Glacier National Park

2011 Use of Selected Trails and Parking Areas on the Going-To-The-Sun Road: Interim Report

Diana M. Bedoya
Wayne Freimund

April, 2012

Department of Society and Conservation
The University of Montana
Missoula, Montana

Acknowledgements

The data reported here could not have been collected without the close collaboration of a number of individuals. National Park Service employees Chas Cartwright, Mark Biel, Kyle Johnson, Mary Riddle, Tara Carolin and Phil Wilson provided administrative support and logistical leadership in ensuring the project was implemented during a unique and challenging data collection season. Our field data collection team, Tyler Warner and Elena Nikolaeva, conducted the observations with a sensitivity and professionalism that greatly enhanced the reliability of the data. We offer special thanks to the visitors who agreed to carry GPS units on their hikes along the Going to the Sun Road during the summer of 2011.

Table of Contents

List of Figures

List of Tables

Section 1. INTRODUCTION

1.1 Purpose of the Study

The reconstruction of the Going to the Sun Road (GTTSR) in Glacier National Park (GNP) poses important questions about impacts on visitor behavior, use levels and patterns of use within the Park, both during and following the construction activity. As now scheduled, the construction will continue through at least 2014, and while the road will not be completely closed during this time, visitors may experience significant time delays and changes in access to popular trailheads and scenic overlooks. The Record of Decision for the Reconstruction Environmental Impact Statement indicates that maintaining visitor access is a key issue.

This project continues a long term study of visitor behavior on the GTTSR. In Phases One and Two, completed in the summers of 2005 and 2006, visitors were observed and interviewed at 17 pullouts on the Going to the Sun Road. Based on 7000+ observations and 1280+ surveys, this research provided a detailed baseline understanding of visitor use of the GTTSR and pullouts before the beginning of road construction and the implementation of the shuttle system (Freimund et al., 2006a; Freimund et al., 2006b). Phase Three was completed in the summer of 2007, the first summer of shuttle operation. Based on 376 completed surveys, this research provided an assessment of the decision processes, motivations, activity choices, and experience of the shuttle riders vs. non shuttle riders. It also provided an assessment of the quality of the shuttle experience and recommendations for improvement (Baker and Freimund, 2007).

Phase Three uncovered some interesting trends in the motivations and activity choices of shuttle riders that deserved further investigation. Phase Four followed up on this information by investigating the role of the shuttle in increased backcountry and point-to-point hiking activity and visitor use and obtaining a greater understanding of how visitors use park-provided shuttle information sources. The results of this phase of research indicated that the shuttle is increasing the number of people hiking on popular trails that are made more accessible by the shuttle, including the Highline Trail. In addition, the results suggested that some visitors may feel that this trail is becoming overcrowded. Finally, a large percentage of hikers are using the shuttle to facilitate a one way hike. However, they are still driving along the GTTSR as part of their hiking travel arrangements and as part of their overall visit to the park.

As a result, this proposed study assessed use of the Highline Trail, The Loop, and other trails made more accessible by the shuttle including Siyeh Bend to Sunrift Gorge, and St Mary's Falls. The original goals of this season's research were to understand the relationship between shuttle use and choice to take extended day hikes including: i) if hikers are using the shuttle to facilitate a longer / point-to-point hike; ii) if hikers who take the shuttle are leaving a car parked for an extended period in high-use parking lots; and iii) if more visitors who would not otherwise have done a long hike are engaging in longer day hikes due to the shuttle. However, the OMB approval for the survey instrument was not given on time. Thus, the objectives of the study were adapted to include:

1. Parking lot use observations at Avalanche and Sunrift Gorge parking lots

2. Trail use monitoring via GPS at the St. Mary and Hidden lake Trailheads.

3. Trail use estimation at eight locations along the corridor.

1.2 Description of the Study

The research described here was designed to provide a baseline of information that will allow park managers to plan improvements associated with reconstruction and mitigate unforeseen impacts to visitor experiences, park values, and key biophysical attributes. Sampled schedule for collected data was implemented in several areas: in parking lots at Avalanche Lake and Sunrift Gorge, trailheads at St. Mary Falls and Logan Pass (Hidden Lake trail), and locations along The Loop, Siyeh Bend Pass, and the Highline trail. These places provide access to hikers who would hike or have hiked these trails (Figure 1).

Data were collected during the period of July 4th, 2011 to November 4th, 2011. From the fourth of July to the third of August sampling occurred Monday through Friday. From August 6th to August 24th sampling occurred Saturday through Wednesday (Appendix A). Because of the complexity of the some areas, sampling was conducted using a 3 or 2 person crew so that both observational and GPS or calibration data could be collected.

All areas were sampled during the primary daylight hours of operation—basically from 8 AM until 8 PM in six-hour sampling periods: a morning sampling period from 8 AM to 2 PM and an afternoon sampling period from 2 PM to 8 PM However, sampling time was dismissed to five-hour sampling in the some places (St. Mary Falls, Sunrift Gorge, and

Logan Pass) due to the travel time used by the crew to approach those places. The sampling procedure used a systematic random sampling process in which the initial study areas and sampling periods (morning or afternoon) were randomly selected. Following the initial day of sampling, time periods and locations were rotated systematically to ensure that over the study period each study area was sampled equally.

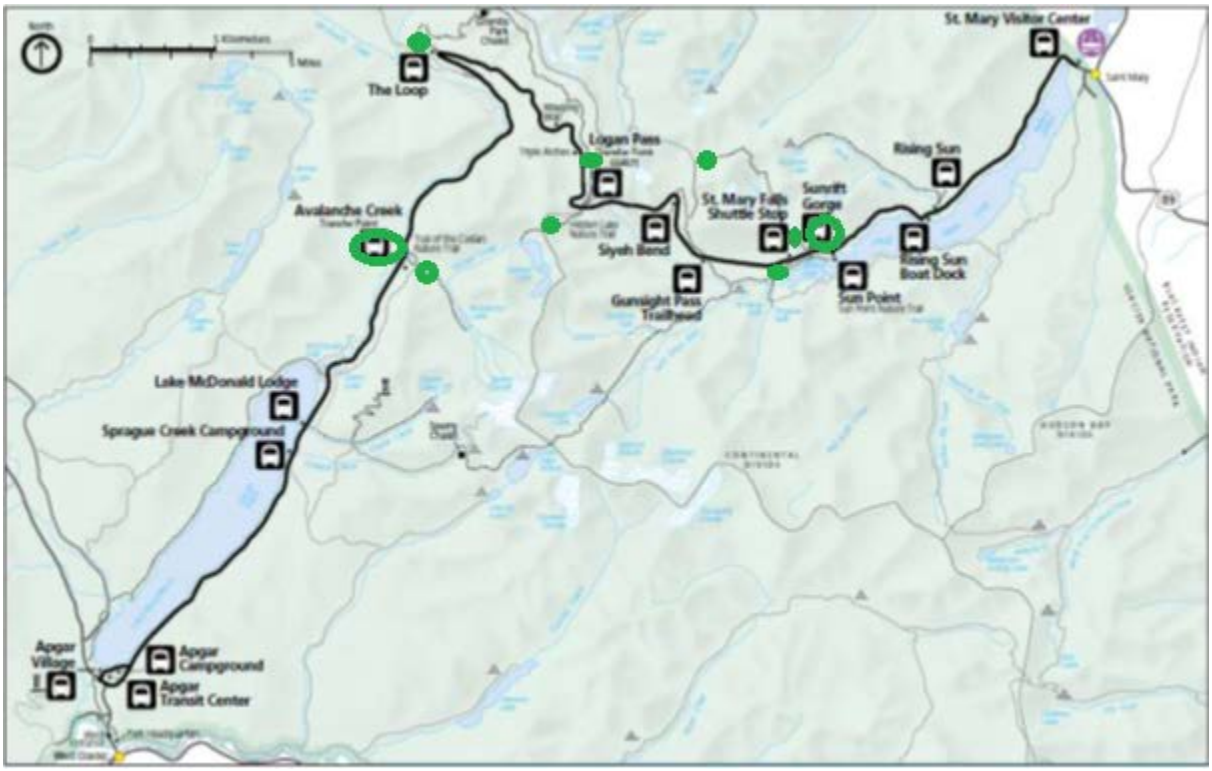

Figure 1 **Location of data collection sites along the GTTSR**.

The data collection method used three approaches or components. The first component was parking lots observations. During the sample days identified for observation, the research crew gathered data on vehicles, visitors, and types of activities in which visitors engaged at Avalanche Lake Trailhead parking lot (the parking area adjacent to the road, the picnic area, and trailhead), and Sunrift Gorge (the parking area adjacent to the shuttle stops and the area located at the east of the bridge). All vehicles in the designated parking area during the observation period were observed. Since use levels, and weather conditions there were 2,073 total valid observations; 55% of those observations included both a start and end time.

The second component involved the use of GPS devices to track hikes at St. Mary Falls and Hidden Lake trail. The research crew followed a recommended protocol for visitor contact. Contact occurred based upon a pre-designed systematic schedule starting with the first available group that would start its hike during the sample time. At the end of the sample period groups were selected depending on the length of stay to avoid giving the GPS to visitors who would take longer than the designed time at the location. One person from each group was selected to carry the GPS. Hikers were approached as they entered the trailheads at St. Mary Falls and Hidden Lake trails. A total of 306 hikes were tracked in both trails; however, not all of them were accurate due to conflicts with satellite reception and other issues. Eighty-one people refused to participate in the study. In addition, crew members observed and recorded information regarding the characteristics of visitors and hiking at locations during the preselected hour sampling period.

The third component involved calibration of eight trail counters installed to assess trail use levels at Avalanche lake, The Loop, Highline trail, Hidden Lake, Siyeh Bend, Sunrift Gorge, St. Mary and Virginia Falls. Crew members placed themselves close to where the trail counter was installed to track with detail every visitor going in or out of the trail during the calibration period. At the end of sampled time the information tracked by the trail counter during the day was collected. There were seven days at Avalanche and four days at the Loop for six hours calibration per day at each place. Also, one day of calibration at Siyeh Bend, four days at Highline trail, five days at Hidden Lake, and six days at Sunrift Gorge of five hour periods. In addition, observations included six days of calibration at St. Mary and Virginia Falls with two days of six hours and the other four days sampled for five hours.

Analysis for components number one and two were made using the IBM Statistical Package for Social Science statistic 19 for windows and Topofusion. For the third component the Trafx Datanet website (www.trafx.net) and Microsoft Excel were used to analyze the data.

1.3 Limitations

During the two first weeks of the July the Going to the Sun Road was closed for snow. Thus, the number of observations calculated was decreased. However, sufficient data was collected to provide a thorough analysis. In addition, the OMB approval for the surveys was not obtained before the summer season. As a result, the information from visitors experience about shuttle and park use was not collected.

1.4 Organization of the Report

This report is divided into four main sections. Following the introduction the second section reports general results of parking use and visitor data characteristic (e.g., state of origin, number of passengers per vehicle, group type, etc.). The third section explores the characteristics of hikers and hikes started from the St. Mary and Hidden Lake Trailheads; the later information was provided by GPS track data. The fourth section addresses the data provided by the trail counters installed in defined trails. Each section offers a discussion and recommendations from the results generated in the study.

Section 2. PARKING LOT OBSERVATIONS

Parking lot usage was observed at Avalanche and Sunrift Gorge. These observations tracked how long groups parked in the parking lots, what activities they appeared to do while parking there, and basic information about group characteristics including group type, group number, and state of residence based on vehicle license plates.

2.1 Avalanche Lake

Avalanche Lake parking area is a highly used and complex area which includes several outlying parking lots. The lots studied were the parking lot directly in front of the restroom facilities, the picnic area (including the shuttles stopping), and the parking lot in front of the Trail of the Cedar's trailhead (Figure 2).

Figure 2 Avalanche study area.

2.1.1 Parking Data

2.1.1.1. Location of Vehicle. Table 1 shows that visitors dominantly used the main parking lot adjacent to the road in front of the restroom facilities (51.6%). However, that location was mainly used as a quick stop for restroom use. Forty-two percent of the observations in Avalanche indicated that visitors left a car at the picnic area, especially when they were going to take the shuttle or hike. The parking lot in front of the Trail of the Cedar's trailhead was only open for two of the nine days Avalanche was monitored. During those two days, that part of the parking lot received 5.5% of the observations. Shuttle vehicles were included in the observations made at the picnic area.

Table 1 Frequency of use per site within the Avalanche parking lot.

	Frequency	Percent
Main lot	1069	51.6
Picnic and shuttle	889	42.9
Trailhead*	115	20.4
Total	2073	100.0

*Percent of the 563 observation that occurred on the two days this parking lot was open

2.1.1.2. Length of Stay. The mean duration of stops at Avalanche was 77 minutes (Table 2) with a median of 50 minutes. One-fourth (25%) of visitors who stopped at Avalanche stayed 14 minutes or less, and 25 percent were there for over two hours (mean 125 minutes).

Table 2 General length of stay.

N	Valid	1479
	Missing	594
Mean		76.71
Median		50.00
Mode		5
Minimum		0
Maximum		356
Percentiles	25	14.00
	50	50.00
	75	125.00

The average length of stay at the main lot was 87 minutes, with a median of 60 minutes and a mode of 10 minutes. The mode was influenced by the frequent use of this location as a quick stoop for restroom use. At the picnic area the duration of stop had a mean of 63 minutes, median of 35 minutes, and mode of five minutes. The mode here was dominated by the short time the shuttles stopped. The parking lot close to the trailhead presented a mean of 90 minutes with a median of 52 minutes. The mode of this location was three minutes, which was explained for the quick stop of visitors who were able to park but were looking for information about the Trail of the Cedars' or were picking up visitors coming from other parking lots or exiting the trail (Table 3).

Table 3 Length of stay per location.

Site within the parking lot	Mean	Median	Minimum	Maximum	Mode
Main lot	87.09	60.00	1	355	10
Picnic and shuttle	62.66	35.00	0	356	5
Trailhead	89.60	52.00	1	304	3

Approximately 29 percent (594 observations) of the 2,073 vehicles observed at Avalanche were parked longer than the six hour observation period. These vehicles were not included in the mean and median parking times. In addition, given the complexity of the area and the limitations of the personal to cover the entire area the crew missed the cars leaving the location 17 percent of the time (Table 4).

Table 4 Observational effectiveness.

	Frequency	Percent
Present and saw depart	337	16.3
Present and did not see depart	35	1.7
Saw arrive and depart	1142	55.1
Saw arrive but not depart	313	15.1
Saw arrive but remained	244	11.8
Present and remained	2	.1
Total	2073	

2.1.1.3. Capacity Used. The parking area was at or above capacity during 49 percent of the observation periods. The lot generally began to fill around 9:30 AM and remained mostly full until around 4:00 PM. The lot adjacent to the street was at capacity or close to capacity the majority of the time. However, since many people stayed for ten minutes or less, there were often sites available and the lot was usually busy with the movement of cars. The high use registered of Avalanche's parking lot may have been the result of the restriction to use the GTTSR during the first two weeks of July in 2011. Due to this restriction Avalanche was a place from where visitors had the chance to access at The Loop via a shuttle.

2.1.1.4. Vehicle Type. Related with the capacity used of the parking lots, the crew observed what types of vehicles were using the parking area. The top five of vehicles shows that SUVs represented the 38 percent of the observations, followed by cars (30%), shuttles (12%), pick-ups (9.5%), and vans (7%) (Figure 3).

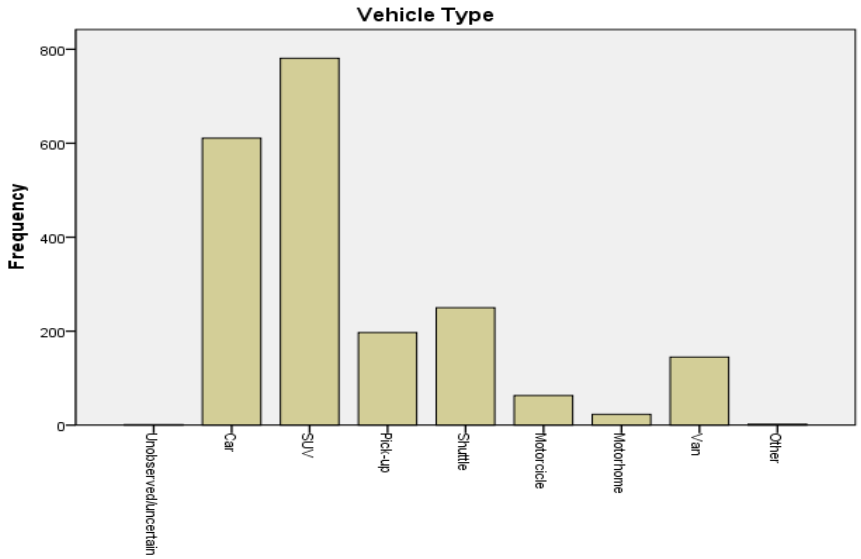

Figure 3 Vehicle type.

2.1.2. Visitor Data

2.1.2.1. State of Origin. The state or province listed on the license plates of vehicles observed at the lots was noted. The largest percentage of cars was from Montana (29.1%) (Table 5). However, that amount may have been affected by rental car license plates. The second large group of observed vehicles corresponded to Shuttles with 12.3

percent of frequency. Though the top ten states, Washington and California also had a high participation (Figure 4).

Table 5 Top 10 of states or provinces.

State	Frequency	Percent
1 Montana	603	29.1
2 Shuttles	256	12.3
3 Washington	203	9.8
4 California	106	5.1
5 Idaho	84	4.1
6 Alberta	76	3.7
7 Utah	63	3.0
8 Colorado	59	2.8
9 Minnesota	59	2.8
10 Oregon	52	2.5

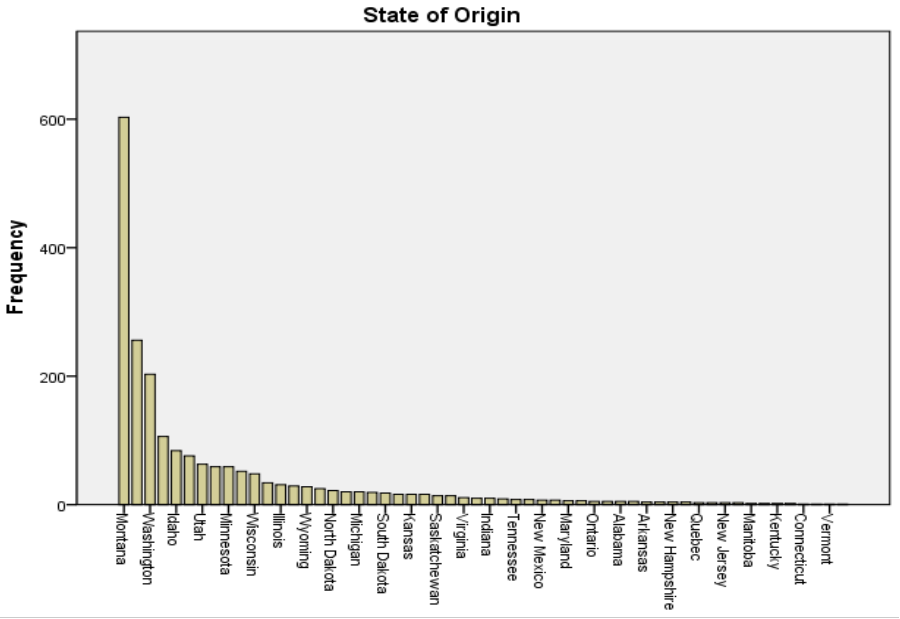

Figure 4 State of origin.

2.1.2.2. Group Type. Visitors were characterized into one of the following categories: alone, couples, friends, family, or family and friends, shuttle groups and other, which included organized groups. Couples referred to a pair of two people who seemed to have a formal relationship; friends and family members in groups of two were excluded

of this category. Thirty-three percent of visitors observed were in a group of family members and twenty-six percent were couples (Figure 5).

In addition, respondents were observed if they were part of an organized tour or group during their visit to the park. Less than 0.4 percent of visitors were observed being part of an organized group or tour. There were just eight observations of organized groups among 2,073 observations made at Avalanche.

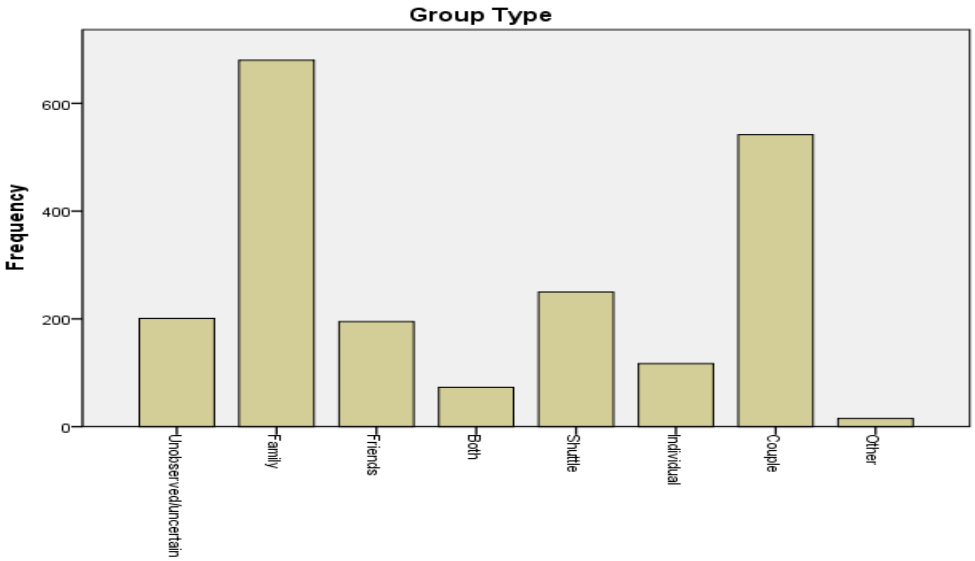

Figure 5 Group type.

2.1.2.3. Group Size. The median party size was two and the mean party size was 3.29 (Table 6). Thirty-four percent of those observed were in a group of two people. The second most common group size was three with 15 percent. In 13 percent of the observations the crew was unable to observe the group size and recorded zero (Figure 6).

Table 6 Group size of visitors.

	Group Size
N	2073
Mean	3.29
Median	2.00
Mode	2
Minimum	0
Maximum	45

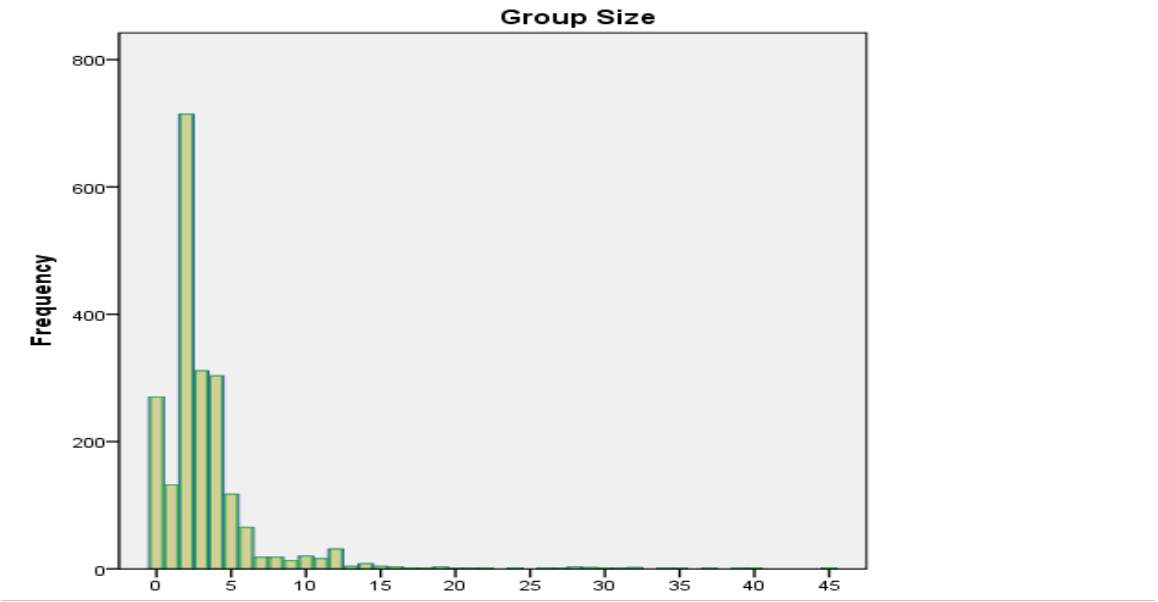

Figure 6 Group size.

2.1.2.4. Activities Observed. Because of the complexity of the Avalanche's parking area, visitors to the area could not be monitored all the times (specifically 24% of the observations). Therefore, observation data for activities was limited. Multiple activities were recorded for each group when possible. The top five activities observed at Avalanche were hiking, quick stop (which includes use of restroom facilities, short hike, or looking at view for less than 20 minutes), shuttle ride, picnicking, and other (include park staff activities or research groups) (Table 7).

Table 7 Top five activities.

Activity	Frequency	Percent
Hiking	969	46.7
Quick stop	264	12.7
Shuttle ride	129	6.2
Picnicking	69	3.3
Biking	31	1.5

In addition, in three percent of the observations, visitors combined hiking with other activities such as picnicking, biking, and riding the shuttle. Accordingly, riding the shuttle was combined with other activities like hiking, picnicking, biking, and restroom use for 1.4 percent of the observations. The shuttle ride was one of the main activities observed in Avalanche the first weeks of July because visitors could gain access to The Loop during this time when the road was otherwise closed.

2.2 Sunrift Gorge

Sunrift Gorge was a much less complex area than Avalanche Lake (Figure 7). As a result, there is more richness in the observation data. However, the short length of stay made it more difficult for observers to track all the vehicles at the location. The parking areas observed during 2011 were adjacent to the shuttle stop, and the area located at the east of the bridge, which we called the main lot. We included the official parking lots and the areas that are not paved but appear to be formal parking areas along side of the road.

Figure 7 Sunrift Gorge study area.

2.2.1 Parking Data

2.2.1.1. Location of Vehicle. Observations at the Sunrift Gorge parking area showed that visitors used the main lot 63.7 percent of the time, while the shuttle stop area was used 36.3 percent of the time (Table 8). Shuttle vehicles were included in the observations made at the shuttle stops' area.

Table 8 Frequency of use per site within the Sunrift Gorge parking lot.

	Frequency	Percent
Main lot	831	63.7
Shuttle area	474	36.3
Total	1305	

Approximately eight percent of the observations were of cars parked at undesignated areas on the side of the road. This fact was especially problematic because it was noted that some cars parked at or very close to the shuttle stops which caused shuttles to have to stop on the road to pick visitors up or drop them off. Consequently, during those times, traffic was stopped for about two minutes (Figure 8).

Figure 8 Parking conflicts at Sunrift Gorge.

2.2.1.2. Length of Stay. The average parking time at Sunrift Gorge was approximately 26 minutes and the median was 14 minutes (Table 9). One forth (25%) of people stayed there for about seven minutes or less, and 25 percent stayed there for longer than 29 minutes.

Table 9 General length of stay.

N	Valid	1181
	Missing	124
Mean		26.32
Median		14.00
Mode		1
Minimum		0
Maximum		284
Percentiles	25	7.00
	50	14.00
	75	29.00

The analysis per location within the parking lot shows that the mean at the main lot was 28 minutes and the median was 15 minutes. The mode was 10 minutes which was influenced by the frequent stops to take pictures. At the shuttle stop lot the mean was 23 minutes and the mean was 13 minutes. The mode in this location was one minute which was dominated by the high observations of shuttles which stop for one minute when there were not people at the stops (Table 10).

Table 10 Length of stay per location.

Site within the parking lot	Mean	Median	Mode	Minimum	Maximum
Main lot	28.09	15.00	10	0	284
Shuttle area	23.34	13.00	1	0	210

Approximately 9.5 percent of the 1,305 vehicles observed at Sunrift Gorge were parked longer than the five hour observation period (Table 11). These vehicles were not included in the mean and median parking times.

Table 11 **Observational effectiveness.**

	Frequency	Percent
Present and saw depart	118	9.0
Present and did not see depart	1	.1
Saw arrive and depart	1063	81.5
Saw arrive but not depart	18	1.4
Saw arrive but remained	98	7.5
Present and remained	7	.5
Total	1305	

2.2.1.3. Capacity Used. Activity generally started at Sunrift Gorge around 10:00 AM and the lots remained busy until approximately 4:00 PM. The lots were rated as full only once during the summer when all possible spots were full, including unmarked parallel spots along the GTTSR of the eastern parking lot. The lots may have appeared full to visitors more of the time since the official parking areas were occupied; however, the areas traditionally used on side of the road were not full at that time. In fact, visitors were observed pulling in and then leaving without parking or considering pulling in and then continuing along the road without parking when the lots were not technically full.

2.2.1.4. Vehicle Type. The dominant vehicles using the parking area were cars and SUVs with 31 and 30 percent respectively. In addition, vans (11%), pick-ups (9%), and motorcycles (9%) were observed. Shuttles accounted six percent of the observations at Sunrift Gorge (Figure 9).

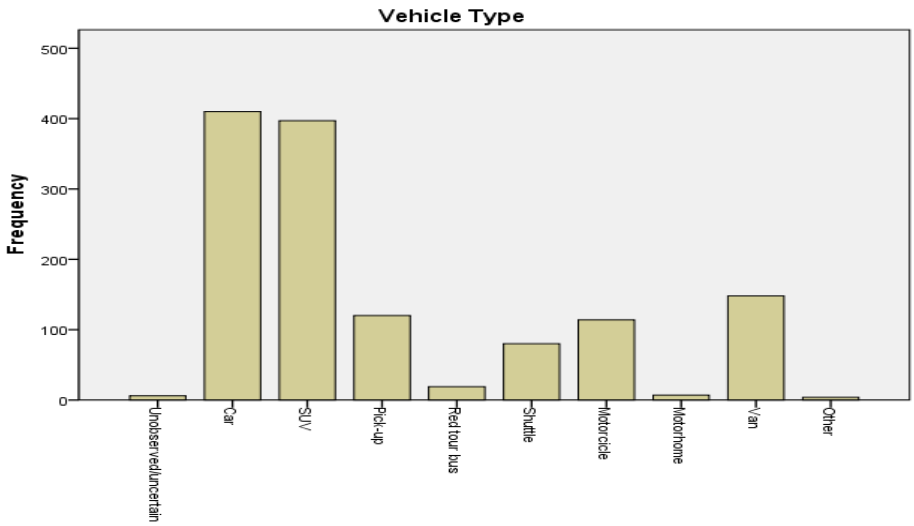

Figure 9 **Vehicle type.**

2.2.2 Visitor Data

2.2.2.1. State of Origin. The information was taken from the license plates of vehicles parked at Sunrift Gorge. Approximately 25 percent of visitors at that location were from Montana (Table 12). However, that fact may have been influenced by rental car license plates. Washington and Alberta were also at the top of the list with 9.4 percent and 8.7 percent respectively. Shuttles accounted for six percent of the observations (Figure 10).

Table 12 Top 10 of states or provinces.

State	Frequency	Percent
1 Montana	321	24.6
2 Washington	123	9.4
3 Alberta	114	8.7
4 Shuttles	80	6.1
5 California	73	5.6
6 Minnesota	62	4.8
7 Idaho	51	3.9
8 Oregon	42	3.2
9 Utah	38	2.9
10 Colorado / Wisconsin	30	2.3

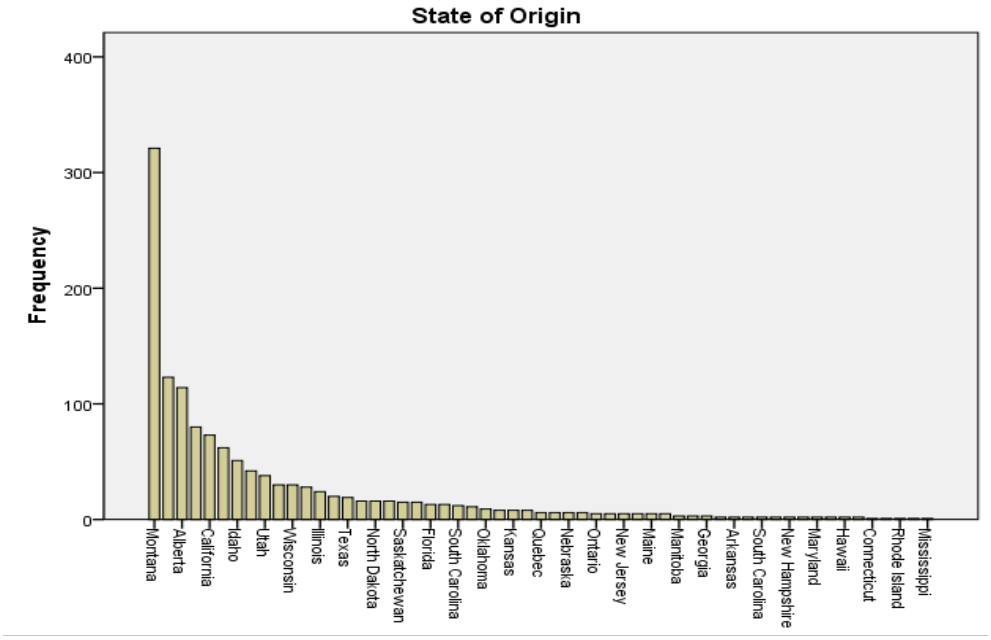

Figure 10 State of origin.

2.2.2.2. Group Type. At the Sunrift Gorge more than 37 percent of visitors observed were couples. Additionally, 31 percent of the visitors were in groups that appeared to include family members. Six percent of the visitors were part of a shuttle group (Figure 11).

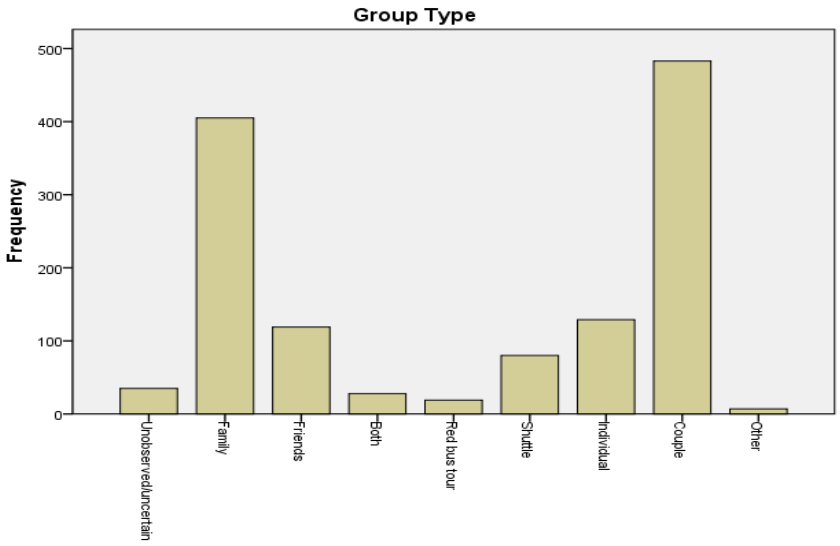

Figure 11 Group type.

A small minority of visitors were part of an organized tour group. In the total sample, less than two percent of the visitors observed were part of an organized tour group. The organized tour groups observed included mainly the red bus tours.

2.2.2.3. Group Size. Among the total observations, the median group number was two and the mean group number was 2.7 (Table 13). Approximately 44 percent of the total sample was in a group of two, followed by 17 percent in groups of four, and 11 percent in groups of three (Figure 12).

Table 13 Group size of visitors.

	Group Size
N	1305
Mean	2.72
Median	2.00
Mode	2
Minimum	0
Maximum	18

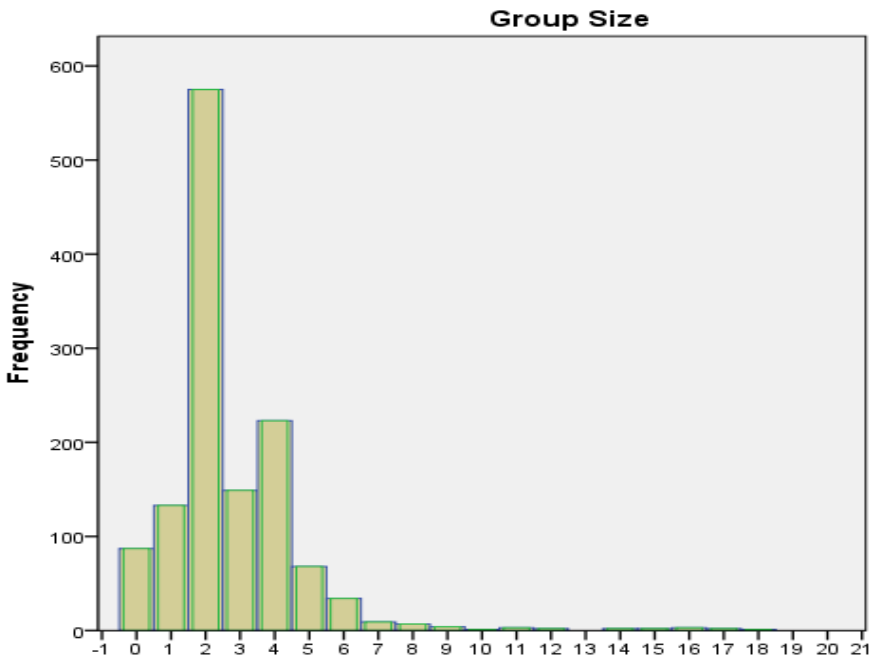

Figure 12 Group size.

2.2.2.4. Activities Observed. The activities that visitors engaged at Sunrift Gorge were noted in the observation component when possible. The top two activities that were observed at Sunrift Gorge were quick stop and hiking (Table 14). This was followed by: other (includes activities like pick tourist up or drop them off, or stop to look at information about shuttle), photography, picnicking and riding the shuttle. The quick stop noted by the crew included taking pictures, view in the gorge and short hikes for less than 20 minutes. Since there is not a designated picnic area at the location, visitors used the bridge, their cars or shuttle seats to eat their food.

Table 14 Top five activities.

Activity	Frequency	Percent
Quick stop	714	54.7
Hiking	412	31.6
Other	12	.9
Photography / Picnic	10	.8
Shuttle	8	.6

2.3 Discussion of Results

There were some issues observed in the Avalanche parking area that may have been the result of an unusual start of the summer season. Many visitors came to Avalanche during the first weeks of July when the GTTSR to take a shuttle ride to The Loop while the remainder of the road was closed. Some visitors, however, arrived before the shuttle system started operations or after it finished during the day. Those visitors were often hikers. Furthermore, hiking and riding the shuttle activities were observed together with other activities like picnicking, and biking. Late in the day visitors mostly came for a quick stop.

In addition, during the times when the parking lots were full, many motorists circled the lots looking for a spot. Accordingly, crew members repeatedly observed that visitors parked at the picnic area in ways that either reduced the capacity of the lot or interfered with traffic flow in the area. It was also observed that appropriate signage about the location of the Trail of the Cedars' was absent from the shuttle stop. Many visitors asked a member of the research team how to get the trailhead.

Sunrift Gorge was lightly used especially in the first hours of the morning until after 10 AM, but during peak hours after 11 AM until 2 PM use was substantial, though the lots were virtually never full. Most stops were short, with a median stop length of fourteen minutes and a mode of one minute. This fact, made it particularly difficult to keep the track of every vehicle coming to the location. The crew noted that many visitors simply got a quick picture and left, and that many times only one person got out of a car. Some visitors to Sunrift Gorge did not appear to know what was there. They stopped and asked the research crew about the place.

In addition, the actual shuttle schedule was off the time marked at the sign at the shuttle stops. Visitors had to wait some times longer than the time scheduled. Shuttle stops were used for visitors to park their vehicles; however, they moved their vehicles as soon as they were aware they were in a shuttle stop. Nevertheless, it was frequent to observe visitors parking very close to the stops, and obstructing the shuttles' approaches to the stops. In addition, seats at the shuttle stops were frequently used for visitors for picnicking. The study team speculated if would be possible to accommodate some facilities for picnickers at the place. Additionally, the study team was concerned about safety for pedestrians moving from the shuttle stops to the trailhead or back.

SECTION 3. HIKES

GPS devices were given to visitors to better understand trail use at the St. Mary Falls, Virginia Falls and the Hidden Lake trails. The recorded GPS tracks demonstrate the amount of time visitors spent on the trail, the routes used and where people congregate within those areas. Thus, 311 random groups of visitors were asked to carry a GPS unit with them as they departed the trailheads at either the St. Mary Falls or Hidden lake trails during the summer of 2011 (Figure 13). Three different models of GPS were used for the study: Garmin Etrex Legend, Garmin GPSmap 60Cx, and Garmin GPSmap 62s. Unfortunately, the Etrex Legend model often presented reception difficulties as hikers approached areas shaded by vegetation and topography since it has a less sophisticated technology. The tracking function of the GPS was turned on and each route was uploaded into the computer program Topofusion version 4.20 immediately after the hiker returned to the trailhead. This program allowed us to see and analyze the details of the routes individually or cumulatively, both graphically and empirically.

Figure 13 Participants of the GPS study at Hidden Lake trailhead.

3.1 St. Mary Falls

During seven days of July (13th to 15th, and 26th to 29th) visitors were asked to carry a GPS unit during their hikes. In total 203 visitors were approached at the trailhead. Of those, 173 agreed to participate which was approximately 84% of those we contacted. Figure 14 depicts the range of routes that visitors explored within the St. Mary and Virginia Falls locations.

Figure 14 Routes used by hikers at St. Mary Falls area.

3.1.1 GPS Data.

Of the 173 visitors to St. Mary Falls that were willing to carry a GPS, 93 tracks were unusable due to the GPS units being accidently turned off, batteries died, and poor satellite reception. In total 80 tracks allowed us to make the complete analysis of trail use in the area.

3.1.1.1. Destination. The most popular hiking destination was Virginia Falls with a 43.8% of frequency, followed by St. Mary Falls (31.3%) and the Overlook one found along the trail between the previously mentioned falls (13.8%) (Figures 15 and 16).

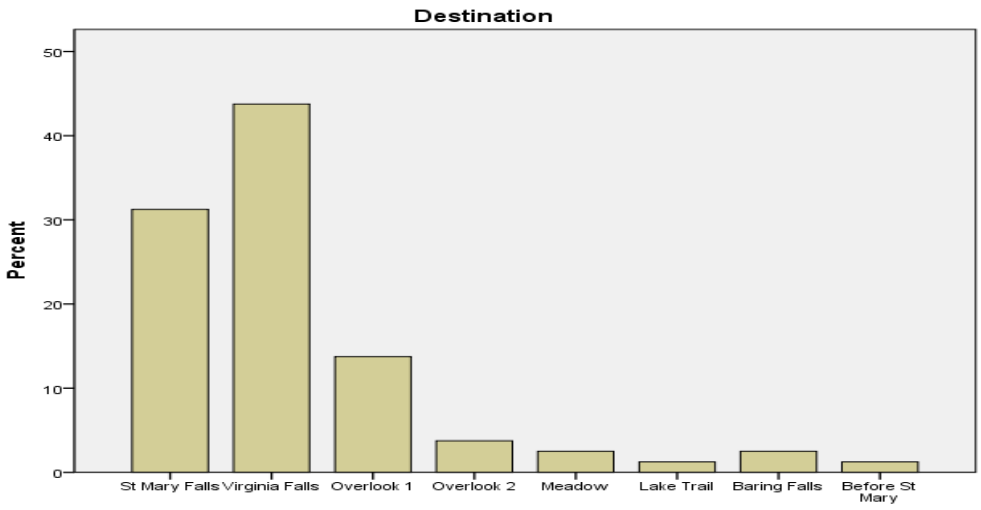

Figure 15 Popular hike destinations at St. Mary Falls.

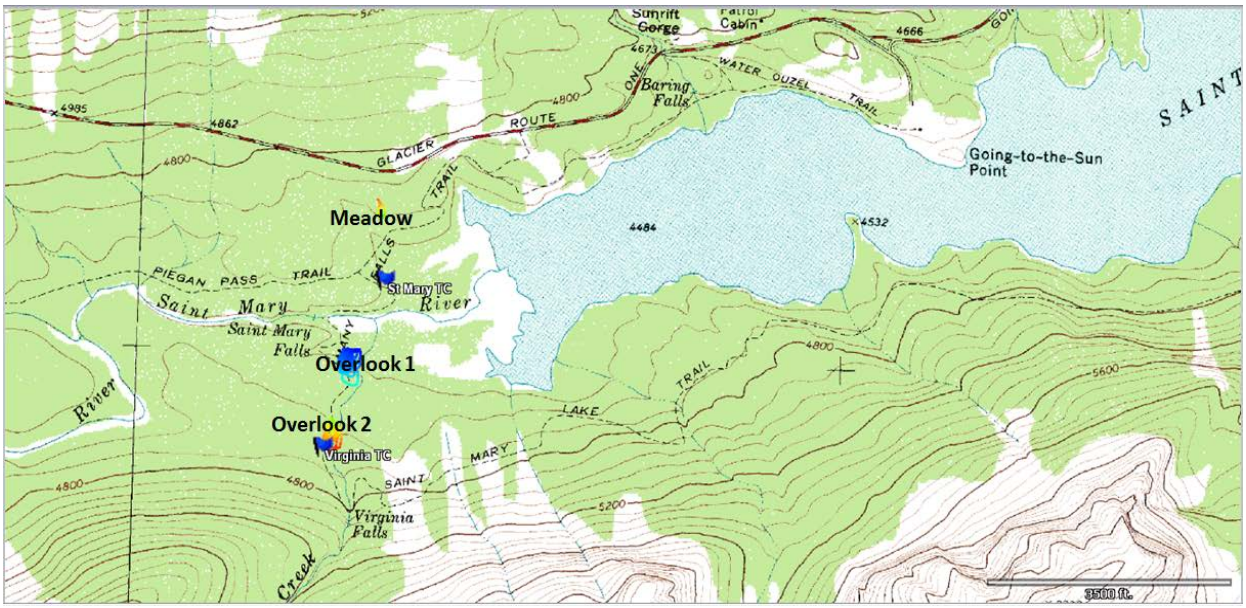

Figure 16 Location of the popular destinations and stops at St. Mary Falls.

Based on the GPS track records, the aggregated mean duration of stops at the hike destinations was 9.17 minutes. The median duration of stop at the destination was eight minutes. Both the mean and distribution of stop durations varied greatly by destination (Standard deviation 7.4). Table 15 shows with detail the length of stops at each destination.

Table 15 Time stopped at St. Mary Falls destinations.

Destination	Mean	N	Std. Deviation	Median	Minimum	Maximum
St Mary Falls	8.36	25	4.881	9.00	0	18
Virginia Falls	11.69	35	8.697	11.00	0	39
Overlook 1	7.82	11	5.618	7.00	0	16
Overlook 2	5.00	3	8.660	.00	0	15
Meadow	.00	2	.000	.00	0	0
Lake Trail	.00	1	.	.00	0	0
Baring Falls	7.50	2	10.607	7.50	0	15
Before St Mary	.00	1	.	.00	0	0
Total	9.17	80	7.441	8.00	0	39

3.1.1.2. Length of Hike. Within the 80 visitor tracks, the mean distance walked was 2.61 miles with a median of 2.56 miles (Table 16). This distance corresponds closely with the distance to the falls located before to the Virginia Falls (Overlook 2).

Table 16 Length in miles (round trip) per destination.

Destination	Mean	N	Std. Deviation	Median	Minimum	Maximum
St Mary Falls	1.6728	25	.1103	1.6600	1.3800	1.9300
Virginia Falls	3.3400	35	.4126	3.2900	3.0400	5.5000
Overlook 1	2.1200	11	.0713	2.1100	2.0100	2.2100
Overlook 2	2.5833	3	.0493	2.5600	2.5500	2.6400
Meadow	.3250	2	.0212	.3250	.3100	.3400
Lake Trail	5.9200	1	.	5.9200	5.9200	5.9200
Baring Falls	5.8200	2	.0849	5.8200	5.7600	5.8800
Before St Mary	1.1700	1	.	1.1700	1.1700	1.1700
Total	2.6146	80	1.0878	2.5550	.3100	5.9200

3.1.1.3. Average Hiking Time. Based on Topofusion data (Table 17) for total time of each hike, the aggregated mean of 80 hikes at St. Mary Falls was 85.70 minutes. The median hike time was 76 minutes. In addition, visitors moved at an average of speed of 2.17 MPH. Thus, visitors moved 74 minutes in average and stopped for about 11 minutes. The total stopped time includes all of the non-moving time along the trail. In relation to the topography of the area, visitors spent on average 29 minutes going uphill, 30 minutes in the way down, and 14 minutes going over flat ground.

Table 17 Averages of time spent at St. Mary Falls area.

Statistics		Total Hike in Minutes	Average Speed (MPH)	Total Moving time in Minutes	Total Stopped time in Minutes	Total Uphill Time in Minutes	Total Downhill time in Minutes	Total Flat Time in Minutes
N	Valid	80	80	80	80	80	80	80
Mean		85.70	2.166	73.76	10.78	29.01	29.95	13.64
Median		76.00	2.100	69.00	7.50	27.50	29.00	5.00
Mode		74	1.9	48	3	0	0	3
Std. Deviation		42.392	.4094	35.535	11.751	15.928	16.560	31.651
Minimum		11	1.4	5	0	0	0	0
Maximum		217	3.6	194	55	67	76	194

3.1.1.4. Stop Locations. To make this report more informative, we separated the information about destinations and stops collected during the study. Destinations referred to the places visitors went as their final location before returning from their hikes. Stops were all the places where hikers stopped for more than three minutes along the trails. Within our sample of 80, visitors stopped at six discrete sites while on

the St. Mary Falls hike (Figure 16). Forty-six percent of all visitors stopped at St. Mary Falls when this place was not their main destination. The next most popular sites to stop were the overlook one (30.8%) and overlook two (12.3%) along the road between St. Mary and Virginia Falls. However, during the calibration time the crew noticed that some visitors stopped by the falls called "overlook two" thinking they were Virginia Falls. Visitors stopped by Virginia Falls (7.7%) in their hikes to the St. Mary Lake trail and Baring Falls (Figure 17).

Figure 17 Popular stops at St. Mary Falls area.

Table 18 Stops of three minutes or longer per group sampled at St. Mary Falls trail.

Number of Stops	Frequency	Percent	Cumulative Percent
.00	42	52.5	52.5
1.00	21	26.3	78.8
2.00	9	11.3	90.0
3.00	6	7.5	97.5
4.00	2	2.5	100.0
Total	80	100.0	

Forty-two groups (53%) of 80 groups sampled never made a stop for more than three minutes during their hike (Table 18). For those who did stop, Table 19 shows the average time per stop at each location. On average, visitors stopped for 9.31 minutes at the different locations along their hikes. In addition, the groups stopped on average 0.825 times during their hike (Standard deviation of 1.07 times).

Table 19 Average time of stops at St. Mary Falls area.

Location Stopped	Mean	Std. Deviation	Median	Minimum	Maximum
St Mary Falls	7.27	3.331	6.00	4	17
Virginia Falls	17.00	10.677	12.00	6	32
Overlook 1	10.35	6.564	7.00	4	30
Overlook 2	10.75	4.683	11.00	4	19
Meadow	5.00	.	5.00	5	5
Baring Falls	4.00	.	4.00	4	4
Total	9.31	5.937	7.00	4	32

3.1.2 Visitor Data

3.1.2.1. Group Type. Visitors were characterized into one of the following categories: alone, couples, friends, family, or family and friends, shuttle groups, red bus tour groups, and other, which included organized groups. Couples referred to a pair of two people who seemed to have a formal relationship; friends and family member in groups of two were excluded of this category. Forty percent of visitors observed were couples and 39 percent were in a group of family members (Figure 18).

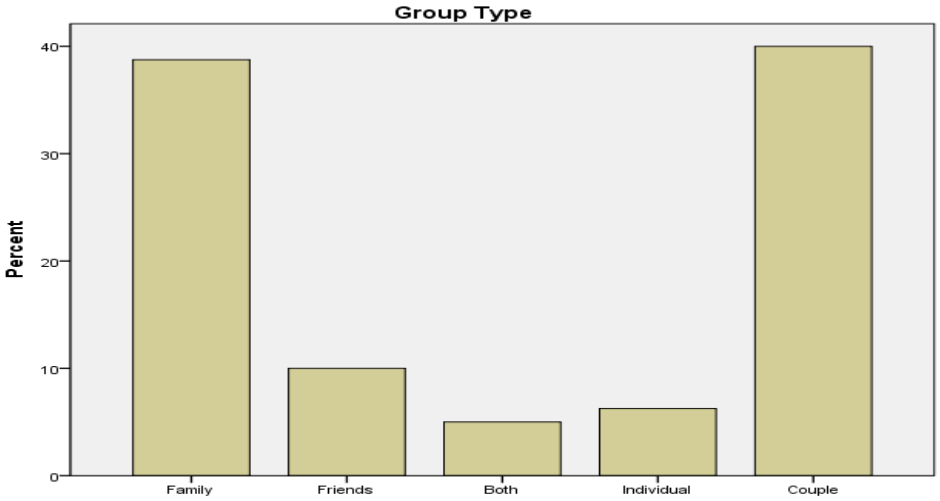

Figure 18 Hiker group types.

3.1.2.2. Group Size. The sizes of the hikers groups were observed during the study. The median party size was two; the mean party size was 3.16 (Table 20). Thirty-nine percent of those observed were in a group of two people. The second most common

group size was four with 19 percent, followed by groups of three people (10%) (Figure 19).

Table 20 Hiker group size at St. Mary Falls area.

N	Valid	80
	Missing	0
Mean		3.16
Median		2.00
Mode		2
Std. Deviation		1.952
Minimum		1
Maximum		13

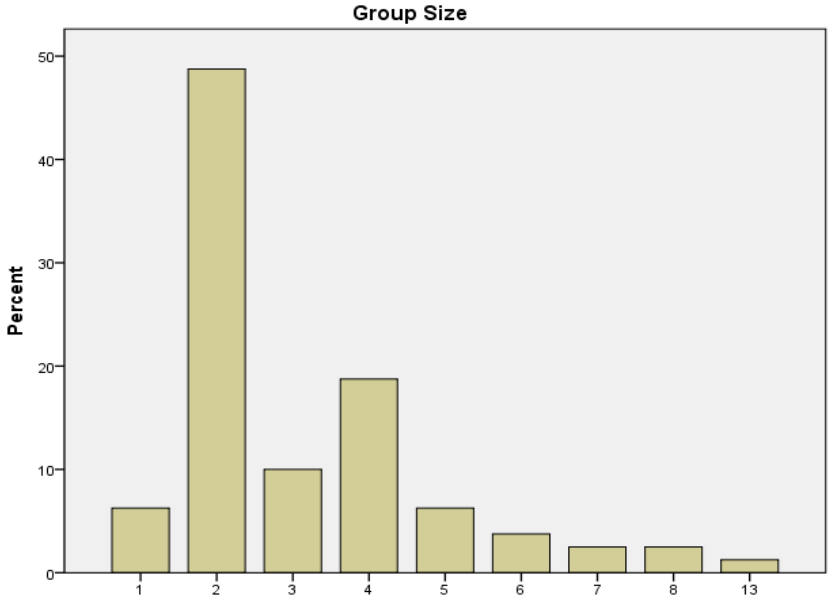

Figure 19 Hiker group size.

3.1.2.3. Average Age. The age group of hikers was observed and estimated (Figure 20). Thirty-two percent of the hikers were in groups of just adults, and thirty percent were groups of adults estimated to be over fifty. Sixteen percent were groups of adults including some people over fifty. Children were with adults 12.5 percent of the time and with adults over fifty 2.5 percent of the observations. Groups composed by people representing the three categories were observed 6.3 percent of the time.

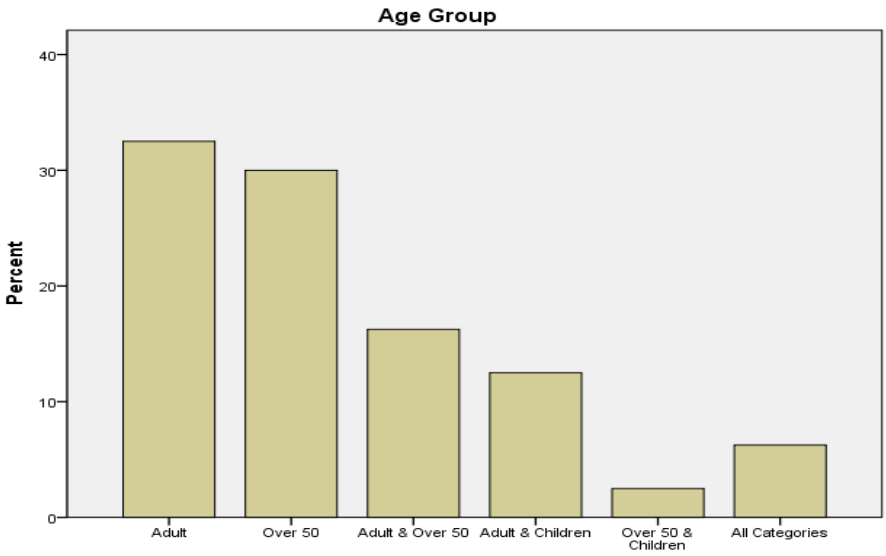

Figure 20 Age of hikers.

3.2 Hidden Lake Trail

During the week of August 20th to 24th visitors to the Hidden Lake location were asked to carry a GPS unit during their hikes. A total of 184 visitors were approached at the trailhead during the five days of the study. Of those, 51 visitors rejected and 133 agreed to participate in the study. Figure 21 illustrates the routes that visitors explored within our location of interest. It is important to mention that the access to the Hidden Lake was closed during the 21st and 24th, so data on hikes to the actual lake were recorded only on the August 20th.

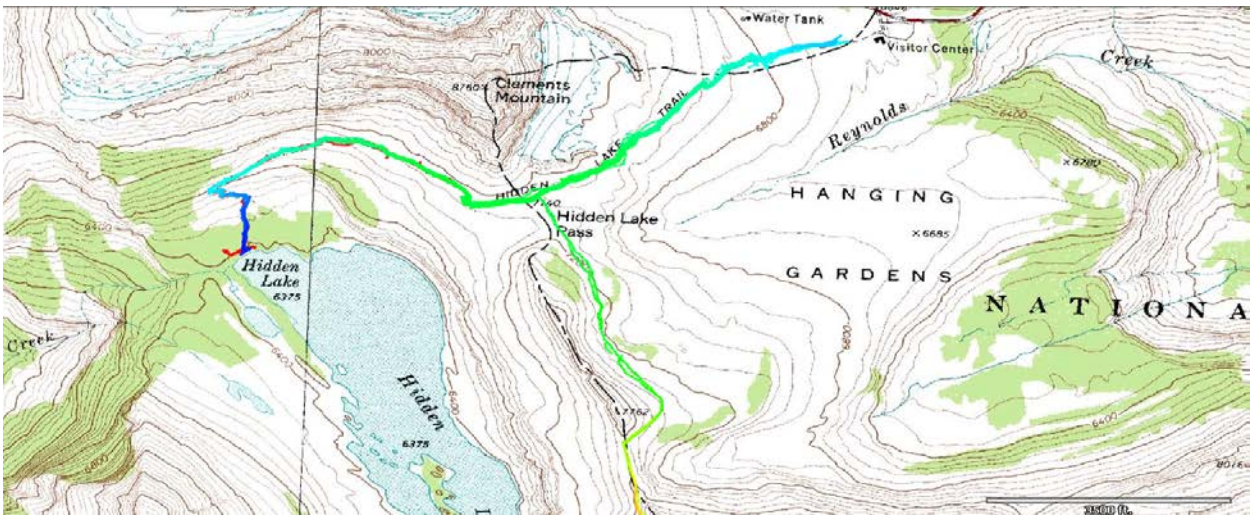

Figure 21 Routes used by hikers at Hidden Lake trail.

3.2.1 GPS Data

Of 184 visitors approached at Hidden Lake trailhead, 133 were willing to participate in the GPS study. Of those 133 tracks saved 64 were not useable due to trouble with GPS units (e.g. the batteries died part way, poor satellite reception, or human mistakes). In total 69 tracks fulfilled the requirements for the statistical analysis of trail use in the area.

3.2.1.1. Destination. The Overlook was the most popular hike destination with a 71 percent of the visitors choosing it as their preferred place to complete their tour to the Hidden Lake trail. The Top of the Boardwalk was the second favorite destination with 10 percent of the visitors turning around there. The Hidden Lake and the halfway up the Boardwalk were both destinations for 5.8 percent of the visitors (Figures 22 and 23). However, Hidden Lake information was constrained to first day of the study due to a bear closure.

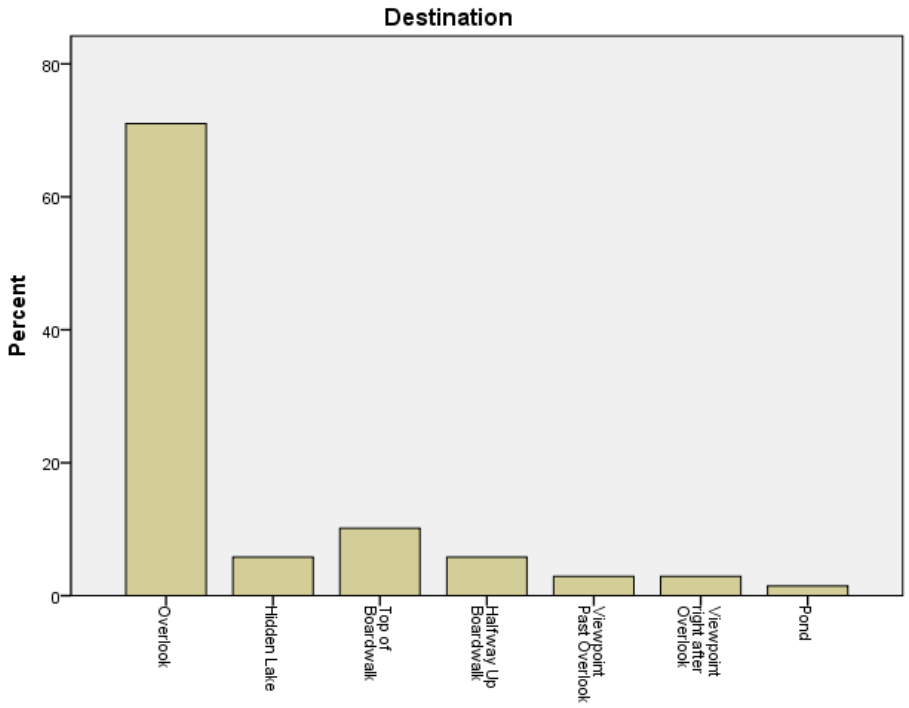

Figure 22 Popular destinations at Hidden Lake trail.

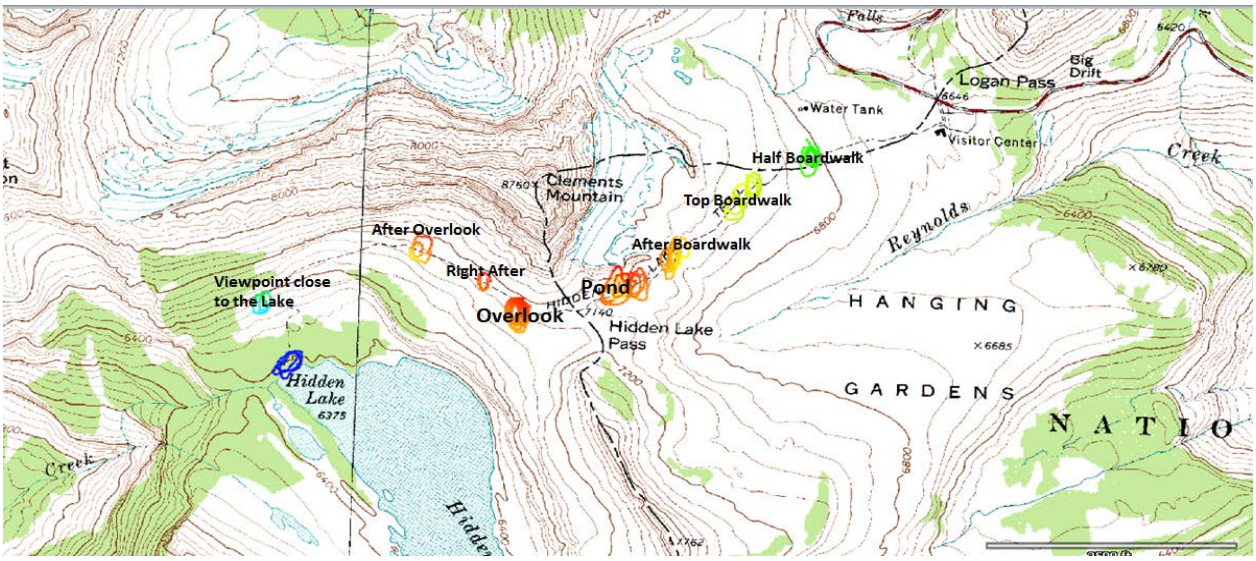

Figure 23 Map of the popular destinations and stops at Hidden Lake trail.

Overall, the mean duration of stop at the hike destination was approximately 16 minutes, with a median of 13 minutes. The maximum length of stop was 48 minutes, and seven cases reported no stop at the destination. Table 21 displays time stopped at each location. Note that averages vary significantly by destination.

Table 21 Time stopped at Hidden Lake trail destinations.

Destination	N	Mean	Std. Deviation	Median	Minimum	Maximum
Overlook	49	16.94	12.345	15.00	0	48
Hidden Lake	4	29.50	11.818	33.00	13	39
Top of Boardwalk	7	6.29	5.619	6.00	0	16
Halfway Up Boardwalk	4	4.25	4.924	4.00	0	9
Viewpoint Past Overlook	2	14.00	4.243	14.00	11	17
Viewpoint right after Overlook	2	19.00	9.899	19.00	12	26
Pond	1	.00	.	.00	0	0
Total	69	15.58	12.347	13.00	0	48

3.2.1.2. Length of Hike. According to the aggregated information from 69 visitors' tracks, the average round trip distance walked at the Hidden Lake trail was 2.44 miles, and a median of 2.5 miles. This distance corresponded greatly with the length from the Visitor Center to the Overlook. However, it is pertinent to remember that the access to the lake from the overlook was closed during four of the five days of the study which may have reduced the overall average length of trip. In fact, the maximum length was 5.7 miles

which was taken from a track to the lake. Table 22 shows the average length for each destination.

Table 22 Length in miles (round trip) per destination.

Destination	N	Mean	Std. Deviation	Median	Minimum	Maximum
Overlook	49	2.5378	.12936	2.5100	2.26	3.00
Hidden Lake	4	5.0750	.41932	4.9000	4.80	5.70
Top of Boardwalk	7	.9829	.24534	1.0300	.57	1.32
Halfway Up Boardwalk	4	.7375	.57933	.5000	.35	1.60
Viewpoint Past Overlook	2	3.3000	.14142	3.3000	3.20	3.40
Viewpoint right after Overlook	2	2.9300	.04243	2.9300	2.90	2.96
Pond	1	1.9300	.	1.9300	1.93	1.93
Total	69	2.4474	.93647	2.5000	.35	5.70

3.2.1.3. Averages Hiking Time. Table 23 displays the average time spent at the Hidden Lake trail based on 69 hikes tracked. Data suggested that visitors moved at an average of speed of 1.84 MPH. The aggregated mean hike time was 106 minutes, with a median hike time of 100 minutes. In addition, visitors moved 81 minutes in average and stopped for about 25 minutes. The total stopped time includes all non-moving time along the trail. According to the topography of this hike, visitors spent on average 33 minutes going uphill, 32 minutes in the way down, and 16 minutes going over flat ground.

Table 23 Averages of time spent at Hidden Lake trail.

Statistics	Average Speed (MPH)	Total Hike in Minutes	Total Moving time in Minutes	Total Stopped time in Minutes	Total Uphill Time in Minutes	Total Downhill time in Minutes	Total Flat Time in Minutes
N	69	69	69	69	69	69	69
Mean	1.842	106.12	81.20	24.45	33.30	31.67	15.57
Median	1.900	100.00	79.00	19.00	35.00	32.00	10.00
Mode	1.9	105	74[a]	6[a]	32[a]	33	10
Std. Deviation	.3108	53.085	37.327	20.846	17.193	15.804	30.585
Minimum	1.1	17	14	1	0	0	1
Maximum	2.5	298	235	95	91	73	235

a. Multiple modes exist. The smallest value is shown.

3.2.1.4. Stop Locations. Visitors stopped for more than three minutes at eight discrete places while on the Hidden Lake trail (Figure 24). Thirty-one percent of visitors stopped after the top of the boardwalk. Nearly the 17 percent of visitors stopped at the pond between the boardwalk and the overlook. The next most popular sites to stop were the overlook and top of boardwalk with 14.6% each, and the halfway up the boardwalk (12.5%). Nevertheless, it was observed by the crew that visitors stopped in any place where wildlife was encountered along the trail.

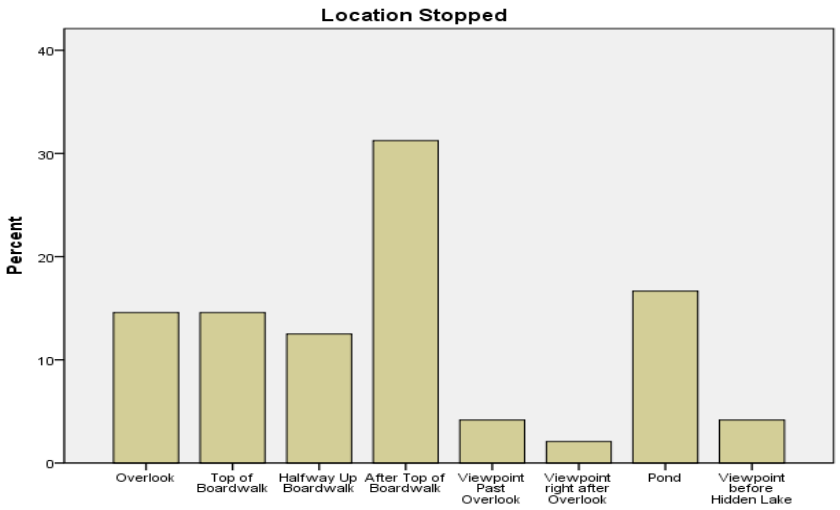

Figure 24 Popular stops at Hidden Lake area.

In addition, the groups stopped on average 0.7 times during their hike (Standard deviation of 1.28 times). Forty-six groups (66%) of 69 groups sampled made no stops for more than three minutes during their hike (Table 24). In those locations visitors stayed in average 7.77 minutes (with a median of 7 minutes). Table 25 demonstrates the stop length at each location.

Table 24 Stops of three minutes or longer per group sampled at Hidden Lake trail.

Number of Stops	Frequency	Percent	Cumulative Percent
0	46	66.7	66.7
1	12	17.4	84.1
2	4	5.8	89.9
3	2	2.9	92.8
4	3	4.3	97.1
5	2	2.9	100.0
Total	69	100.0	

Table 25 Average time of stops at Hidden Lake trail.

Location Stopped	Mean	Std. Deviation	Median	Minimum	Maximum
Overlook	12.71	8.712	11.00	4	30
Top of Boardwalk	5.14	1.215	5.00	4	7
Halfway Up Boardwalk	6.50	2.588	6.00	4	10
After Top of Boardwalk	6.33	2.526	5.00	4	11
Viewpoint Past Overlook	4.00	1.414	4.00	3	5
Viewpoint right after Overlook	8.00	.	8.00	8	8
Pond	9.50	4.957	8.00	4	18
Viewpoint before Hidden Lake	11.00	.000	11.00	11	11
Total	7.77	4.826	7.00	3	30

3.2.2 Visitor Data

3.2.2.1. Group Type. Visitors at Hidden Lake were recorded in one of the following categories: alone, couples, friends, family, or family and friends, shuttle groups, red bus tour groups, and other, which included organized groups. Forty-five percent of visitors observed were part of a group of family members and thirty-nine percent were couples (Figure 25).

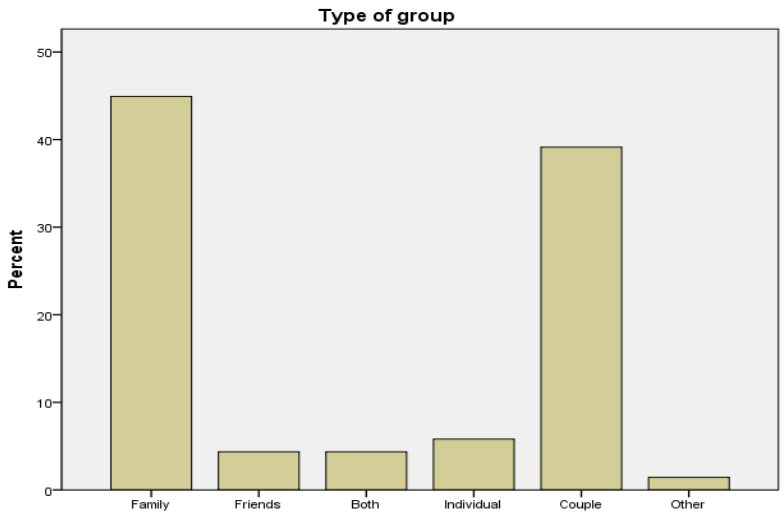

Figure 25 Hiker group types.

3.2.2.2. Group Size. Among the total 69 observations, the median group size was two and the mean group size was 3.55 (Table 26). Approximately 51 percent of the total groups participating at the GPS study was a group of two people, followed by groups of four (14.5%), and groups of three (11.6%) (Figure 26).

Table 26 Hiker group size at Hidden Lake trail.

N	Valid	69
	Missing	0
Mean		3.55
Median		2.00
Mode		2
Std. Deviation		4.954
Minimum		1
Maximum		42

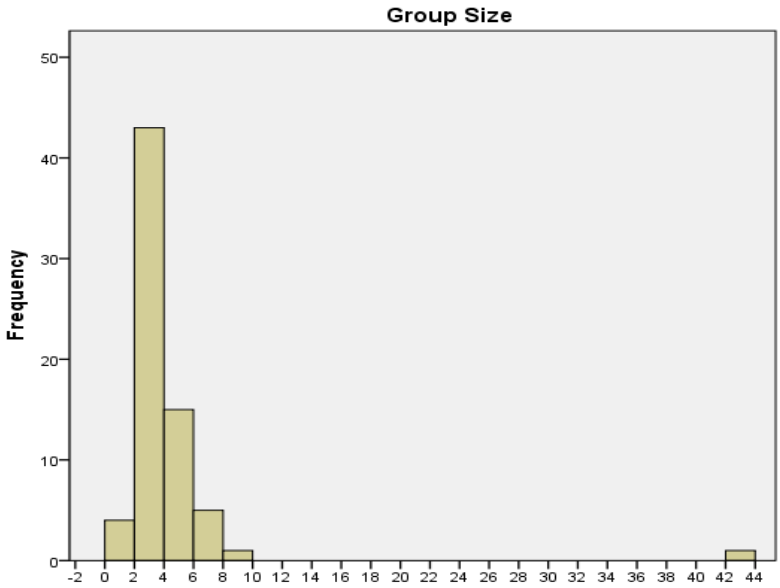

Figure 26 Hiker group size.

3.2.2.3. Average Age. The age of the members of hikers groups was noted by the crew according to three categories children, adults, and adults over fifty (Figure 27). Thirty percent of the hikers were in groups of just adults. Groups of adults over fifty and also groups of adults with children occurred in 23 percent of the observations. Nineteen percent were groups of adults and people over fifty. Groups composed by people representing the three categories were observed 4.3% of the time.

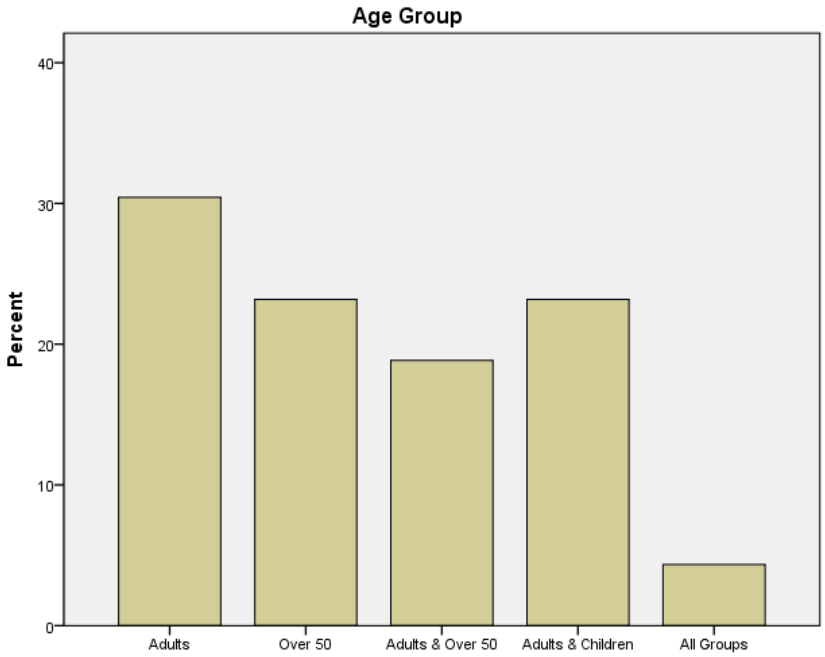

Figure 27 Hiker age group.

3.3 Discussion of Results

At the St. Mary Falls location, nearly 44 percent of the visitors we tracked went all the way to Virginia Falls, but they make a stop at the St. Mary Falls. Some stopped at other viewpoints along the way, or went up to the St. Mary Lake trail or the Baring Falls and then turned back. Indeed, the longest visits were by those who visited the Baring Falls and the St. Mary Lake trail. Those visits averaged 5.8 and 5.9 miles in distance, and 209 minutes and 162 minutes in length respectively.

It is import to clarify that the results which showed Virginia Falls as the predominant destination for hikers rather than St. Mary Falls contradicted the findings of the trail use given by the trail counters installed (those results will be discussed in the fourth section). Although the study crew tried to take a random sample, the sample could have been biased for people who had time to do a longer hike and were also willing to participate in the study. Moreover, it could have been the case that more of the tracks erased for bad quality had the destination to St. Mary Falls. For the purpose of this study, the results provided for the GPS study were taken as informative for length of the hikes and visitor behavior along the trail rather than level of use of the trail.

The crew observed that the parking lot started to fill up around 10 AM and remained heavily used until about 4 PM. It was often difficult to find a spot available to stop during the peak hours. In fact, many vehicles parked on sidewalks of the GTTSR. People stayed for about an hour and half to make a hike to the falls.

In addition, hikers coming from Sun Point or Baring Falls were occasionally disoriented when exiting the trail. There was not a sign to indicate to them where to find the shuttle stop. Appropriate information about the shuttle stop should be posted on the trail billboard located at the trailhead.

During the days of the study at Hidden Lake trail the access to the lake was closed due to bear activity. Consequently, the results about destination preferred by visitors, (e.g., length of hike, places stopped, etc.) may have been different under normal conditions. Therefore, an additional study of hiking use of this area is necessary in further seasons.

Logan Pass is an area where wildlife interactions are common. The study team noted that hikers at the Hidden Lake trail stopped where they find wildlife. The seemingly-constant presence of mountain goats leaded to visitors following the animals and taking pictures, so diverse stops were tracked along the trail. Moreover, due the presence of snow in some spots it was difficult to keep tracking one single route along trail. The trail is also very wide allowing visitors to go elsewhere to take pictures and view the landscape or wildlife present in the area.

SECTION 4. TRAIL COUNTER DATA

The Infrared Trail Counter is a device designed to count warm, moving objects like hikers, horseback riders, snowmobiles, deer, etc. (Figure 28). It continually monitors the amount of infrared energy within its field of view and when there is a significant change from the ambient amount, a count is recorded. The infrared scope has a 10 degree field of view that widens with distance, like a narrow spot light. The maximum detection distance is approximately 20 ft.

Figure 28 Infrared trail counter.

The trail counters' default settings were set to collect data via timestamps during the summer. This setting recorded the date/time of each event. Events were considered as every time a visitor walked in front of the trail counter. The timestamp setting allowed maximum detail in the data but required considerable memory to store the data. Consequently, during the fall season hourly period totals were used on the trail counters rather than timestamps. Using hourly periods was much more memory efficient than timestamps.

In addition the default value for delay of 030 (1.5 seconds) to 025 (1.25 seconds delay) was used on all counters. These delay times capture traffic that moves quickly along the trails. When a warm object (e.g. hikers, wildlife) enters the infrared scope's field of view, a count is initiated. However, it takes time for a warm object (and the heat trail it

creates) to completely pass through the field of view, and for the sensor to re-stabilize. Therefore, a delay is used to avoid multiple counts from the same object. Although some double counts may have occurred, this was compensated by occasions when two or more people were walking side-by-side on the trail and were counted as one.

Infrared trail counters were installed at eight trails along the GTSR, specifically at Avalanche Lake, The Loop, Highline, Hidden Lake, St Mary and Virginia Falls, Siyeh Bend and Sunrift Gorge during the summer season (Appendix B). Data analysis was completed using the TRAFx DataNet (http://www.trafx.net/), and Microsoft Excel.

4.1 Trail Use across the Corridor

There is considerable variation in the use levels that trails within the corridor receive, both across trails and across seasons (Table 27). Trails close to the pass (The Loop, Highline and Hidden Lake trails) were only monitored during a short window in the summer season when the snow was cleared enough for hiking. During the summer season, the Hidden lake trail is the most heavily used within the corridor (mean = 811 people per day) followed by Avalanche lake (mean = 796) and the highline trail (mean =623). In contrast, the Siyeh bend and Sunrift Gorge trails average 50 or less visitors per day in the summer. Fall use levels are substantially lower than those in the summer.

4.2 Avalanche Lake

The trail counter at the Avalanche lake trail was installed on July 18th and taken down November third. The trail counter was located at the coordinates Northing 5395170, Easting 0293139, and Zone 12 UTM (Figure 29). The elevation was 3,425 feet. The trail offered settings with enough shade from the dense forest and spots free of short vegetation which may overheat due to the sun and in turn overheat the infrared device causing it to function erratically (e.g., extremely high counts). However, it was quite difficult to find a narrow spot along the trail since the trail is fairly wide and visitors often walk side-by-side. The trail counter was installed at a 3 feet of distance from the trail, and approximately 0.72 miles from the trailhead.

Table 27 Trail counters: Summary of Results

	Avalanche Lake Trail	The Loop	Highline Trail	Hidden Lake Trail	Siyeh Bend Trail	Sunrift Gorge Trail	St. Mary Falls Trail	Virginia Falls Trail
General Findings								
Total number of days monitored	103	36	15	16	69	87	100	100
Total visitation registered	45,620	9,678	9,338	12,971	3,416	4,019	37,005	13,960
Daily Average	443	269	623	811	50	46	370	140
Total visitation estimated	68,238	15,652	19,299	40,280	6,853	6,090	45,465	17,833
Maximum visitation in a single day	1,185	418	779	1,054	186	156	856	605
Minimum visitation in a single day	8	98	353	51	0	0	3	0
Summer Findings								
Total number of days monitored	43	36	15	16	27	42	55	55
Total visitation registered	34,217	9,678	9,338	12,971	2,665	3,447	32,143	12,387
Daily Average	796	269	623	811	98.7	81.9	584	225
Total visitation estimated	55,170	15,652	19,299	40,280	5,642	5,185	39,102	15,719
Maximum visitation in a single day	1,185	418	779	1,054	186	156	856	605
Minimum visitation in a single day	382	98	353	51	13	6	273	90
Fall Findings (Beginning September 6)								
Total number of days monitored	59	NA	NA	NA	42	45	45	45
Total visitation registered	11,403	NA	NA	NA	751	578	4,862	1,573
Daily Average	193	NA	NA	NA	18	13	108	35
Total visitation estimated	13,068	NA	NA	NA	1,210	906	6,363	2,114
Maximum visitation in a single day	525	NA	NA	NA	84	72	350	168
Minimum visitation in a single day	8	NA	NA	NA	0	0	3	0

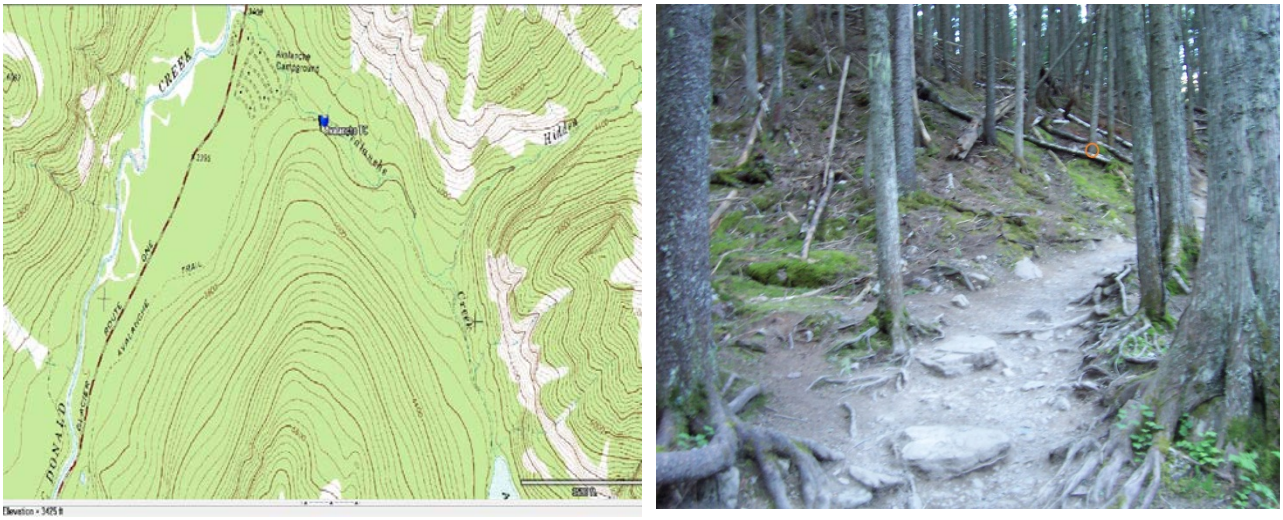

Figure 29 Map and location of Avalanche Lake trail counter.

Since the trail counters are not 100 percent accurate, a person from the research crew was placed on the trail to calibrate the trail counter. That activity involved comparing visual counts recorded by an attentive person to those recorded by the counter over several hours. The calibration of Avalanche trail counter occurred during six hours periods on two separate days: July 20th from 8 AM to 2 PM, and 2 PM to 8 PM on July 21st. The results of the calibration showed a difference of 85 counts during the first period, and 141 counts on the second day (Appendix C).

The adjustment factor obtained from the calibration was 1.12661 (2,061 counts from the visual observations divided by the 1,785 trail counter's counts). Those results suggested that the trail counter was nearly 90 percent accurate. Observers noted that that it was a busy trail, and many visitors walk side-by-side or in tight clusters.

4.2.1 General Findings

Before analysis of the trail counts at Avalanche was completed, the counts were divided by two since the trail is a single up and back route. Additionally, the trail counts were multiplied by 1.13 to adjust the results of the calibration. The estimate from the trail counter show that the total use during the five months monitored was 68,238 visitors. The highest use of the trail was estimated in July with a total of 30,566 visitors, followed by August 22,588, September 12,092, October 2,714, and November with 278 visitors (Table 28).

Table 28 Estimated visitation at Avalanche Lake trail: July to November 2011.

Month	TC Data	# Days Monitored	Daily Average	Total Estimate for Month
July	11,832	12	986	30,566
August	18,945	26	729	22,588
September	12,092	30	403	12,092
October	2,714	31	88	2,714
November	37	4	9	278
Total	45,620	103	443	68,238

Figure 30 portrays the daily trend during the complete season of 103 days of the trail counter's operation. There were six days without data due to technical problems with the installation of the device. The average daily use from the original data was 443 visitors with a median of 405 visitors. It was clear that demand for the Avalanche Lake trail declined steadily as the season progressed.

Figure 30 Daily use at the Avalanche Lake trail.

During the full 103 days of operation, the trail counter registered most visitors during the weekend days (Figure 31), Saturdays and Sundays had 16.4 percent (mean 513) and 16.3% (mean 508) visitors respectively. Among the week days, Mondays and Thursdays showed the same use with 14.9 percent (mean 465) of the visitors. The lowest visitation was on Wednesdays with 12.1 percent (mean 377).

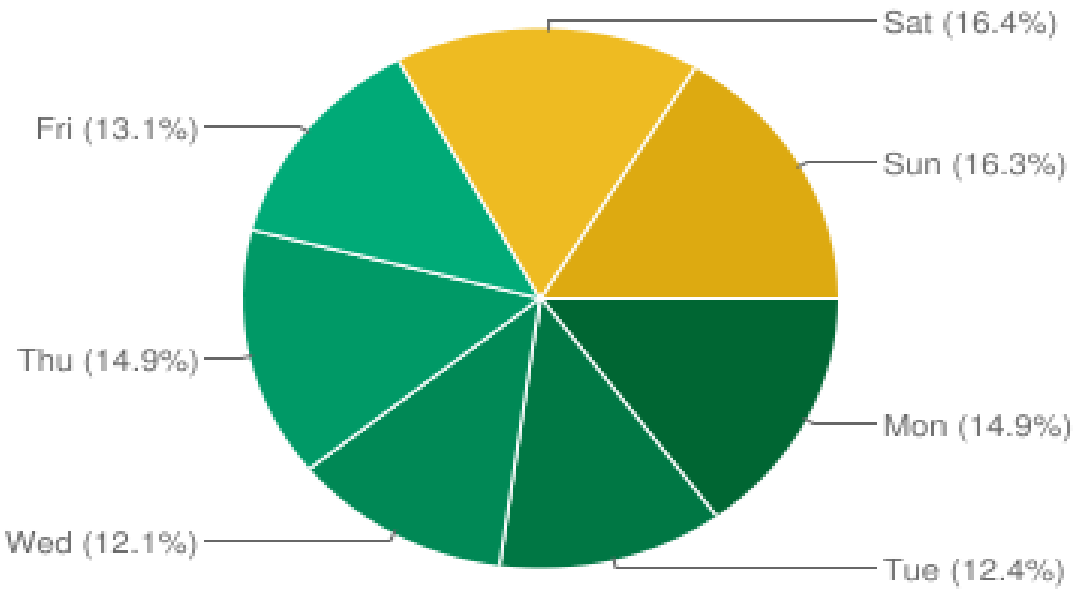

Figure 31 Use at Avalanche Lake trail by day of week.

Over the entire season, the average of visitation per hour was 19.1 people with a median of 4.3 people and a standard deviation of 23.3 people (demonstrating considerable variation throughout the days). Figure 32 shows that the maximum use was presented around 1 PM with 63.3 people per hour in average, followed by noon with 60.4 people per hour and 2 PM with 58.6 people per hour. There was no presence of visitors from 10 PM until 5 AM. The trail started to have considerable use around 10 AM and remained highly visited until 5 PM.

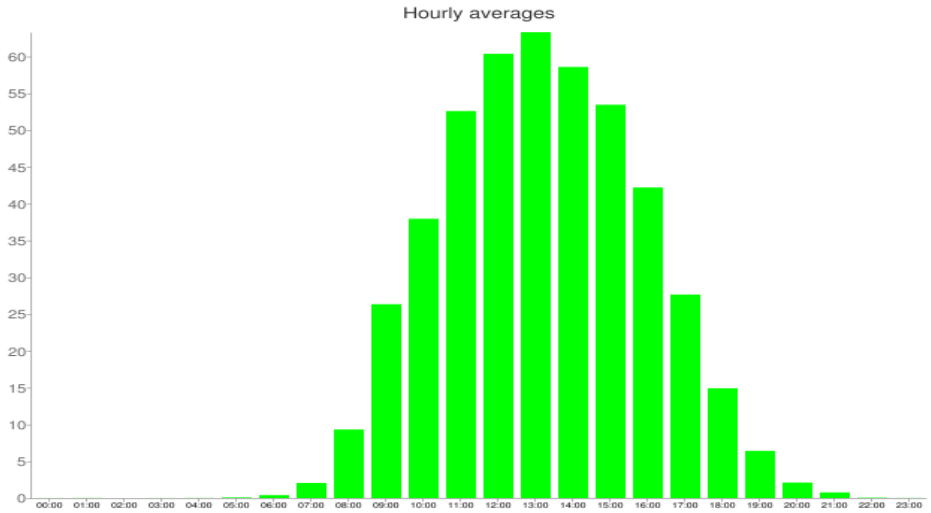

Figure 32 Hourly use at Avalanche Lake trail.

4.2.2. Summer Findings

For the purpose of this report, the summer season included the days from when the trail counter was installed (July 18th) through the Labor Day weekend (September 5th). A total of 34,217 visitors were counted during that 43 day period. The average visitation per day during the summer was 796 people with a median of 831 people. The estimated visitation from July first to September 5th was 55,170 visitors. The maximum day of visitation registered by the trail counter was July 27th with 1,185 people. The minimum count for a single day was August 31st with 382 people (Figure 33).

Figure 33 Summer daily visitation at Avalanche Lake trail.

During the summer season Thursdays were the days most visited with 15.2 percent of visitors (mean 841), followed closely for the weekend days Sundays and Saturdays with 15.1 percent each and averaging 836 and 834 visitors respectively. Fridays had the lowest visitation averaging 701 people or 12.6 percent of the weekly use (Figure 34).

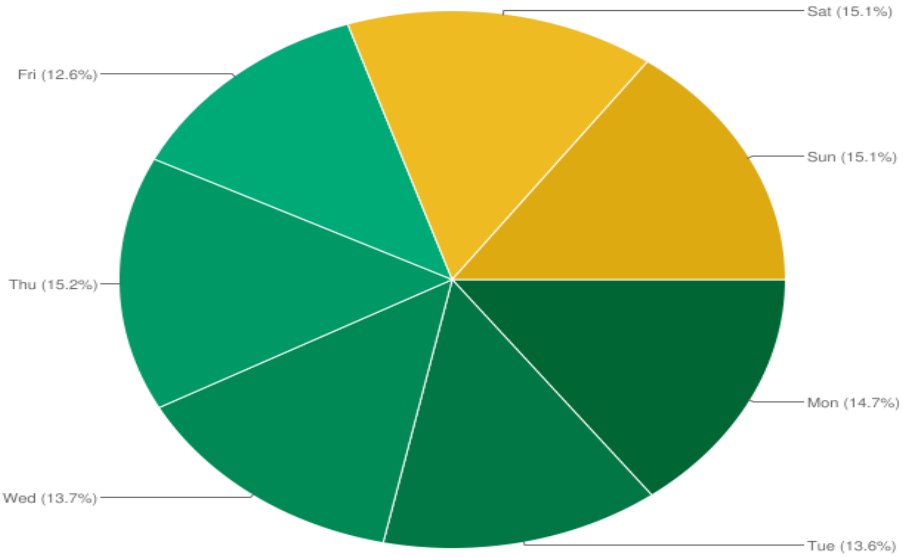

Figure 34 Summer use at Avalanche Lake trail by day of week.

4.2.3 Fall Findings .

For the purpose of this report, the fall season at Avalanche included September 6th through November 3rd. There was a total of 59 days with a total of visitation of 11,403 people counted during the days monitored. The average per day use was 193 visitors with a median of 143 visitors. The estimated use during the complete fall season (September 6th to November 30th) was 13,068 visitors. On September 24th the trail counter registered the maximum visitation of the season with 525 people; contrastingly, November 1st had the lower visitation, registering 8 people (Figure 35).

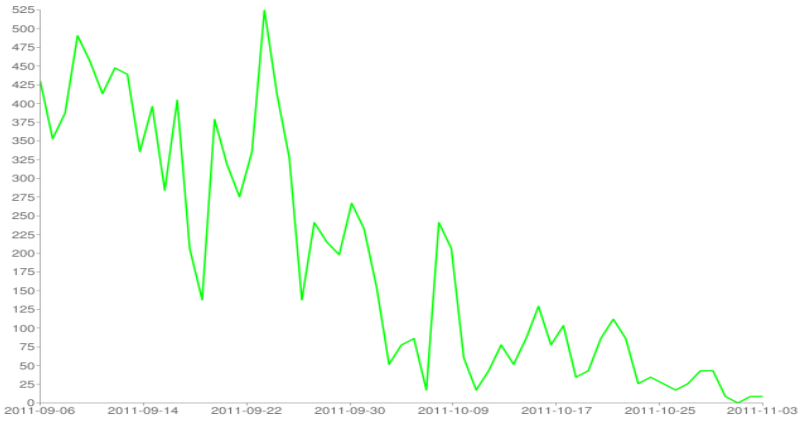

Figure 35 Fall daily visitation at Avalanche Lake trail.

During the fall season figure 36 depicts that the weekend days presented the highest visitation with 19.9 percent (mean 271) and 15.5 percent (mean 220) for Saturdays and Sundays respectively. Fridays followed them with 14.1 percent (mean 192). The lowest visitation day was Monday with 11.7 percent (mean 159). These findings may indicate a more local user during the fall season.

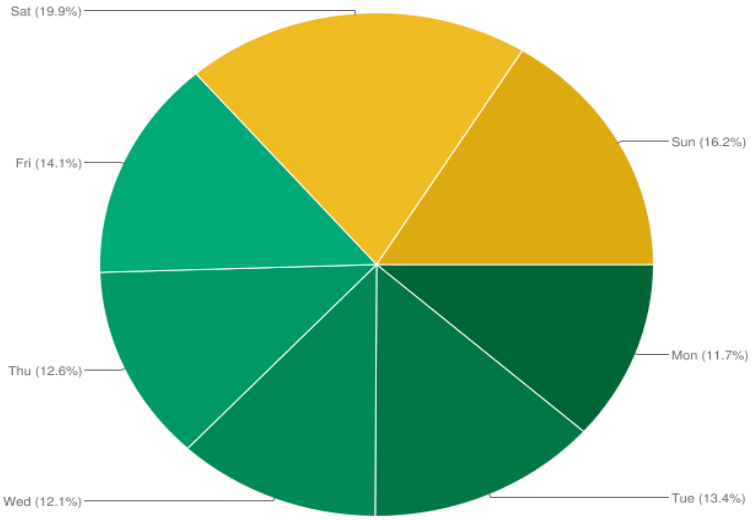

Figure 36 Fall use at Avalanche Lake trail by day of week.

4.3 The Loop

The trail counter at The Loop trail was installed on July 19th and taken down August 25th. The trail counter was located at the coordinates Northing 5404566, Easting 0293371, and Zone 12 UTM (Figure 37). The elevation was 4,393 feet. Since the trail is narrow many places were suitable for the counter; however, other considerations such as distance from the GTSR, enough shade (given the burned forest), spots free of short vegetation (which may overheat the infrared device), and a spot for our crew to be placed during the calibrations hours were taken into account when selecting a site. The device was installed at a 3 feet distance from the trail, and approximately 086 miles from the trail.

The calibration of The Loop trail counter occurred during six hours periods on four days during the week of August 13rd to 16th from 9 AM to 3 PM, and 1 PM to 7 PM. The results of the calibration showed a difference of 41 visitors during the calibration period (Appendix C). The adjustment factor obtained from the calibration was 1.06047 (719 counts from the visual observations divided by the 678 trail counter's counts). Those results suggested that the trail counter was 94 percent accurate. The study crew noted that it was not as busy trail as Avalanche or St. Mary Falls trails, and most visitors walked single file but the presence the mules with provisions to the Granite Chalet was frequent on this trail.

Figure 37 Map and location of The Loop trail counter.

4.3.1 General Findings

For the analysis the trail counts were multiplied by 1.06 to adjust the results of the calibration. However, those counts were not divided by two since this trail is connected

to the Highline trail so visitors may have taken a single up and did not come back by the same route. In fact, Table 29 shows that 85 percent of the hikers observed came toward The Loop at the GTTSR (exiting the trail) in contrast to 15 percent entering.

Table 29 Route direction on The Loop trail.

Mornings	Toward The Chalet	Toward The Loop
August 13 from 9 a.m. to 3 p.m.	33	67
August 15 from 9 a.m. to 3 p.m.	59	62
Total Observations Mornings	92	129
Percent	41.63	58.37
Afternoons	**Toward the Chalet**	**Toward The Loop**
August 14 From 1 p.m. to 7 p.m.	11	232
August 16 From 1 p.m. to 7 p.m.	8	247
Total Observations Afternoons	19	479
Percent	3.82	96.18
Total Observations The Loop	111	608
Total Percent	15.44	84.56

The estimate from the trail counter shows that the total use during the two months monitored was 15,652 visitors. The highest estimated use of the trail was in August with a total of 9,349 visitors (Table 30).

Table 30 Estimated visitation at The Loop trail: July to August 2011.

Month	TC Data	# Days Monitored	Daily Average	Total Estimate for Month
July	2,440	12	203	6,303
August	7,238	24	302	9,349
Total	9,678	36	269	15,652

Figure 38 portrays the daily trend during the season along 36 days of the trail counter's operation. The average daily use from the original data was 269 visitors with a median of 264 visitors. The maximum day of visitation registered by the trail counter was August 3rd with 418 people. The minimum value per a single day registered was July 26th with 98 people. It is clear that demand for The Loop trail increased gradually as the season progressed. This fact may have been related with the closure of the Highline trail during July due snow accumulation along the trail. Nevertheless, it is clear also that the use decreased at the end of August as did the overall trend in trail use.

Figure 38 Daily use at The Loop trail.

During the 36 days of operation, the trail counter registered most visitors on Wednesdays with 15.8 percent (mean 297) (Figure 39), followed by Sundays with 15 percent (mean 281) and Tuesdays with 14.6 percent (mean 275) visitors respectively. The lowest visitation was on Fridays with 12.7 percent (mean 238). This trail does not show a clear difference in the trend of use between weekdays and weekend days.

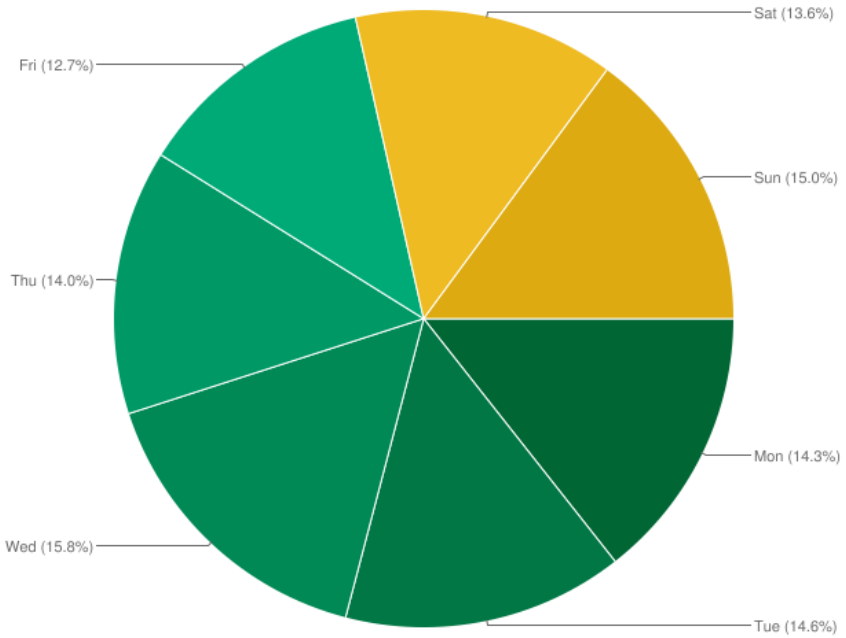

Figure 39 Use at The Loop trail by day of week.

Over the season, the average of visitation per hour was 11.3 people with a median of 4.6 people and a standard deviation of 13.5 people (demonstrating variation throughout the days). Figure 40 shows that the trail started to have a considerable use around 2 PM and remained highly visited until 6 PM. Indeed, the maximum use was presented around 4 PM with 45.9 people per hour in average, followed by 5 PM with 40 people per hour and 3 PM with 38.1 people per hour. This high use at the middle afternoon might be explained by the groups coming from the Highline trail. Although the graph shows presence of visitors late in the night and early in the morning, those counts could have been caused by wildlife presence.

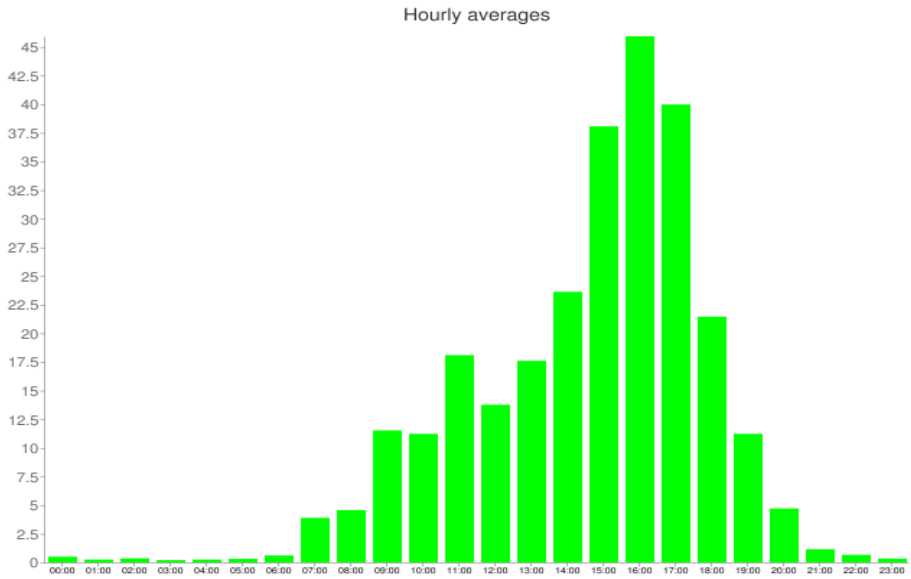

Figure 40 Hourly use at The Loop trail.

4.4 The Highline Trail

The trail counter at the Highline trail was installed on August 9th and taken down August 25th. The trail counter was located at the coordinates Northing 5398947, Easting 0300239, and Zone 12 UTM (Figure 41). The elevation was 6,552 feet. The trail offered some challenges in finding suitable sites to install the counters. While there are numerous narrow places, there were few trees. The shaded spots on the trail tend to be associated with a high presence of short vegetation. Accordingly, the selection of the place was influenced by the distance from the trail head, vegetation, and the appropriate conditions for the crew to be placed during the calibrations hours. The device was installed at less than two feet from the trail, and approximately 1.1 miles from the trailhead at Logan Pass.

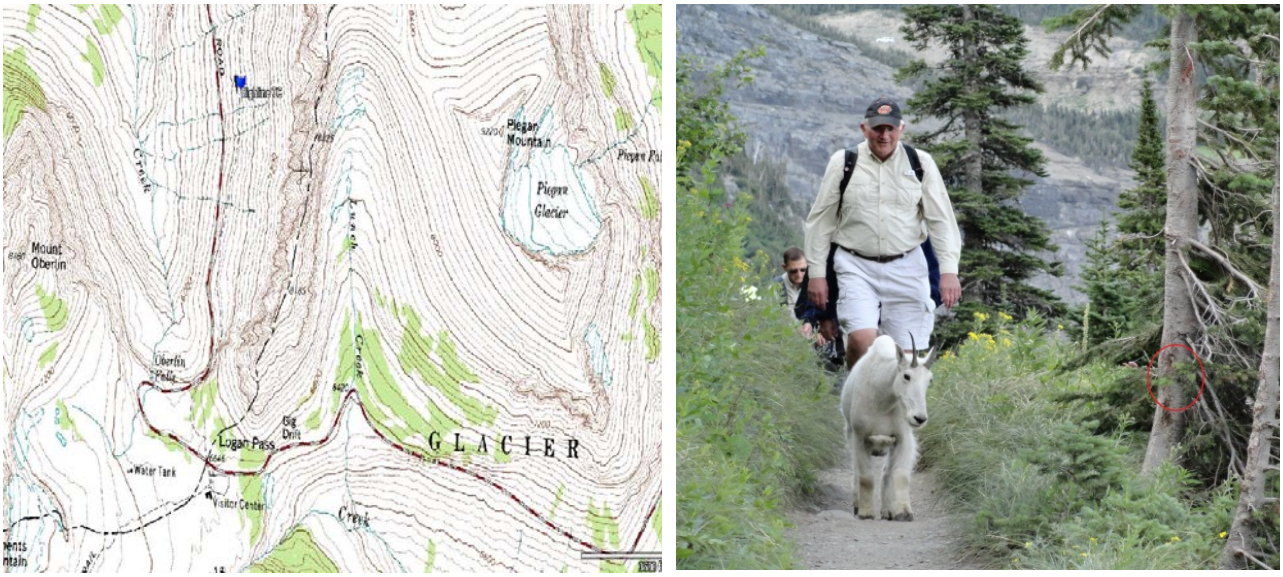

Figure 41 Map and location of Highline trail counter.

The calibration of Highline trail counter occurred during five hour periods on four days during the week of August 13th to 16th (from 9 AM to 2 PM, and 2 PM to 7 PM). The results of the calibration showed a difference of 113 visitors during the calibration period (Appendix C). The adjustment factor obtained from the calibration was 1.0884 (1,391 counts from the visual observations divided by the 1,278 trail counter's counts). Those results suggested that the trail counter was 92 percent accurate. The study crew noted that the trail got very busy a couple of hours in the morning then the use gradually decreased.

4.4.1 General Findings

The trail counts were not divided by two since this trail is connected to The Loop trail so visitors may have taken a single up and did not come back by the same route. Indeed, it is shown by Table 31 that the 69.45 percent of the hikers observed were walking toward the Chalet and just the 30.55 percent hiked toward to Logan Pass. Nevertheless, for the analysis, the trail counts were multiplied by 1.09 to adjust the results of the calibration. The estimate from the trail counter in Table 32 shows that the total use during the month monitored was 19,299 visitors.

Table 31 Route direction on the Highline trail.

Mornings	Toward The Chalet	Toward Logan Pass
August 13 from 9 a.m. to 2 p.m.	441	87
August 15 from 9 a.m. to 2 p.m.	392	85
Total Observations Mornings	833	172
Percent	82.89	17.11
Afternoons	**Toward the Chalet**	**Toward Logan Pass**
August 14 From 2 p.m. to 7 p.m.	76	147
August 16 From 2 p.m. to 7 p.m.	57	106
Total Observations Afternoons	133	253
Percent	34.46	65.54
Total Observations The Loop	966	425
Total Percent	69.45	30.55

Table 32 Estimated visitation at the Highline trail: August 2011.

Month	TC Data	# Days Monitored	Daily Average	Total Estimate for Month
August	9,338	15	623	19,299

Figure 42 portrays the daily trend during August along 15 days of the trail counter's operation. The average daily use from the original data was 622.5 visitors with a median of 623 visitors. The maximum day of visitation registered by the trail counter was August 12th with 779 people. The minimum value per a single day registered was August 23th with 353 people. The trend showed in the picture reflects the high demand of the trail during the first half of the month. Besides, it is clear that the use steadily decreased at the end of the month as the overall trend of trail use in the corridor did.

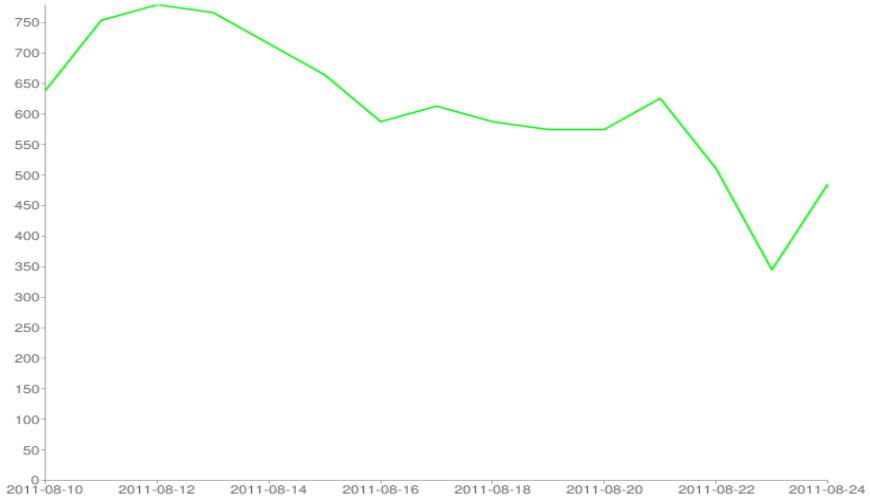

Figure 42 Daily use at the Highline trail.

During the 15 days of operation, the trail counter registered most visitors on Fridays and Thursdays with 15.6 percent (mean 683) and 15.5 percent (mean 680) visitors respectively, followed very close by weekend days Saturdays and Sundays with 15.4 percent (mean 676) and 15.5 percent (mean 678) visitors respectively. The lowest visitation was on Tuesdays with 10.9 percent (mean 476). This distribution suggested that visitors preferred to hike this trail on weekends, starting on Thursdays (Figure 43).

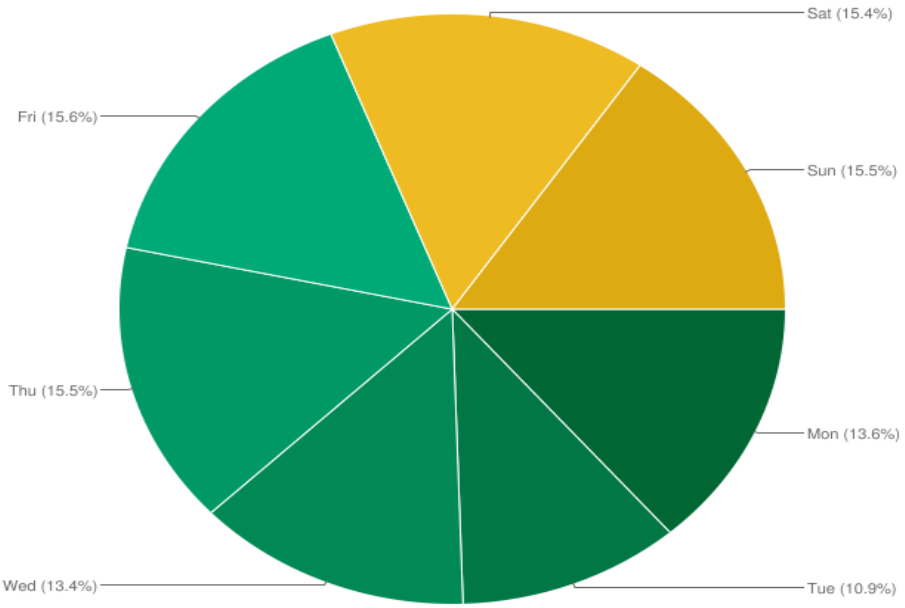

Figure 43 Use at Highline trail by day of week.

Over the month, the average of visitation per hour is 32.8 people with a median of 20.1 people and a standard deviation of 36 people (demonstrating variation throughout the days). Figure 44 shows that the trail started to have considerable use around 9 AM and remained highly visited until 3 PM. Indeed, the maximum use was presented around 10 AM with 109.6 people per hour in average, followed by 11 AM with 98.4 people per hour and noon with 76.9 people per hour. This high use at morning hours might be explained by visitors attempting to hike all the way to the Granite Park Chalet or The Loop. Although the graph shows presence of visitors late in the night and early in the morning, those counts may have been caused by wildlife presence.

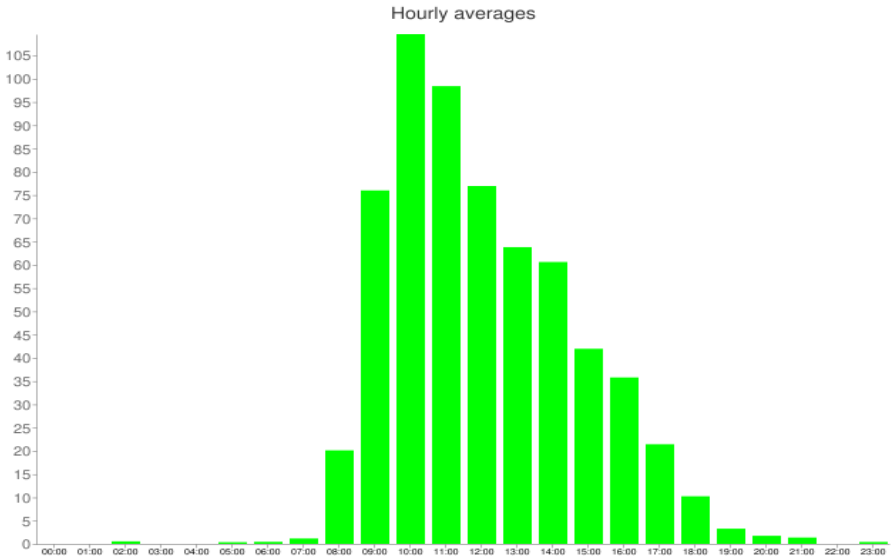

Figure 44 Hourly use at Highline trail.

4.5 Hidden Lake Trail

The trail counter at the Hidden Lake trial was installed on August 17th and it stopped collecting data on September 3rd. The trail counter was located at Northing 5396422, Easting 0298635, and Zone 12 UTM (Figure 45). The elevation was 7,106 feet. It was quite difficult to find a narrow spot along the trail since it is fairly wide and visitors often walk side-by-side. Moreover, there was little dense forest to offer shade and protection for the counter. The device was installed at less than two feet of distance from the trail in a place free of short vegetation and enough shade, and approximately 1.1 miles from the visitor center.

The calibration of the Hidden Lake counter occurred during five days during the week of August 20th to 24th. Crew members observed for a six hour period on the 20th (from 8 AM to 2 PM) and five hours periods from the 21st to the 24th (from 9 AM to 2 PM, and 2 PM to 7 PM). The results of the calibration showed a difference of 512 visitors during the calibration period (Appendix C). The adjustment factor obtained from the calibration was 1.1354 (4,294 counts from the visual observations divided by the 3,782 trail counter's counts). Those results suggested that the trail counter was 88 percent accurate. Observers noted that it is a busy trail, and many visitors walk side-by-side or in tight clusters. Thus, the underestimation registered by the trail counter is reasonable.

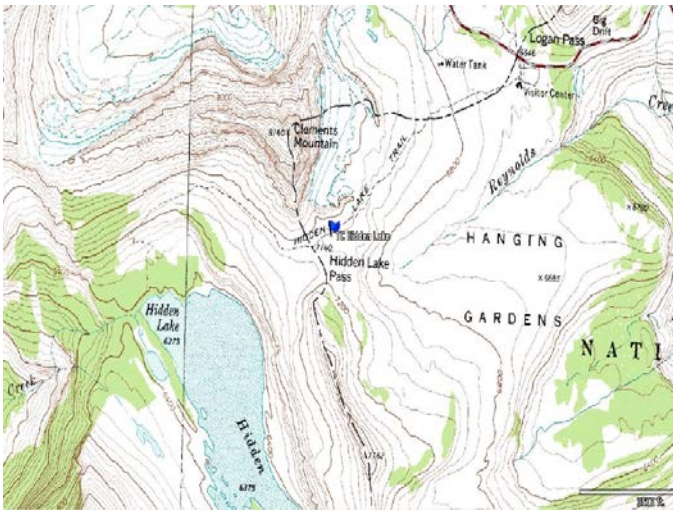

Figure 45 Map and location of Hidden Lake trail counter.

4.5.1 General Findings

Before the analysis of the trail counts was completed, the counts were divided by two since the trail is a single up and back route. Additionally, the trail counts were multiplied by 1.14 to adjust the results of the calibration. The estimate from the trail counter showed that the total use during the season (August and September) monitored was 40,280 visitors. The highest estimated use was in August with a total of 26,720 visitors (Table 33).

Table 33 Estimated visitation at the Hidden Lake trail: August to September 2011.

Month	TC Data	# Days Monitored	Daily Average	Total Estimate for Month
August	12,067	14	862	26,720
September	904	2	452	13,560
Total	12,971	16	811	40,280

Figure 46 portrays the daily trend during August along 16 days of the trail counter's operation. The average daily use from the original data is 810.7 visitors with a median of 910 visitors. The maximum day of visitation registered by the trail counter was August 19th with 1,054 people. The minimum day was August 31st with 51 people. This day was colder than the other days in the sample. The trend showed in the picture reflects the high demand of the trail during the second half of the month. Additionally, it is clear that

the use gradually decreased at the end of month, although with a little recovery for the Labor Day holiday weekend.

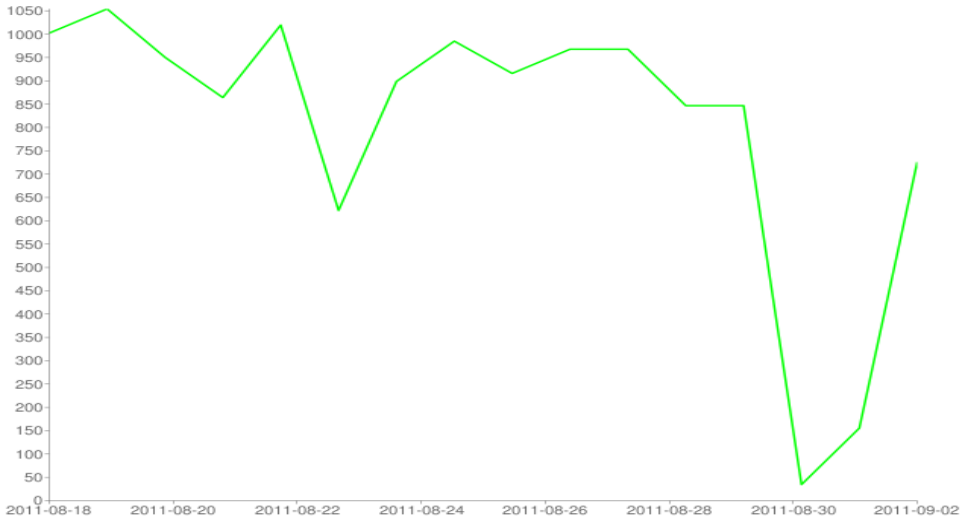

Figure 46 Daily use at the Hidden Lake trail.

During the 16 days of operation, the trail counter registered most visitors on Saturdays with 17 percent (mean 962), followed Mondays and Sundays with 16.6 percent (mean 943) and 16.4 percent (mean 928) visitors respectively. The lowest visitation was on Wednesdays with 8.4 percent (mean 478). The distribution showed in Figure 47 suggests that visitors preferred hike this trail on weekends, starting on Fridays.

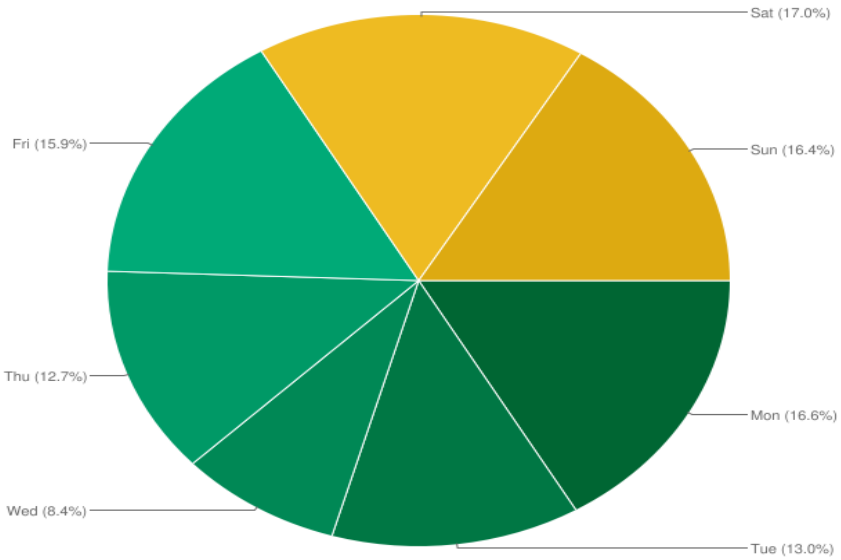

Figure 47 Use at Hidden Lake trail by day of week.

Over the season, the average of visitation per hour was 51.6 people with a median of 38.2 people and a standard deviation of 47 people (demonstrating variation throughout the days). Figure 48 shows that the trail started to have a considerable use around 10 AM and remained highly visited until 5 PM. Indeed, the maximum use was presented at noon with 120.4 people per hour in average, followed by 1 PM with 115.6 people per hour. This trend reflected high demand of for this trail which was constant throughout the day. Although the graph shows presence of visitors late in the night and early in the morning, those counts may have been caused by wildlife presence.

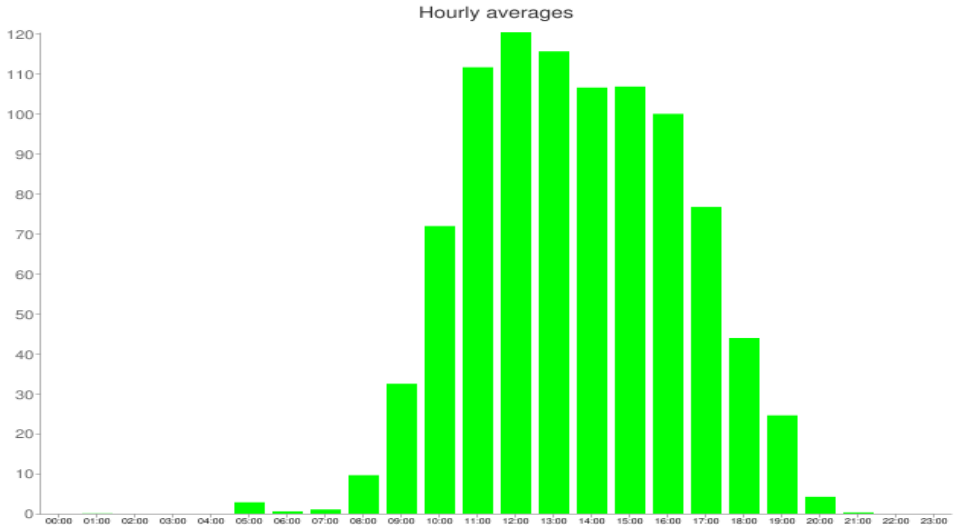

Figure 48 Hourly use at the Hidden Lake trail.

4.6 Siyeh Bend

The trail counter at the Siyeh Bend trial was installed on July 19th and taken down October 19th. However, given mechanical issues the device started to collect data July 29th. The trail counter was located at about three miles from the trailhead in the GTTSR at the coordinates Northing 5398868, Easting 0304957, and Zone 12 UTM (Figure 49). The elevation was 7,051 feet. The selection of the place was influenced by the distance from the trailhead, adequate shade, enough vegetation, and the appropriate conditions for the crew to be placed during calibration. The device was installed at less than five feet from the trail, and 2.9 miles from the trailhead.

The calibration of the Siyeh Bend's trail counter occurred during a five hour period on July 29th from 2 PM to 7 PM. The results of the calibration showed a difference of one visitor during the period (Appendix C). The adjustment factor obtained from the calibration was 1.0556 (19 counts from the visual observations divided by the 18 trail

counter's counts). Those results suggested that the trail counter was 95 percent accurate. Nevertheless, it is recommended to calibrate this counter during an additional period to better define the accuracy of the machine and to get a better understanding of the use patterns of this trail.

Figure 49 Map and location of Siyeh Bend trail counter.

4.6.1 General Findings

The trail counts were not divided by two since this trail is connected to Sunrift Gorge trail so visitors may have taken a single up and did not come back by the same route. It is shown by Table 34 that the 36.84 percent of the hikers observed were in their way to the Siyeh Pass and 63.16 percent were hiking toward the GTTSR. However, data was collected on a single period so it is not possible make inferences about direction used by hikers.

Table 34 Route direction on Siyeh Bend trail.

Afternoon	Toward the Siyeh Pass	Toward the GTTSR
From 2:01 p.m. to 3:00 p.m.	5	0
From 3:01 p.m. to 4:00 p.m.	2	7
From 4:01 p.m. to 5:00 p.m.	0	3
From 5:01 p.m. to 6:00 p.m.	0	0
From 6:01 p.m. to 7:00 p.m.	0	2
Total Observations	7	12
Total Percent	36.84	63.16

Before analysis of the trail counts was completed the counts were multiplied by 1.06 to adjust for the calibration. The estimate from the trail counter showed that the total use during the four months monitored was 6,853 visitors. The highest estimated use of the trail was in August with a total of 2,993 visitors, followed by July 2,434, September 1,295, and October with 131 visitors (Table 35).

Table 35 Estimated visitation at Siyeh Bend trail: July to October 2011.

Month	TC Data	# Days Monitored	Daily Average	Total Estimate for Month
July	157	2	79	2,434
August	1,931	20	97	2,993
September	1,252	29	43	1,295
October	76	18	4	131
Total	3,416	69	50	6,853

Figure 50 portrays the daily trend during the complete season along 69 days of the trail counter's operation. There were 24 days without data due to technical problems with the installation and operation of the device. The average daily use from the original data was 50 visitors with a median of 33 visitors. It is clear that demand for the Siyeh Bend trail declined steadily as the season progressed, except for the maximum use on the Labor Day weekend.

Figure 50 Daily use at the Siyeh Bend trail.

During the 69 days of operation, the trail counter registered most visitors during the weekend days (Figure 51), Saturdays and Sundays had 18.9 percent (mean 65) and 18.5 percent (mean 64) visitors respectively. Among the week days, Fridays had a visitation of 14.8 percent (mean 51 visitors). The lowest visitation was on Wednesdays with 9.4 percent (mean 32).

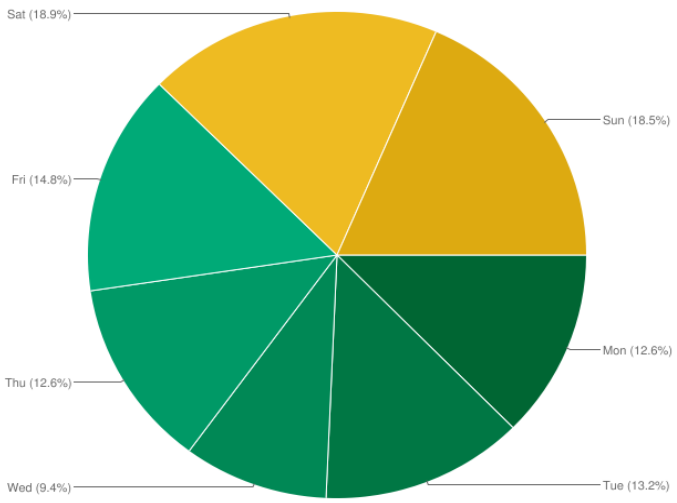

Figure 51 Use at Siyeh Bend trail by day of week.

Over the entire season, the average visitation per hour was 2.2 people with a median of 0.3 people and a standard deviation of 3.1 people (demonstrating considerable variation throughout the days). Figure 52 shows that the maximum use was presented around 11 AM with 9.9 people per hour in average, followed by noon with 9.7 people per hour. The trail started to have considerable use around 10 AM and remained visited until 4 PM. The presence of visitors registered by the counter early in the morning and during evenings may have been caused by wildlife.

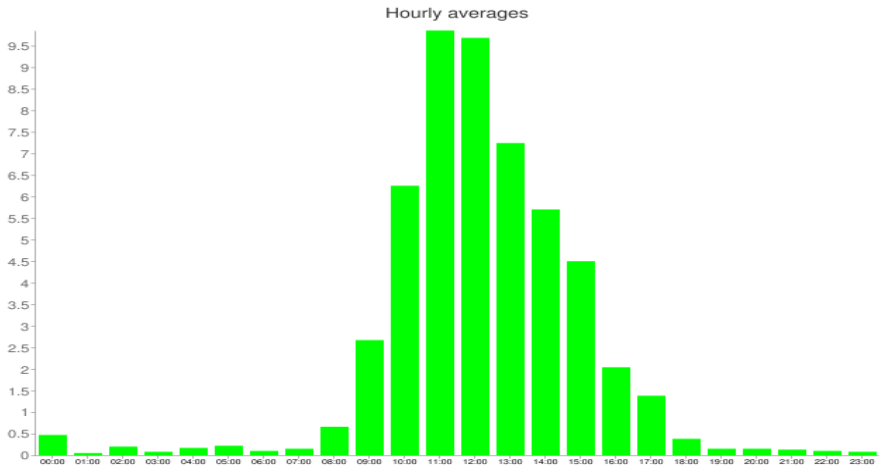

Figure 52 Hourly use at Siyeh Bend trail.

4.6.2 Summer Findings

For the purpose of this report, the summer season included the days from when the device started to count (July 29th) through the Labor Day weekend (September 5th). A total of 2,665 visitors were counted during that 27 day period. The average visitation per day during the summer was 98.7 people with a median of 105 people. The estimate visitation from July first to September 5th was 5,642 visitors. The day of maximum visitation registered by the trail counter was September 4th with 186 people. The minimum value per a single day registered was August 31st with 13 people (Figure 53).

Figure 53 Summer daily visitation at Siyeh Bend trail.

During the same summer season at the Siyeh Bend trail, Sundays and Saturdays remained the most visited days with 19.7 percent and 16.6 percent, averaging 134 and 112 visitors respectively. Wednesdays had the lowest visitation averaging 71 people or 10.4 percent of the weekly use (Figure 54).

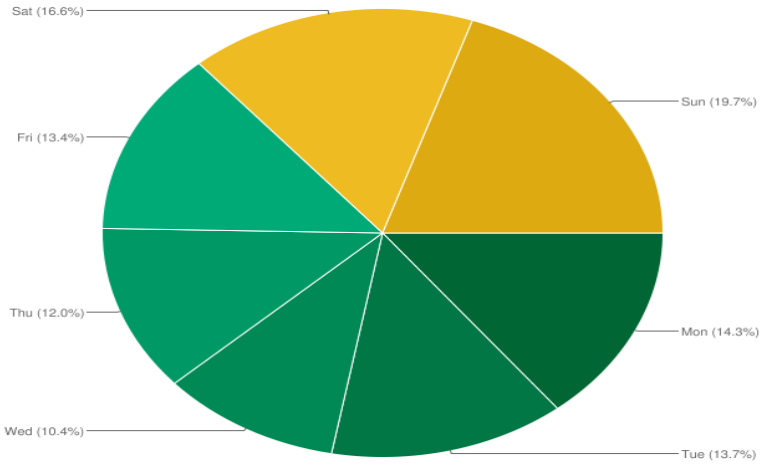

Figure 54 Summer use at Siyeh Bend trail by day of week.

4.6.3. Fall Findings.

For the purpose of this report, the fall season in Siyeh Bend included September 6th through October 18th, when the trail counter was taken down. There was a total of 42 days with a total of visitation of 751 people counted during the days monitored. The average per day use was 17.9 visitors with a median of 6.5 visitors. The estimated use during the complete fall season (through September 6th to October 31st) was 1,210 visitors. On September 6th the trail counter registered the maximum visitation of the season with 84 people; contrastingly, September 26st and eight days in October registered no visitation by the trail counter (Figure 55).

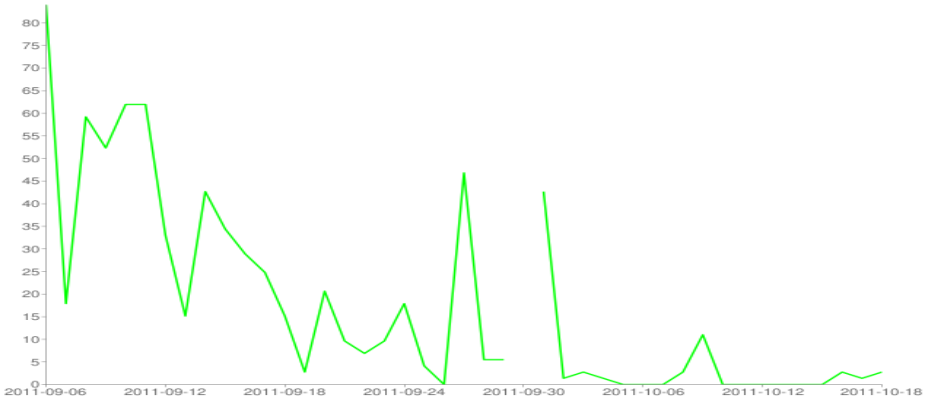

Figure 55 Fall daily visitation at Siyeh Bend trail.

During the fall season Figure 56 depicts that Saturdays and Tuesdays presented the highest visitation with 20.4 percent (mean 25) and 20.2 percent (mean 25) respectively, followed by Fridays and Thursdays with 14.8 percent (mean 18) and 14.5 percent (mean 18) respectively. The lowest visitation day was Mondays with 5.8 percent (mean 7). Surprisingly, these findings contrast with the user trend showed by other trails during the fall season.

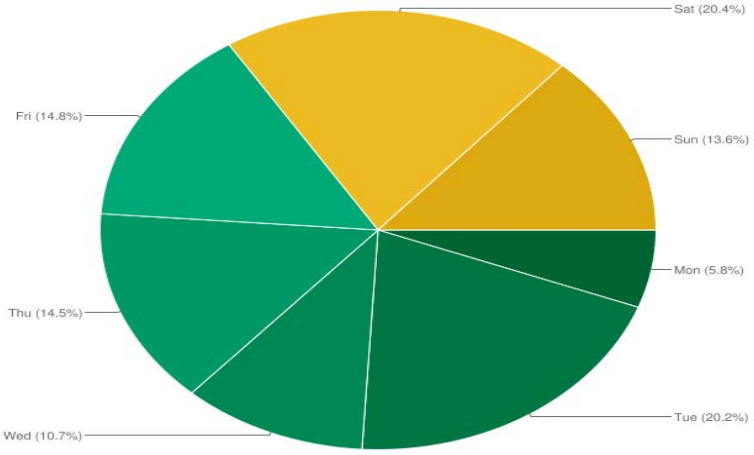

Figure 56 Fall use at Siyeh Bend trail by day of week.

4.7 Sunrift Gorge

The trail counter at the Sunrift Gorge trial was installed on July 12th and taken down October 21th. However, given mechanical issues the device started to collect data on July 19th. The trail counter was located less than one mile from the GTSSR trailhead at coordinates Northing 5398868, Easting 0308748, and Zone 12 UTM (Figure 57). The elevation was 4,882 feet. The selection of the place was influenced by the distance from the trailhead, availability of shade vegetation, and the appropriate conditions for the crew to be placed during the calibrations hours. The device was installed less than five feet from the trail, and approximately 0.35 miles from the trailhead.

Figure 57 Map and location of the Sunrift Gorge trail counter.

The calibration of the Sunrift Gorge's trail counter occurred during five hour periods on August 1st to the 3rd, and August 6th to the 8th. During that time, the trail counters showed additional eight counts during the first period, and three less counts in the second period compared to the visual observations of a crew member (Appendix C). The difference during the first period of the calibration was caused by the presence of short vegetation in front of the counter which caused over counting. Given the difference of counts from the visual observations (180) and the trail counter's counts (185) over both periods, no adjustment factor was used. The accuracy of the trail counter seems understandable since the trail is lightly used, and is very narrow so people do not walk side-by-side.

4.7.1 General Findings

The trail counts were not divided by two since this trail is connected to Siyeh Bend trail so visitors may have taken a single up and did not come back by the same route. It is shown by Table 36 that the 18.89% of the hikers observed were in their way to the Siyeh Pass and 81.11% were toward the GTTSR, so the additional people who came up to the GTTSR could have come from the Siyeh Pass.

Table 36 Route direction on Sunrift Gorge trail.

Mornings (From 9 a.m. to 2 p.m.)	**Toward Siyeh Pass**	**Toward GTTSR**
August 1st	10	11
August 3rd	5	3
August 7th	10	11
Total Observations Mornings	25	25
Percent	50	50
Afternoons (From 2 a.m. to 7 p.m.)	**Toward Siyeh Pass**	**Toward GTTSR**
August 2nd	1	19
August 6th	0	45
August 8th	8	57
Total Observations Afternoons	9	121
Percent	6.92	93.08
Total Observations Sunrift Gorge	**34**	**146**
Total Percent	**18.89**	**81.11**

The estimate from the trail counter during the four months monitored was 6,090 visitors. The highest estimated use of the trail was in July with a total of 2,542 visitors, followed by August 2,481, September 968, and October with 99 visitors (Table 37).

Table 37 Estimated visitation at Sunrift Gorge trail: July to October 2011.

Month	TC Data	# Days Monitored	Daily Average	Total Estimate for Month
July	1,066	13	82	2,542
August	1,921	24	80	2,481
September	968	30	32	968
October	64	20	3	99
Total	4,019	87	46	6,090

Figure 58 portrays the daily trend during the complete season along 87 days of the trail counter's operation. There were 13 days without data due to technical problems with the installation of the device. The average daily use from the original data was 46.2 visitors with a median of 30 visitors. It is clear that the demand for the Sunrift Gorge trail was highly variable but declined steadily as the season progressed.

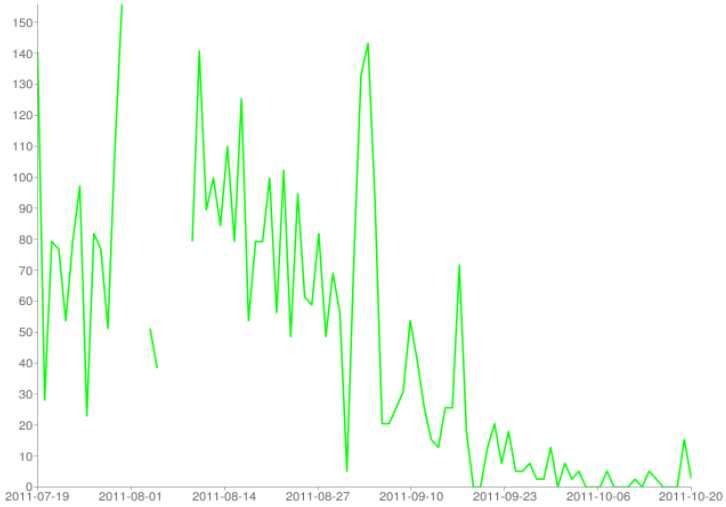

Figure 58 Daily use at the Sunrift Gorge trail.

During the 87 days of operation, the trail counter registered most visitors during the weekend days (Figure 59), Saturdays and Sundays had 17.9 percent (mean 58) and 18.8 percent (mean 61) visitors respectively. Among the week days, Fridays had a visitation of 13.6 percent (mean 44 visitors). The lowest visitation was on Wednesdays with 12 percent (mean 39).

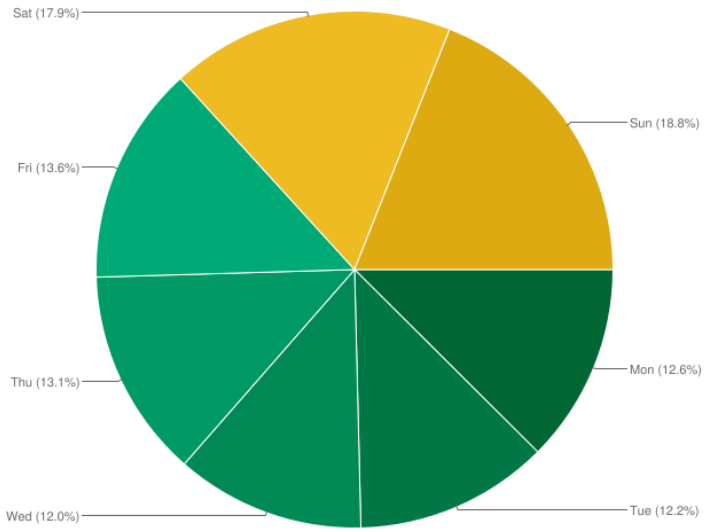

Figure 59 Use at Sunrift Gorge trail by day of week.

Over the entire season, the average of visitation per hour was two people with a median of 0.6 people and a standard deviation of 2.5 people (demonstrating considerable variation throughout the days). Figure 60 shows that the maximum use was presented in the afternoons around 4 PM with 7.5 people per hour in average, followed by 3 PM with 7.4 people per hour. The trail started to have its highest levels of use around 11 AM and remained visited until 6 PM. The presence of visitors registered by the counter early in the morning and during evenings could have been caused by wildlife.

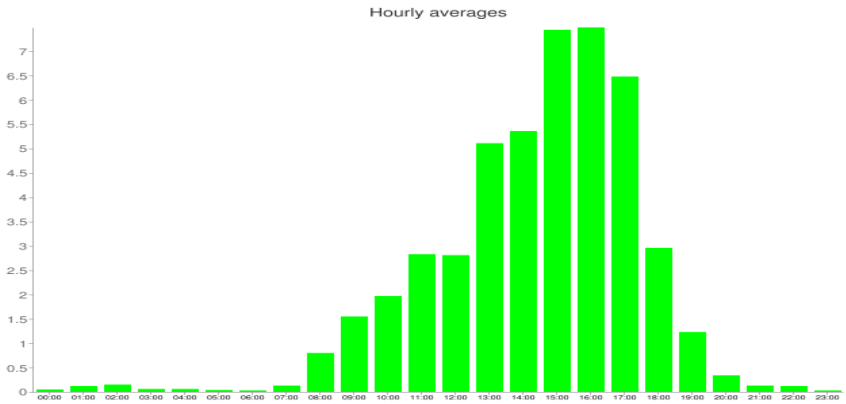

Figure 60 Hourly use at Sunrift Gorge trail.

4.7.2 Summer Findings

For the purpose of this report, the summer season includes the days from when the device started to count (July 19th) through the Labor Day weekend (September 5th). There was counted a total of 3,441 visitors during that 42 day period. The average visitation per day during the summer was 81.9 people with a median of 81 people. The estimate visitation from July first to September 5th was 5,185 visitors. The maximum day of visitation registered by the trail counter was July 31st with 156 people. The minimum value per a single day registered was September first with six people (Figure 61).

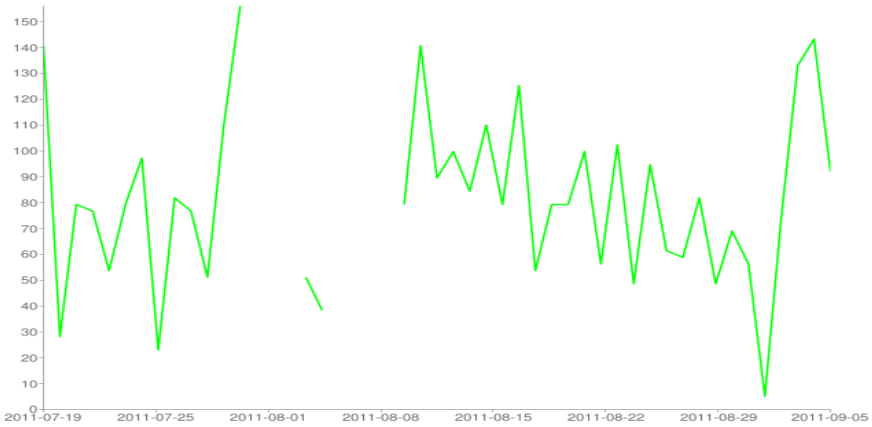

Figure 61 Summer daily visitation at Sunrift Gorge trail.

During the same summer season at Sunrift Gorge trail, Sundays and Saturdays remained as the most visited days with 18.8 percent and 15.6 percent, and averaging 109 and 90 visitors respectively. Among the week days Tuesdays had the highest visitation with 14.5 percent (mean 84 visitors). Fridays presented the lowest visitation averaging 69 people or 11.9 percent of the weekly use (Figure 62).

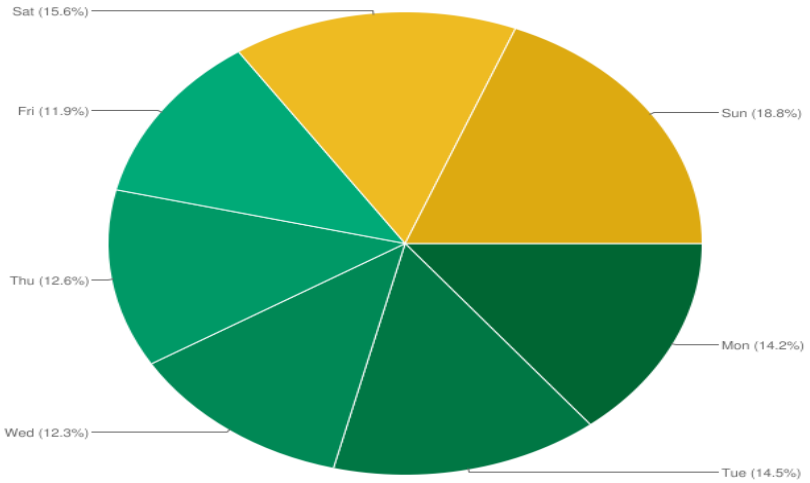

Figure 62 Summer use at Sunrift Gorge trail by day of week.

4.7.3. Fall Findings

For the purpose of this report, the fall season in Sunrift Gorge included September 6th through October 20th, when the trail counter was taken down. There were a total of 45 days with a total of visitation of 578 people counted during the days monitored. The average per day use was 12.8 visitors with a median of 7 visitors. The estimated use during the complete fall season (September 6th to October 31st) was 906 visitors. On September 17th the trail counter registered the maximum visitation of the season with 72 people; contrastingly, September 19st and seven days in October registered no visitation by the trail counter.

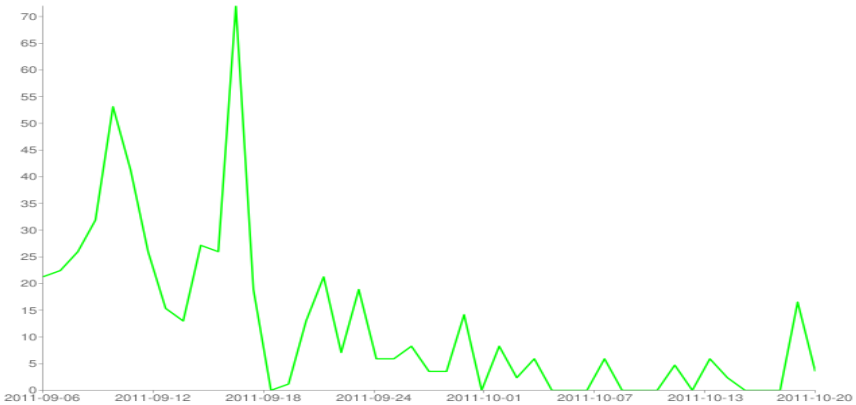

Figure 63 Fall daily visitation at Sunrift Gorge trail.

During the fall season figure 64 depicts that Saturdays were the days most visited with 28.2 percent (mean 26) followed by Fridays and Sundays with 16.5 percent and 14.6 percent, and averaging 15 and 13 visitors respectively. Mondays presented the lowest visitation averaging six people or 6.8 percent of the weekly use. These findings may indicate a more local user during the fall season.

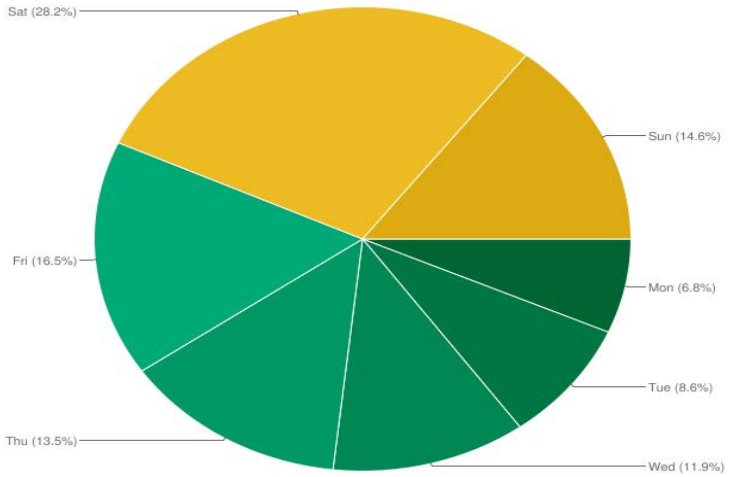

Figure 64 Fall use at Sunrift Gorge trail by day of week.

4.8 St. Mary Falls

The trail counter at the St. Mary Falls trail was installed on July 12th and taken down October 21st. The trail counter was located at the coordinates Northing 5394000, Easting 0307746, and Zone 12 UTM (Figure 65). The elevation was 4,560 feet. The trail counter was installed at one feet of distance from the trail. Considerations to install the device were related with enough shade, distance from the trailhead (approximately .9 miles), narrow spots to avoid side-by-side hikers and spots free of short vegetation which may overheat the infrared device and cause it to function erratically (e.g., extremely high counts).

The calibration of the trail counter at St. Mary Falls occurred on three separate periods: July 14th during a six hour period, and July 26th and 28th with five hours each period. The results of the calibration showed a difference of 465 visitors during the three days of calibration (Appendix C). The adjustment factor obtained from the calibration was 1.31271 (1,952 counts from the visual observations divided by the 1487 trail counter's counts). Those results suggested that the trail counter was 76 percent accurate. Observers noted that that it is a busy trail, and some visitors walk side-by-side or in tight clusters. Thus, the underestimation seen by the trail counter seems understandable.

Figure 65 Map and location of St. Mary Falls trail counter.

4.8.1 General Findings

Before analysis of the trail counts was completed, the counts were divided by 2 since the trail is a single up and back route. Additionally, the trail counts were multiplied by 1.31 to adjust the results of the calibration. The estimate from the trail counter showed that the total use during the four months monitored was 45,465 visitors. The highest estimated use of the trail was in July with a total of 21,224 visitors, followed by August 16,744, September 6,808, and October with 690 visitors (Table 38).

Table 38 Estimated visitation at St. Mary Falls trail: July to October 2011.

Month	TC Data	# Days Monitored	Daily Average	Total Estimate for Month
July	13,008	19	685	21,224
August	16,744	31	540	16,744
September	6,808	30	227	6,808
October	445	20	22	690
Total	37,005	100	370	45,465

Figure 66 illustrates the daily trend during the complete season along 100 days of the trail counter's operation. The average daily use from the original data was 370.1 visitors with a median of 372.5 visitors. It is clear that the demand for the St. Mary Falls trail declined gradually as the season progressed. However, there was a peak at the middle of the season which corresponded to the Labor Day holiday weekend.

Figure 66 Daily use at St. Mary Falls trail.

During the 100 days of operation, the trail counter registered most visitors during the weekend days (Figure 67), Saturdays and Sundays had 15.8 percent (mean 410) and 14.9 percent (mean 386) visitors respectively. Among the week days, Wednesdays showed the highest use with 14.1 percent (mean 366) of the visitors. The lowest visitation was on Tuesdays with 13.5 percent (mean 351).

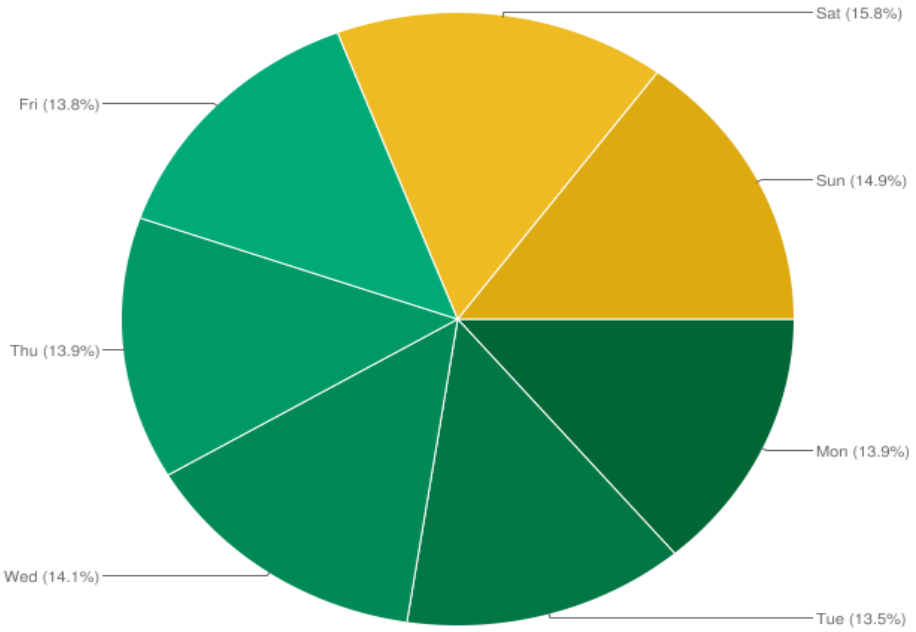

Figure 67 Use at St. Mary Falls trail by day of week.

Over the entire season, the average of visitation per hour was 15.4 people with a median of 2.3 people and a standard deviation of 20 people (demonstrating considerable variation throughout the days). Figure 68 shows that the maximum use was presented around 3 PM with 55.6 people per hour on average, followed by 2 PM with 50.3 people per hour and 1 PM with 50.2 people per hour. The trail started to have considerable use around 10 AM and remained highly visited until 6 PM. The presence of visitors registered by the trail counter late in the nights and early in the morning could have been caused by wildlife.

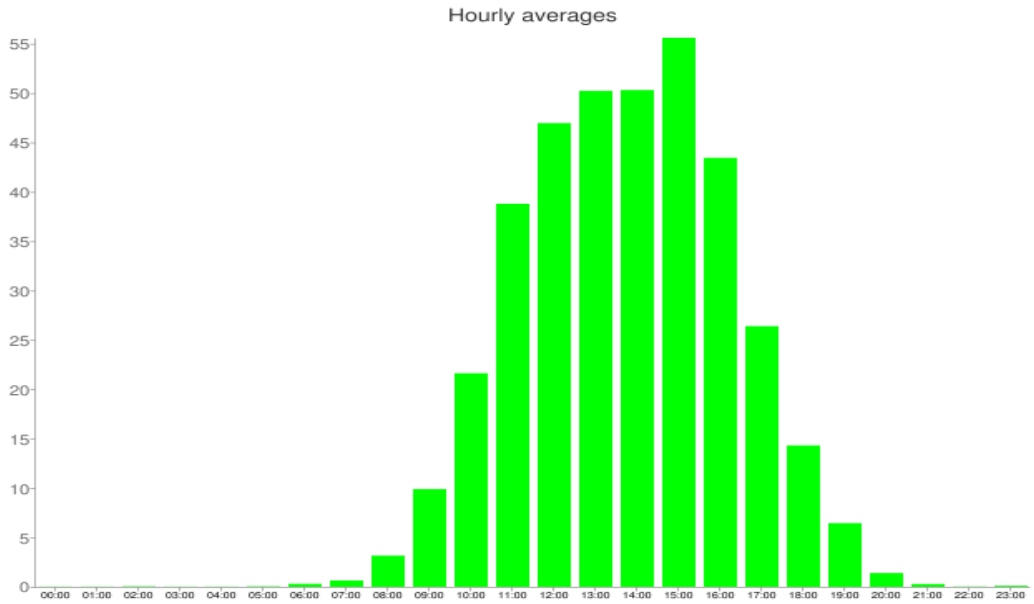

Figure 68 Hourly use at St. Mary Falls trail.

4.8.2 Summer Findings

For the purpose of this report, the summer season included the days from when the trail counter was installed (July 12th) through the Labor Day weekend (September 5th). A total of 32,143 visitors were counted during that 55 day period. The average visitation per day during the summer was 584.4 people with a median of 610 people. The estimated visitation from July first to September 5th was 39,102 visitors. The maximum day of visitation registered by the trail counter was July 28th with 856 people. The minimum value per a single day registered was August 29th with 273 people (Figure 69).

Figure 69 Summer daily visitation at St. Mary Falls trail.

During the same summer season at St. Mary Falls trail, Saturdays were the days most visited with 14.9 percent of visitors (mean 612), followed for Tuesdays with 14.6 percent and averaging 598 visitors. Fridays had the lowest visitation averaging 547 people or 13.4 percent of the weekly use (Figure 70).

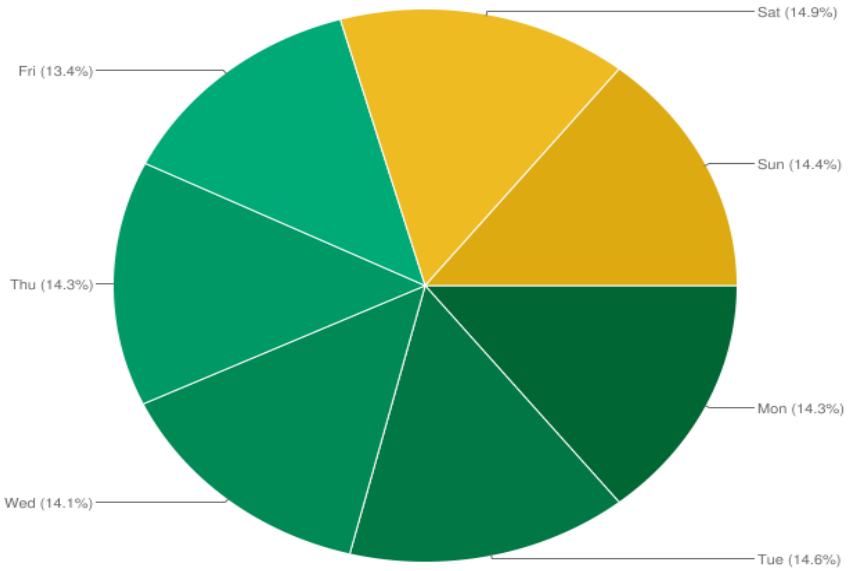

Figure 70 Summer use at St. Mary Falls trail by day of week.

4.8.3 Fall Findings

For the purposes of this report, the fall season included September 6th through October 20th, when the trail counter was taken down. There were a total of 45 days with a total of visitation of 4,862 people counted during the days monitored. The average per day use

was 108 visitors with a median of 56 visitors. The estimated use during the complete fall season (September 6th to October 31st) was 6,363 visitors. On September 7th the trail counter registered the maximum visitation of the season with 350 people; contrastingly, October 12th had the lowest visitation registering three people (Figure 71).

Figure 71 Fall daily visitation at St. Mary Falls trail.

During the fall season, Figure 72 indicates that Saturdays presented the highest visitation with 18.6 percent (mean 141), followed for Wednesdays with 16.3 percent (mean 123). The lowest visitation day was on Mondays with 8.3 percent (mean 63).

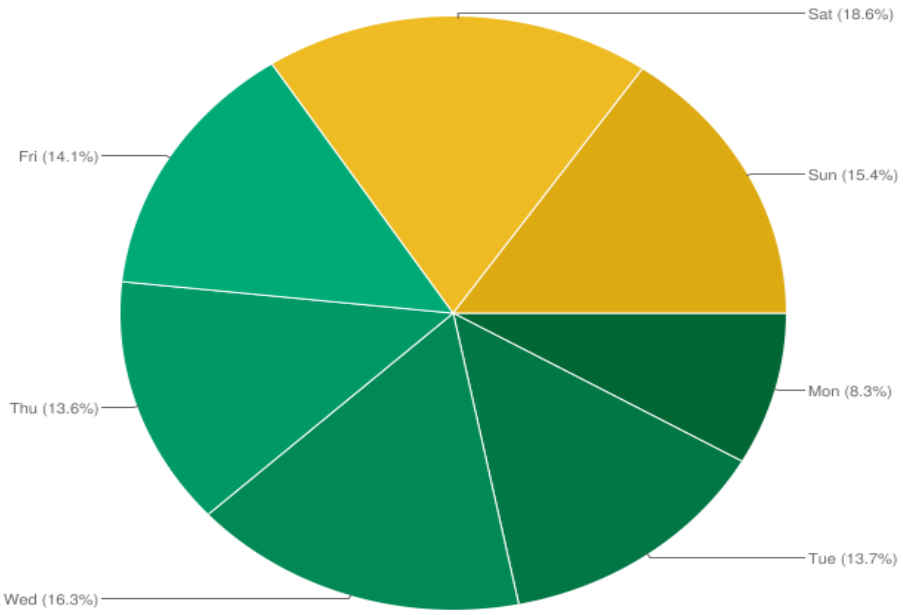

Figure 72 Fall use at St. Mary Falls trail by day of week.

4.9 Virginia Falls

The trail counter at the Virginia Falls trail was installed on July 12th and taken down October 21st. The trail counter was located at the coordinates Northing 5393295, Easting 0307475, and Zone 12 UTM (Figure 73). The elevation was 4,682 feet. The trail counter was installed six feet from the trail, and approximately 1.6 miles from the road. The site offered enough shade and a narrow spot. Considerations to install the device also included distance from St. Mary Falls, spots free of short vegetation to avoid overheating the infrared device, and space to place the study crew for calibration.

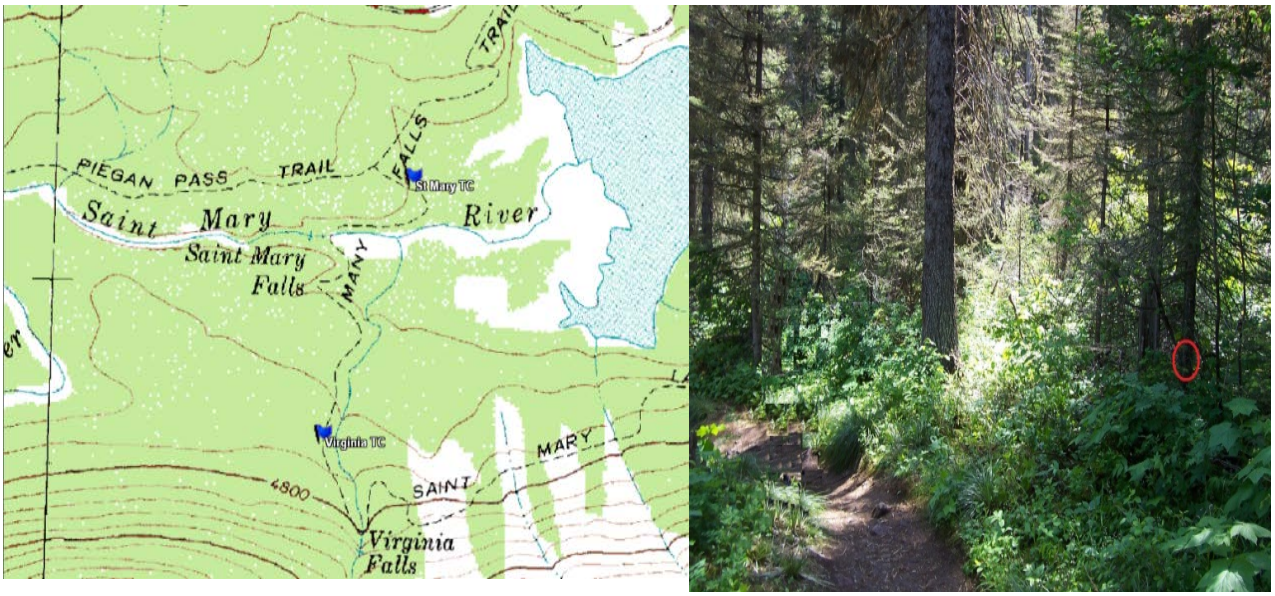

Figure 73 Map and location of Virginia Falls trail counter.

The calibration of the trail counter at Virginia Falls occurred on three separate periods: July 13th during six hours period, and July 15th and 27th with five hours each period. The results of the calibration showed a difference of 191 visitors during the three days of calibration (Appendix C).

The adjustment factor obtained from the calibration was 1.25569 (938 counts from the visual observations divided by the 747 trail counter's counts). Those results suggested that the trail counter was nearly 80 percent accurate. Observers noted that it is not as busy trail as St. Mary Falls; however, some visitors walk side-by-side or in tight clusters. Thus, the underestimation seen by the trail counter seems understandable.

4.9.1 General Findings

Before analysis of the trail counts was completed, the counts were divided by 2 since the trail is a single up and back route. Additionally, the trail counts were multiplied by 1.26 to adjust the results of the calibration. The estimates from the trail counter showed that the total use during the four months monitored was 17,833 visitors. The highest estimated use of the trail was in July with a total of 9,878 visitors, followed by August 5,447, September 2,369, and October with 140 visitors (Table 39).

Table 39 Estimated visitation at Virginia Falls: July to October 2011.

Month	TC Data	# Days Monitored	Daily Average	Total Estimate for Month
July	6,054	19	319	9,878
August	5,447	31	176	5,447
September	2,369	30	79	2,369
October	90	20	5	140
Total	13,960	100	140	17,833

Figure 74 shows the daily trend during the complete season along 100 days of the trail counter's operation. The average daily use from the original data was 139.6 visitors with a median of 114 visitors. It is clear that demand for the Virginia Falls trail increased at the beginning of the season and then declined steadily as the season progressed.

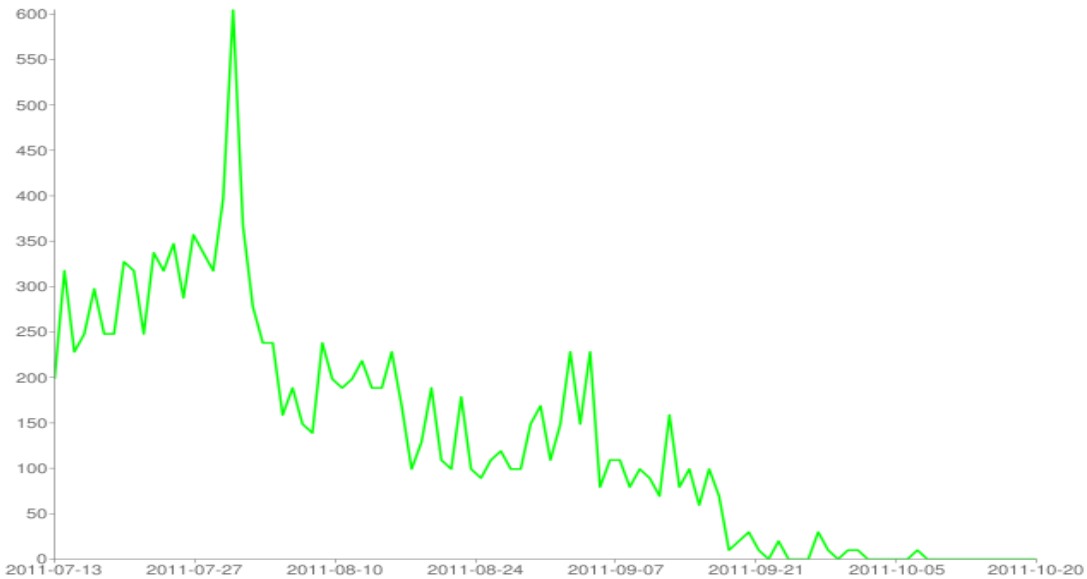

Figure 74 Daily use at the Virginia Falls trail.

During the 100 days of operation, the trail counter registered most visitors during the weekends similar to St. Mary Falls (Figure 75). Saturdays and Sundays had 16.3 percent (mean 159) and 15.6 percent (mean 153) visitors respectively. Among the week days, Wednesdays and Tuesdays showed the highest use with 14.1 percent (mean 138) and 14 percent (mean 137) of the visitors. The lowest visitation was on Friday with 12.8 percent (mean 125).

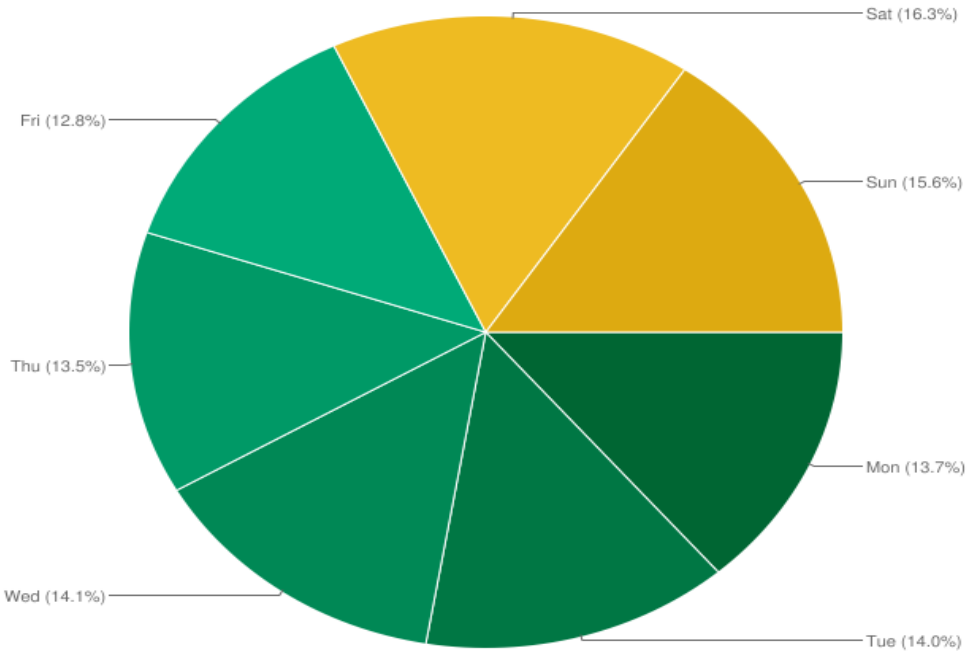

Figure 75 Use at Virginia Falls trail by day of week.

Over the entire season, the average of visitation per hour was 5.8 people with a median of 0.7 people and a standard deviation of 7.6 people (demonstrating considerable variation throughout the days). Figure 76 shows that the maximum use was presented around 1 PM with 21.5 people per hour on average, followed by noon with 20.5 people per hour and 2 PM with 18.4 people per hour. The trail started to have significant use around 9 AM and remained visited until 6 PM. The presence of visitors registered by the trail counter late in the nights and early in the morning may have been caused by wildlife.

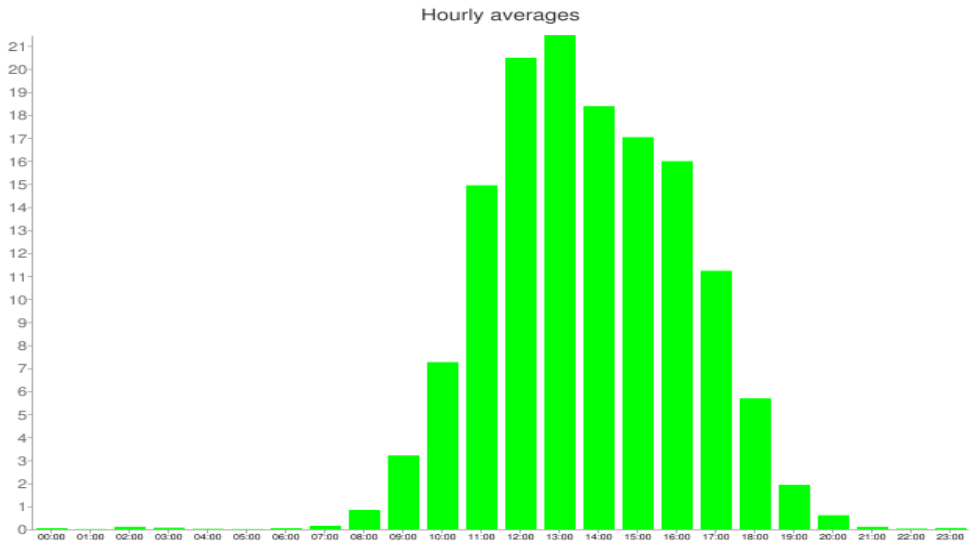

Figure 76 Hourly use at Virginia Falls trail.

4.9.2 Summer Findings

For the purpose of this report, the summer season included the days from when the trail counter was installed (July 12th) through the Labor Day weekend (September 5th). A total of 12,387 visitors were counted during that 55 day period. The average visitation per day during the summer was 225.2 people with a median of 208 people. The estimated visitation from July first to September 5th was 15,719 visitors. The maximum day of visitation registered by the trail counter was July 31th with 605 people. The minimum count on a single day was August 25th with 90 people (Figure 77).

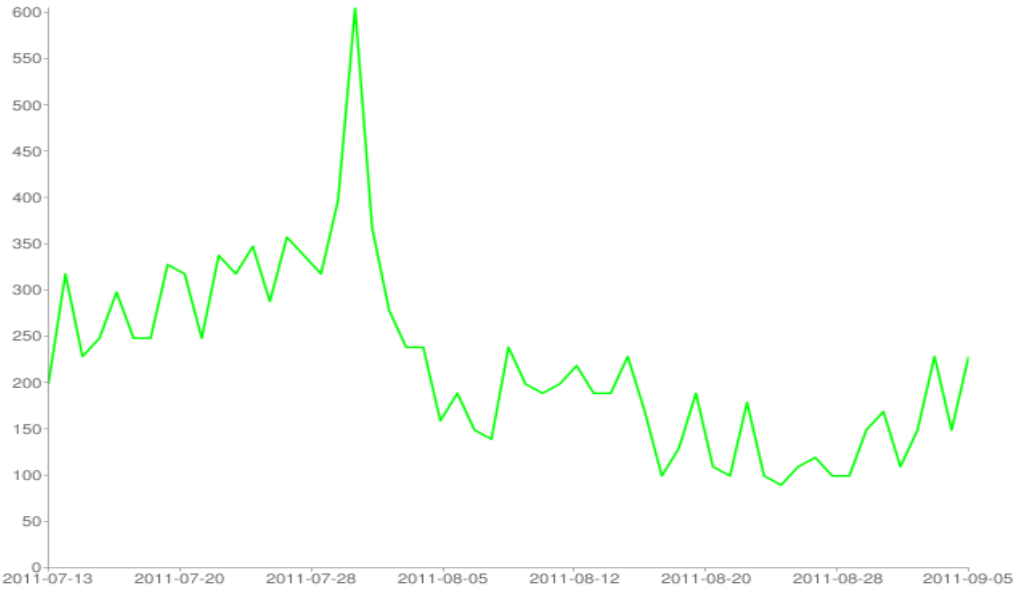

Figure 77 Summer daily visitation at Virginia Falls trail.

During the same summer season at Virginia Falls trail, Saturdays and Sundays were the days most visited with 15.5 percent (mean 245) and 15.4 percent (mean 243) of visitors respectively. Among week days Tuesdays were the days most visited with 14.7 percent and averaging 232 visitors. Fridays had the lowest visitation averaging 198 people or 12.5 percent of the weekly use (Figure 78).

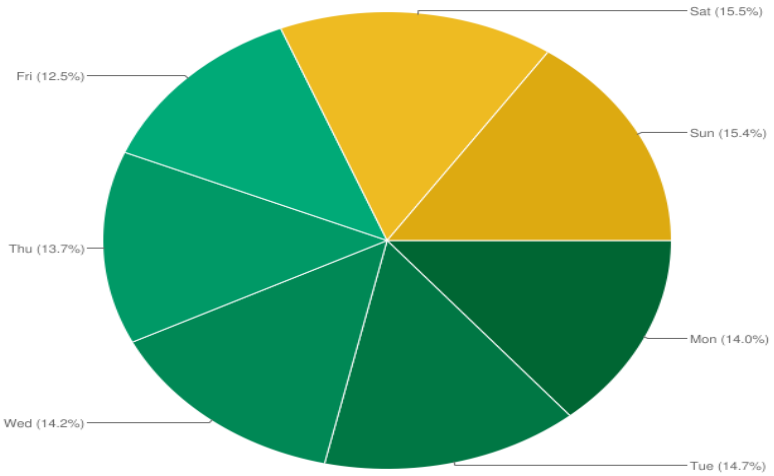

Figure 78 Summer use at Virginia Falls trail by day of week.

4.9.3 Fall Findings

For the purpose of this report, the fall season in Virginia Falls included September 6th through October 20th, when the trail counter was taken down. There were a total of 45 days with a total of visitation of 1,573 people counted. The average per day use was 35 visitors with a median of 10 visitors. The estimated use during the complete fall season (September 6th to October 31st) was 2,114 visitors. On September 13th the trail counter registered the maximum visitation of the season with 168 people; contrastingly, three days in October (6th, 7th, and 13th) registered no people (Figure 79).

Figure 79 Fall daily visitation at Virginia Falls trail.

During the fall season figure 80 depicts that Saturdays presented the highest visitation with 18.5 percent (mean 45), followed for Tuesdays with 17.3 percent (mean 42). The lowest visitation day was on Mondays with 7.5 percent (mean 18).

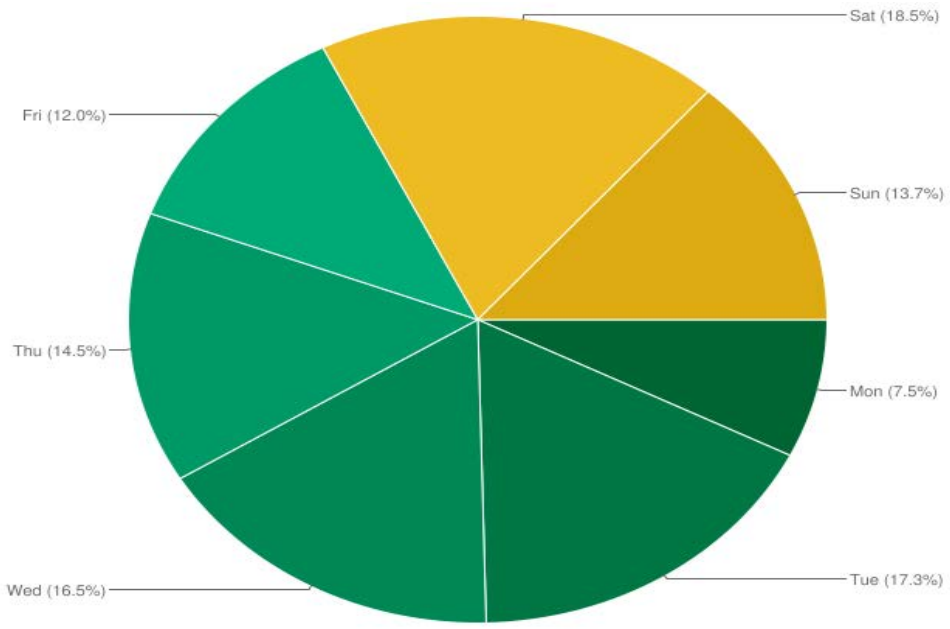

Figure 80 Fall use at Virginia Falls trail by day of week.

4.10 Discussion of Results

The last comprehensive backcountry use study in Glacier National Park was conducted in 1988 by Professor Steve McCool and Amy Braithwaite of the University of Montana. In that study they used multiple methods to estimate backcountry use. Self-registration cards were provided at 47 trailheads. Observations of the use of registration cards at a sample of these trailheads discovered approximately 60 percent compliance (although there was considerable variation across trails). Additionally, infrared beam activated cameras were used at five trailheads. Finally, electronic vibration sensor pads were used at two trailheads and compared to the film data captured by the cameras. The Avalanche lake trail was one of those two trails and presents among the best data of the study.

The 1988 study estimated that Avalanche lake trail received 26,200 visitors between May 21st and September 5th. According to the NPS public use statistics office, in 1988 the park received 1,817,733 visits and in 2011, just 35,831 more for a total of 1,853,564 visits. Based on the trail counter we installed, we got an estimate of 55,170 visitors for

the summer season (July first to September 5th) in 2011 at avalanche creek trail. An additional 13,068 visitors hiked Avalanche from September through November of 2011. Thus, it appears that use levels on the Avalanche lake trail have increased by as much as 250 percent since last measured 23 years ago.

Among the other trails monitored during the 2011 season, Hidden Lake presented the second highest visitations with an average of 811 visitors per day. This trail received a higher amount of visitors during the weekends and Mondays, with noon being the hour when the trail had the most demand. The trail remained high in demand through the afternoon hours. However, this trail was monitored only for about 16 days and it will be necessary to gain a better sample of the season in future years.

Contrastingly, St. Mary and Virginia Falls trail were monitored during 100 days which cover almost all the summer and fall seasons from July to October. Moreover, those counters did not present technical problems so the data was collected from the day of installation. The average daily use in St. Mary was 370.1 visitors. Virginia Falls trail received approximately the 40 percent of the total visitation of St. Mary Falls. Those findings suggested that 60 percent of the visitors in this area just went to St. Mary Falls and then return. Nevertheless, during the calibration times the crew noted that some visitors came to the falls before where the trail counter was installed (called Overlook two in the GPS report) and they thought those falls were the Virginia Falls so they did not go further. An additional study may give clarity about the percent of visitors who just visit St. Mary Falls.

In the case of The Loop and Highline trails, it was clearly registered during the calibration periods that those trails are connected so not all visitors came back by the same route. That was the same situation for Sunrift Gorge and Siyeh Bend trails. For those four trails it is necessary to do a comprehensive study which better estimates the percent of visitors that enter and exit different places on the trail. For the case of the Highline and The Loop the study also may help to understand the use related with the Chalet.

It was not surprising that all the trails experienced high visitation during the Labor Day holiday weekend after which there was a progressive reduction of use. Furthermore, almost all the trails with exception of St. Mary and Virginia Falls trails showed a trend of higher weekend use during the fall season. The level use in The Loop, Highline, Hidden Lake, Sunrift Gorge and Siyeh Bend trails was affected by the closure of the trails due snow presence and bear activity, among other factors. Moreover, use levels at Avalanche Lake and St. Mary Falls trails may have been affected by the closure of the trails previously mentioned.

References

Baker, Melissa and Freimund, Wayne. 2007. Initial Season of the Going-to-the-Sun Road Shuttle System at Glacier National Park: Visitor Use Study. Missoula, MT: University of Montana Department of Society and Conservation.

Freimund, Wayne; Mccool, Stephen F. and Adams, John C. 2006a. Recreational Use of Selected Viewpoints on Going-to-the-Sun Road, 2005. Missoula, MT: University of Montana Department of Society and Conservation.

Freimund, Wayne; Baker, Melissa L.; Mccool, Stephen F. 2006b. Recreational Use of Selected Viewpoints on Going-to-the-Sun Road, 2006. Missoula, MT: University of Montana Department of Society and Conservation.

McCool, Stephen F. and Braithwaite, Amy M. 1989. An Estimate of Backcountry Day Use of Glacier National Park. Missoula, MT: University of Montana, Institute for Tourism and Recreation Research, School of Forestry.

Appendix A: Sampling Plan

Date	Day	Time	Site	Activity
7/4/2011	Monday	PM	Avalanche	Observation/Calibration
7/5/2011	Tuesday	AM	Avalanche	Observation/Calibration
7/6/2011	Wednesday	PM	Avalanche	Observation/Calibration
7/7/2011	Thursday	AM	Avalanche	Observation/Calibration
7/8/2011	Friday	PM	Avalanche	Observation/Calibration
7/13/2011	Wednesday	AM	St. Mary	Gps/Calibration
7/14/2011	Thursday	PM	St. Mary	Gps/Calibration
7/15/2011	Friday	AM	St. Mary	Gps/Calibration
7/20/2011	Wednesday	AM	Avalanche	Observation/Calibration
7/21/2011	Thursday	PM	Avalanche	Observation/Calibration
7/22/2011	Friday	AM	Avalanche	Observation
7/25/2011	Monday	PM	Avalanche	Observation
7/26/2011	Tuesday	AM	St. Mary	Gps/Calibration
7/27/2011	Wednesday	PM	St. Mary	Gps/Calibration
7/28/2011	Thursday	AM	St. Mary	Gps/Calibration
7/29/2011	Friday	PM	St. Mary/Siyeh Bend	Gps/Calibration
8/1/2011	Monday	AM	Sunrift	Observation/Calibration
8/2/2011	Tuesday	PM	Sunrift	Observation/Calibration
8/3/2011	Wednesday	AM	Sunrift	Observation/Calibration
8/6/2011	Saturday	PM	Sunrift	Observation/Calibration
8/7/2011	Sunday	AM	Sunrift	Observation/Calibration
8/8/2011	Monday	PM	Sunrift	Observation/Calibration
8/13/2011	Saturday	AM	The Loop/Highline Trail	Calibration
8/14/2011	Sunday	PM	The Loop/Highline Trail	Calibration
8/15/2011	Monday	AM	The Loop/Highline Trail	Calibration
8/16/2011	Tuesday	PM	The Loop/Highline Trail	Calibration
8/20/2011	Saturday	AM	Logan Pass	Gps/Calibration
8/21/2011	Sunday	PM	Logan Pass	Gps/Calibration
8/22/2011	Monday	AM	Logan Pass	Gps/Calibration
8/23/2011	Tuesday	PM	Logan Pass	Gps/Calibration
8/24/2011	Wednesday	AM	Logan Pass	Gps/Calibration

Appendix B: Trail counters locations

PLACE	LOCATION	DATE OF INSTALLATION
Avalanche New Trail Counter	Northing 5395170	7/18/2011
	Easting 0293139	
	Zone 12 UTM	
Virginia Falls Trail Counter	Northing 5393295	7/12/2011
	Easting 0307475	
	Zone 12 UTM	
St Mary Falls Trail Counter	Northing 5394000	7/12/2011
	Easting 0307746	
	Zone 12 UTM	
Sunrift Trail Counter	Northing 5395247	7/12/2011
	Easting 0308748	
	Zone 12 UTM	
Siyeh Bend Trail Counter	Northing 5398868	7/19/2011
	Easting 0304957	
	Zone 12 UTM	
The Loop Trail Counter	Northing 5404566	7/19/2011
	Easting 0293371	
	Zone 12 UTM	
Highline Trail Counter	Northing 5398947	8/9/2011
	Easting 0300239	
	Zone 12 UTM	
Hidden Lake Trail Counter	Northing 5396422	8/17/2011
	Easting 0298635	
	Zone 12 UTM	

Appendix C: Calibration Results

Calibration results at Avalanche Lake trail

Day	Time		Visual Observation	Trail Counter Data	Difference
	From	To			
July 21th	08:01 a.m.	09:00 a.m.	28	30	(-)2
	09:01 a.m.	10:00 a.m.	100	96	4
	10:01 a.m.	11:00 a.m.	146	140	6
	11:01 a.m.	12:00 a.m.	190	186	4
	12:01 a.m.	01:00 p.m.	231	213	18
	01:01 p.m.	02:00 p.m.	269	214	55
July 22th	02:01 p.m.	03:00 p.m.	278	252	26
	03:01 p.m.	04:00 p.m.	316	260	56
	04:01 p.m.	05:00 p.m.	185	168	17
	05:01 p.m.	06:00 p.m.	135	118	17
	06:01 p.m.	07:00 p.m.	97	81	16
	07:01 p.m.	08:00 p.m.	36	27	9
Total			2061	1785	226

Calibration results at The Loop trail

Day	Time		Visual Observation	Trail Counter Data	Difference
	From	To			
13-Aug	09:01 a.m.	10:00 a.m.	6	6	0
	10:01 a.m.	11:00 a.m.	5	5	0
	11:01 a.m.	12:00 a.m.	7	7	0
	12:01 a.m.	01:00 p.m.	9	8	1
	01:01 p.m.	02:00 p.m.	15	16	-1
	02:01 p.m.	03:00 p.m.	58	51	7
14-Aug	02:01 p.m.	03:00 p.m.	7	7	0
	03:01 p.m.	04:00 p.m.	17	15	2
	04:01 p.m.	05:00 p.m.	43	41	2
	05:01 p.m.	06:00 p.m.	72	67	5
	06:01 p.m.	07:00 p.m.	57	48	9
	07:01 p.m.	08:00 p.m.	47	44	3
15-Aug	09:01 a.m.	10:00 a.m.	18	20	-2
	10:01 a.m.	11:00 a.m.	9	8	1
	11:01 a.m.	12:00 a.m.	16	15	1
	12:01 a.m.	01:00 p.m.	16	17	-1
	01:01 p.m.	02:00 p.m.	21	20	1
	02:01 p.m.	03:00 p.m.	41	41	0

14-Aug	02:01 p.m.	03:00 p.m.	16	16	0
	03:01 p.m.	04:00 p.m.	30	29	1
	04:01 p.m.	05:00 p.m.	34	34	0
	05:01 p.m.	06:00 p.m.	66	60	6
	06:01 p.m.	07:00 p.m.	88	83	5
	07:01 p.m.	08:00 p.m.	21	20	1
Total			719	678	41

Calibration results at Highline trail

Day	Time		Visual Observation	Trail Counter Data	Difference
	From	To			
13-Aug	09:01 a.m.	10:00 a.m.	130	122	8
	10:01 a.m.	11:00 a.m.	135	124	11
	11:01 a.m.	12:00 a.m.	129	123	6
	12:01 a.m.	01:00 a.m.	73	71	2
	01:01 p.m.	02:00 p.m.	61	61	0
14-Aug	02:01 p.m.	03:00 p.m.	105	90	15
	03:01 p.m.	04:00 p.m.	38	33	5
	04:01 p.m.	05:00 p.m.	38	35	3
	05:01 p.m.	06:00 p.m.	26	24	2
	06:01 p.m.	07:00 p.m.	16	15	1
15-Aug	09:01 a.m.	10:00 a.m.	143	130	13
	10:01 a.m.	11:00 a.m.	94	91	3
	11:01 a.m.	12:00 a.m.	89	82	7
	12:01 a.m.	01:00 a.m.	94	83	11
	01:01 p.m.	02:00 p.m.	57	51	6
14-Aug	02:01 p.m.	03:00 p.m.	49	43	6
	03:01 p.m.	04:00 p.m.	59	53	6
	04:01 p.m.	05:00 p.m.	25	21	4
	05:01 p.m.	06:00 p.m.	21	17	4
	06:01 p.m.	07:00 p.m.	9	9	0
Total			1391	1278	113

Calibration results at Hidden Lake trail

Day	Time		Visual Observation	Trail Counter Data	Difference
	From	To			
20-Aug	08:01 a.m.	09:00 a.m.	18	26	-8
	09:01 a.m.	10:00 a.m.	65	77	-12
	10:01 a.m.	11:00 a.m.	111	129	-18
	11:01 a.m.	12:00 a.m.	211	210	1
	12:01 a.m.	01:00 a.m.	228	195	33
	01:01 p.m.	02:00 p.m.	216	174	42

21-Aug	02:01 p.m.	03:00 p.m.	224	183	41
	03:01 p.m.	04:00 p.m.	192	140	52
	04:01 p.m.	05:00 p.m.	199	169	30
	05:01 p.m.	06:00 p.m.	144	115	29
	06:01 p.m.	07:00 p.m.	84	73	11
22-Aug	09:01 a.m.	10:00 a.m.	69	58	11
	10:01 a.m.	11:00 a.m.	123	142	-19
	11:01 a.m.	12:00 a.m.	245	218	27
	12:01 a.m.	01:00 a.m.	265	234	31
	01:01 p.m.	02:00 p.m.	360	285	75
23-Aug	02:01 p.m.	03:00 p.m.	151	130	21
	03:01 p.m.	04:00 p.m.	192	160	32
	04:01 p.m.	05:00 p.m.	167	149	18
	05:01 p.m.	06:00 p.m.	100	85	15
	06:01 p.m.	07:00 p.m.	53	52	1
24-Aug	09:01 a.m.	10:00 a.m.	62	53	9
	10:01 a.m.	11:00 a.m.	125	115	10
	11:01 a.m.	12:00 a.m.	217	199	18
	12:01 a.m.	01:00 a.m.	244	214	30
	01:01 p.m.	02:00 p.m.	229	197	32
Total			4,294	3,782	512

Calibration results at Siyeh Bend trail

Day	Time		Visual Observation	Trail Counter Data	Difference
	From	To			
29-Jul	02:01 p.m.	03:00 p.m.	5	5	0
	03:01 p.m.	04:00 p.m.	9	8	1
	04:01 p.m.	05:00 p.m.	3	3	0
	05:01 p.m.	06:00 p.m.	0	0	0
	06:01 p.m.	07:00 p.m.	2	2	0
Total			19	18	1

Calibration results at Sunrift Gorge trail

Day	Time		Visual Observation	Trail Counter Data	Difference
	From	To			
1-Aug	09:01 a.m.	10:00 a.m.	0	0	0
	10:01 a.m.	11:00 a.m.	0	0	0
	11:01 a.m.	12:00 a.m.	5	6	-1
	12:01 a.m.	01:00 p.m.	14	14	0
	01:01 p.m.	02:00 p.m.	2	6	-4

2-Aug	02:01 p.m.	03:00 p.m.	9	11	-2
	03:01 p.m.	04:00 p.m.	8	8	0
	04:01 p.m.	05:00 p.m.	0	0	0
	05:01 p.m.	06:00 p.m.	3	3	0
	06:01 p.m.	07:00 p.m.	0	1	-1
3-Aug	09:01 a.m.	10:00 a.m.	1	1	0
	10:01 a.m.	11:00 a.m.	5	5	0
	11:01 a.m.	12:00 a.m.	2	2	0
	12:01 a.m.	01:00 p.m.	0	0	0
	01:01 p.m.	02:00 p.m.	0	0	0
6-Aug	02:01 p.m.	03:00 p.m.	0	0	0
	03:01 p.m.	04:00 p.m.	11	11	0
	04:01 p.m.	05:00 p.m.	21	20	1
	05:01 p.m.	06:00 p.m.	11	10	1
	06:01 p.m.	07:00 p.m.	2	2	0
7-Aug	09:01 a.m.	10:00 a.m.	0	0	0
	10:01 a.m.	11:00 a.m.	3	3	0
	11:01 a.m.	12:00 a.m.	8	8	0
	12:01 a.m.	01:00 p.m.	0	1	-1
	01:01 p.m.	02:00 p.m.	10	9	1
8-Aug	02:01 p.m.	03:00 p.m.	10	10	0
	03:01 p.m.	04:00 p.m.	8	7	1
	04:01 p.m.	05:00 p.m.	24	24	0
	05:01 p.m.	06:00 p.m.	18	19	-1
	06:01 p.m.	07:00 p.m.	5	4	1
Total			180	185	-5

Calibration results at St. Mary Falls trail

Day	Time		Visual Observation	Trail Counter Data	Difference
	From	To			
14-Jul	02:01 p.m.	03:00 p.m.	198	142	56
	03:01 p.m.	04:00 p.m.	203	144	59
	04:01 p.m.	05:00 p.m.	174	125	49
	05:01 p.m.	06:00 p.m.	122	97	25
	06:01 p.m.	07:00 p.m.	66	49	17
	07:01 p.m.	08:00 p.m.	29	23	6
26-Jul	09:01 a.m.	10:00 a.m.	20	14	6
	10:01 a.m.	11:00 a.m.	64	50	14
	11:01 a.m.	12:00 a.m.	93	69	24
	12:01 a.m.	01:00 p.m.	156	131	25
	01:01 p.m.	02:00 p.m.	146	109	37
28-Jul	09:01 a.m.	10:00 a.m.	24	20	4
	10:01 a.m.	11:00 a.m.	106	80	26
	11:01 a.m.	12:00 a.m.	163	129	34
	12:01 a.m.	01:00 p.m.	134	121	13
	01:01 p.m.	02:00 p.m.	254	184	70
Total			1952	1487	465

Calibration results at Virginia Falls trail

Day	Time		Visual Observation	Trail Counter Data	Difference
	From	To			
13-Jul	08:01 a.m.	09:00 a.m.	0	0	0
	09:01 a.m.	10:00 a.m.	11	8	3
	10:01 a.m.	11:00 a.m.	14	10	4
	11:01 a.m.	12:00 a.m.	54	41	13
	12:01 a.m.	01:00 p.m.	63	45	18
	01:01 p.m.	02:00 p.m.	83	54	29
15-Jul	09:01 a.m.	10:00 a.m.	12	11	1
	10:01 a.m.	11:00 a.m.	86	72	14
	11:01 a.m.	12:00 a.m.	22	17	5
	12:01 a.m.	01:00 p.m.	106	94	12
	01:01 p.m.	02:00 p.m.	74	62	12
27-Jul	02:01 p.m.	03:00 p.m.	91	63	28
	03:01 p.m.	04:00 p.m.	167	141	26
	04:01 p.m.	05:00 p.m.	75	60	15
	05:01 p.m.	06:00 p.m.	62	54	8
	06:01 p.m.	07:00 p.m.	18	15	3
Total			938	747	191

Appendix D: Forms

Calibration sheet

TRAIL _____		DAY _____	PERSON _____

HOUR	minute	# up	# down		HOUR	minute	# up	# down
	1					31		
	2					32		
	3					33		
	4					34		
	5					35		
	6					36		
	7					37		
	8					38		
	9					39		
	10					40		
	11					41		
	12					42		
	13					43		
	14					44		
	15					45		
	16					46		
	17					47		
	18					48		
	19					49		
	20					50		
	21					51		
	22					52		
	23					53		
	24					54		
	25					55		
	26					56		
	27					57		
	28					58		
	29					59		
	30					60		

GPS observations sheet

VISUAL OBSERVATION GPS GROUPS DATA SHEET

Date _____ Weather_____ Observer _____

Sample time _____ Location _____

GPS #	Group Size	Time Started	Type of group	Transportation used	Hike Destination	Hike Duration Expected	Age (Approx.)			Time Returned	Observations
							Children	Adult	Over 50		

Parking lot observations sheet

Date _____ Site _____ Observer _____

Parking Lot: Observation Form

Time In	Time Out	Group Size	Group Type	Activity type	State of Origin	Vehicle Type	Ped. Conflict	Parking lot full	Wildlife Present	Weather	Traffic flow	Group Tour	Other