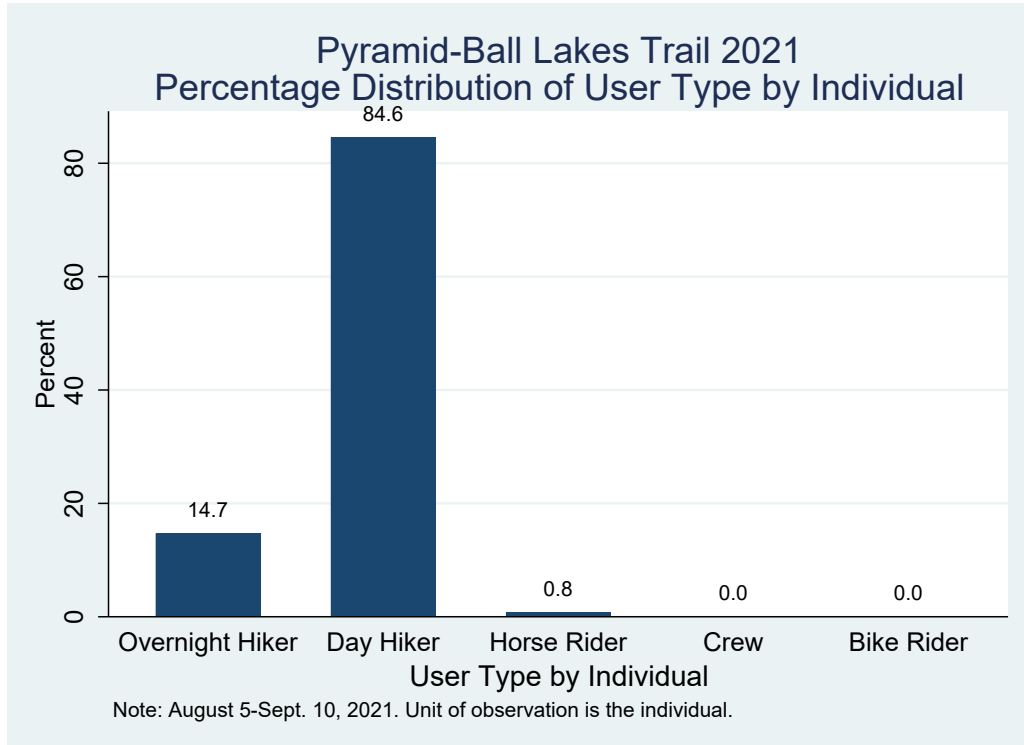
**Figure 15.5 Pyramid-Ball Lakes Percentage Distribution of Party Size**



**Figure 15.6 Pyramid-Ball Lakes Percentage Distribution of User Types by Party**



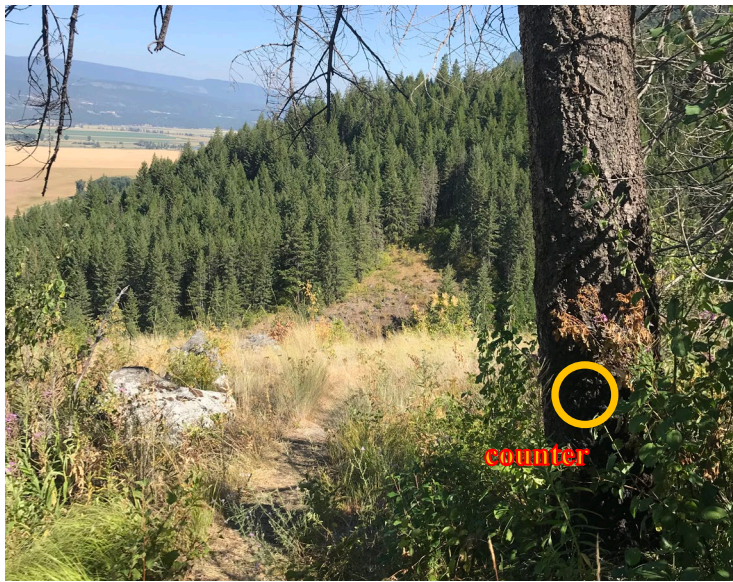
**Figure 15.7 Pyramid-Ball Lakes Percentage Distribution of User Types by Individual**





## Parker Ridge 2021

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 2021 monitoring site was located about 0.5 miles from this trailhead.



**2021 counter location.**  
Counter to climber's left.



**2021 camera location.**  
Camera to climber's right.

From June 14, 2021 through September 11, 2021, an estimated 177 trail visits were recorded at the Parker Ridge monitoring site. Figure 16.1 displays the daily trail visit counts for this site as well as the corresponding air quality measured in Libby. Trail use may have been affected by lower air quality in July and August due to wildfires in the area. For example, trail visits peaked during a time when AQI lowered for a bit in early August, before AQI rose again during the month and trail visits lowered.

Figure 16.2 shows the total weekly trail visits for the Parker Ridge monitoring site. The weeks with the highest use included July 19<sup>th</sup>-25<sup>th</sup> with 34 trail visits, followed by August 2<sup>nd</sup>-8<sup>th</sup> with 32 trail visits. The average number of weekly trail visits for this site was 14.9 trail visits for the weeks monitored during 2021.

Figure 16.3 shows the parties per week that were observed at the Parker Ridge. Camera data was missing for this site from June 22<sup>nd</sup>-28<sup>th</sup>, July 7<sup>th</sup>-17<sup>th</sup>, and August 30<sup>th</sup>-September 5<sup>th</sup>. The week noted to have the greatest number of parties observed at Parker Ridge was July 19<sup>th</sup>-26<sup>th</sup>. During this week 16 parties passed by the monitoring site.

Figure 16.4 includes the daily average number of trail visits by the day of the week at the Parker Ridge site. The highest use day for this site was Friday, with an average of 2.8 visitors per day, followed by Saturdays with 2.8 average visitors, and Sundays with 2.5 average visitors. Based on camera data, this trail was frequented by day hikers on the weekends, which could account for the higher weekend traffic, which is typical of day use patterns.

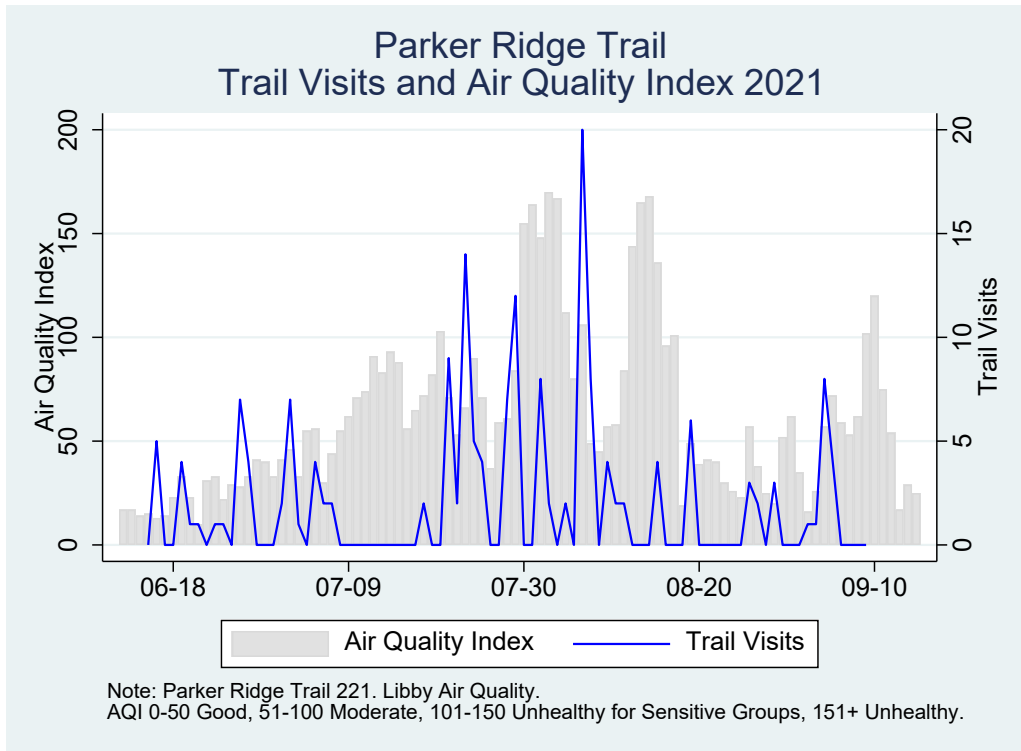
Figure 16.5 shows the percentage distribution of Parker Ridge party sizes. The most common party size at this site involved solo trail users, which composed 56.6% of parties, followed by pairs of users, which made up another 31.3% of parties. Most of the remaining parties were composed of three or four individuals. However, 2.4% of parties included over ten people.

Figure 16.6 shows the distribution of user types observed at the party level for Parker Ridge. Most parties at this site were day hikers, which composed 56.6% of parties at this site. The next most common type of user included the 42.2% of parties that were overnight hikers. Additionally, a small 1.2% of parties at this site were bike riders.

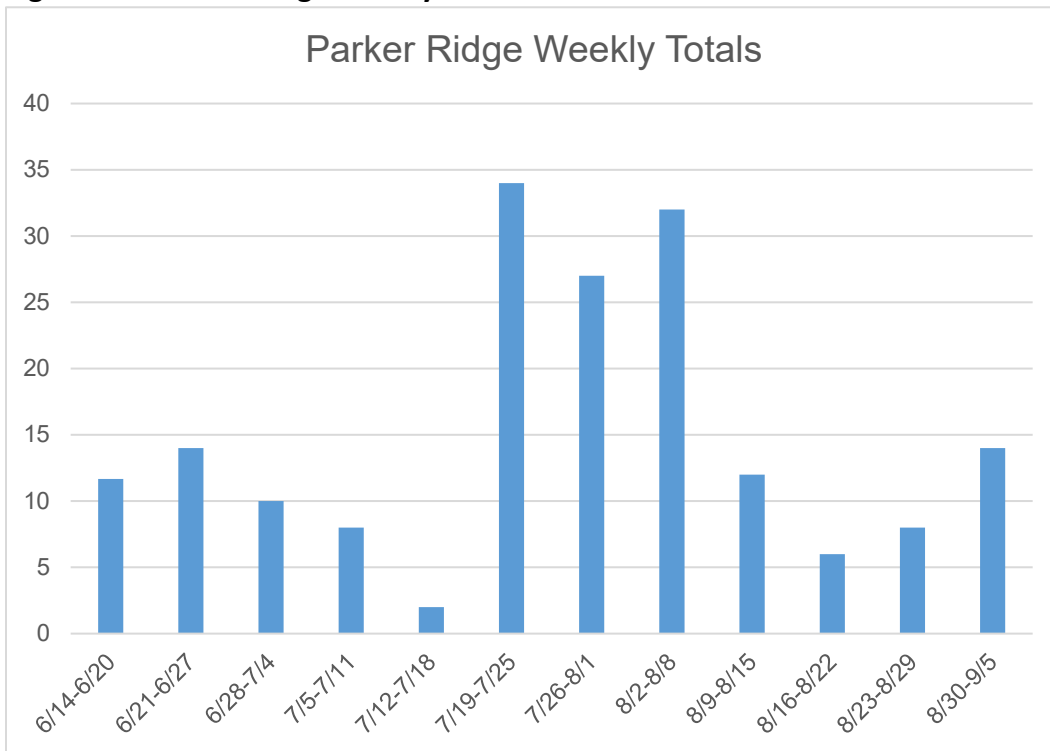
Figure 16.7 shows the distribution of user types at the individual level that were recorded at Parker Ridge during 2021. In contrast to the percentage distribution by party, the percentage distribution of user type by individual showed that overnight hikers were more common than day hikers at Parker Ridge. Overnight hikers made up 53.2% of trail visits, compared to day hikers making up 46.2%, and bike riders making up the other 0.6% of users.



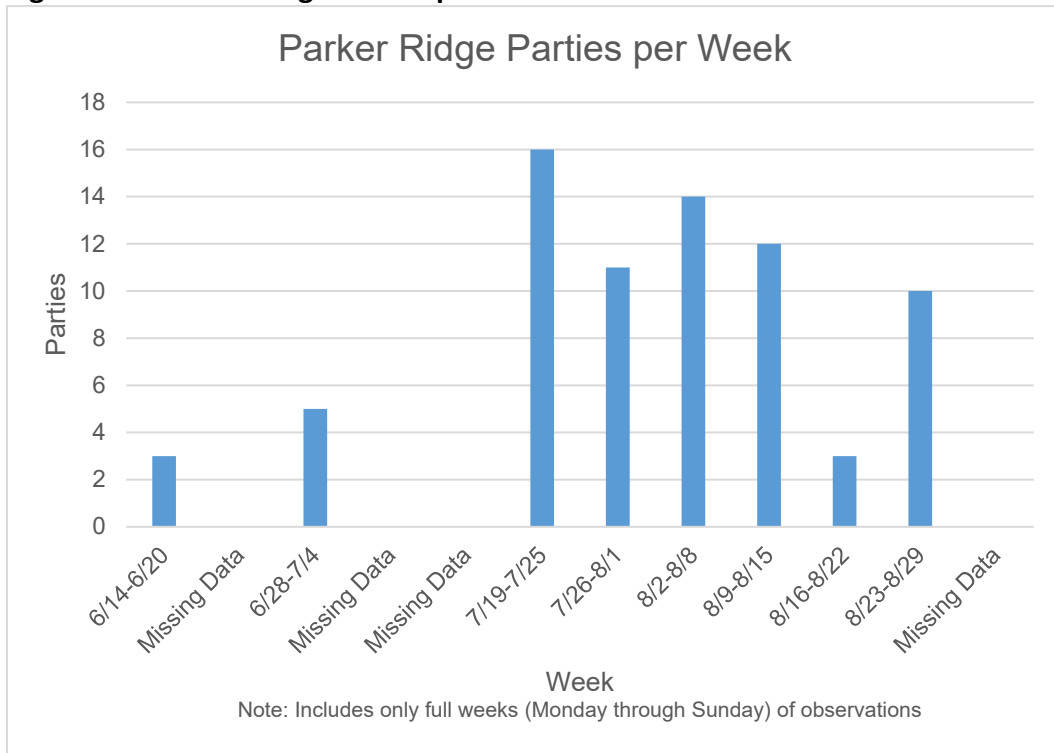
**Figure 16.1 Parker Ridge Daily Counts and Air Quality**



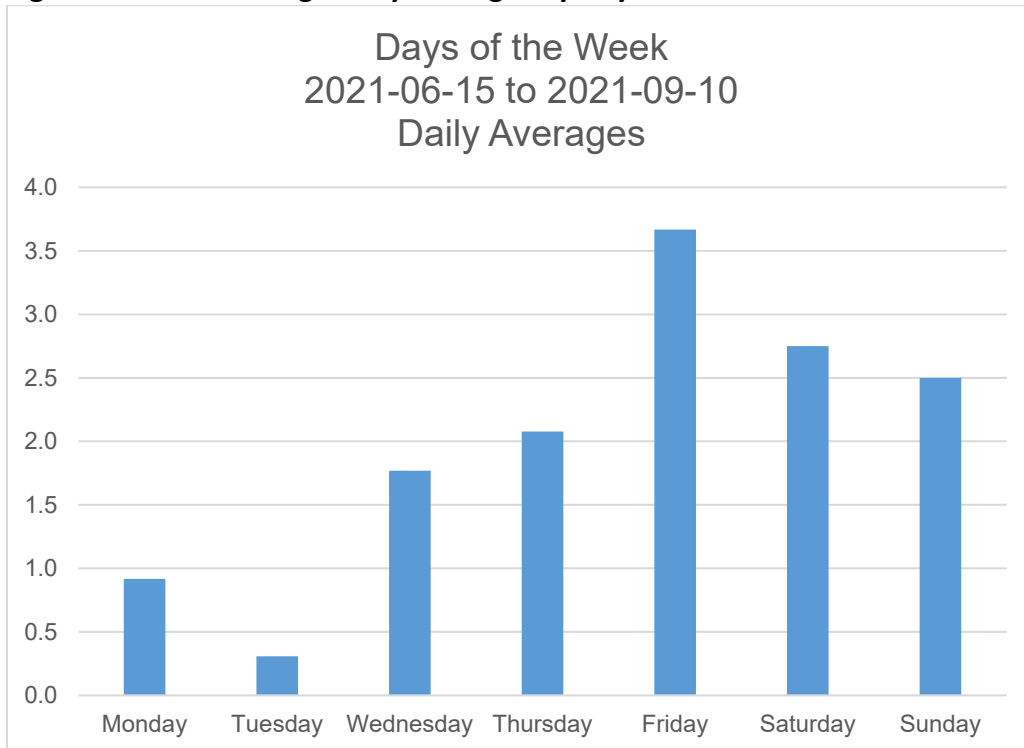
**Figure 16.2 Parker Ridge Weekly Counts**



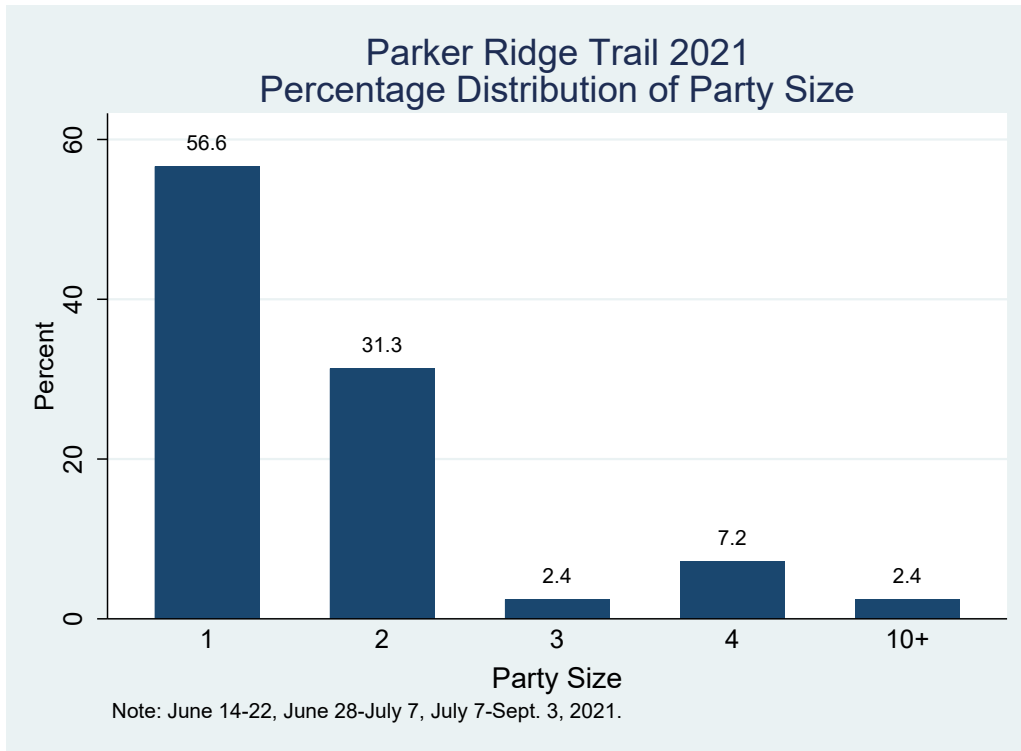
**Figure 16.3 Parker Ridge Parties per Week**



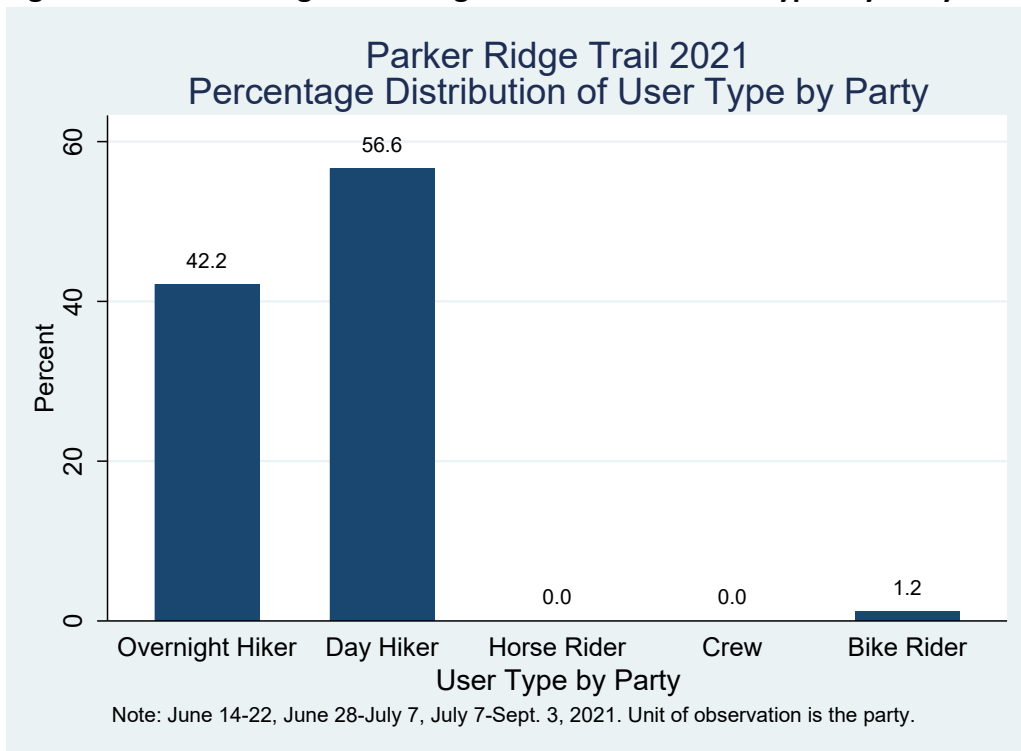
**Figure 16.4 Parker Ridge Daily Averages by Day of the Week**



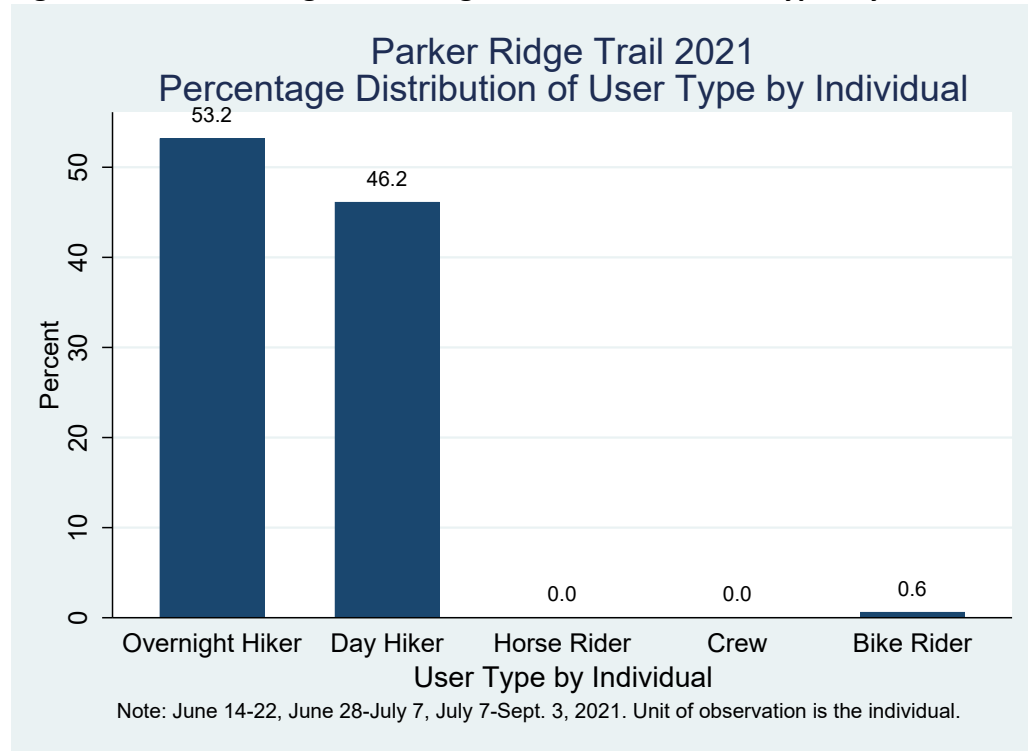
**Figure 16.5 Parker Ridge Percentage Distribution of Party Size**



**Figure 16.6 Parker Ridge Percentage Distribution of User Types by Party**



**Figure 16.7 Parker Ridge Percentage Distribution of User Types by Individual**



## Brush Lake 2021

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 2021 monitoring site was located about 0.8 miles from this intersection.



**2021 counter location.**  
Counter to climber's right.



**2021 camera location.**  
Camera to climber's left.

From June 14, 2021 through September 10, 2021, an estimated 335 trail visits were recorded at the Brush Lake monitoring site. Figure 17.1 displays the daily trail visit counts for Brush Lake as well as the corresponding air quality measured in Libby. Trail use at Brush Lake may have been affected by lower air quality in July and August due to wildfires in the area, however, use did remain relatively high during one of the AQI peaks in early August.

Figure 17.2 shows the total weekly trail visits for Brush Lake during 2021. The week with the highest use was July 19<sup>th</sup>-25<sup>th</sup> with 75 trail visits. The average number of weekly trail visits for this site was 26.4 trail visits for the weeks monitored during 2021.

Figure 17.3 shows the parties per week at Brush Lake. Camera data ended mid-week at this site, so parties per week were not calculated for the final week of September 6<sup>th</sup>. The week with the most parties at Brush Lake was July 12<sup>th</sup>-18<sup>th</sup>. During this week 20 parties passed by the Brush Lake monitoring site.

Figure 17.4 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 Wednesday, with an average of 5.3 visitors per day, followed by Sundays with 4.8 average visitors, and Saturdays with 4.2 average visitors.

Figure 17.5 shows the percentage distribution of Parker Ridge party sizes (excluding motorized users, as this was the only site to have these types of users). The most common party size at this site was made up of solo trail users, which composed 49.0% of parties, followed by pairs of users which made up 37.5% of parties. However, party sizes had a relatively wide range at this site, with parties of up to eight people observed. For example, groups of three made up 7.3% of parties observed at the Brush Lake site.

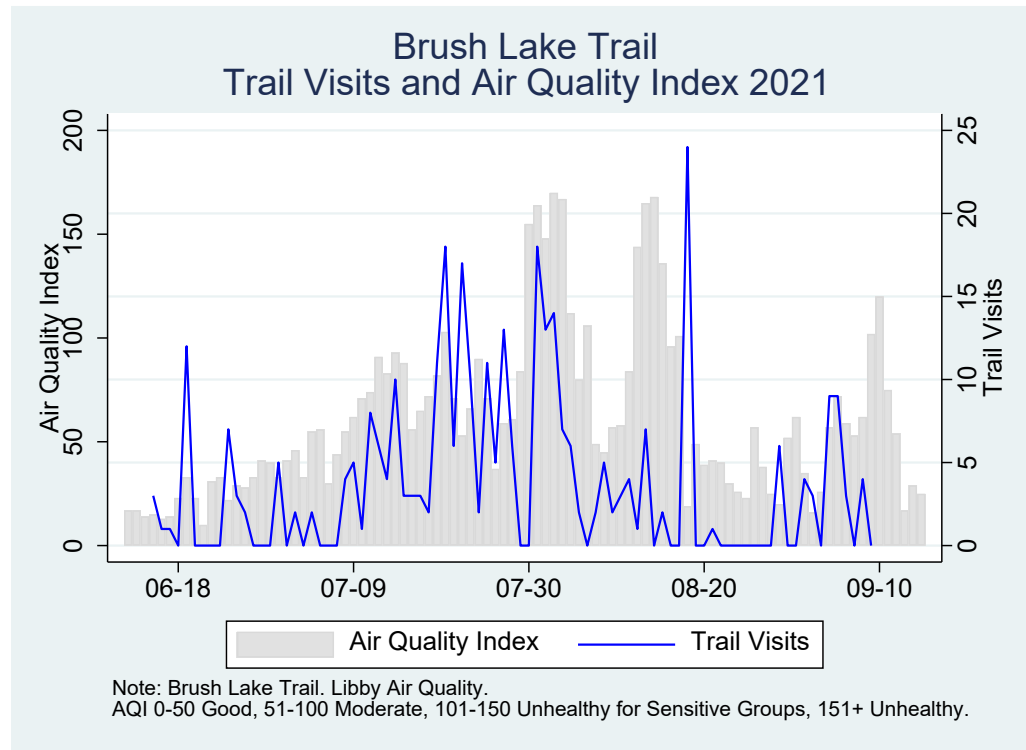
Figure 17.6 shows the distribution of user types observed at the party level for Brush Lake (excluding motorized users). With these exclusions, overnight hikers were the most common, making up 43.8% of parties. Day hikers composed 28.1% of parties and bike riders made up 26.0% of parties at Brush Lake. Lastly, crew made up 2.1% of parties at this site.

Figure 17.7 shows the distribution of user types at the individual level that were recorded at Brush Lake during 2021 (excluding motorized users). The percentage distribution of user type by individual showed that overnight hikers were more common than day hikers at Brush Lake, with 37.9% of users being overnight hikers compared to 30.8% being day hikers. Bike riders then composed 30.2% of users, followed by 1.2% of users being crew.

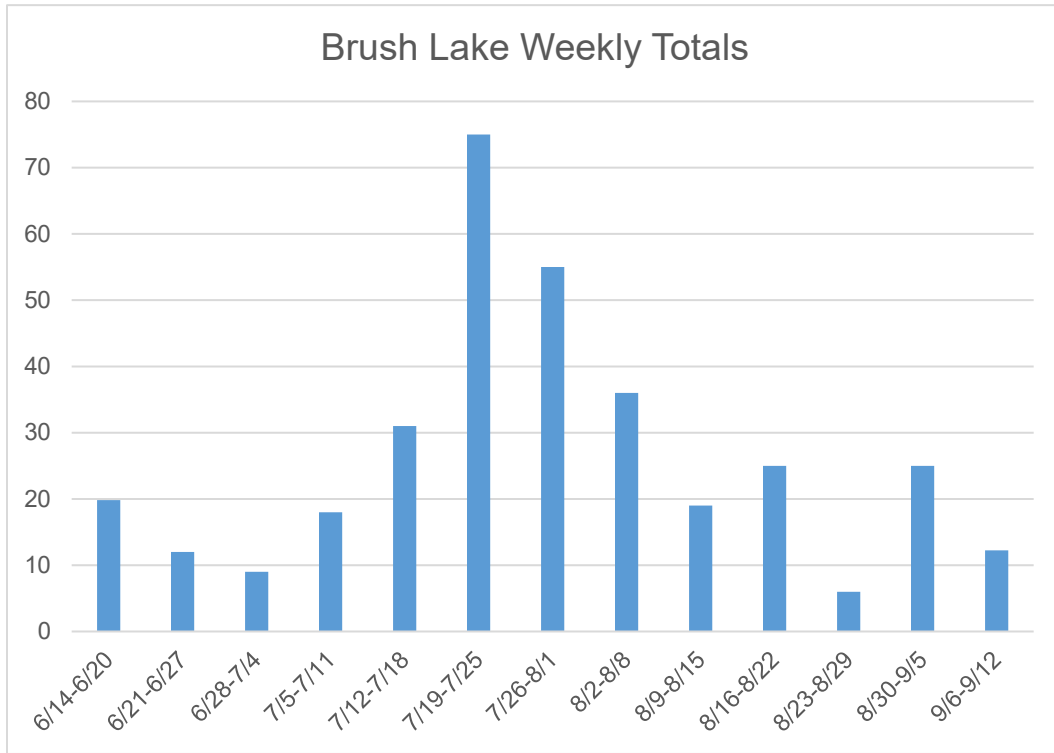
Unlike any of the other monitored sites, Brush Lake is on a trail where some motorized uses are allowed, and so it had additional types of users observed. During 2021 there were 50 ATV parties observed, composed of 102 total individuals. Additionally, Brush Lake had approximately 8 parties of motorized bike/motorcycle riders, which included 25 individuals overall. Lastly, 32 cars were observed at this site during the season. 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.

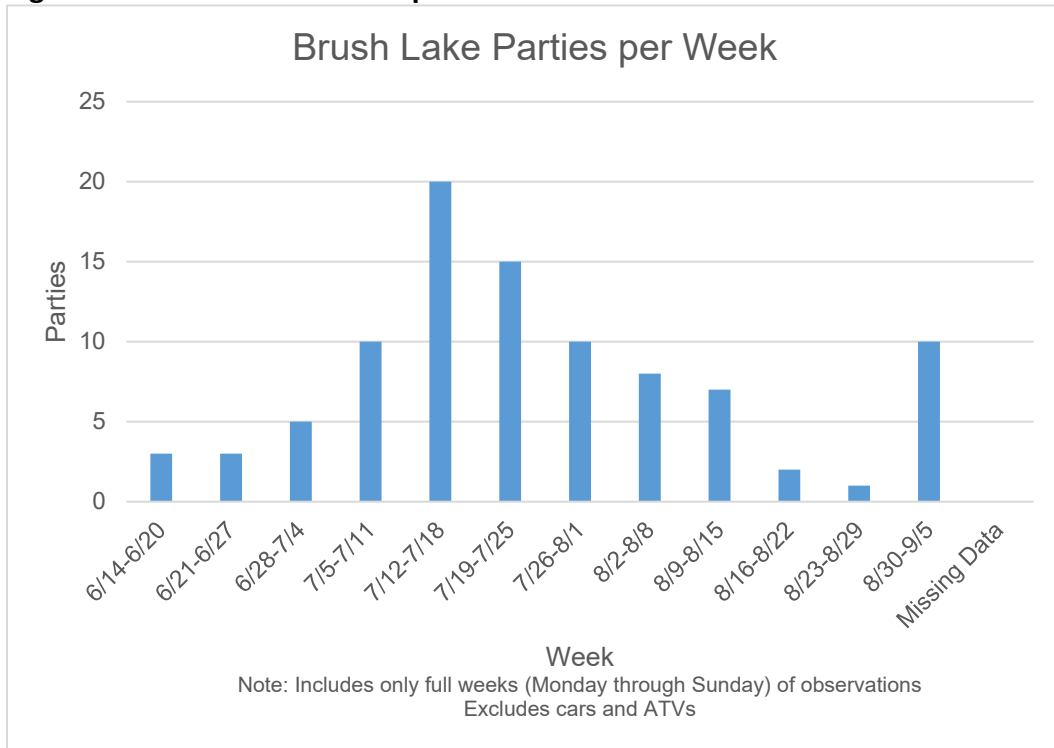
**Figure 17.1 Brush Lake Daily Counts and Air Quality**



**Figure 17.2 Brush Lake Weekly Counts**

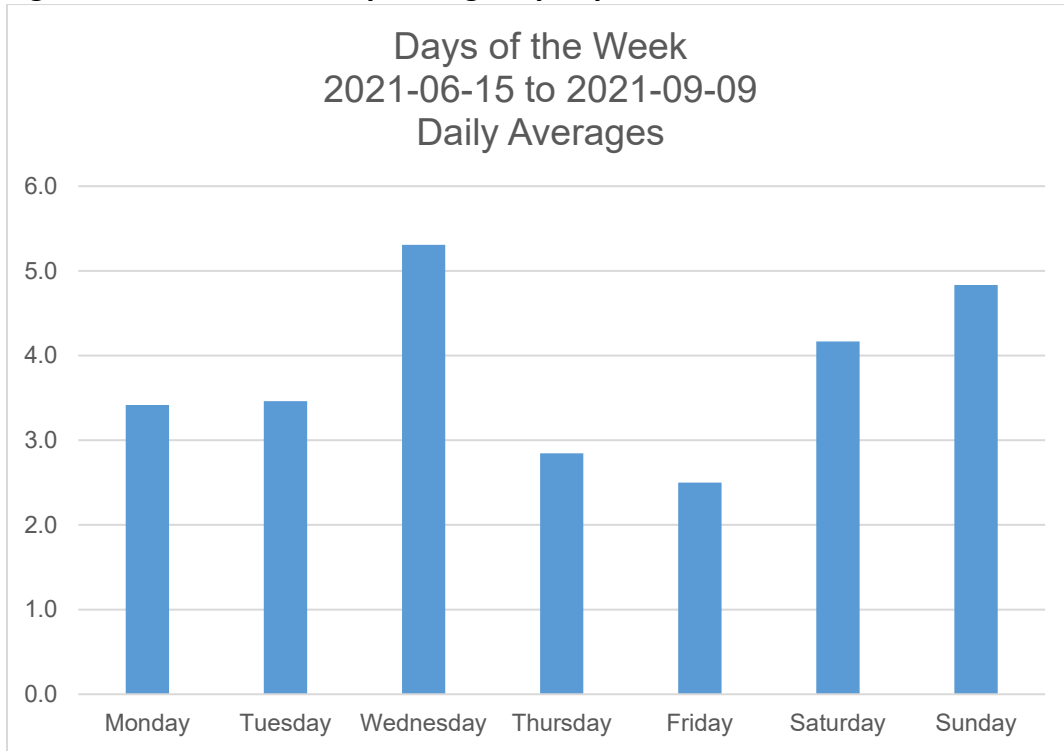


**Figure 17.3 Brush Lake Parties per Week**

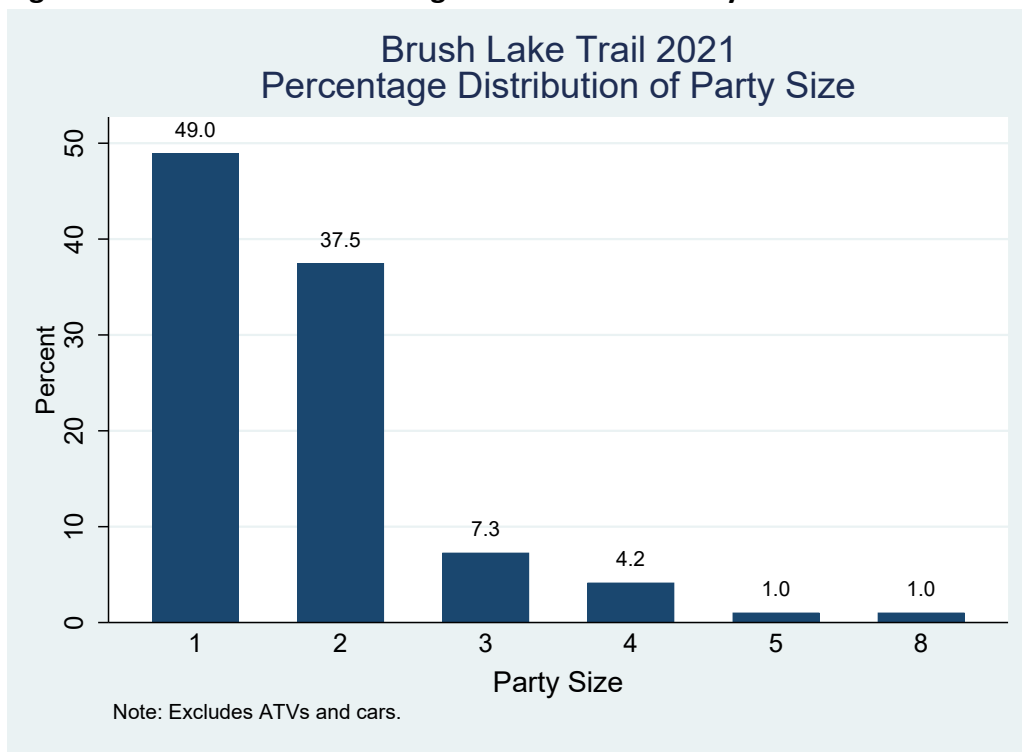




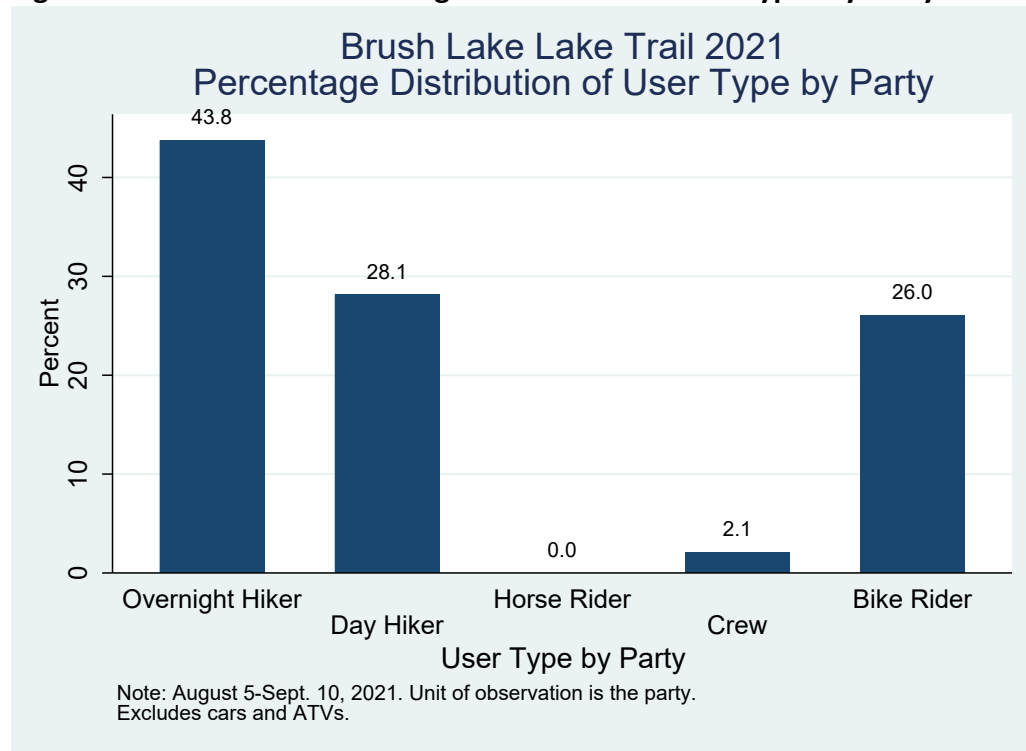
**Figure 17.3 Brush Lake Daily Averages by Day of the Week**



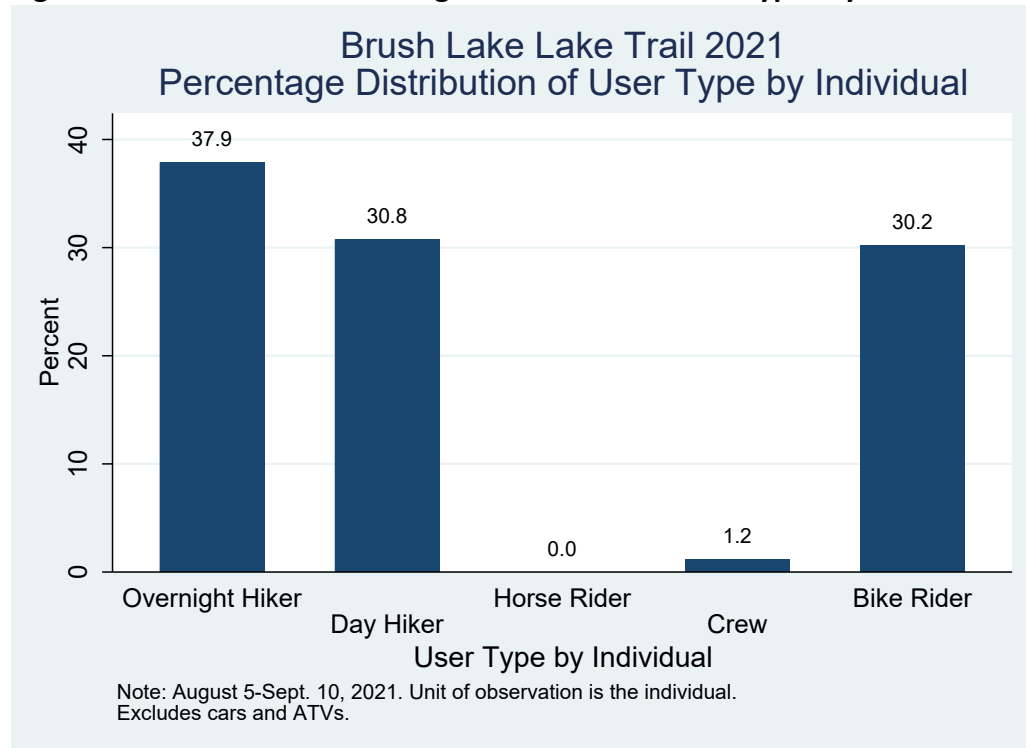
**Figure 17.4 Brush Lake Percentage Distribution of Party Size**



**Figure 17.5 Brush Lake Percentage Distribution of User Types by Party**



**Figure 17.6 Brush Lake Percentage Distribution of User Types by Individual**



## Comparison of 2017 – 2021 Average Daily Trail 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. The three new Idaho sites (Pyramid-Ball Lakes, Parker Ridge, and Brush Lake) were not included in these graphs as this was the first year they were each monitored.

Because no calibration factors were available from 2017, the 2018 calibration factors have been applied to the 2017 data for when making calculations. New calibration factors were added to 2019, 2020, and 2021 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.

Additionally, when making these comparisons it is important to note that the calibration factors for 2017, 2018, 2019, 2020, and 2021 were calculated in somewhat different ways. Calibration factors for 2019, 2020, and 2021 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). In contrast, 2018 data was calibrated only for day and overnight hikers (excluding all other types of users). 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, comparisons between 2017, 2018, 2019, 2020, and 2021 are not entirely equivalent. Trail user estimates for 2017 and 2018 would likely be at least slightly higher than the reported estimates.

Figures 18.1 compares average daily trail visits for each trail for July across 2017, 2018, 2019, 2020, and 2021. The number of average daily trail visits increased from 2017 to 2018, and again from 2018 to 2019, for Whitefish Divide, Boulder Lake, and Vinal Creek<sup>19</sup> sites. Whitefish Divide was not monitored during 2020 but had a slight increase in average daily trail visits during 2021 as well. Boulder Lake saw a decrease in average daily visits in 2020 but had another increase in

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<sup>19</sup> The Vinal Creek monitoring site is not located on the PNNST and data is not PNNST use. See pp. 41-46.

2021, reaching its highest number of average daily trail visits yet. In contrast, Vinal Creek<sup>20</sup> had a large increase in daily trail use from 2019 to 2020 but saw a decrease in 2021 (though its average daily visits were still above that of 2019). Blue Sky Creek saw a decline in average daily trail use from 2017 to 2018 to 2019. However, this trend reversed after 2019, with 2020 and 2021 both exhibiting increases in the number of average daily trail visits for Blue Sky Creek in July. Lastly, Canuck Peak has had a more inconsistent pattern of change in average daily trail visits between 2018 and 2021, with these values decreasing in 2019, increasing in 2020, before decreasing to the site's lowest average daily use in 2021. Notably, 2018 and 2021 were years with bad fire and smoke compared to both 2019 and 2020.

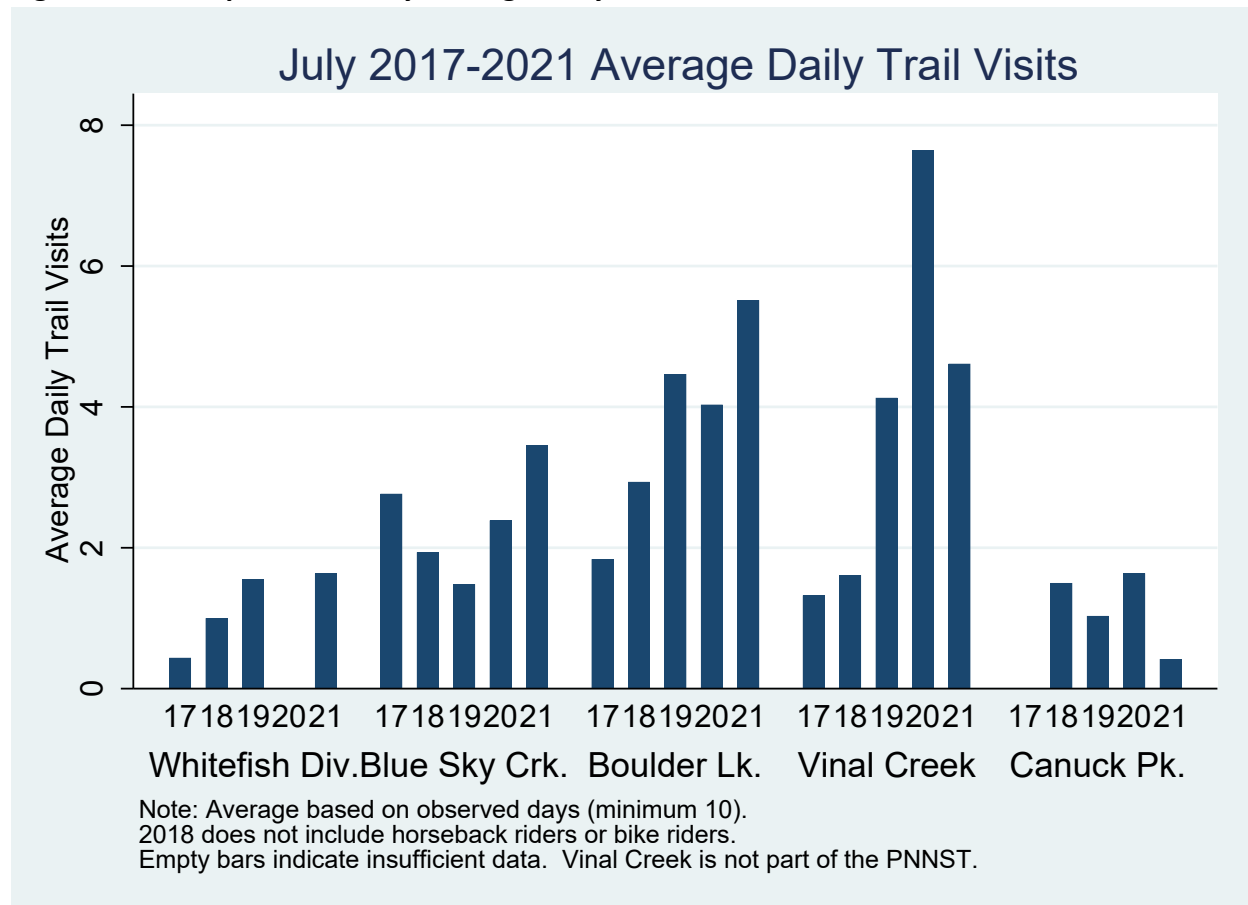
The greatest number of average daily trail visits for a site occurred at Vinal Creek<sup>20</sup> during 2020, where there was an average of nearly 8 trail visits a day during July. This may have been due to its ease of access and COVID impacts on usual travel patterns.

Overall, comparing use over the past few years, average daily trail visits in July appear to be increasing for Boulder Lake and Vinal Creek<sup>20</sup>. Whitefish Divide may be leveling out in use or increasing slightly over time. Additionally, Blue Sky Creek and Canuck Peak have more variable trends, with more fluctuating changes up and down from year to year.

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<sup>20</sup> The Vinal Creek monitoring site is not located on the PNNST and data is not PNNST use. See pp. 41-46.

Figure 18.1 Comparison of July Average Daily Trail Visits Between Sites: 2017 – 2020<sup>21,22</sup>



<sup>21</sup> 2017 and 2018 calibration factors accounted for only hikers (including day and overnight), while 2019, 2020, and 2021 calibration factors accounted for all trail users.

<sup>22</sup> The Vinal Creek monitoring site is not located on the PNNST and data is not PNNST use. See pp. 41-46.

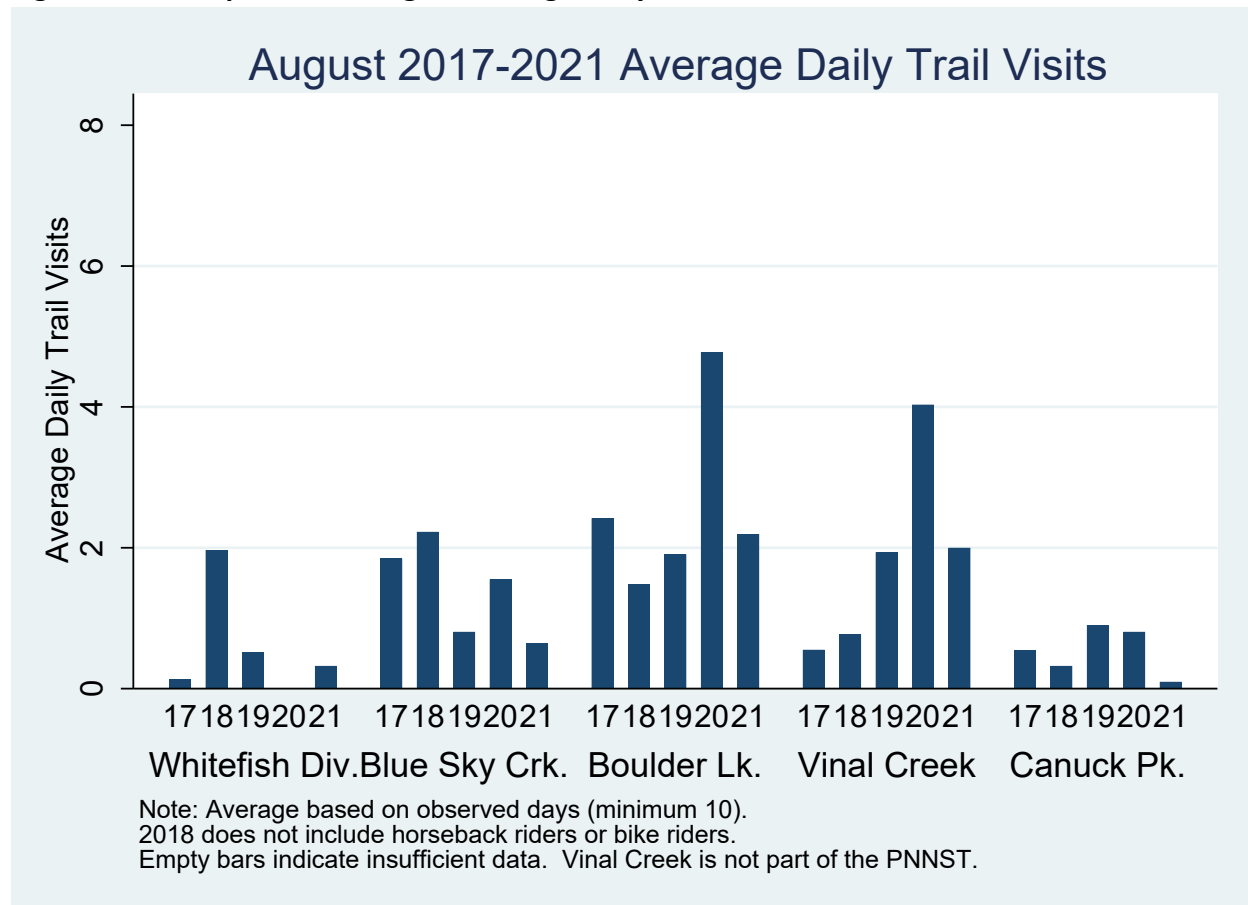
Figure 18.2 compares average daily trail visits across each site for August during 2017, 2018, 2019, 2020, and 2021. Among these sites, August average daily trail visits increased each year for Vinal Creek<sup>23</sup> between 2017 and 2020, before dropping substantially in 2021 to near its 2019 average. Average daily trail visits at Whitefish Divide increased substantially from 2017 to 2018 but decreased in both 2019 and 2021 to near the site's original 2017 average. Patterns of average daily trail visits during August were more variable for Blue Sky Creek, Boulder Lake, and Canuck Peak, with averages fluctuating between years.

Overall, Boulder Lake and Vinal Creek<sup>23</sup> may be experiencing a broader trend of growth for August over time, though it's both had substantial decreases in their average daily trail visits from 2020 to 2021, potentially due to wildfires and smoke.

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<sup>23</sup> The Vinal Creek monitoring site is not located on the PNNST and data is not PNNST use. See pp. 41-46.

Figure 18.2 Comparison of August Average Daily Trail Visits Between Sites: 2017 – 2021<sup>2425</sup>



<sup>24</sup> 2017 and 2018 calibration factors accounted for only hikers (including day and overnight), while 2019, 2020, and 2021 calibration factors accounted for all trail users.

<sup>25</sup> The Vinal Creek monitoring site is not located on the PNNST and data is not PNNST use. See pp. 41-46.

Figure 18.3 compares average daily trail visits across each site for the Septembers of 2017, 2018, 2019, 2020, and 2021. For example, the number of average daily trail visits increased for Boulder Lake from 2017 to 2018, and again from 2018 to 2019, before decreasing in 2020 and increasing greatly in 2021. Vinal Creek<sup>26</sup> experienced an increase in the number of average daily trail visits in September between 2018, 2019, and 2020. However, this site had a decrease in average daily trail visits during 2021. Alternatively, Blue Sky Creek experienced a decrease in average daily trail visits from 2018 to 2019, but then had increases in its averages in both 2020 and 2021. Both Whitefish Divide and Canuck Peak had a more inconsistent pattern of change in average daily trail visits between 2017 and 2021.

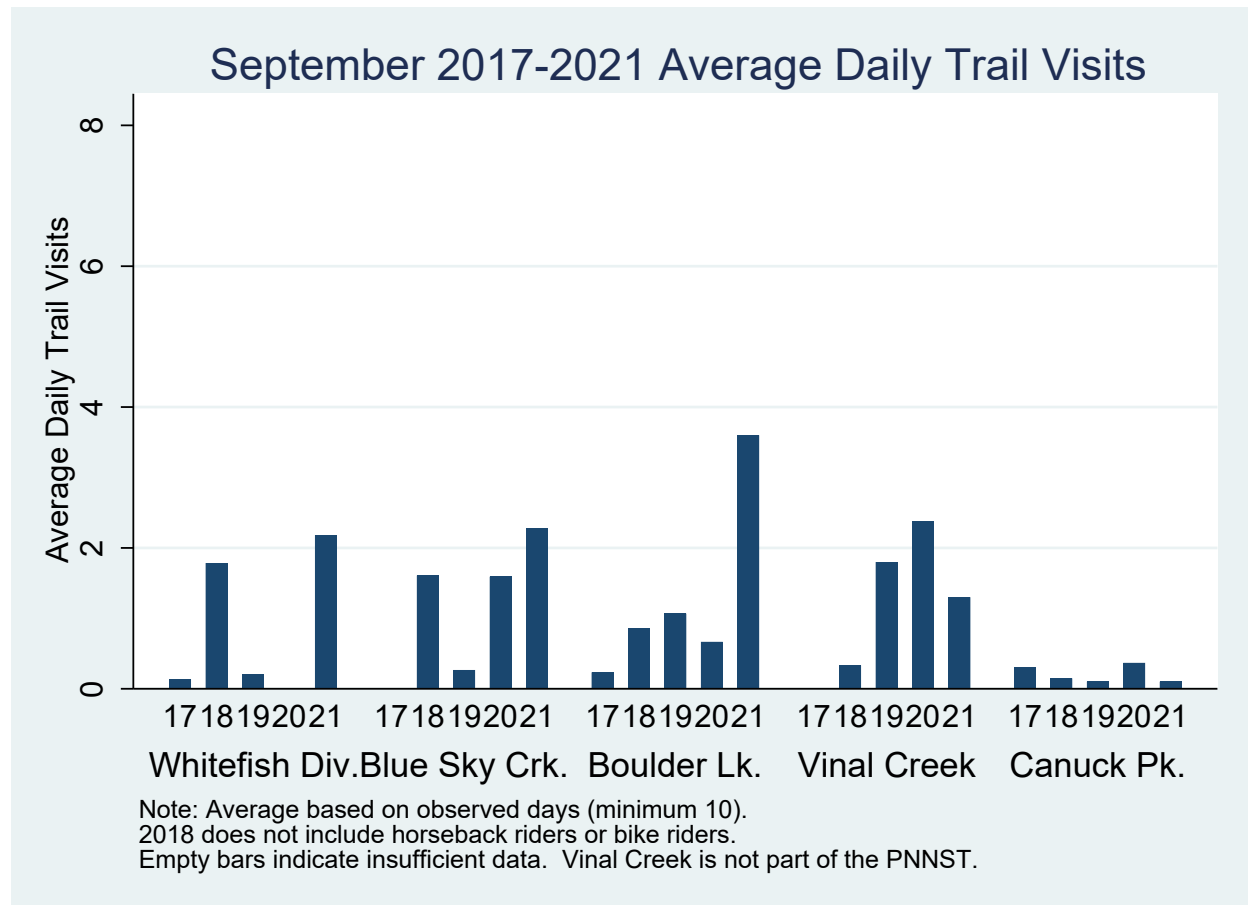
Overall, comparing use over the past few years, average daily trail visits in July appear to be increasing for Boulder Lake and Vinal Creek<sup>26</sup>. In contrast, Whitefish Divide, Blue Sky Creek, and Canuck Peak all tended to have more variable September trends, with more fluctuations up and down from year to year.

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<sup>26</sup> The Vinal Creek monitoring site is not located on the PNNST and data is not PNNST use. See pp. 41-46.



**Figure 18.3 Comparison of September Average Daily Trail Visits Between Sites: 2017 – 2021<sup>2728</sup>**



<sup>27</sup> 2017 and 2018 calibration factors accounted for only hikers (including day and overnight), while 2019, 2020, and 2021 calibration factors accounted for all trail users.

<sup>28</sup> The Vinal Creek monitoring site is not located on the PNNST and data is not PNNST use. See pp. 41-46.

## Comparison of 2020 and 2021 Party Sizes

Party size was determined for the 2020 and 2021 field seasons using camera data observations. During 2021, party size was measured as the number of individuals that appeared to be traveling together (based on being the same user type and traveling in the same direction) that passed by the camera within two minutes of each other, such that there is at least 2 minutes between one party and the next. Notably, this differed from the pilot method utilized for 2020 data. During 2020 individuals were assessed as being in the same party if they were of the same user type, were traveling in the same direction on the trail, and passed the camera within 30 seconds of each other. This difference in measurement should be kept in mind when comparing data between these two years.

Figure 19.1 shows the approximate percentage distribution of party sizes at Blue Sky Creek for overlapping dates observed between 2020 and 2021. For both years at this site the most common party involved solo users, which was then followed by pairs of users. A smaller percentage of groups of three or four were also observed both years.

**Figure 19.1 Blue Sky Creek Percentage Distribution of Party Size 2020 vs 2021**

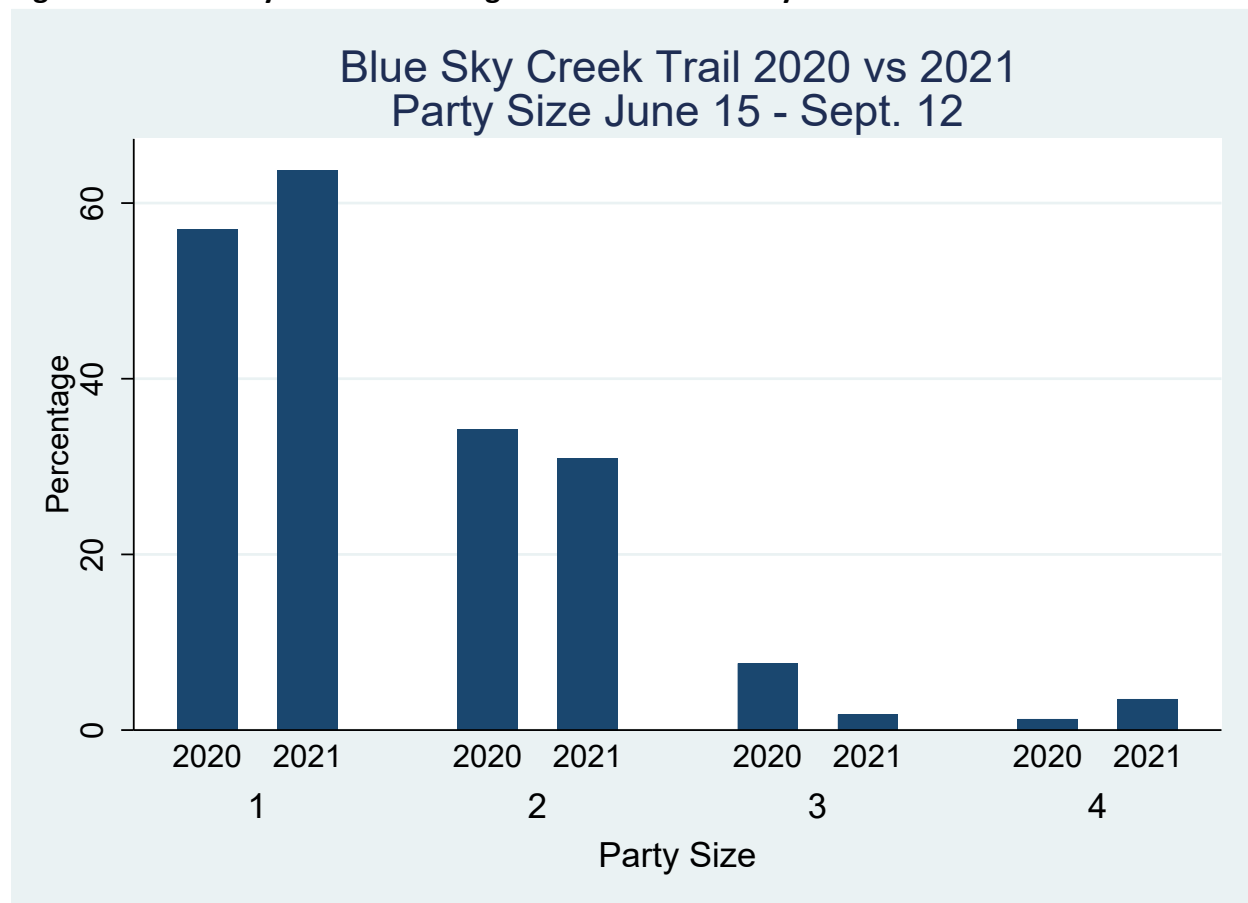


Figure 19.2 shows the approximate percentage distribution of party sizes at Boulder Lake for overlapping dates observed during 2020 and 2021. The spread of party sizes at Boulder Lake was relatively wide for both 2020 and 2021. During both 2020 and 2021, the most common party involved solo users, which was then followed relatively closely in percentage by pairs of users. Parties of four individuals made up the next largest percentage of parties during 2021. Smaller percentages of parties involved larger groups of individuals across both years, with some parties in 2020 being composed of over ten people.

**Figure 19.2 Boulder Lake Percentage Distribution of Party Size 2020 vs 2021**

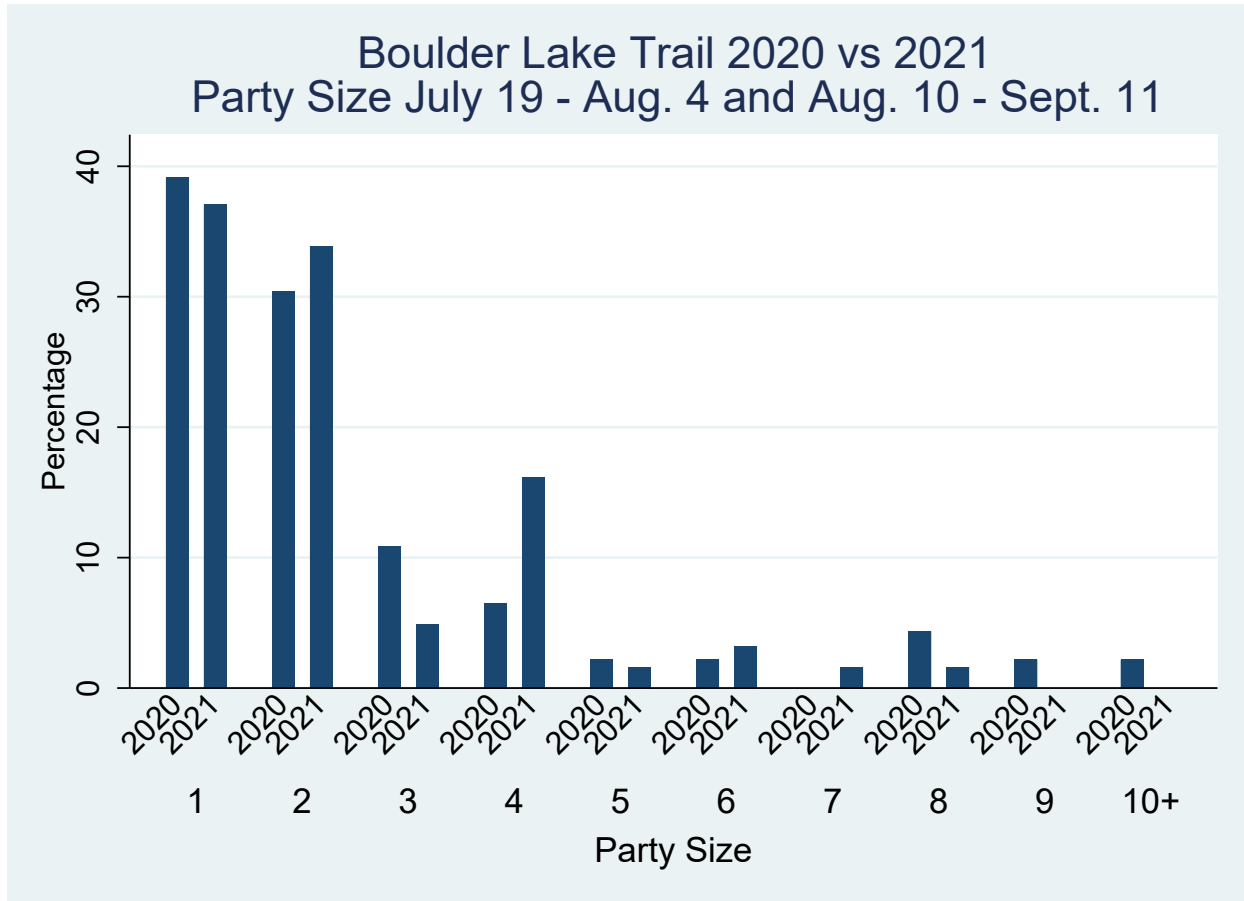
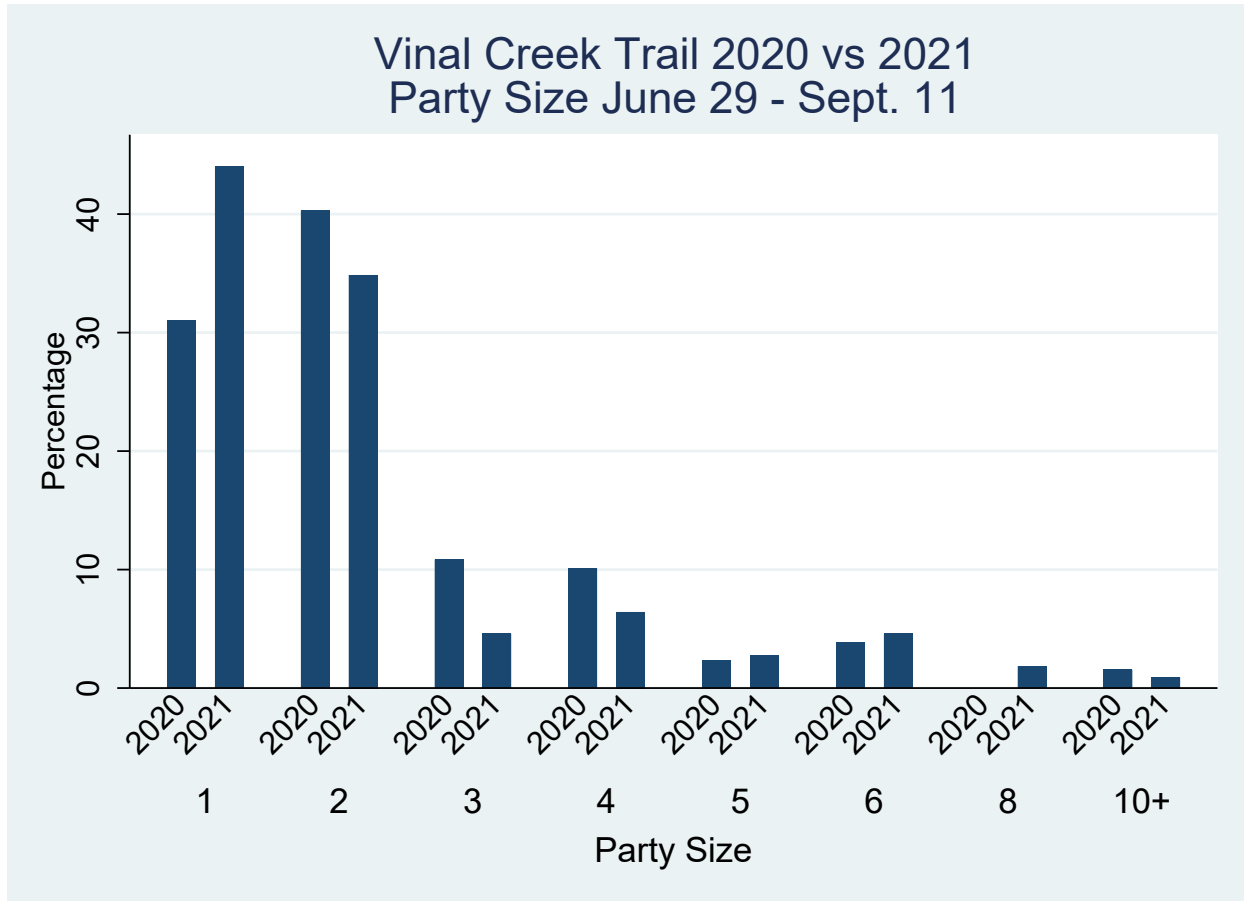


Figure 19.3 shows the approximate percentage distribution of party sizes at Vinal Creek<sup>29</sup> for overlapping dates observed during 2020 and 2021. The spread of party sizes at Vinal Creek<sup>29</sup> ranged for both 2020 and 2021. During 2020, pairs of trail users composed the largest percentage of parties, followed by solo users. In contrast, solo users were the most common party size at Vinal Creek<sup>29</sup> in 2021, then followed by pairs of users. Larger groups of individuals were noted at this site across both years, with some parties in both 2020 and 2021 having over ten people.

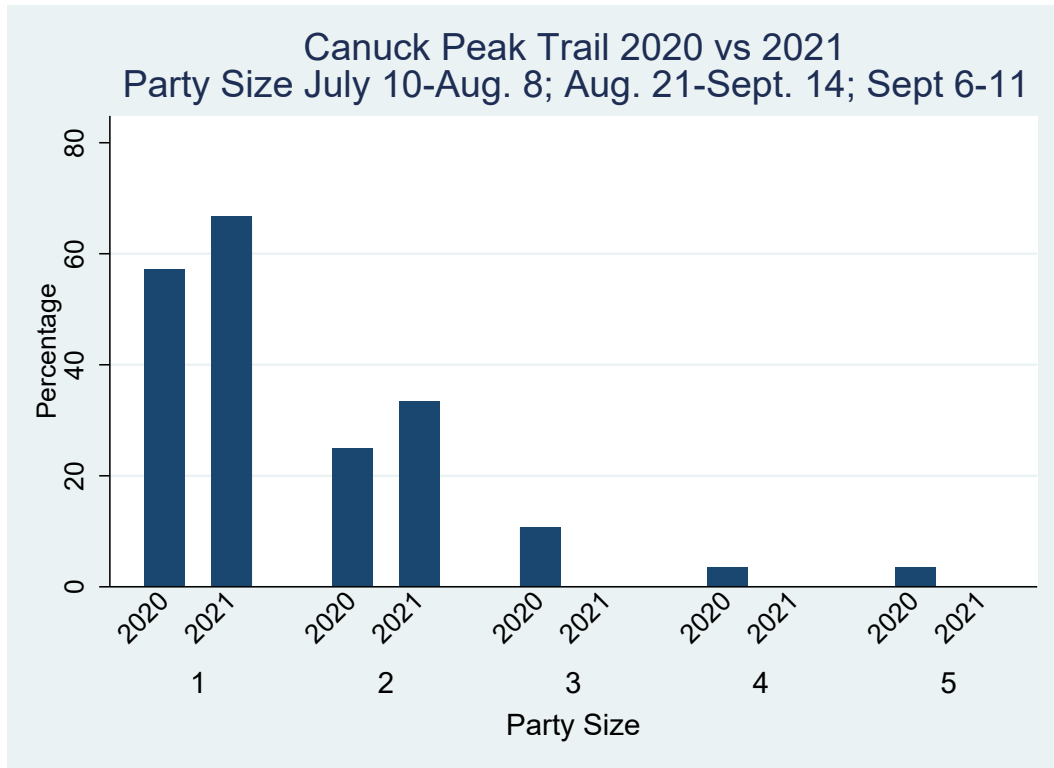
**Figure 19.3 Vinal Creek Percentage Distribution of Party Size 2020 vs 2021**



<sup>29</sup> The Vinal Creek monitoring site is not located on the PNNST and data is not PNNST use. See pp. 41-46.

Figure 19.4 shows the approximate percentage distribution of party sizes at Canuck Peak for overlapping dates observed during 2020 and 2021. During both 2020 and 2021, the most common party observed at Canuck Peak involved solo users, which was then followed by pairs of users. Some parties of three to five individuals were also observed during 2020.

**Figure 19.4 Canuck Peak Percentage Distribution of Party Size 2020 vs 2021**

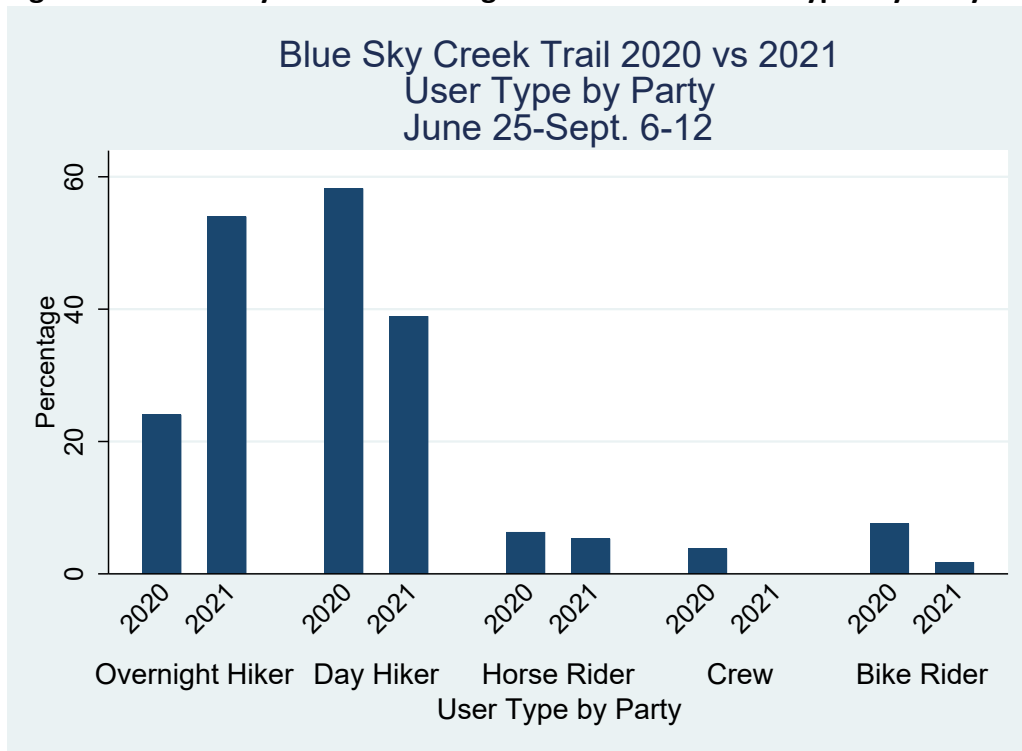


## Comparison of 2020 and 2021 User Types

Figure 20.1 shows the distribution of user types by party at Blue Sky Creek for overlapping dates observed over 2020 and 2021. During 2020 the most common types of party was composed of day hikers, followed by overnight hikers. In contrast, during 2021, the most common type of party was made of overnight hikers, then followed by day hikers. The percentage of parties of horse riders and bike riders stayed relatively small across both years, and no crew were observed at this trail during the compared 2021 dates.

Figure 20.2 shows the distribution of user types observed at the individual level for Blue Sky Creek across 2020 and 2021. Similar to the party analysis, the most common types of users during 2020 were day hikers followed by overnight hikers. Again, this was in contrast to how the most common users in 2021 were overnight hikers, followed by day hikers.

**Figure 20.1 Blue Sky Creek Percentage Distribution of User Types by Party**



**Figure 20.2 Blue Sky Creek Percentage Distribution of User Types by Individual**

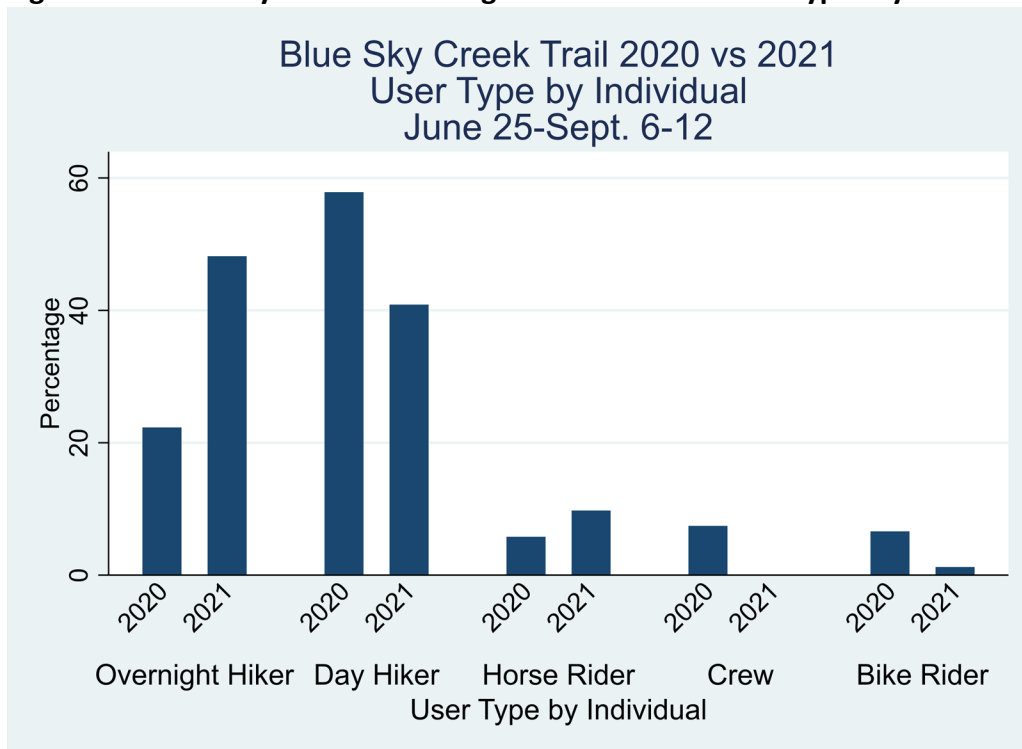
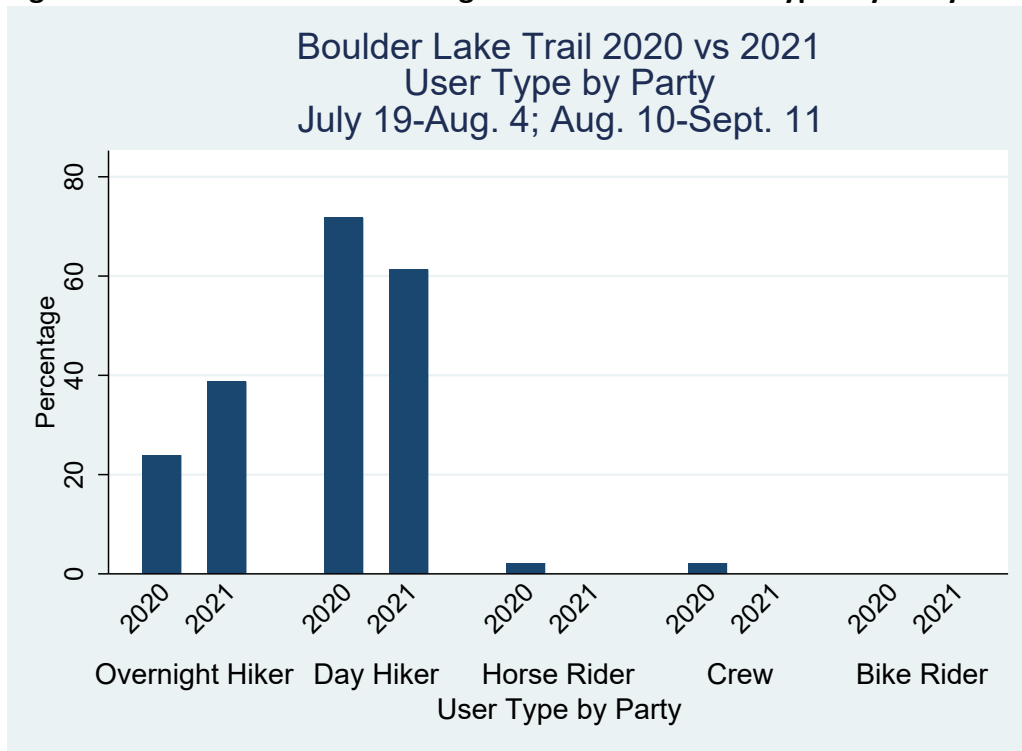


Figure 20.3 shows the distribution of user types by party at Boulder Lake for overlapping dates observed between 2020 and 2021. Day hikers were the most common type of party at Boulder Lake during both 2020 and 2021. Similarly, overnight hikers made up the next largest percentage of parties for both years. A small percentage of horse riders and crew were observed at this site during 2020.

Figure 20.4 shows the distribution of user types observed at the individual level for Boulder Lake across 2020 and 2021. Similar to the analysis by party, the most common types of users at Boulder Lake during both 2020 and 2021 were day hikers followed by overnight hikers.



**Figure 20.3 Boulder Lake Percentage Distribution of User Types by Party**



**Figure 20.4 Boulder Lake Percentage Distribution of User Types by Individual**

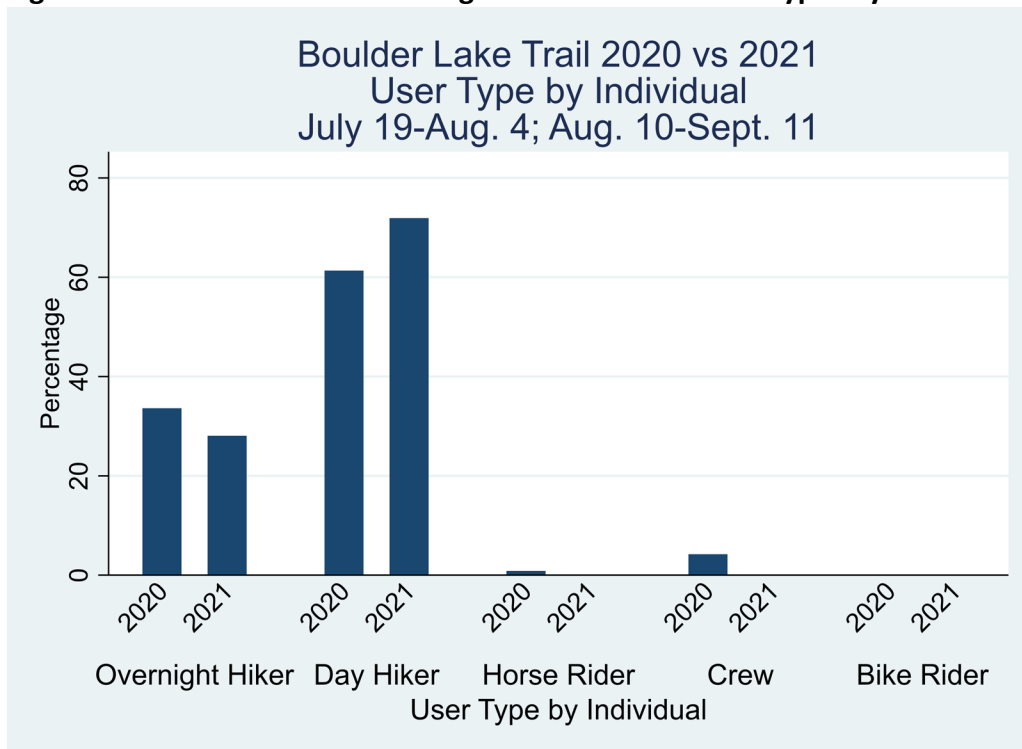


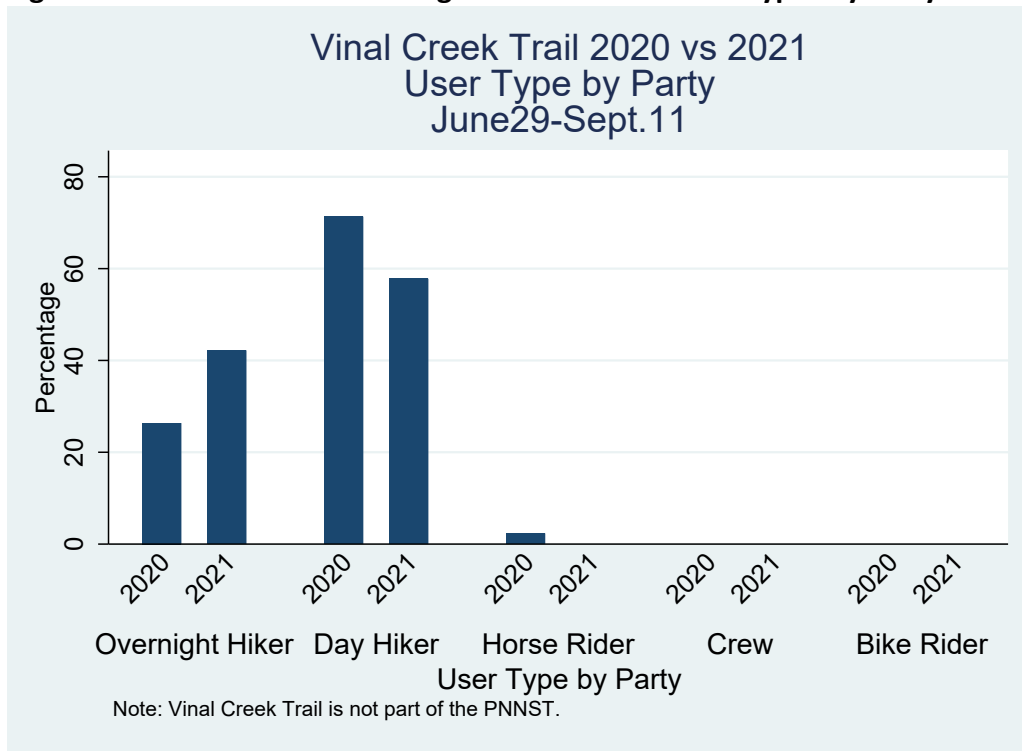
Figure 20.5 shows the distribution of user types by party at Vinal Creek<sup>30</sup> for overlapping dates observed during 2020 and 2021. Day hikers were also the greatest percentage of type of user by party at Vinal Creek<sup>30</sup> during both 2020 and 2021. Overnight hikers made up the next largest percentage of parties for both years. A small percentage of horse riders were observed at Vinal Creek<sup>30</sup> during 2020.

Figure 20.6 shows the distribution of user types observed at the individual level for Vinal Creek's<sup>30</sup> overlapping dates across 2020 and 2021. Similar to the analysis by party, most trail users at Vinal Creek<sup>30</sup> during both 2020 and 2021 were day hikers, followed by overnight hikers.

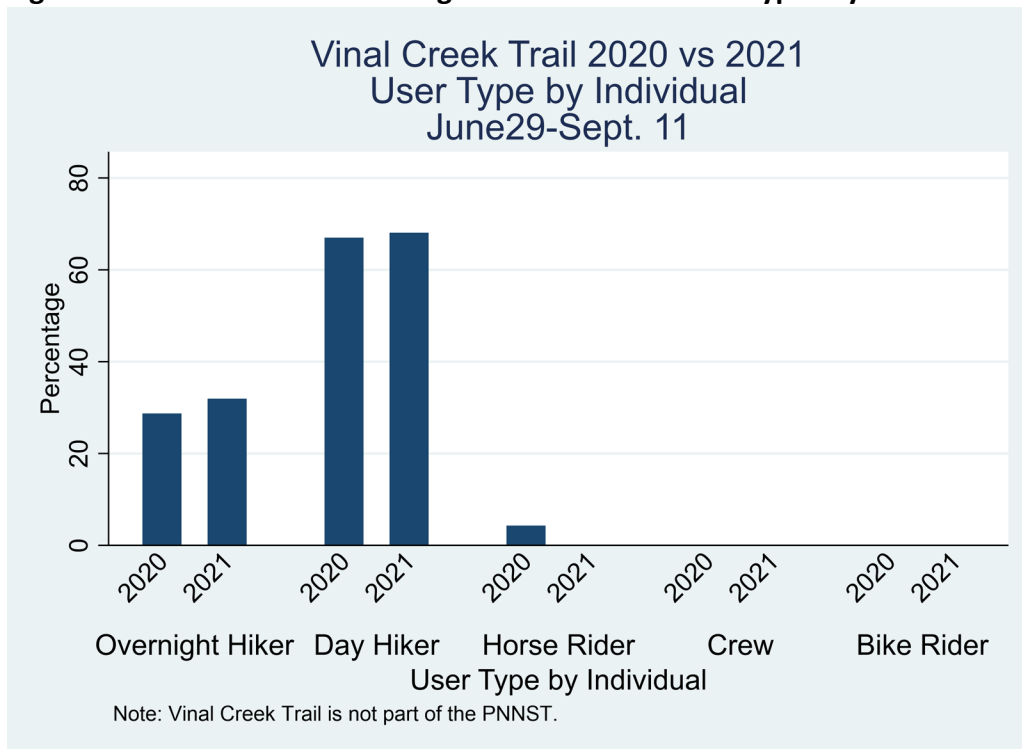
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<sup>30</sup> The Vinal Creek monitoring site is not located on the PNNST and data is not PNNST use. See pp. 41-46.

**Figure 20.5 Vinal Creek Percentage Distribution of User Types by Party<sup>31</sup>**



**Figure 20.6 Vinal Creek Percentage Distribution of User Types by Individual**

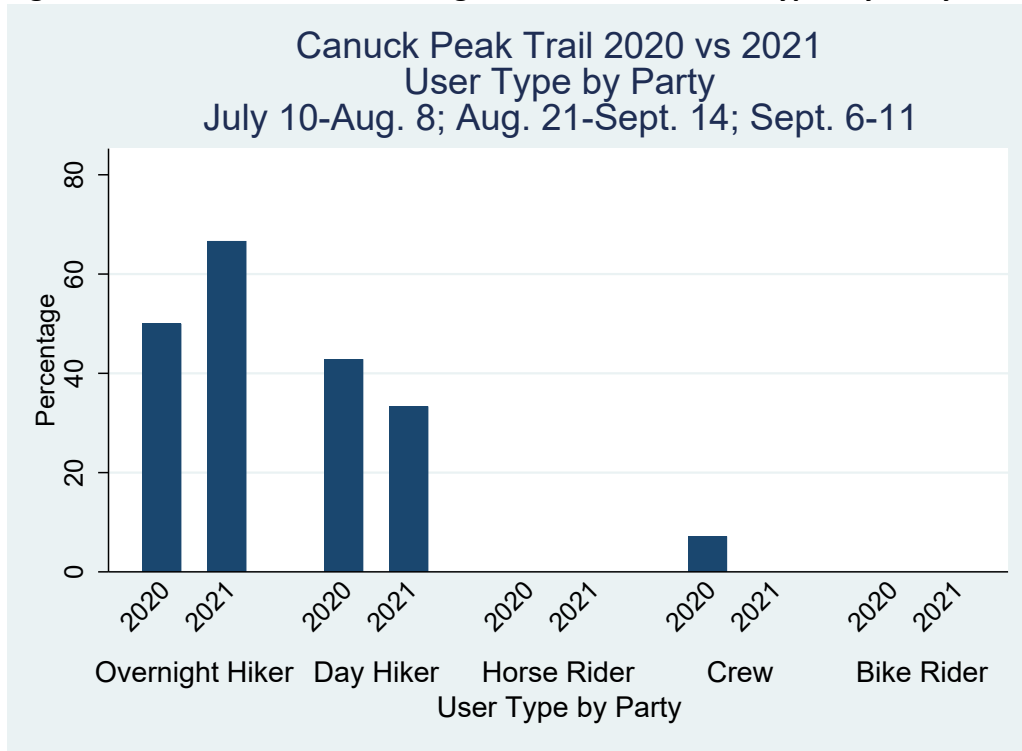


<sup>31</sup> The Vinal Creek monitoring site is not located on the PNNST and data is not PNNST use. See pp. 41-46.

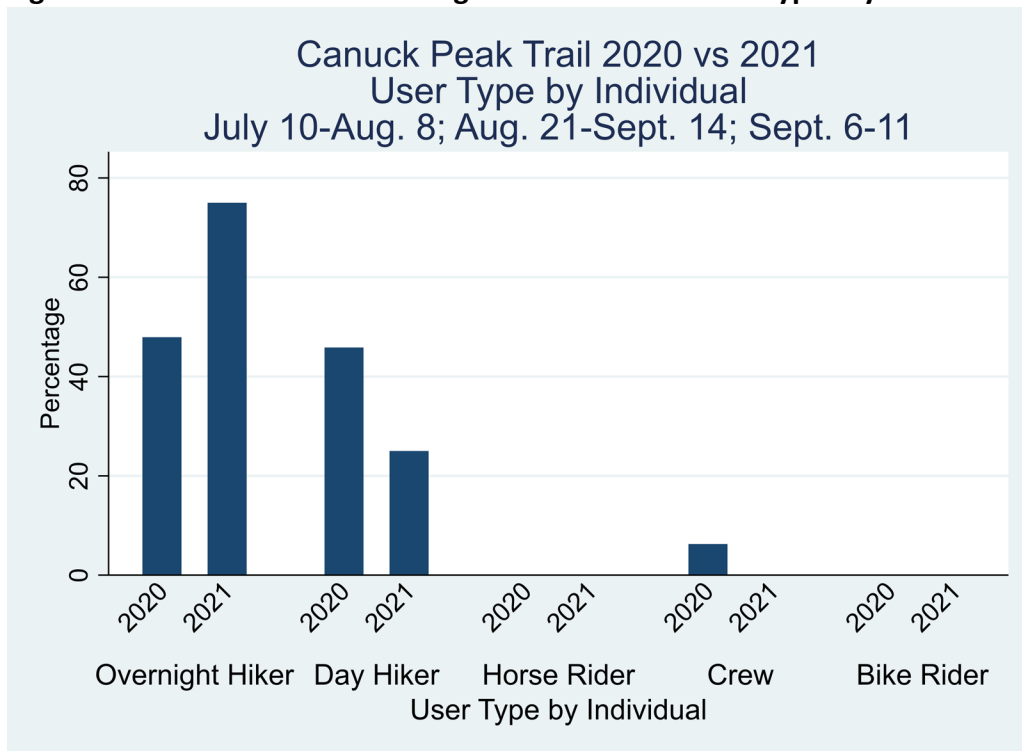
Figure 20.7 shows the distribution of user types by party at Canuck Peak for overlapping dates observed during 2020 and 2021. Overnight hikers made up the largest percentage of parties during both 2020 and 2021. Similarly, day hikers composed the next greatest percentage of parties at Canuck Peak for both years. A small percentage of crew members were also observed at Canuck Peak during the 2020 observed days.

Figure 20.8 shows the distribution of user types observed at the individual level for Canuck Peak's overlapping dates across 2020 and 2021. Similar to the analysis by party, most trail users at Canuck Peak during both 2020 and 2021 were overnight hikers, followed by day hikers. However, measured by individuals, the number of overnight hikers and day hikers were quite a bit closer to each other.

**Figure 20.7 Canuck Peak Percentage Distribution of User Types by Party**



**Figure 20.8 Canuck Peak Percentage Distribution of User Types by Individual**



## Recommendations and Reflections

### Field Work

- During the 2021 field season the number of cameras being used increased from 7 cameras used at 7 sites in 2020, to 8 cameras stationed at 8 sites (including 3 new Idaho locations). Cameras were set up at each site throughout the entirety of the season for both 2020 and 2021. In contrast, only 6 cameras were used during 2019, with cameras being rotated between 10 sites. Consistent camera use throughout the season has increased the ease and efficiency of data collection and analysis and allowed for a larger sample of dates to be used for data calibration.
- The 2021 field season was able to begin in mid-June and extend into mid-September. Start and end dates were influenced by trail conditions, with snow limiting access to some sites in the early season, and wildfires influencing air quality later in the season.
- Some counter data was lost for every site except Whitefish Divide, primarily during some middle sections of the 2021 season. Additionally, while no cameras were stolen during 2021, some camera data was lost due to memory card issues.
- Losses in counter and camera data impacted calibration factors, as there were fewer dates with overlapping camera and counter data to use for calibration calculations. Additionally, like prior years, there continued to be quite a big difference between the counter data and camera data. The research team would like to continue improving on the precision of the study's calibration methods.
- During 2021, for dates without raw counter data, camera data was used to substitute trail visit estimates when possible. This mixture of data is not wholly equivalent, and thus must be interpreted with more caution.
- A loss of some camera data among sites may also make it more difficult to extrapolate some trends regarding specific types of visitor use (user type and party size) and their corresponding frequency at each site.
- During 2021, party size was measured as the number of individuals that appeared to be traveling together (based on being the same user type and traveling in the same direction) that passed by the camera within two minutes of each other, such that there is at least 2 minutes between one party and the next. These measures were used to calculate the number of parties using each trail per week in order to assess disturbance patterns.

### Specific Sites

- Wildfires and lower air quality were higher in 2021 than 2020, which likely has affected observed trends in visitor use for at least some PNNST trails monitored. These

conditions may have impacted lower trail use among some users (for example, among sensitive health groups).

- No cameras were stolen during the 2020 or 2021 field seasons (though some were investigated by passersby). The research team continues to be concerned about the efficacy of the safety lock system in protecting the cameras from potential theft. For sites that are more frequently used, manual calibration by a researcher may be a more appropriate option than a camera. If there are some sites that are particularly hard to hide a camera or appear more vulnerable to theft, the research team may have to forgo cameras at those sites or consider changing the sites for long-term monitoring.
- Newer cameras (those purchased for the 2020 field season) were particularly susceptible to motion-activated photo-capture in response to foliage movement. For sites like Parker Ridge, where the counter location is in a more open area with more wind movement, the camera regularly took thousands of photos in reaction to moving branches, even when moved around within the vicinity to have slightly different vantage points.

#### Future Research

- Some possible explanations for the difference in counter and camera data at some sites could be that the infrared cameras take photos every five seconds (the minimum setting), which is too long to capture quick hikers and thus, the cameras do not take these hikers into account. This year, some sites had newer cameras, which had a shorter interval of 0 seconds, which may have been able to better capture hikers that were moving quickly. Thus, these newer cameras may be able to provide more accurate camera data for comparison to counter data, which may yield more accurate calibration factors and trail use estimates for these monitoring sites. However, the significance of these potential differences is not known.
- 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 select locations throughout the field season in 2022. This could also be administered using a QSR code that is posted at select trailheads and ranger stations.
- In order to better understand disturbance patterns related to trail use it is recommended that the research team could engage in systematic trail observations of characteristics like anthropogenic noise. Trail observations could be prioritized, and would be more feasible, for more high use sites such as Pyramid-Ball Lakes or Vinal Creek<sup>32</sup>.

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<sup>32</sup> The Vinal Creek monitoring site is not located on the PNNST and data is not PNNST use. See pp. 41-46

## Appendices

### Appendix A. Pacific Northwest Trail Association maps of trails in Section 1-3 of the PNNST.

Section 1, or “Rocky Mountains,” consists of 149 miles (240 km) of trail from Glacier National Park to Eureka, Montana. Section 2, “Purcell Mountains,” consists of 97 miles (156 km) of trail from Eureka, Montana to Bonners Ferry, Idaho. Section 3, “Selkirk Mountains”, consists of 152 miles (245 km) of trail from Bonners Ferry, ID to Northport, WA.

The maps follow the trail from East to West and show the general location of trail counter/camera. The trails that are included in this study are featured in pages 8-28 of the following sectional maps of the PNNST. The trail name, National Forest designation, and page number are included to orient the reader to the location of the study sites within the PNNST. Specific locations of trail counters/cameras are not included to avoid vandalism in future studies.

<b>Counter/Camera Site</b>	<b>Trail</b>	<b>National Forest</b>	<b>Page Number in Map</b>
Whitefish Divide	Whitefish Divide Trail 26	Kootenai National Forest	8-10
Blue Sky Creek	Blue Sky Creek Trail 74	Kootenai National Forest	10-11
Boulder Lake	Boulder Lake Trail 62	Kootenai National Forest	17
Vinal Creek <sup>33</sup>	Vinal Creek Trail 9 (the monitoring site is not located on the PNNST)	Kootenai National Forest	18
Canuck Peak	Rock Candy Mountain Trail 461	Kootenai National Forest	22
Pyramid-Ball Lakes	Pyramid Pass Trail 13	Kaniksu National Forest	28
Parker Ridge	Parker Ridge Trail 221	Kaniksu National Forest	25-26
Brush Lake	Brush Lake Loop Trail 377	Kaniksu National Forest	24

At the time of this report, the complete 2021 map set of the PNNST, including strip maps with greater details on individual trails, can be downloaded from <https://www.pnt.org/product/2021-maps/>

<sup>33</sup> The Vinal Creek monitoring site is not located on the PNNST and data is not PNNST use. See pp. 41-46.



These maps show the locations of the counter/camera sites included in this report. The sites' corresponding page number is located in the lower right-hand corner of the sections of the map.

The folder containing "Section 1 – Rocky Mountains" includes strip maps for Whitefish Divide and Blue Sky Creek.

The folder containing "Section 2 – Purcell Mountains" includes strip maps for Boulder Lake, Vinal Creek<sup>34</sup>, and Canuck Peak.

The folder containing "Section 3 – Selkirk Mountains" includes strip maps for Pyramid-Ball Lakes, Parker Ridge, and Brush Lake.

The Pacific Northwest Trail maps available in future years may be updated, and are likely to be found under <https://www.pnt.org/pnta/maps/>

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<sup>34</sup> The Vinal Creek monitoring site is not located on the PNNST and data is not PNNST use. See pp. 41-46.

## Appendix B. 2021 Missing Counter and Camera Data Summary

Due to technical issues during the 2021 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 in order to hopefully provide more accurate trail visit measurements once calibrated. However, for days where counter data was missing, trail visits were estimated using camera data as a substitute. Generally, camera data may be more likely to underestimate trail use compared to the calibrated counter data.

Additionally, the Pyramid-Ball Lakes site lacked both counter and camera data from June 28<sup>th</sup>-July 17<sup>th</sup>, 2021. Thus, some specific trail use trends could not be estimated for this set of dates at the site.

Table 3 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 3 Calibration Dates and Calculated Calibration Factors**

<b>Site</b>	<b>Counter Data Calibrated and Used</b>	<b>Camera Data Substituted</b>	<b>Both Data Missing</b>
Whitefish Divide	7/2-9/11		
Blue Sky Creek	6/17-6/29; 8/26-9/11	6/30-8/25	
Boulder Lake	6/16-8/6; 8/26-9/11	8/7-8/25	
Vinal Creek <sup>35</sup>	6/30-7/17; 8/25-9/10	7/18-8/6	
Canuck Peak	6/30-7/17; 8/25-9/10	7/18-8/24	
Pyramid-Ball Lakes	6/16-6/27; 7/18-9/9		6/28-7/17
Parker Ridge	6/15-6/27; 8/24-9/9	6/28-8/23	
Brush Lake	6/15-6/27	6/28-9/9	

<sup>35</sup> The Vinal Creek monitoring site is not located on the PNNST and data is not PNNST use. See pp. 41-46.