

Salmon Wild and Scenic River: 2020 River Use Report



Gabriel Oppler, Jennifer Thomsen, Chris Armatas, Leon Miller, and Iree Wheeler

March 2021

The University of Montana

W.A. Franke College of Forestry and Conservation

Missoula, MT USA

We acknowledge support from the Aldo Leopold Wilderness Research Institute, Rocky Mountain Research Station, USDA Forest Service, the University of Montana, and the Salmon-Challis National Forest, USDA Forest Service.

Suggested citation: Oppler, G, Thomsen, J, Armatas, C, Miller, L, and Wheeler, I (2021). 'Salmon Wild and Scenic River: 2020 River Use Report'. Missoula: W.A. Franke College of Forestry and Conservation, University of Montana. 72 pg. [URL]

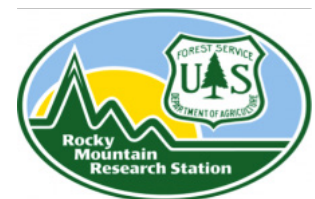
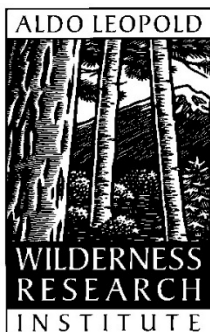


Table of Contents

Executive Summary.....	4
Introduction.....	5
Methods and Study Site	5
Results.....	8
Camera Data - Season Summary.....	8
Site Reports.....	21
Newland.....	21
Deadwater	24
Indianola	28
Spring Creek.....	31
Pine Creek Rapids	35
Cove Creek.....	38
Confluence Upstream	41
Confluence Downstream	45
Cache Bar	49
Traffic Counters.....	52
Spring Creek Campground	52
Panther Creek Road	54
Cache Bar Boat Ramp	56
Salmon River Road at Indian Creek Bridge	58
Salmon River Road at Boulder Creek Bridge.....	60
Salmon River Road at Owl Creek Bridge	62
Salmon River Road at Colson Creek Bridge	64
Research Reflections	66
Data Collection	66
Data Analysis	67
Trends in River Use	67
Trends in Vehicle Use	68
Appendix 1: Insights into Fall and Spring Fishing Seasons	70

Executive Summary

This report provides the findings from recreation monitoring of the Salmon Wild and Scenic River's recreation segment during summer of 2020. This baseline study is intended to provide a greater understanding of river use on this segment and, in combination with visitor use social science, inform user capacity and management actions in the future.

Researchers placed game cameras at nine locations along the river segment and recorded passing boat traffic, including the number of crafts, type of craft, and number of users. Locations were chosen strategically with local managers to assess recreational use patterns along the length of the river section. From upstream (East) to downstream (West), the nine locations included: Newland, Deadwater, Indianola, Spring Creek, Pine Creek Rapids, Cove Creek, Confluence Upstream, Confluence Downstream, and Cache Bar.

Three road traffic counters were also used to determine vehicle traffic patterns along the river at select put-in and take-out spots. The three locations included: Spring Creek Campground, intersection of Salmon River Road and Panther Creek Road, and Cache Bar Boat Ramp. In addition, this section of the report includes data from a separate study conducted by the USFS of traffic on four bridges along Salmon River Road: at Indian Creek, Boulder Creek, Owl Creek, and Colson Creek.

On average, cameras were active for 64 observation days. Across all nine sites, an average of 8.4 craft were observed per day (19.8 individuals/day). The site with greatest boat traffic was Confluence Downstream (directly downstream of the confluence with the Middle Fork of the Salmon), where 2,198 crafts with 4,574 individuals were recorded (39.3 craft/day and 81.7 people/day). Newland was the site with lowest usage: 23 total crafts (0.3/day) and 37 total people (0.5/day). Overall, July was the month with highest usage and Saturday was the day with highest usage. Generally, river usage was greatest during the middle of the day, and rafts were the most common craft type. However, there is significant variation across sites, as discussed in the full report.

Of the three road counters, Spring Creek Campground was the most heavily trafficked, followed by Cache Bar Boat Ramp and then Panther Creek Road.

Introduction

The Salmon River runs for 425 miles from its origin in Idaho's Sawtooth and Lemhi Valleys to its confluence with the Snake River at the Idaho/Oregon border (Fig. 1).

In 1980, portions of the Middle Fork of the Salmon River were designated under the 1968 Federal Wild and Scenic Rivers Act. 79 miles of the river – passing through the Frank Church-River of No Return Wilderness and Gospel-Hump Wilderness – were classified as “wild”. Another 46 miles are classified as recreational.¹ The focus of this study is the “recreational” segment, which stretches from North Fork to Corn Creek.

The Salmon Wild and Scenic River Management Plan was completed in 1982. Subsequent guidelines and court decisions have confirmed that all comprehensive river management plans for a designated Wild and Scenic River require a ‘user capacity’ determination. The purpose of this preliminary study is to empirically describe the baseline level of recreational usage on the river segment.



Figure 1. Salmon River system

Methods and Study Site

Researchers from the University of Montana, in partnership with the U.S. Forest Service, monitored river recreation every day from July 7 to September 12, 2020. Game cameras were set up at nine sites along the recreation segment (see Fig. 2). Cameras were mounted at strategic locations to capture all floaters to the greatest extent practicable, given available

¹ <https://www.rivers.gov/rivers/salmon-id.php>

resources. Cameras took photos at three second intervals, from 8:30am to 7:00pm. The camera footage was reviewed by UM researchers using GameFinder Software. Researchers recorded the type of each passing craft and the approximate number of people on each. Each craft was also assigned a time stamp to later assess how river traffic changes over the course of the day. Figure 3 is a typical screenshot of the camera footage used during analysis.

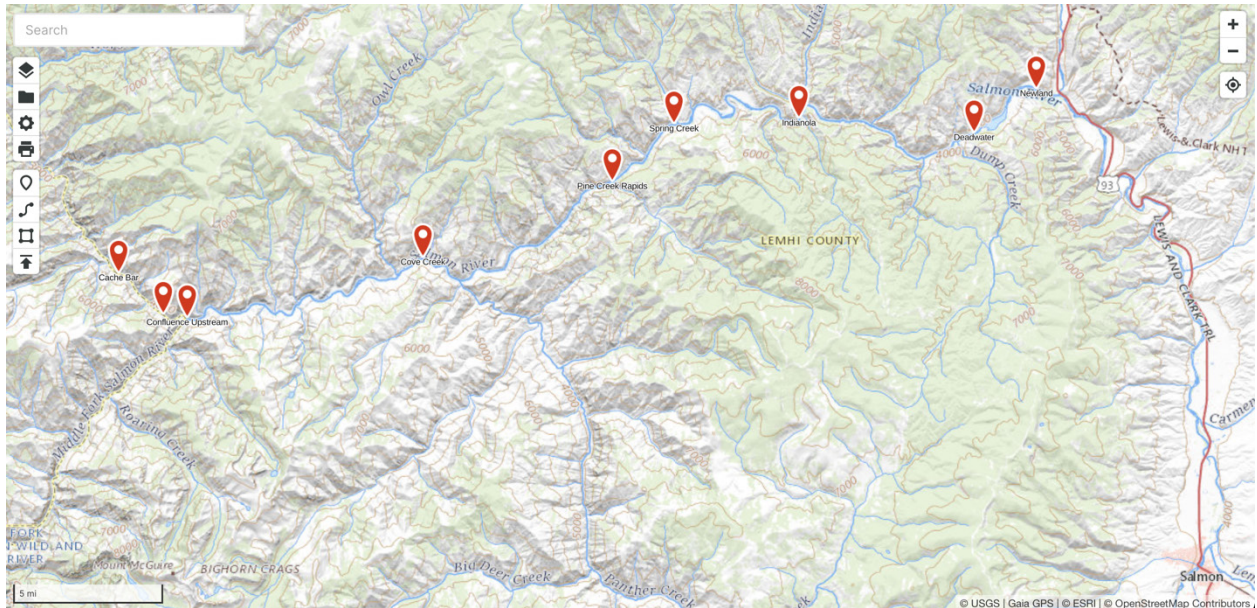


Figure 2. Camera locations, from East (right) to West (left): Newland, Deadwater, Indianola, Spring Creek, Pine Creek Rapids, Cove Creek, Confluence Upstream, Confluence Downstream, Cache Bar



Figure 3. Example of camera footage in GameFinder

Data was also collected on vehicle activity at three sites along the river. TRAFX traffic counters were set up at the Spring Creek Campground, intersection with Panther Creek Road, and Cache Bar Boat Ramp (see Fig. 4). Vehicles were counted entering and exiting each area. To account for equipment error and possible overnight stays inside parking areas, total daily traffic is considered the average of daily entrances and exits. Hourly data were collected automatically from June 18-September 12 with no interruptions.

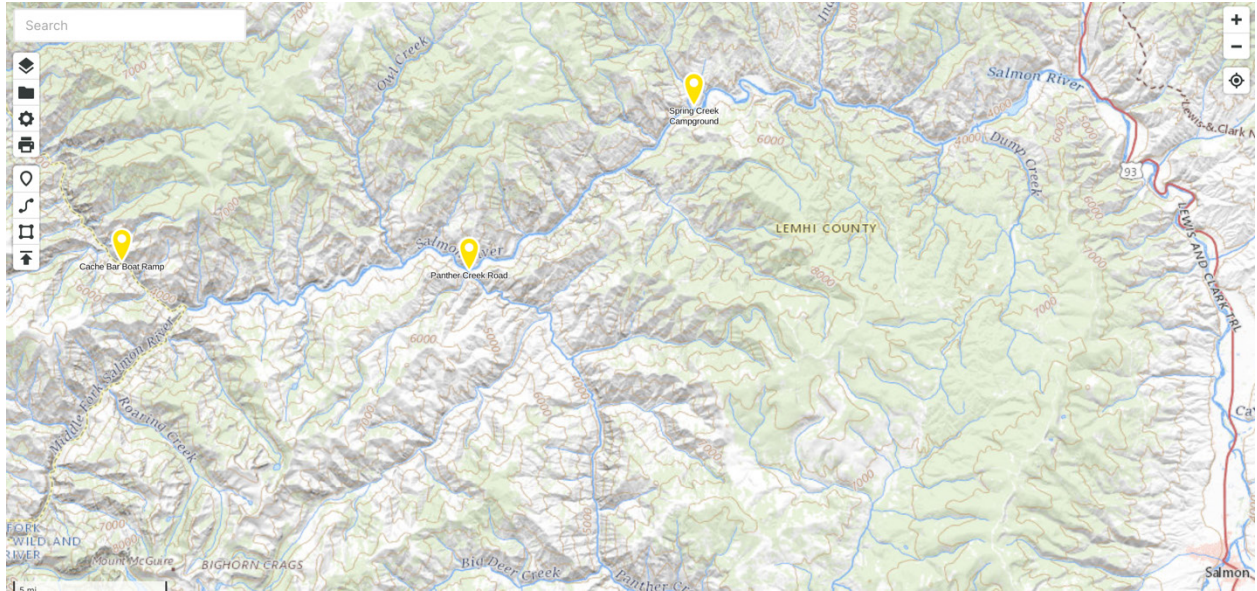


Figure 4. Traffic counter locations from East (right) to West (left): Spring Creek Campground, Panther Creek Road, Cache Bar Boat Ramp

To complement this effort, researchers obtained traffic counter data from monitoring conducted by USFS civil engineers at four bridges along Salmon River Road: at Indian Creek, Boulder Creek, Owl Creek, and Colson Creek. While these data were not actually collected as part of the recreation monitoring study, they were later shared by USFS civil engineers for inclusion in this report.

Results

Camera Data - Season Summary

This section provides an overview of river usage in the 2020 summer season. During the first two weeks of data collection, we experienced technical issues with the cameras filling up the SD cards too quickly. We then replaced these cameras with Plotwatcher Pro cameras that were able to adequately capture river usage over a two-week period. Throughout data collection, there were some minor camera malfunctions or periodic disturbances, such as camera movement or inadvertently triggered settings, making the total observation days at each site variable. Table 1 presents the nine sites with the total observation days, total crafts, total people, and then an average craft per day and average people per day. By both measures, the site with by far the greatest usage was Confluence Downstream. Importantly, though, most users passing through Confluence Downstream were coming off of the Middle Fork of the Salmon River and, therefore, were generally only floating 3 miles of the recreational segment of the Salmon River. Pine Creek Rapids saw the second greatest usage, followed closely by Spring Creek. Fewest floaters were observed at Newland. A more in-depth analysis of each site follows in subsequent sections of the report.

Table 1. Camera data season summary

Location	Observation Days	Total Craft	Average Craft Per Day	Total People	Average People Per Day
Newland	70	23	0.3	37	0.5
Deadwater	68	135	2.0	201	3.0
Indianola	68	131	1.9	200	2.9
Spring Creek	57	683	12.0	2163	37.9
Pine Creek Rapids	68	838	12.3	2613	38.4
Cove Creek	67	109	1.6	197	2.9
Confluence Upstream	58	105	1.8	198	3.4
Confluence Downstream	56	2198	39.3	4574	81.7
Cache Bar	67	297	4.4	495	7.4
TOTAL		4519	8.4	10678	19.8

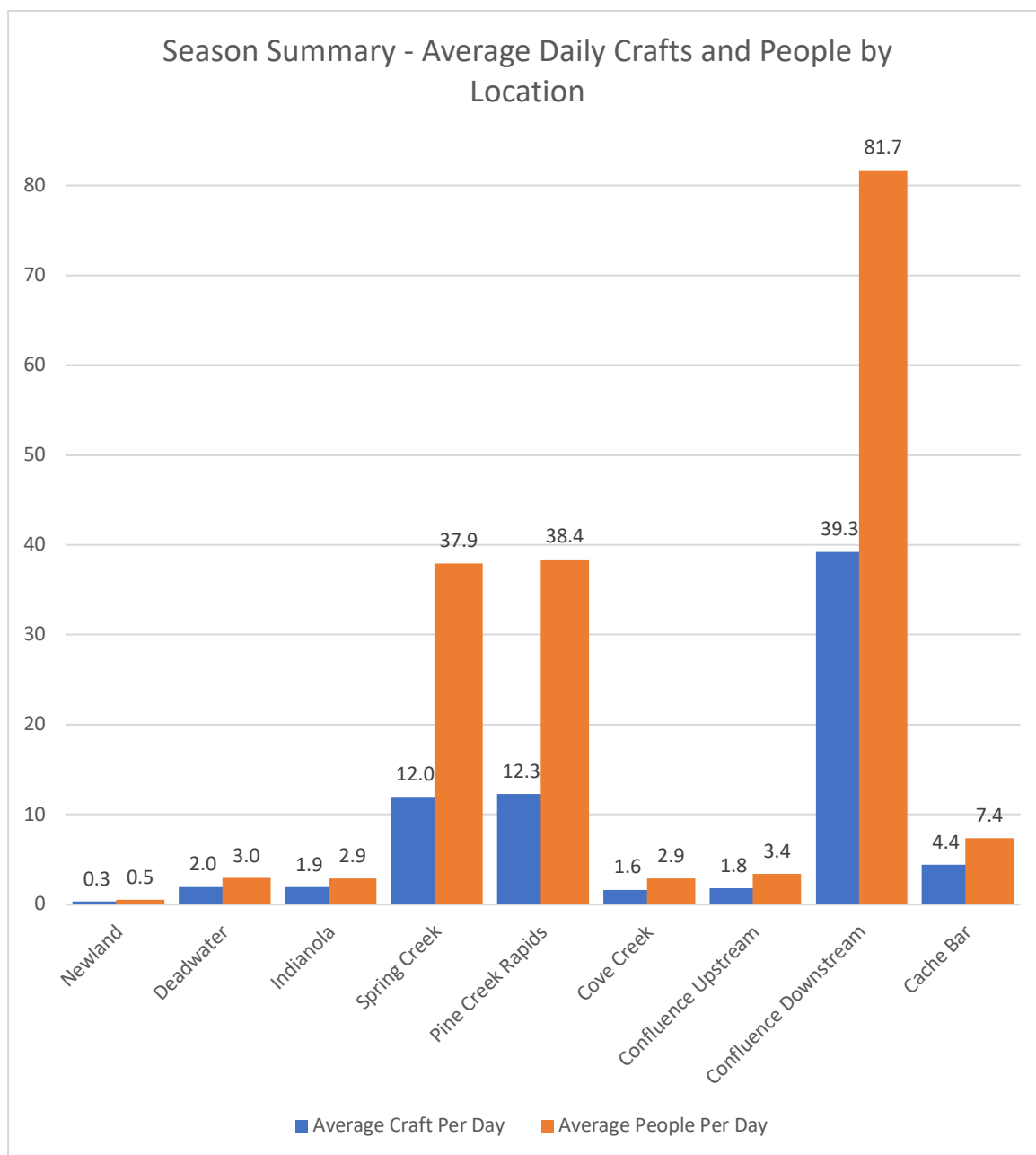


Figure 5. Season summary - Average daily crafts and people by location

Table 2. Season summary by location and month (Not shown: two observation days in June at Newland and one day at Confluence Upstream (both with 0 crafts).

Location	Month	Daily Average Crafts	Daily Average People	Observation Days
Newland	July	0.6	1.0	25
	August	0.3	0.4	31
	September	0.0	0.0	12
Deadwater	July	2.0	2.7	25
	August	1.7	2.8	31
	September	2.8	3.8	12
Indianola	July	1.7	2.4	25
	August	2.0	3.2	31
	September	2.3	3.5	12
Spring Creek	July	13.2	45.6	26
	August	12.9	41.3	19
	September	7.8	15.9	12
Pine Creek Rapids	July	13.1	47.4	25
	August	12.1	37.2	31
	September	11.3	22.9	12
Cove Creek	July	1.4	2.9	24
	August	1.3	2.3	31
	September	3.0	5.3	12
Confluence Upstream	July	1.0	2.8	26
	August	1.5	2.7	19
	September	4.1	6.1	12
Confluence Downstream	July	50.5	110.3	24
	August	35.1	71.9	20
	September	23.8	40.8	12
Cache Bar	July	3.0	6.3	24
	August	3.7	6.1	31
	September	9.3	12.8	12

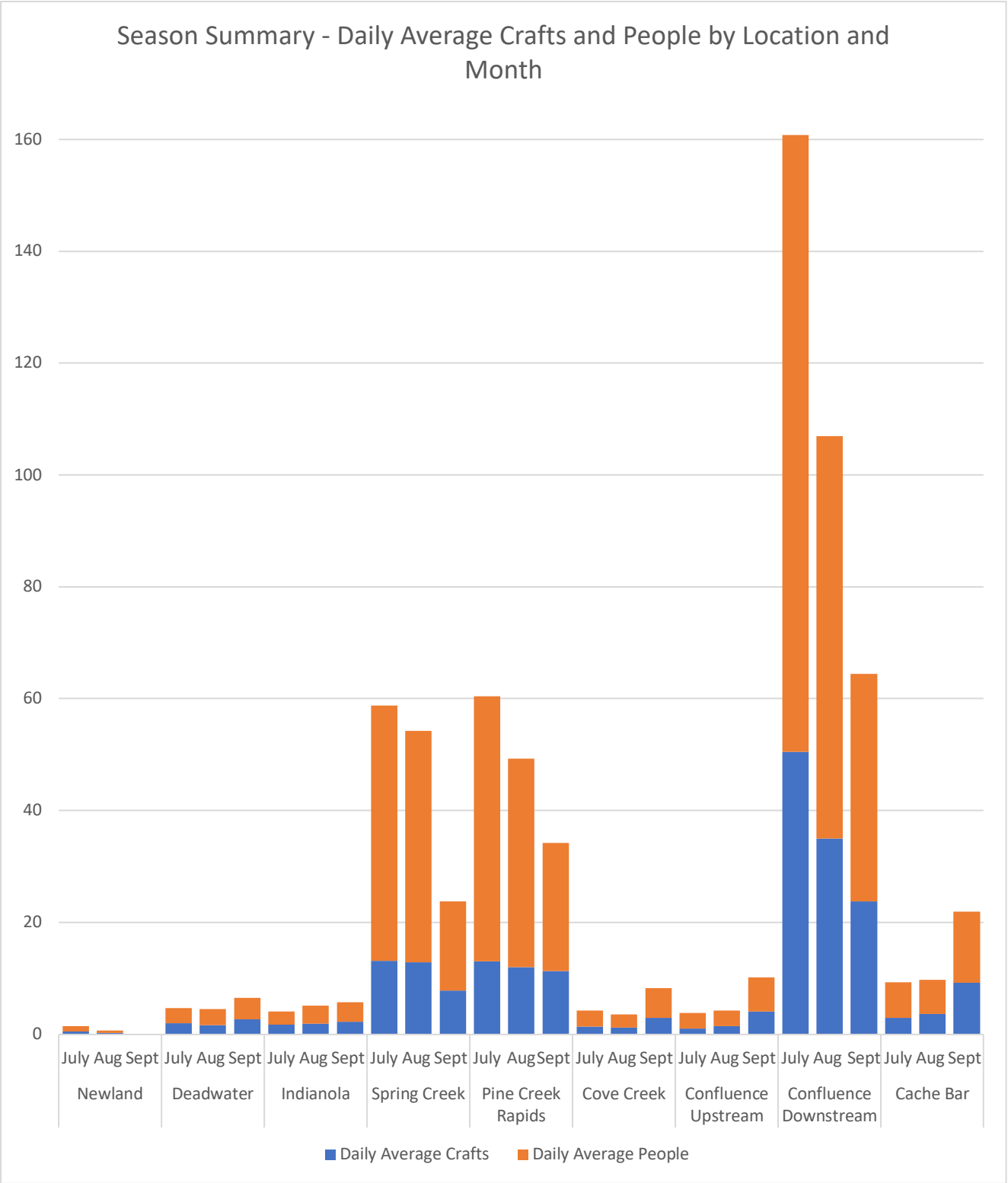


Figure 6. Season summary - daily average crafts and people by location and month

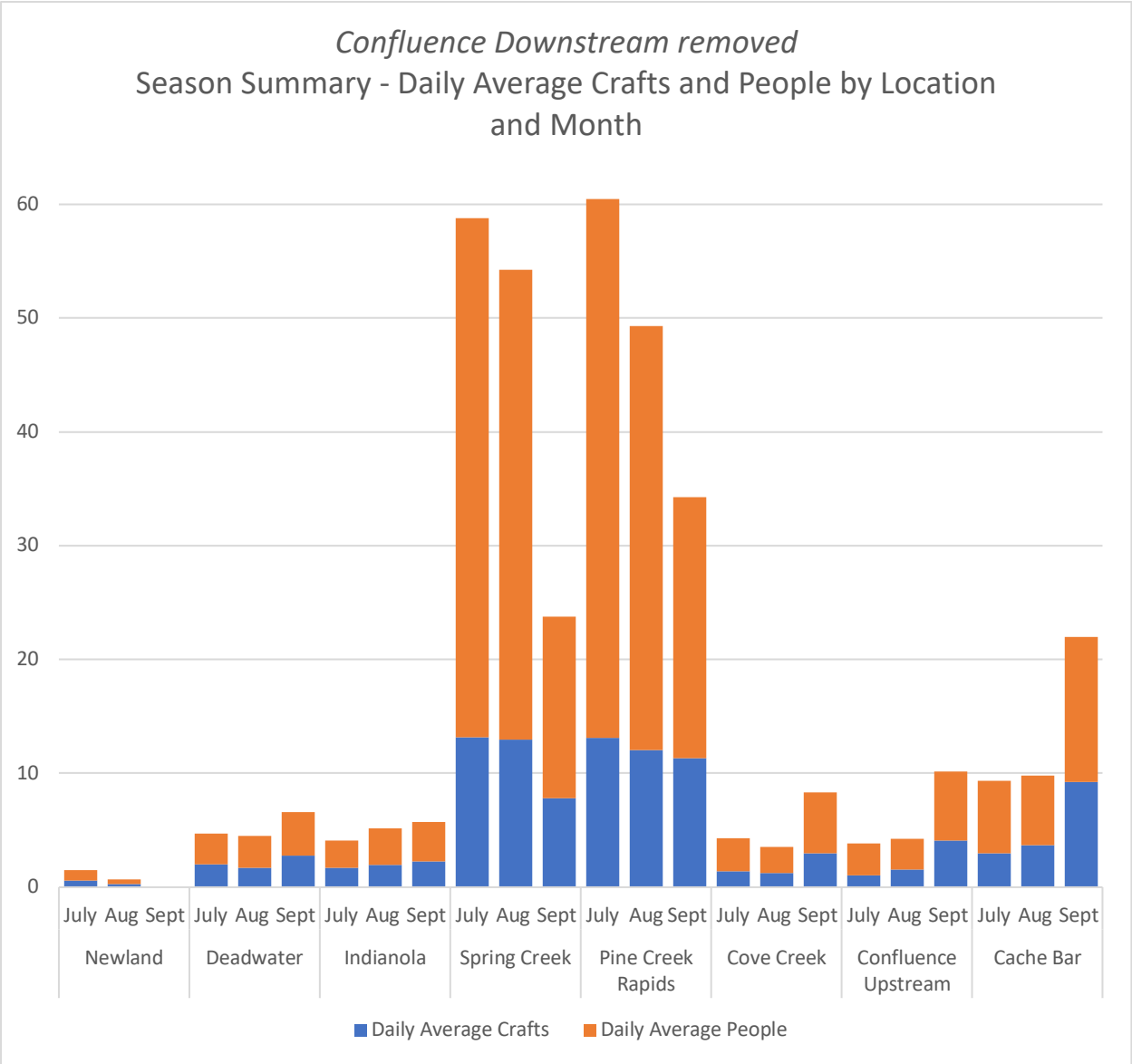


Figure 7. To facilitate easier comparisons among all other sites, this figure displays the same data as Fig. 6 above (daily average crafts and people by location and month), with the omission of Confluence Downstream.

Throughout the summer, Spring Creek, Pine Creek Rapids, and Confluence Downstream all exhibited large discrepancies between the number of crafts and number of people, indicative of crafts with large carrying capacities (rafts). Figure 15 shows the proportion of each craft type at each location.

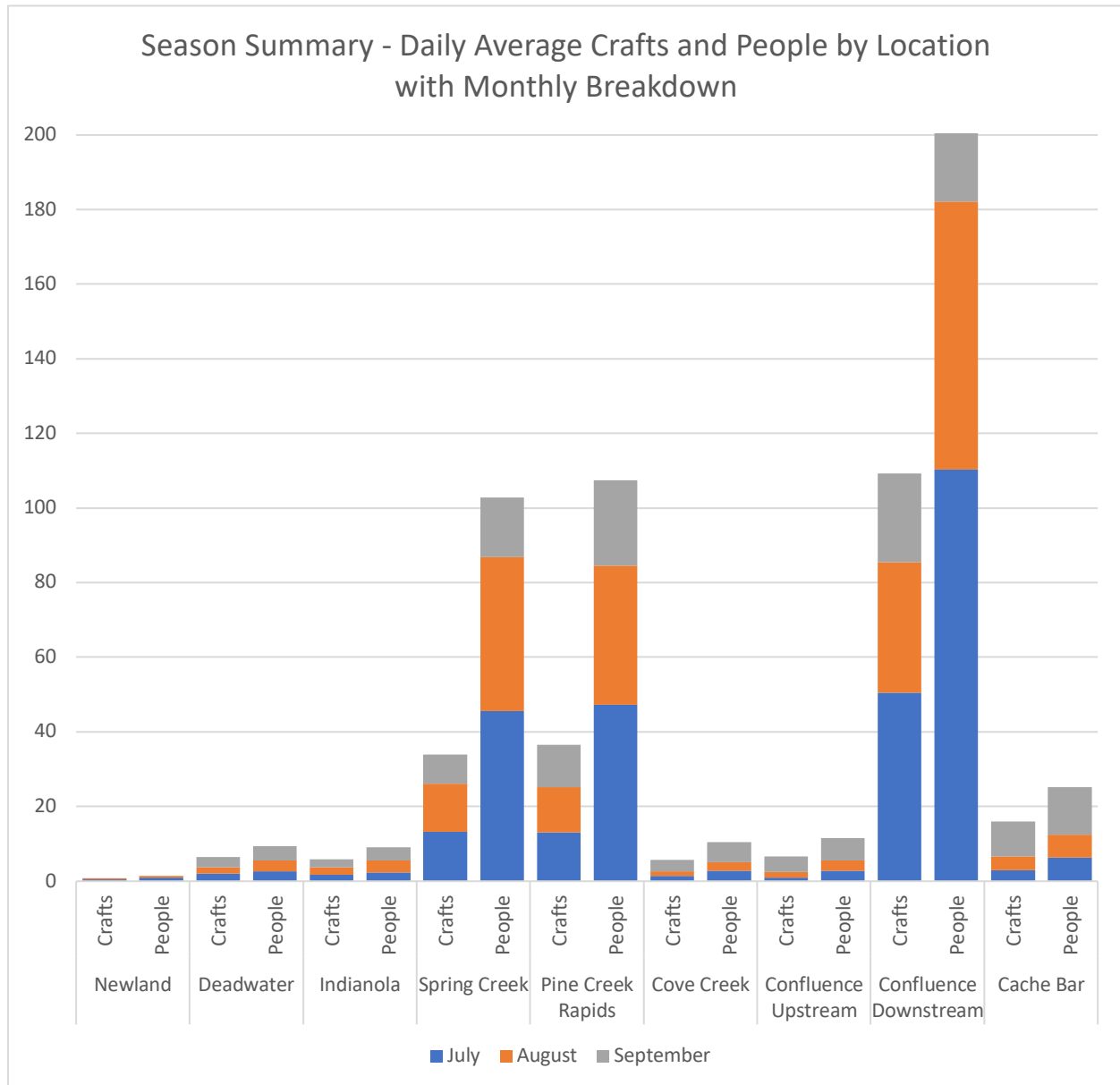


Figure 8. Season summary - daily average crafts and people by location, showing proportions by month

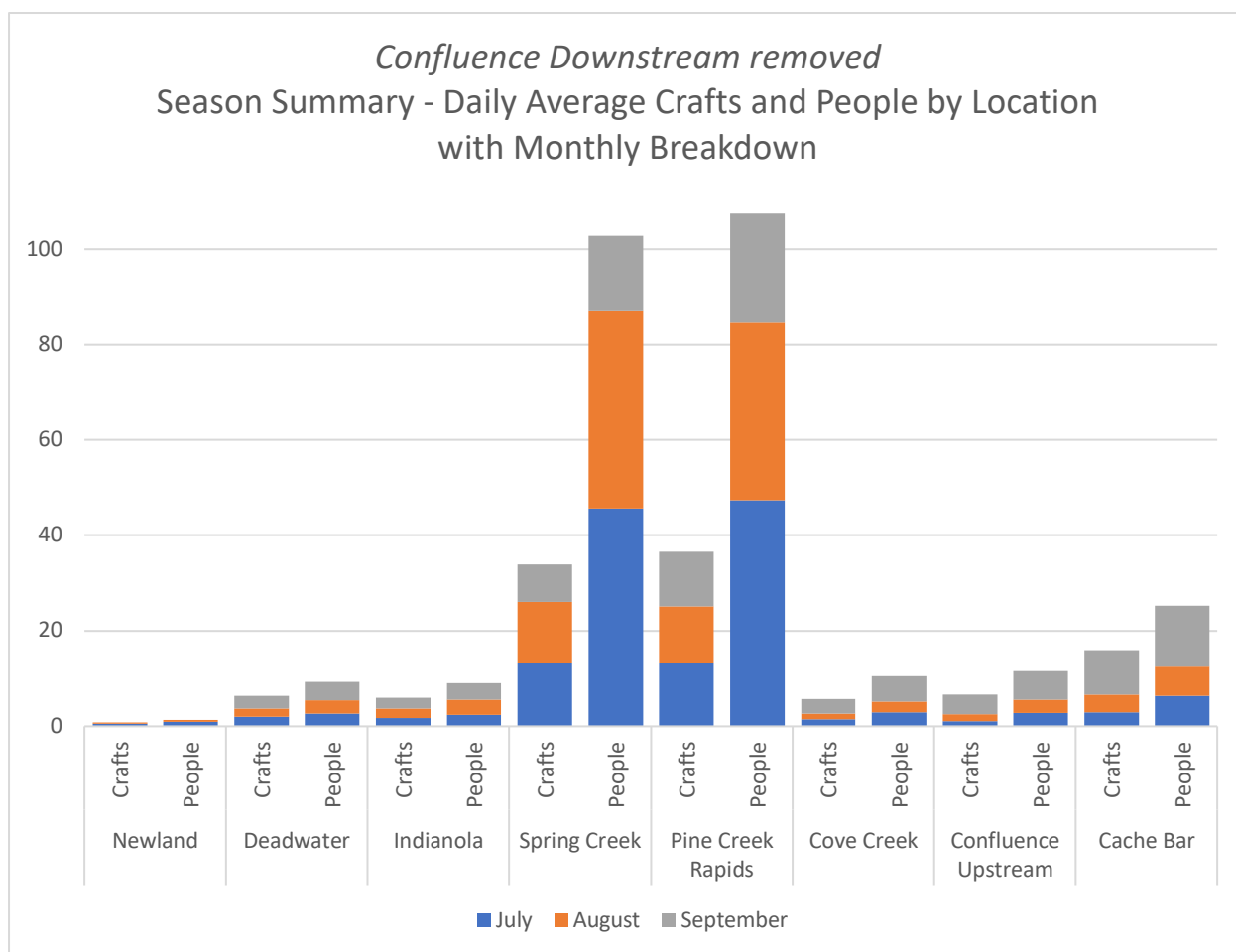


Figure 9. To facilitate easier comparisons among all other sites, this figure displays the same data as Fig. 8 above (daily average crafts and people by location showing proportions by month), with the omission of Confluence Downstream.

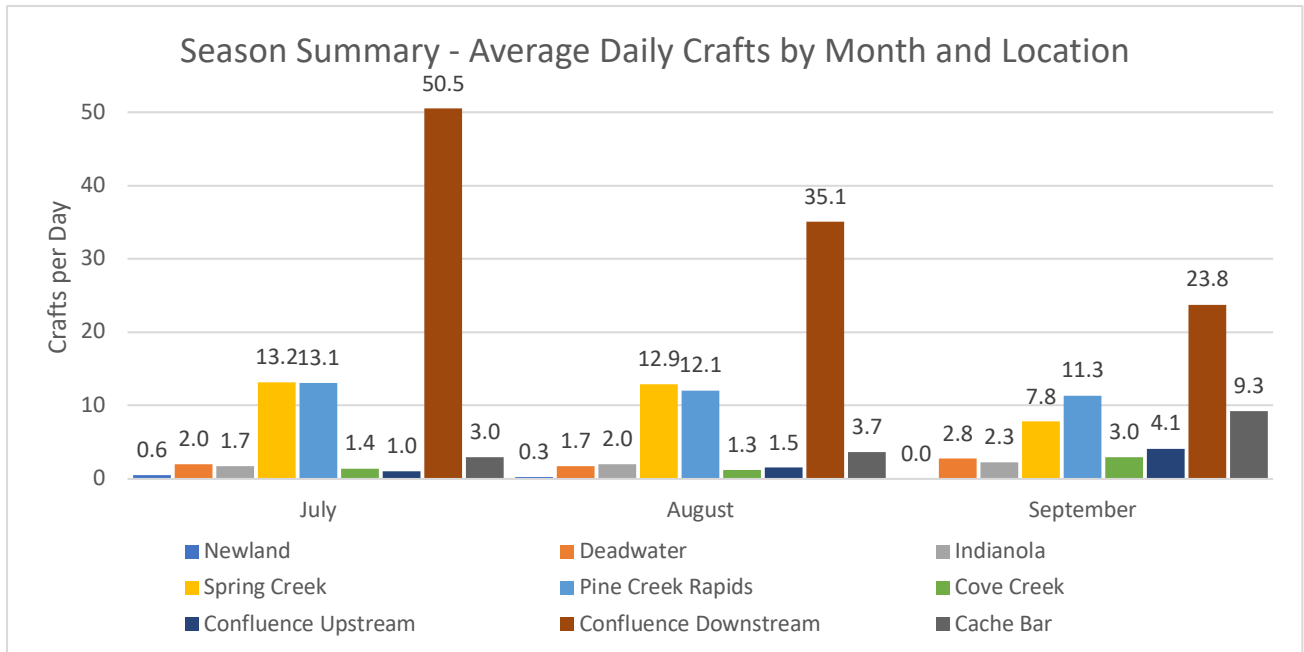


Figure 10. Season summary - average daily crafts by month and location

Whether these data are observed from the perspective of average daily *crafts* or average daily *people*, similar trends emerge in comparisons across sites and across time.

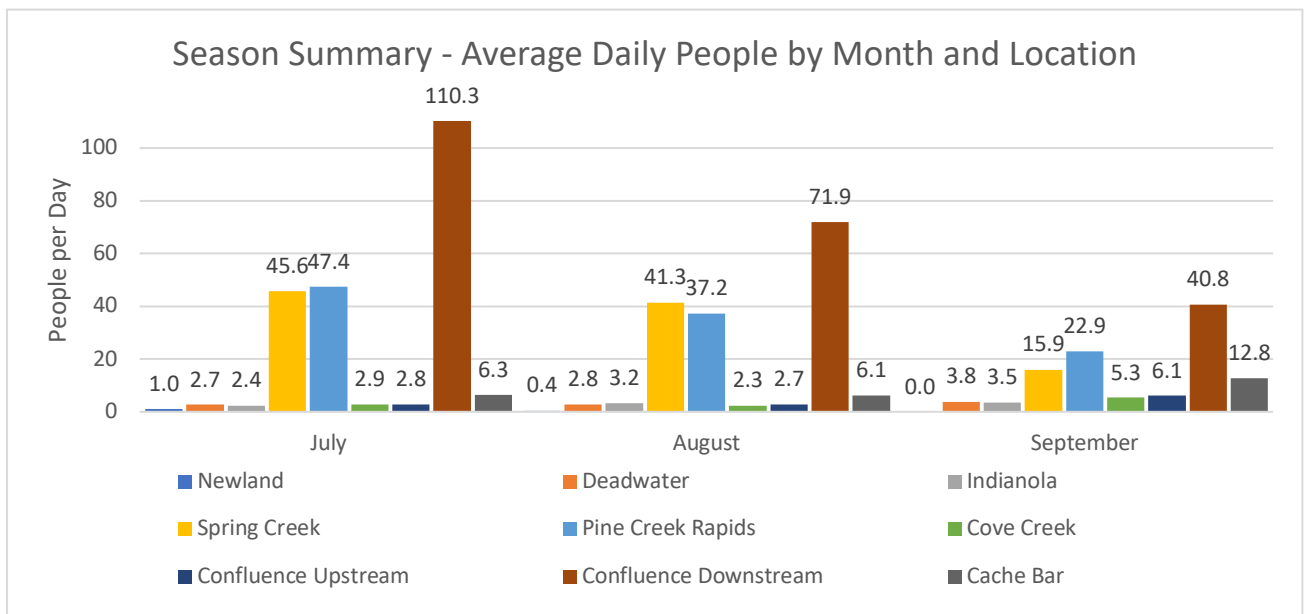


Figure 11. Season summary - average daily people by month and location

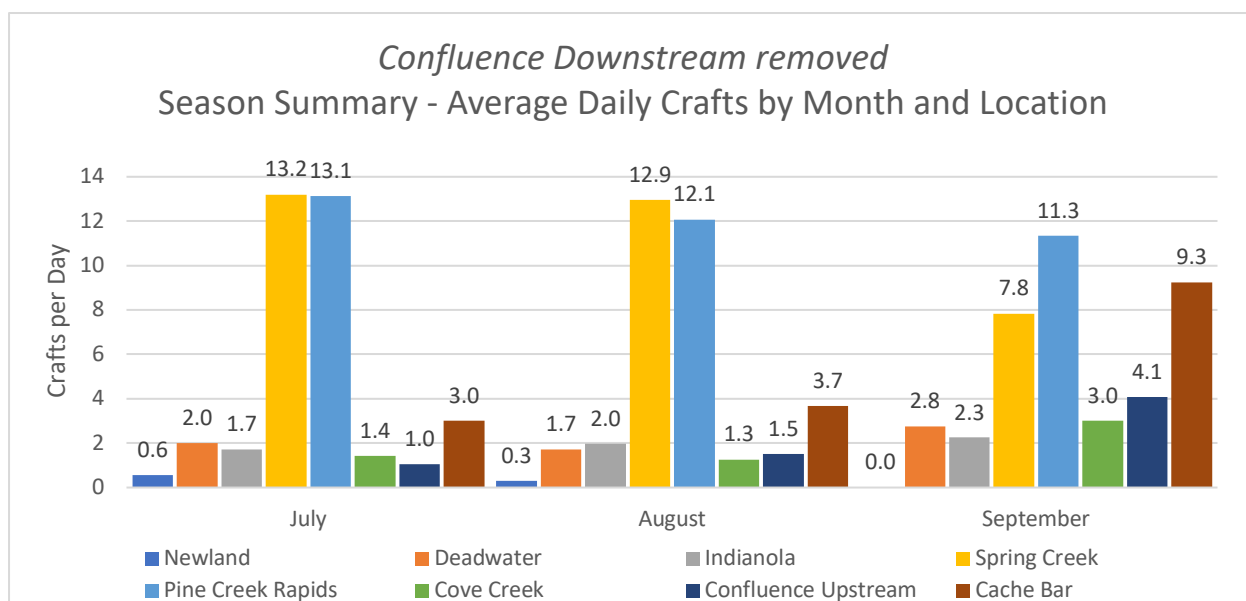


Figure 12. To facilitate easier comparisons among all other sites, this figure displays the same data as Fig. 10 above (average daily crafts by month and location), with the omission of Confluence Downstream.

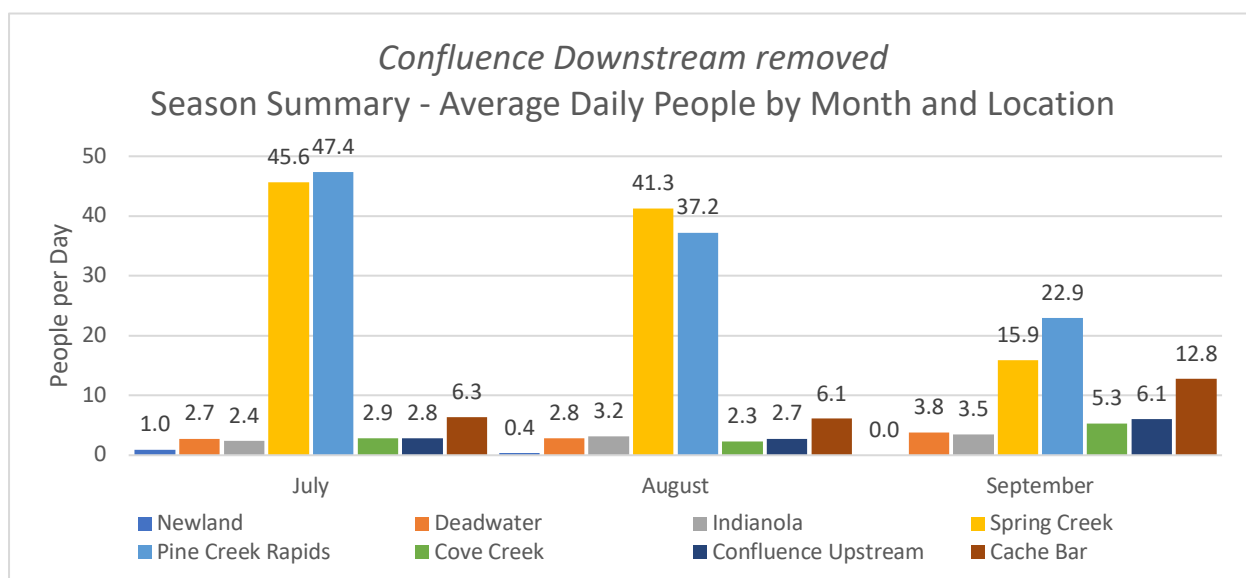


Figure 13. To facilitate easier comparisons among all other sites, this figure displays the same data as Fig. 11 above (average daily people by month and location), with the omission of Confluence Downstream.

Table 3. Season summary - total crafts by day of week

Total Crafts							
Location	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Newland	2	2	1	1	1	6	9
Deadwater	5	5	11	22	31	24	37
Indianola	12	12	7	24	13	45	18
Spring Creek	63	34	56	57	128	204	141
Pine Creek Rapids	74	39	48	59	162	290	166
Cove Creek	2	11	8	3	20	41	24
Confluence Upstream	11	9	12	2	8	20	43
Confluence Downstream	221	276	402	342	308	338	311
Cache Bar	32	42	25	37	60	28	73
TOTAL	422	430	570	547	731	996	822

Table 4. Season summary - total people by day of week

Total People							
Location	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Newland	2	4	2	3	2	12	12
Deadwater	8	7	15	23	54	40	54
Indianola	14	19	8	31	27	66	35
Spring Creek	202	132	218	214	448	547	401
Pine Creek Rapids	219	149	184	210	585	812	454
Cove Creek	2	15	27	6	39	65	50
Confluence Upstream	21	14	30	5	22	43	63
Confluence Downstream	540	593	812	717	580	697	635
Cache Bar	64	65	52	42	93	67	112
TOTAL	1072	998	1348	1251	1850	2349	1816

At most sites, usage rises over the course of the week, peaking on Friday and Saturday. However, Confluence Downstream shows near uniform high usage across all days. This is easily explained by the fact that the Middle Fork permit quota is generally filled every day of the permitted season, irrespective of the day of the week.

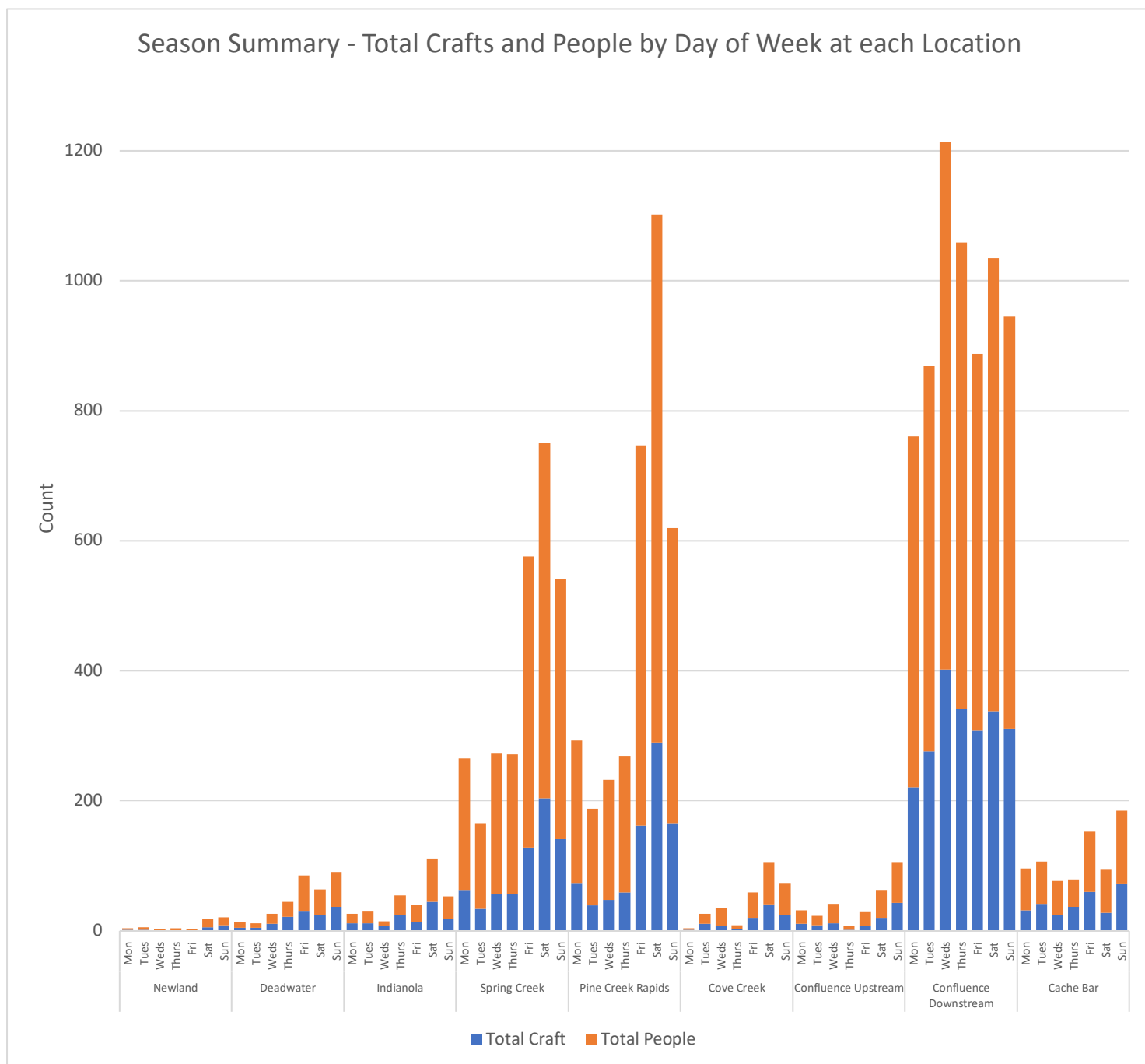


Figure 14. Season summary - total crafts and people by day of week at each location

Table 5. Season summary - percentage of each observed craft type by month at each location (dashes indicate value of zero).

Location	Month	Raft (%)	Kayak (%)	Canoe (%)	Fishing Boat (%)	Inner Tube (%)	SUP (%)	Motor Boat (%)	Freight Raft (%)
Newland	July	28.6	50.0	7.1	14.3	-	-	-	-
	Aug	22.2	66.7	-	-	11.1	-	-	-
	Sept	-	-	-	-	-	-	-	-
Deadwater	July	10.2	49.0	4.1	2.0	30.6	4.1	-	-
	Aug	34.0	30.2	1.9	13.2	13.2	1.9	5.7	-
	Sept	18.2	51.5	6.1	3.0	-	-	21.2	-
Indianola	July	8.8	61.8	11.8	2.9	14.7	-	-	-
	Aug	25.4	42.4	1.7	3.4	23.7	3.4	-	-
	Sept	24.0	20.0	4.0	4.0	8.0	-	40.0	-
Spring Creek	July	77.8	19.6	0.3	0.3	1.5	0.6	-	-
	Aug	70.3	27.2	-	0.4	1.2	0.8	-	-
	Sept	34.0	51.1	1.1	-	-	1.1	12.8	-
Pine Creek Rapids	July	75.9	23.2	-	0.3	-	0.6	-	-
	Aug	65.1	31.9	0.5	-	1.6	0.8	-	-
	Sept	25.7	59.6	2.9	-	-	0.7	11.0	-
Cove Creek	July	35.3	44.1	2.9	5.9	11.8	-	-	-
	Aug	71.8	25.6	-	2.6	-	-	-	-
	Sept	33.3	25.0	-	8.3	11.1	-	22.2	-
Confluence Upstream	July	59.3	37.0	-	-	-	3.7	-	-
	Aug	89.7	10.3	-	-	-	-	-	-
	Sept	32.7	63.3	-	-	2.0	-	2.0	-
Confluence Downstream	July	74.0	17.1	-	3.4	-	0.1	-	5.4
	Aug	76.4	15.3	-	2.1	-	0.1	-	6.0
	Sept	68.1	24.9	-	1.1	-	-	2.8	3.2
Cache Bar	July	68.1	26.4	-	-	-	2.8	2.8	-
	Aug	73.2	24.1	-	1.8	-	-	-	0.9
	Sept	45.5	47.3	-	-	-	-	7.3	-

Overall, rafts and kayaks are the most common types of craft. Farther upstream (Newland, Deadwater, Indianola), kayaks outnumber all other crafts. At Spring Creek and Pine Creek Rapids, kayak usage increased over the course of the summer. Rafts are the dominant craft in most of the river, especially in July and August in the middle section, and all summer in the downstream section. In September, several parties traveled upstream and downstream on motor boats and speed boats, forming a large proportion of total monthly usage in otherwise lightly used sections (e.g. Indianola and Deadwater).

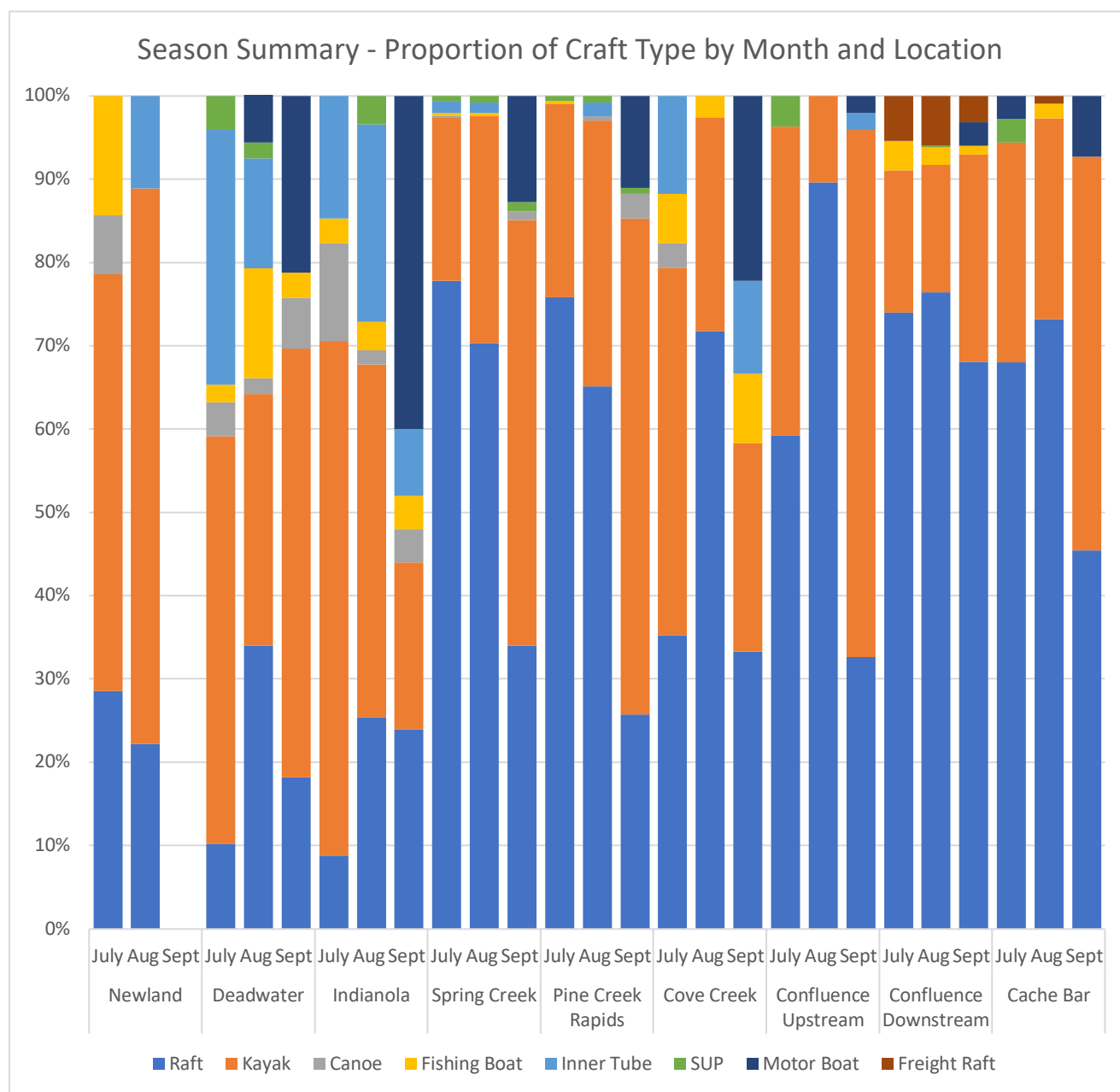


Figure 15. Season summary - proportion of craft type during each month at every location

Site Reports

Newland

From North Fork (upstream), the first monitoring site is Newland. This camera was mounted to a tree just west of the Newland Ranch Picnic Site (GPS coordinates 45.40787, -114.01025). This camera was in operation from July 7 - September 12.

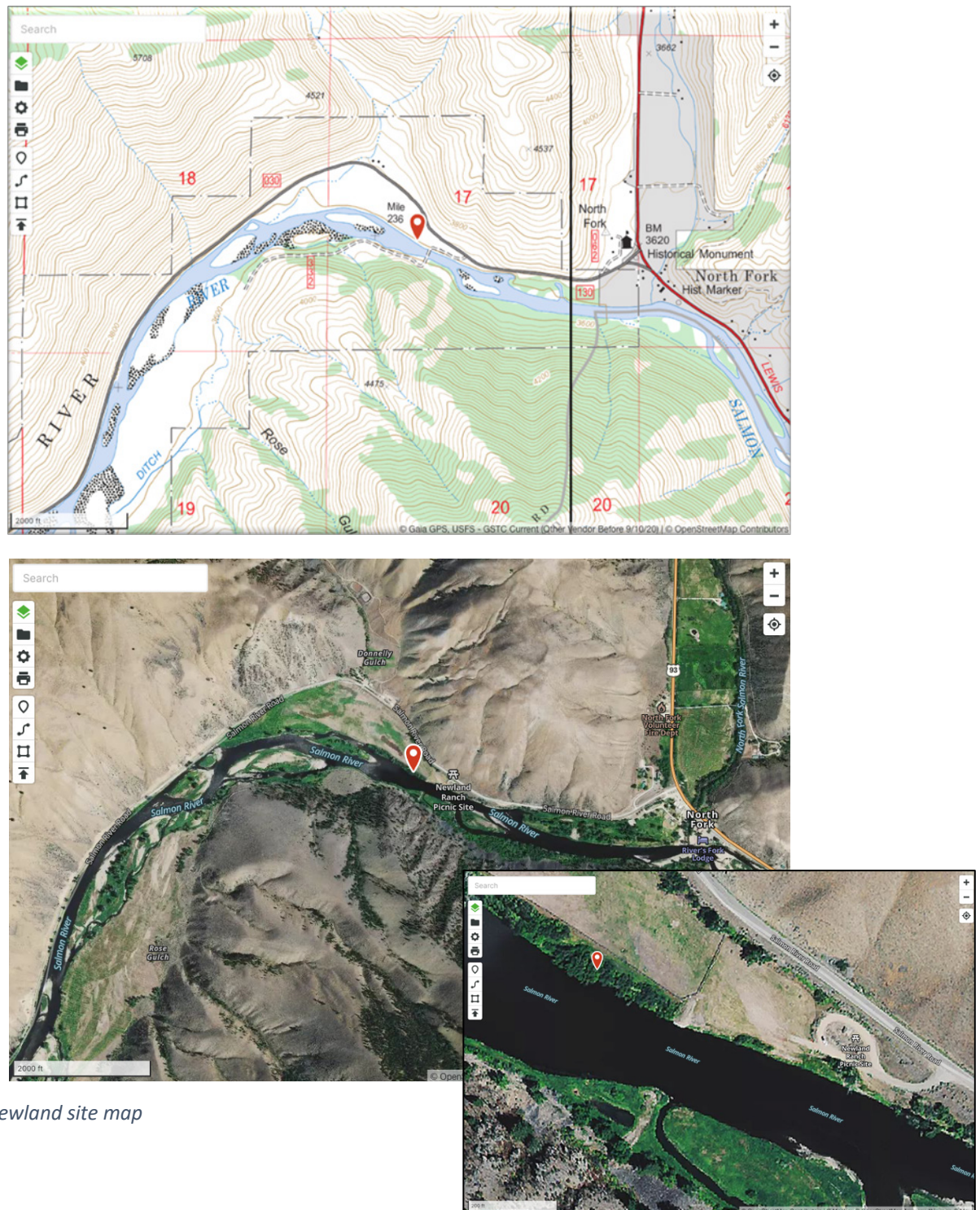


Figure 16. Newland site map

The following graphs describe the crafts and users observed passing by the Newland camera during the monitoring period. Despite overall low numbers of crafts and floaters, both peaked in late July at 5 and 8, respectively.

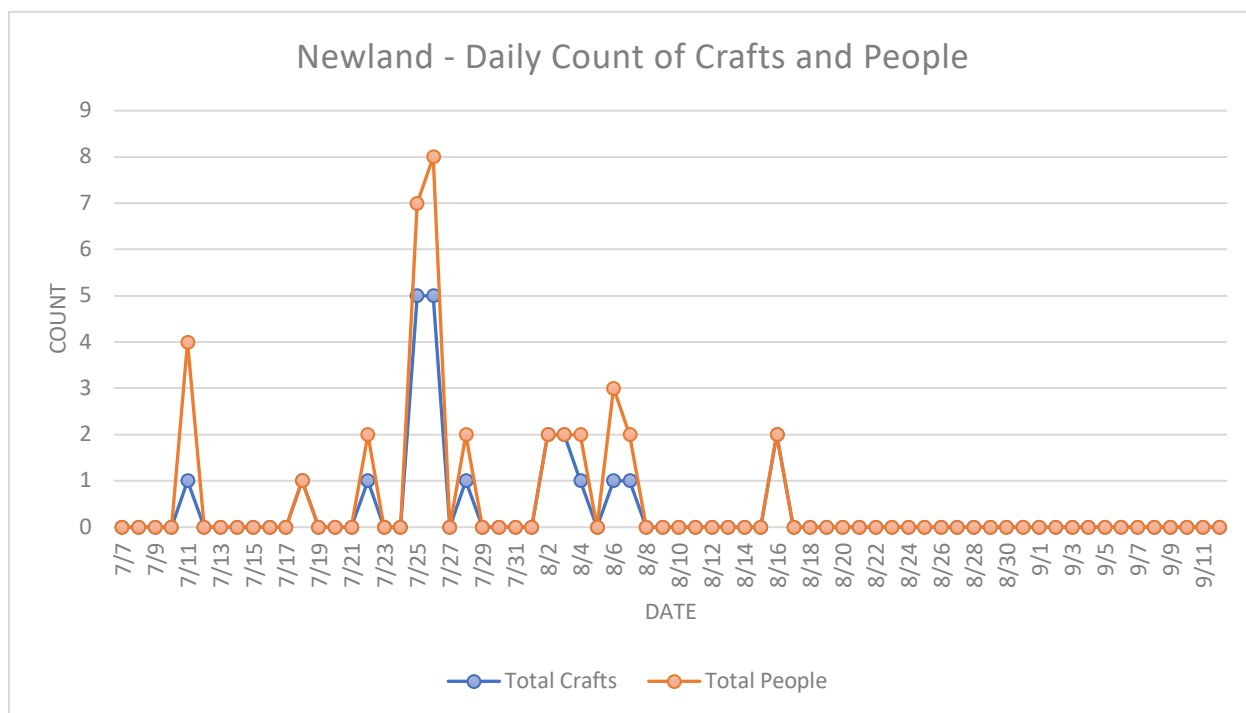


Figure 17. Newland - daily count of crafts and people

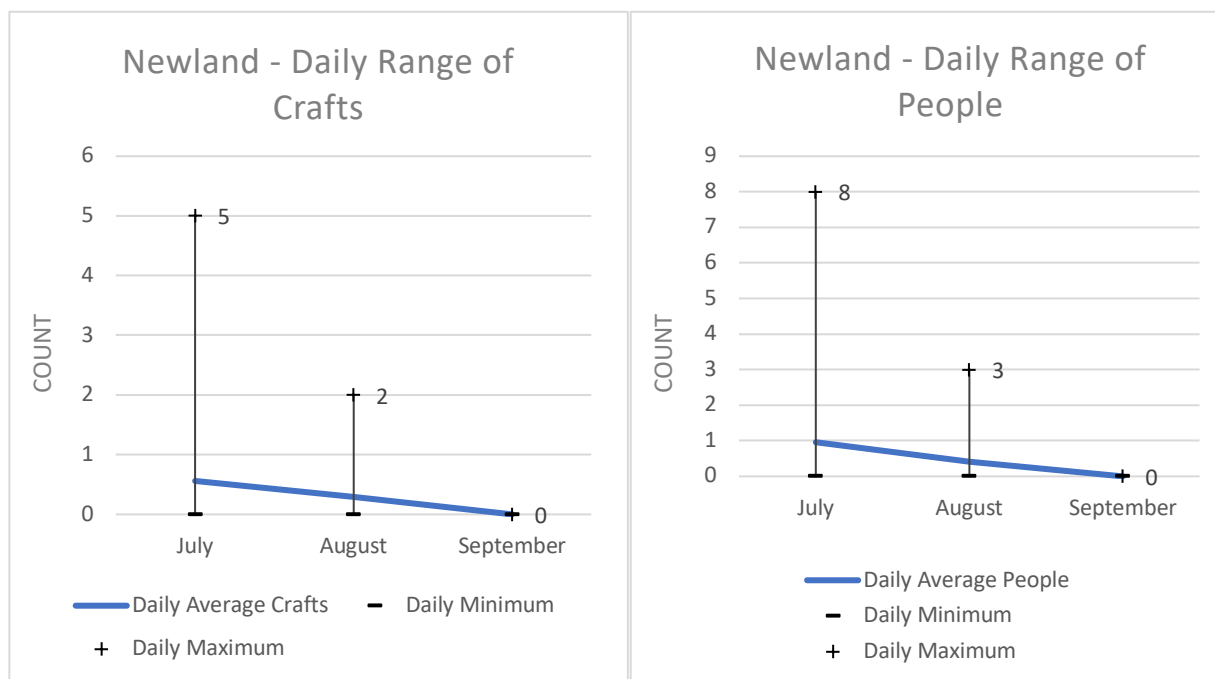


Figure 18. Newland - daily ranges of crafts (left) and people (right)

Most crafts and people were observed during on weekends and during the middle of the day.

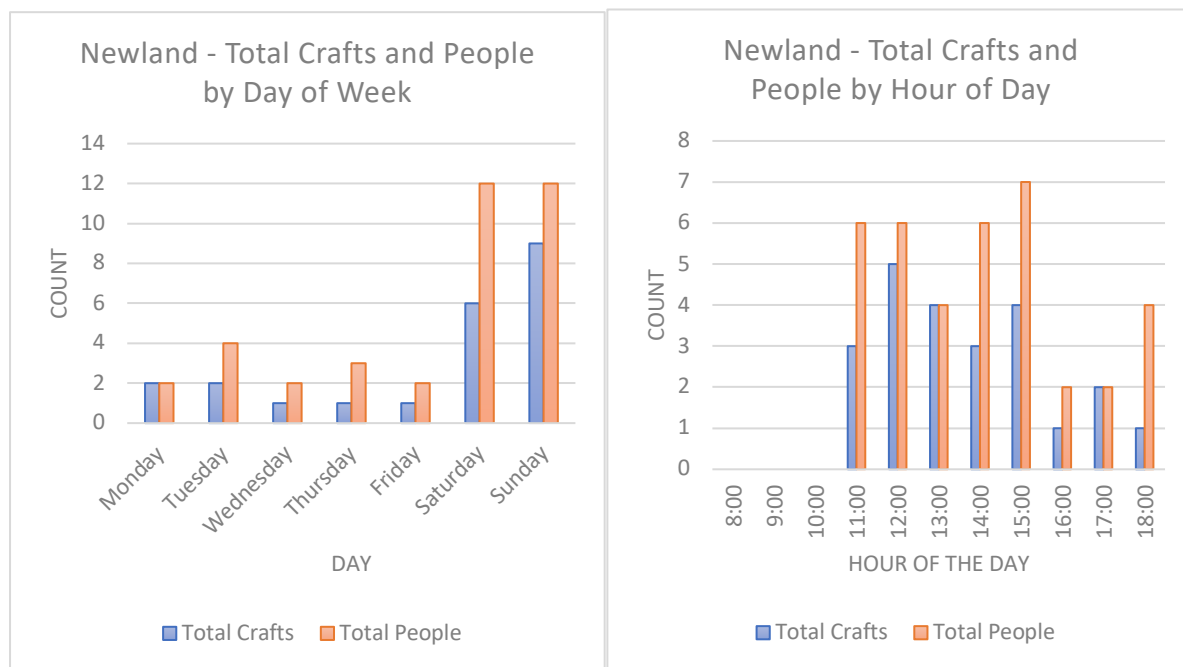


Figure 19. Newland - total crafts and people by day of week (left) and hour of day (right)

Kayaks made up the majority of total crafts.

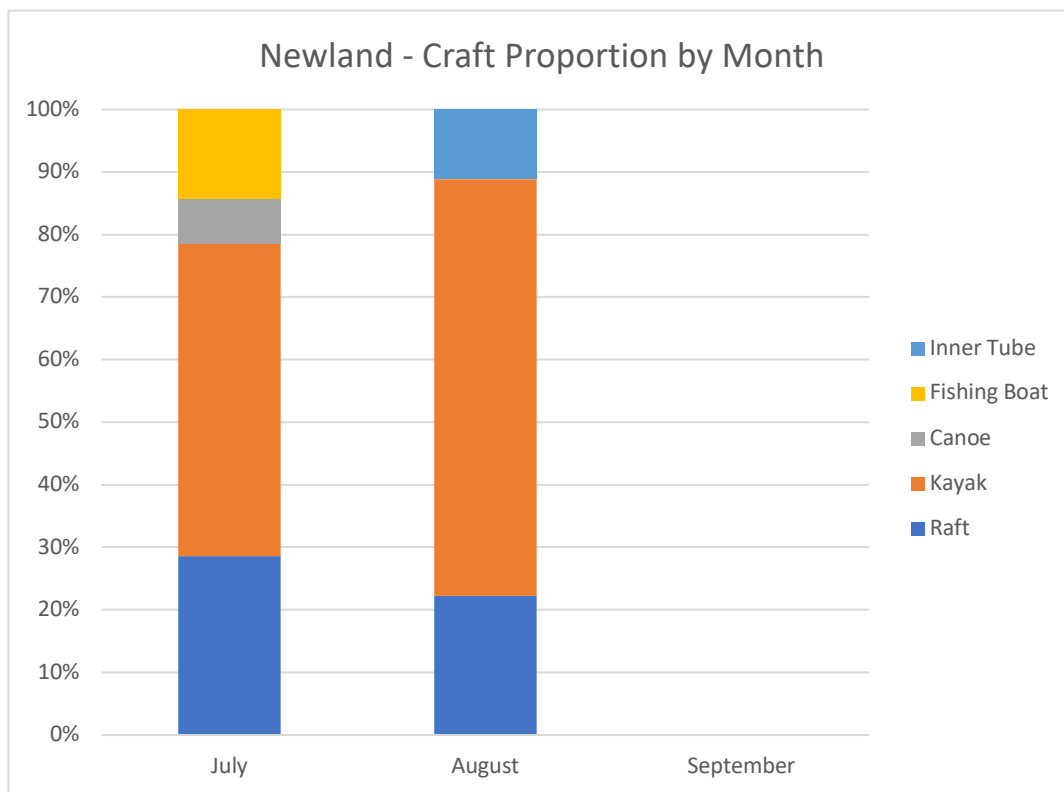


Figure 20. Newland - craft proportion by month

Deadwater

The second monitoring site is Deadwater. This camera was mounted to a shrub just west of the Deadwater Picnic Area (GPS coordinates 45.38674, -114.05292). This camera was in operation from July 7 - September 12.

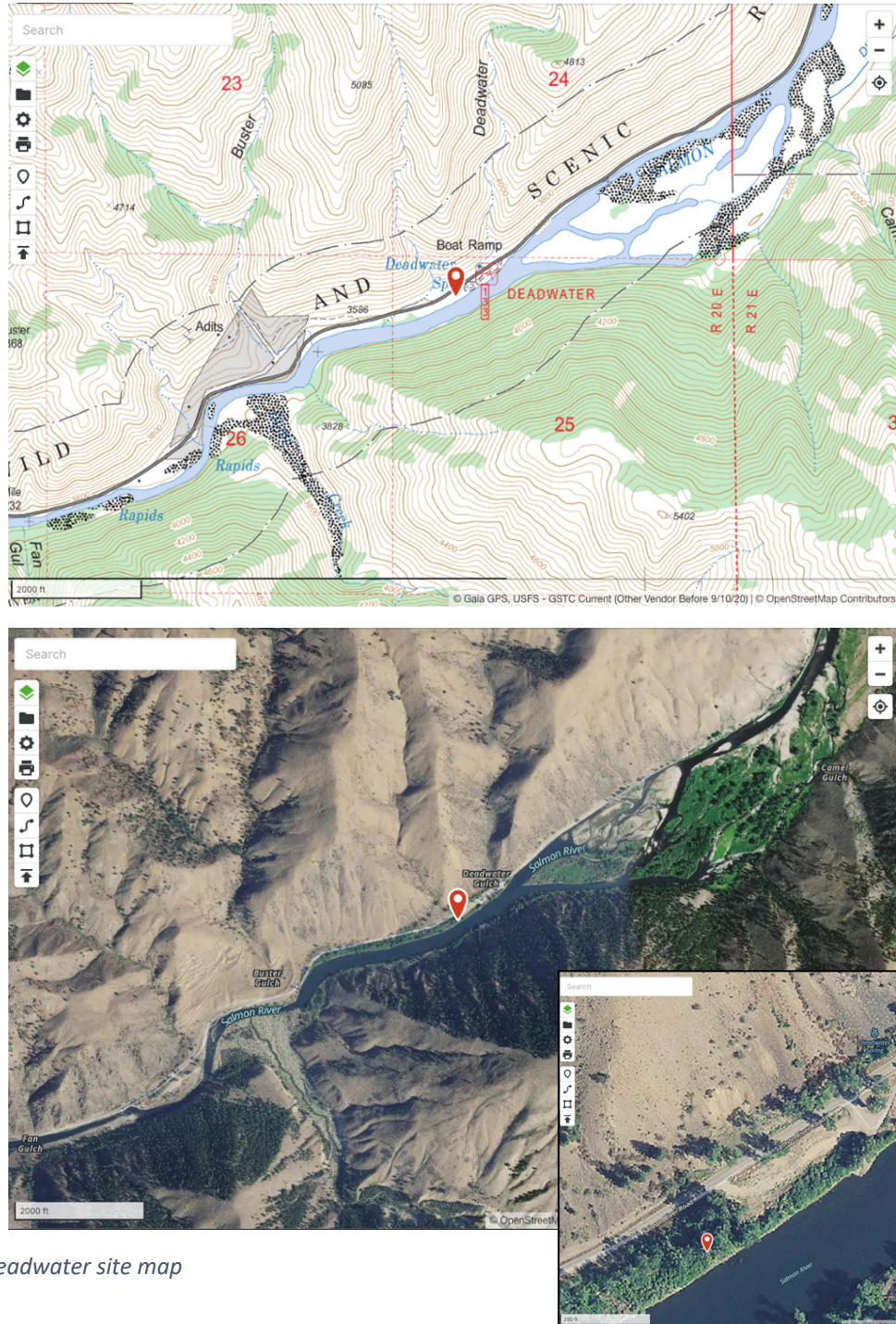


Figure 21. Deadwater site map

The following graphs describe the crafts and users observed passing by the Deadwater camera during the monitoring period. This site saw moderate activity, with daily maximum numbers of crafts passing in late July, but daily average usage rising in September.

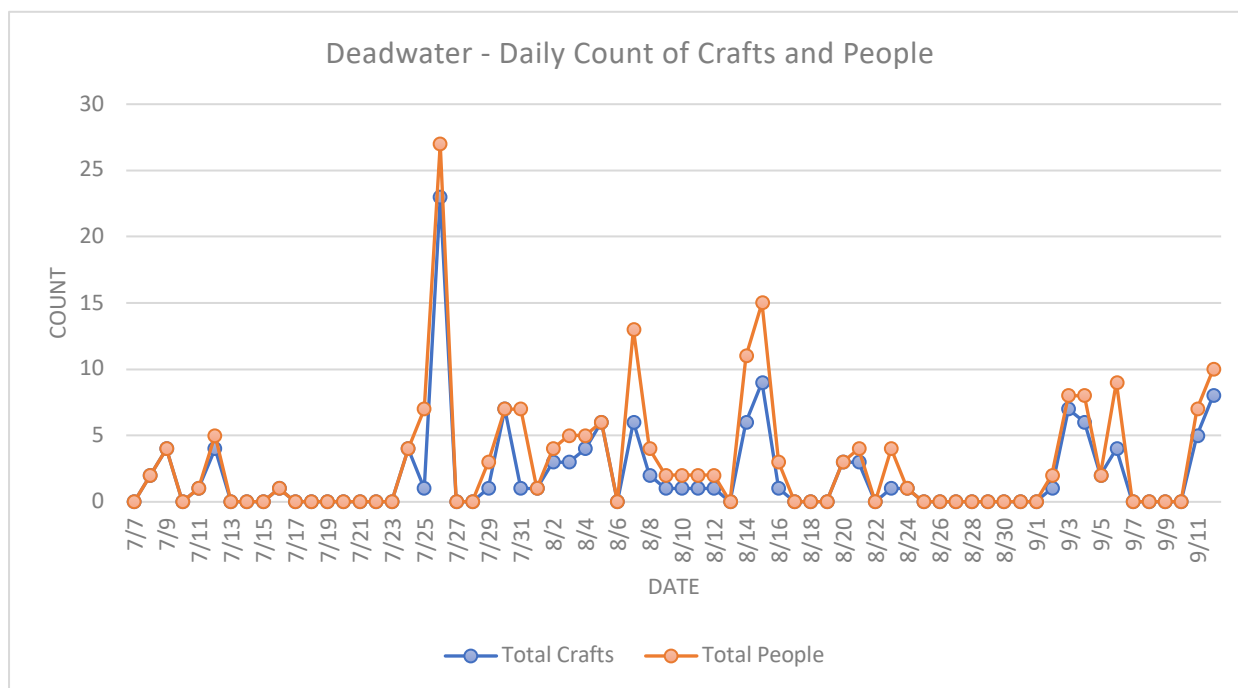


Figure 22. Deadwater - daily counts of crafts and people

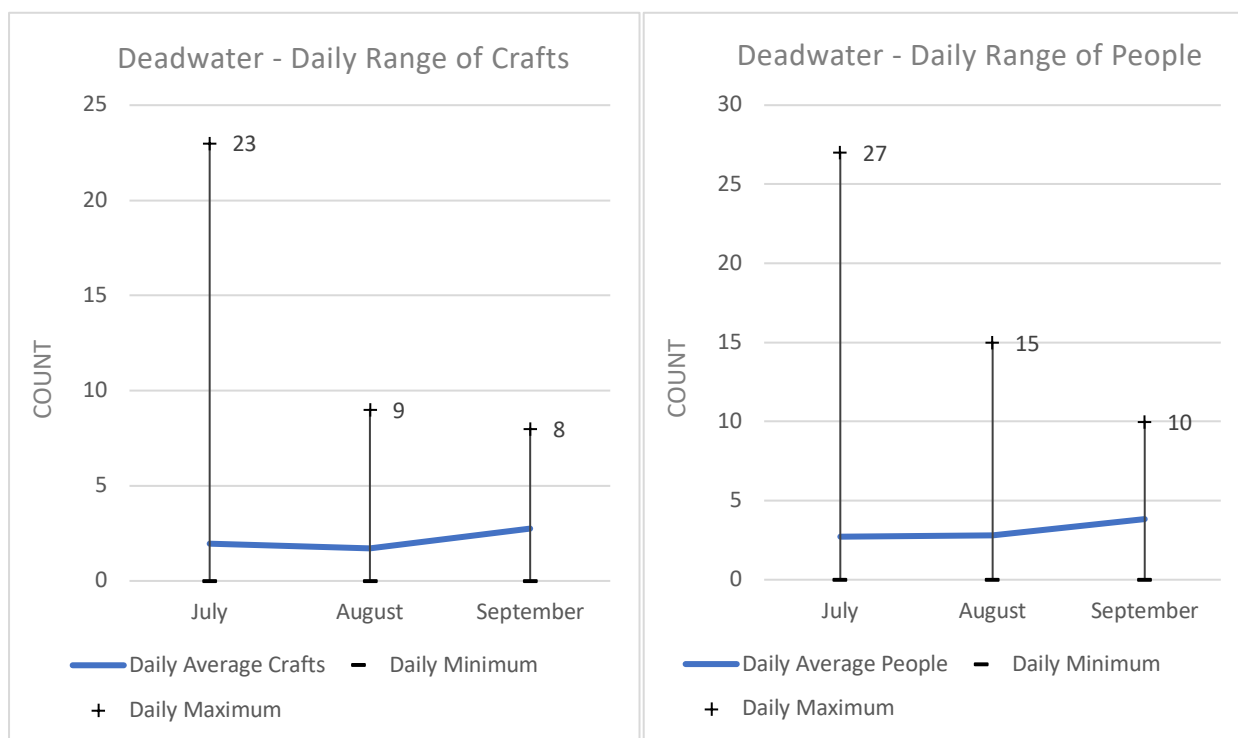


Figure 23. Deadwater - daily ranges of crafts (left) and people (right)

Most crafts passed from Friday to Sunday, and more often before 1:00pm.

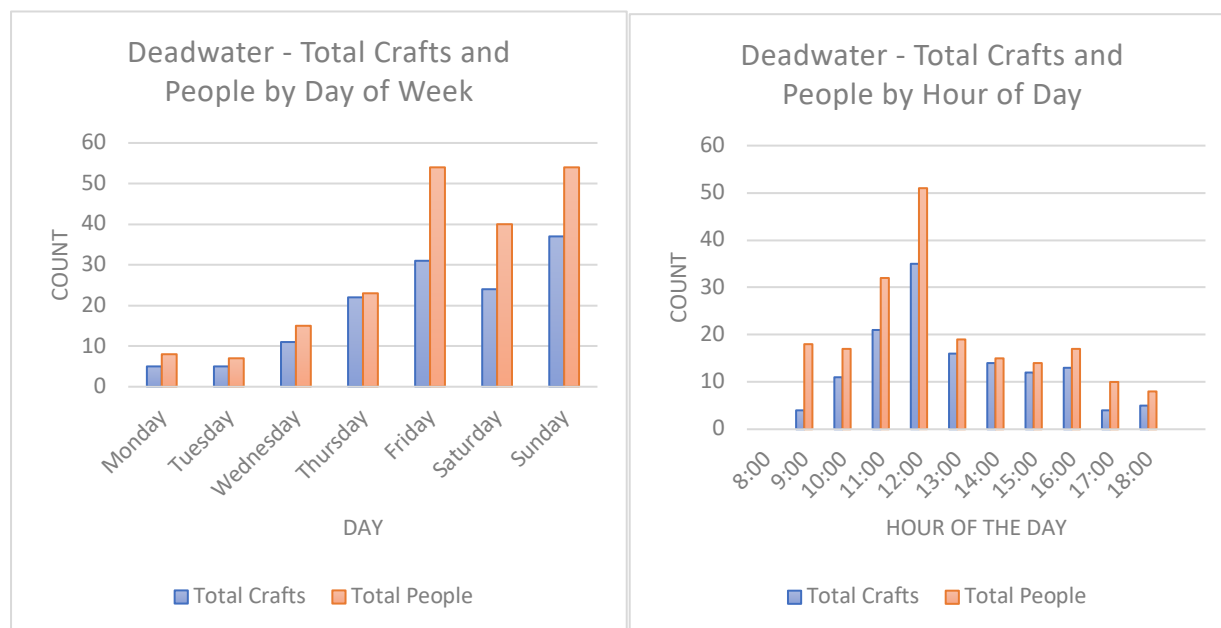


Figure 24. Deadwater - total crafts and people by day of week (left) and hour of day (right)

In July, the majority of crafts were inner tubes and kayaks. In August, more rafts and fishing boats joined the assemblage. In September, motor boats made up over 20% of all crafts. These users were likely on the river to fish steelhead trout.

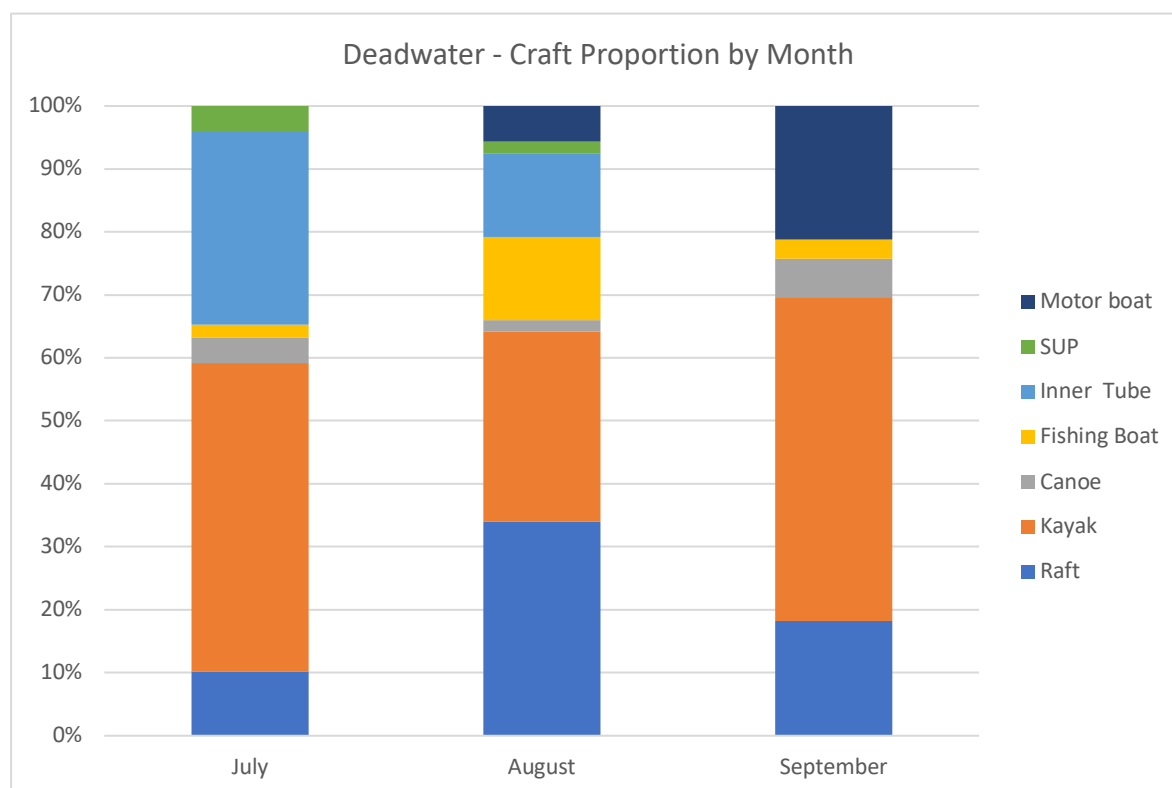


Figure 25. Deadwater - craft proportion by month

Indianola

The Indianola site is located about 0.5 miles southwest of the Indianola Ranger Station. This camera was mounted to a shrub about halfway down the steep slope from the main road (GPS coordinates 45.39370, -114.17310). This camera was in operation from July 7 - September 12.

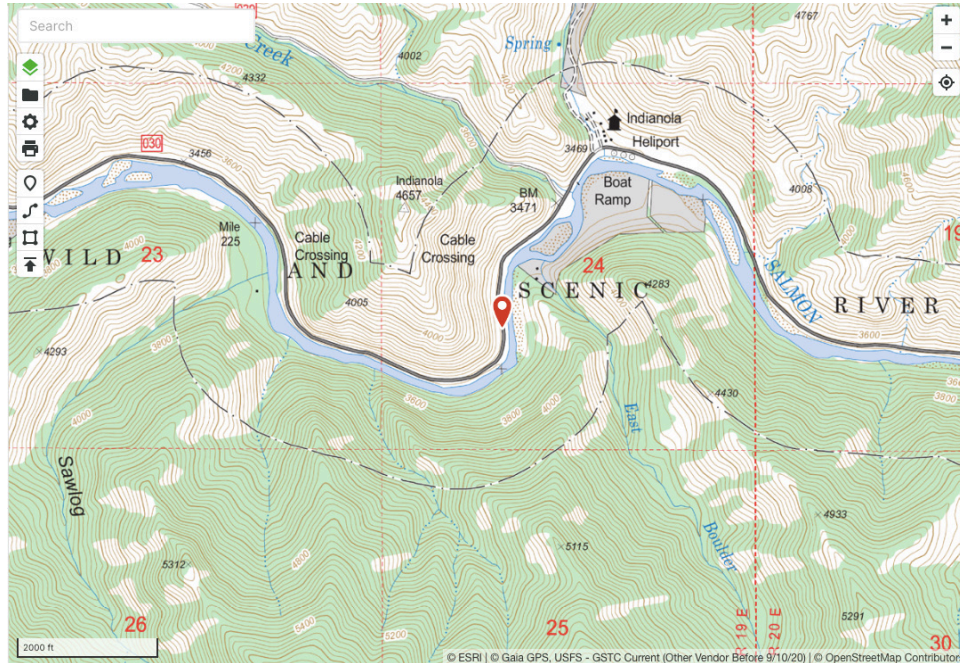


Figure 26. Indianola site map

The following graphs describe the crafts and users observed during the monitoring period. This site saw moderate activity, with greatest numbers of crafts

passing in mid-August. On average, though, usage increased to a high in September, likely as users transitioned to fishing.

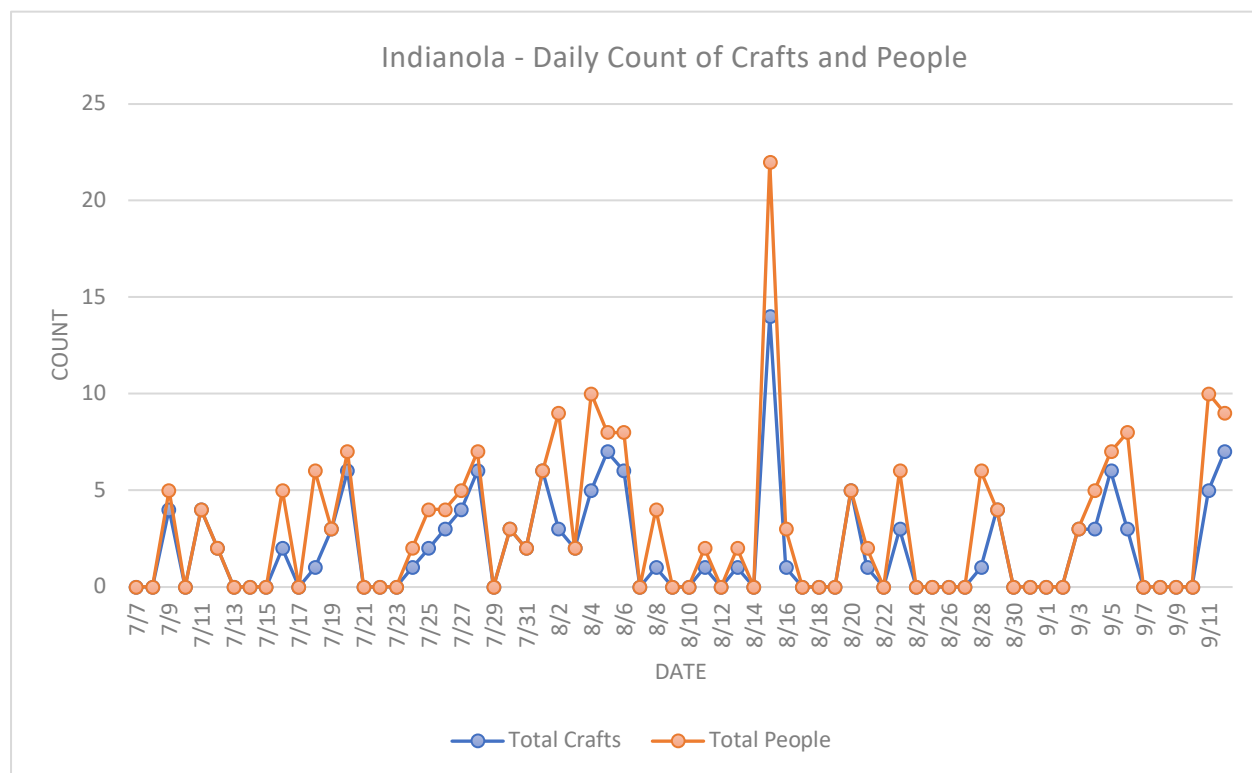


Figure 27. Indianola - daily counts of crafts and people

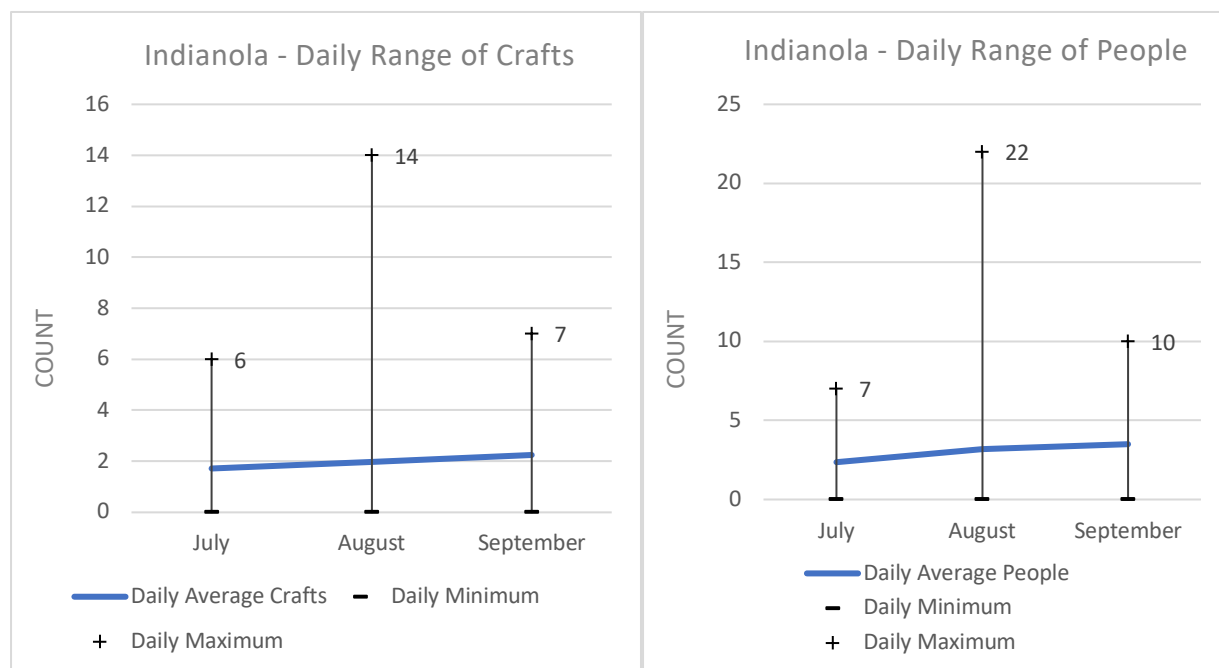


Figure 28. Indianola - daily ranges of crafts (left) and people (right)

Most crafts passed on Thursdays and Saturdays, with greatest numbers between 11:00am and 5:00pm.

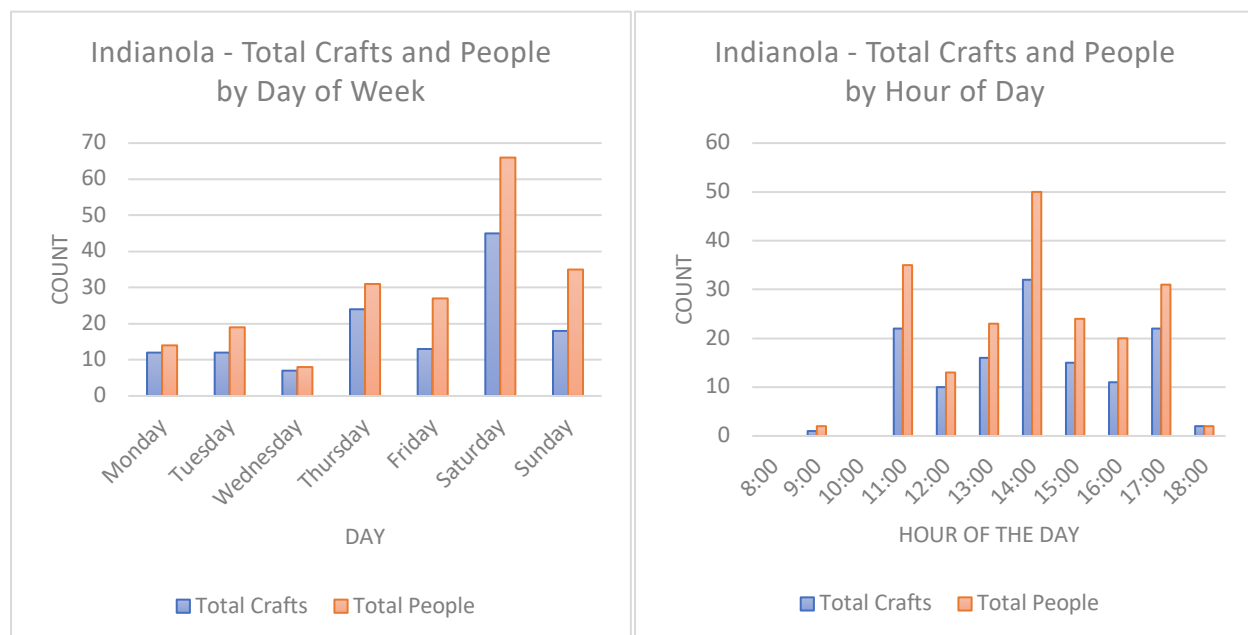


Figure 29. Indianola - total crafts and people by day of week (left) and hour of day (right)

In July and August, kayaks made up the majority of total crafts. In September, motorized craft accounted for almost one third of all crafts.

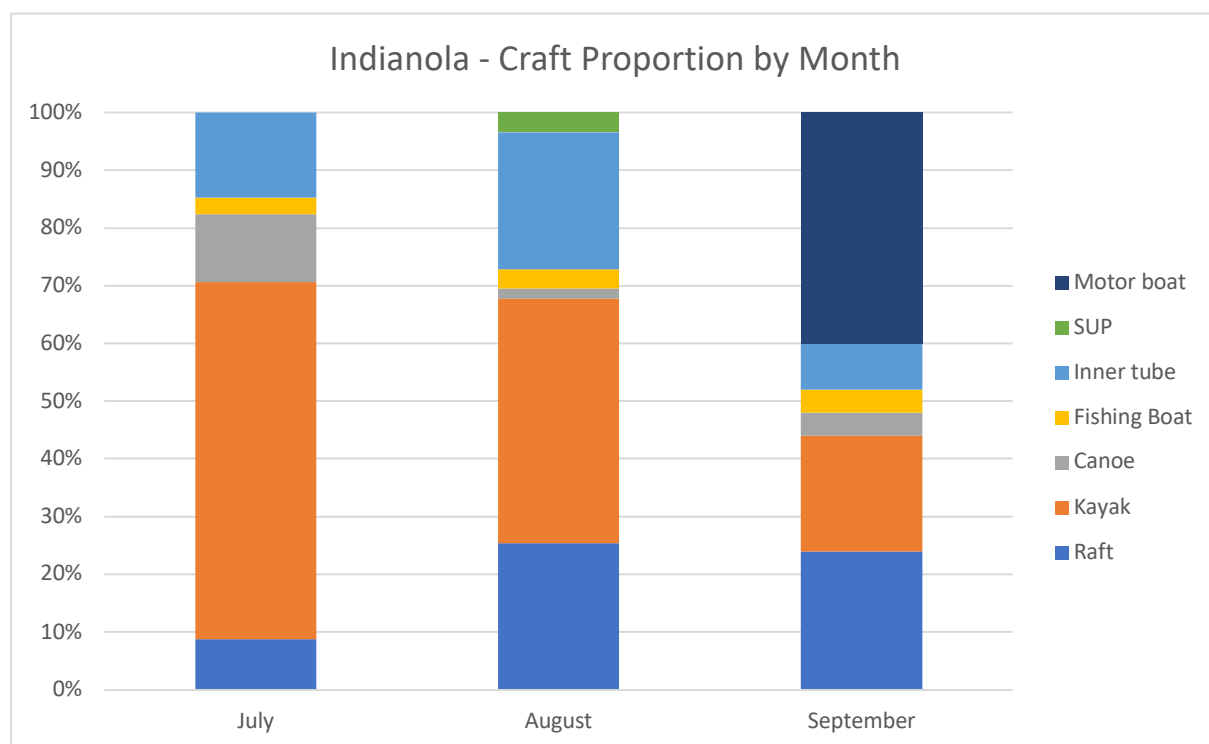


Figure 30. Indianola - craft proportion by month

Spring Creek

The Spring Creek site is located on the western edge of the Spring Creek Campground area, about 1000 feet downstream of the boat ramp. This camera was mounted to a large pine tree, separated from the river by a patch of willows (*GPS coordinates 45.39096, -114.25874*). This camera was in operation from July 7-September 12, except for a data gap from August 18-29. During this period, the camera was inadvertently set to shut off for several hours in the middle of the day. Data from these 12 days has been removed from the analysis.

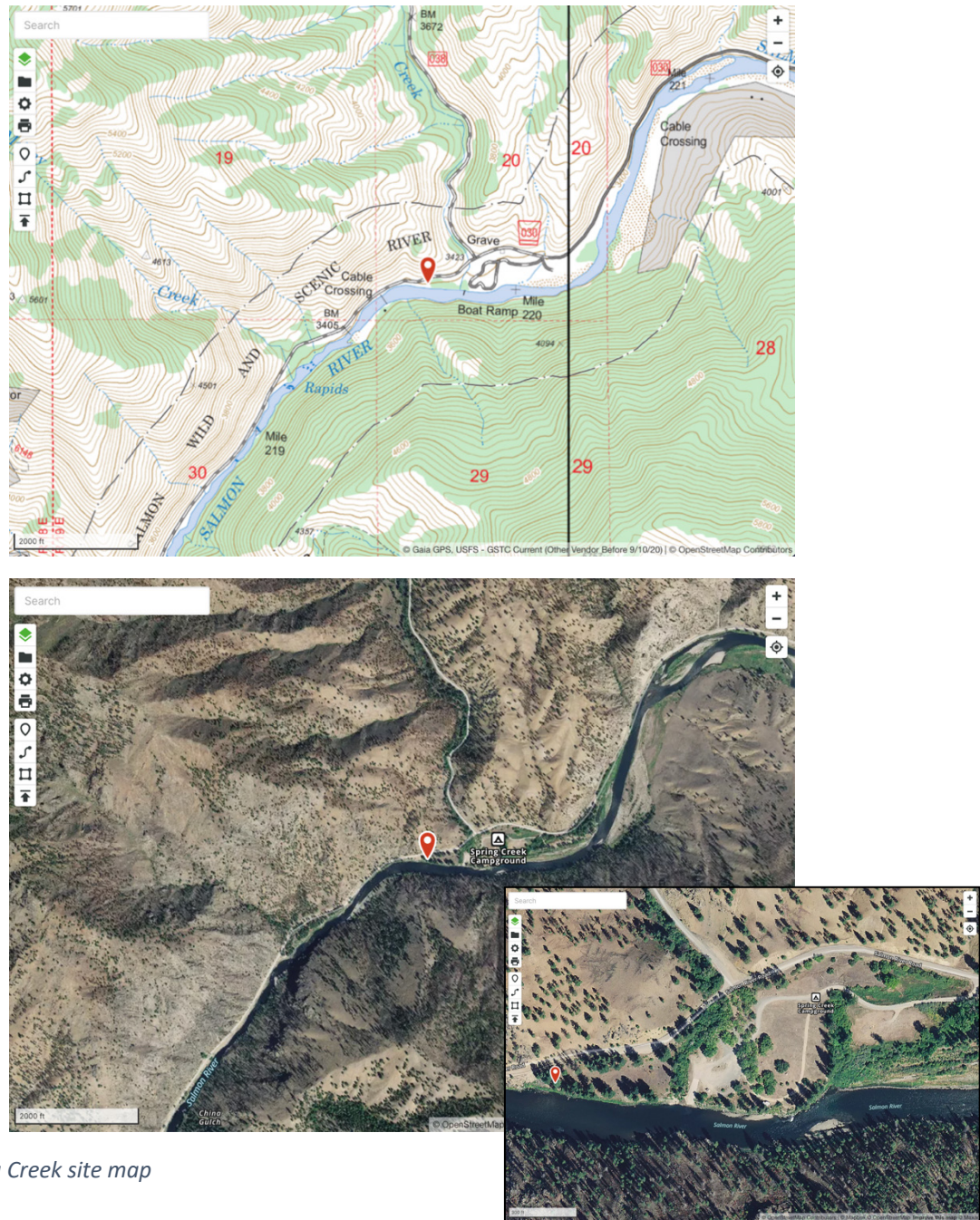


Figure 31. Spring Creek site map

The following graphs describe the crafts and users observed passing by the Spring Creek camera during the monitoring period. This site saw high activity throughout July and August, tapering off by September. Discrepancies between the number of crafts and number of people indicates the large portion of rafts passing through Spring Creek, each one carrying 5-10 individuals. This stretch is known to be popular for whitewater rafting day trips. As described above, the data gap from Aug. 18-29 was due to camera malfunction.

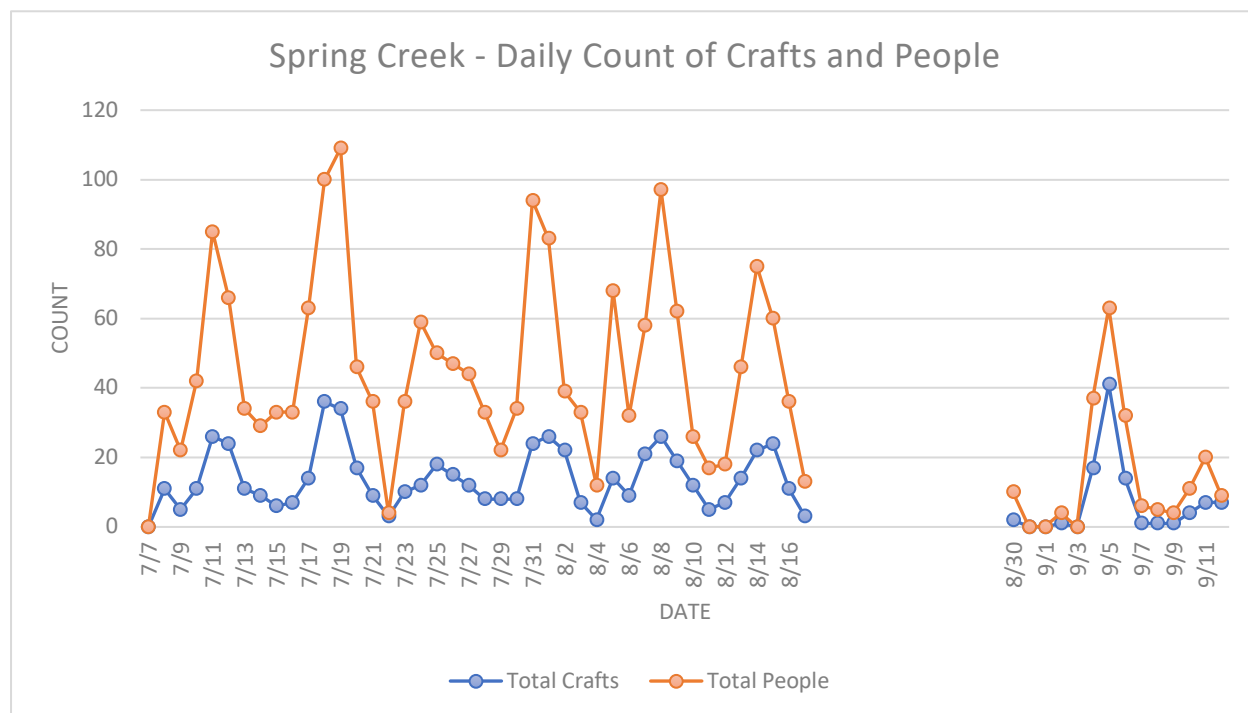


Figure 32. Spring Creek – daily counts of crafts and people. Not shown: July 1 (five crafts and 32 people).

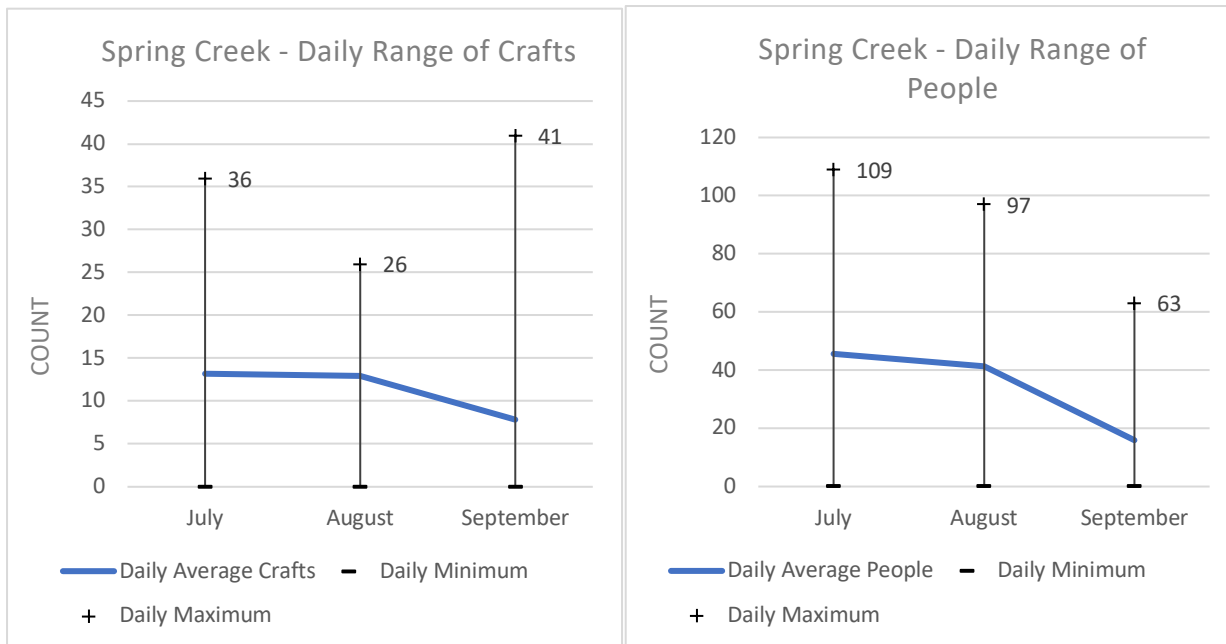


Figure 33. Spring Creek - daily ranges of crafts (left) and people (right)

Usage was highest over the weekend, particularly during morning hours (10:00am – 12:00pm).

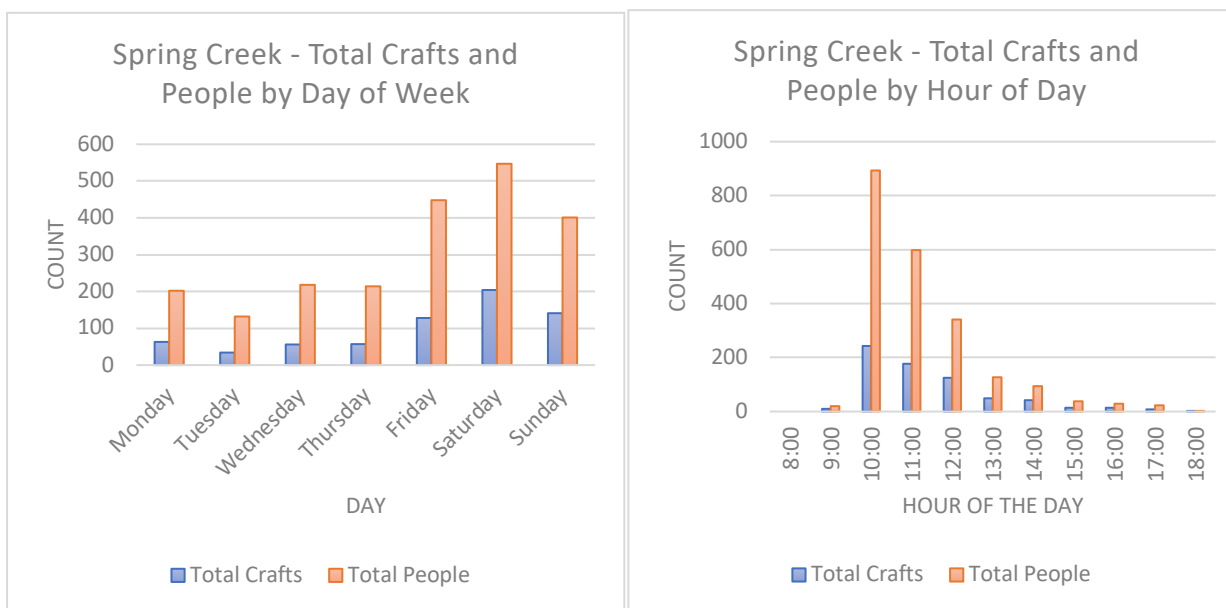


Figure 34. Spring Creek - total crafts and people by day of week (left) and hour of day (right)

In July and August, rafts made up 75% or more of all crafts at Spring Creek. In September, kayaks were the dominant craft type here. This trend can likely be explained by the drop in

water level and consequent increase in exposed rocks, which makes kayaks the craft of choice.

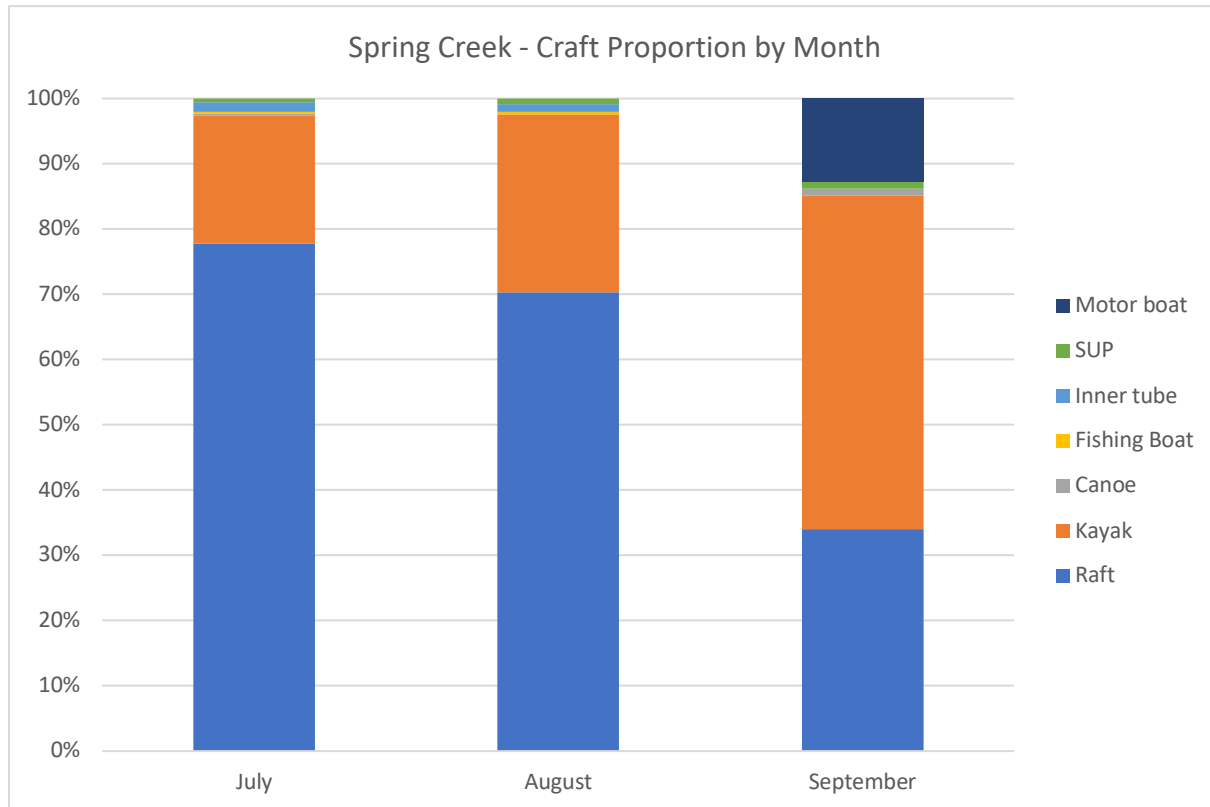


Figure 35. Spring Creek - craft proportion by month

Pine Creek Rapids

The Pine Creek Rapids site is located about 500 feet southwest of the Pine Creek Bridge (where Pine Creek Road joins the main Salmon River Road). This camera was mounted to shrub growing amongst large boulders and pointed upstream into the rapids (GPS coordinates 45.36321, -114.30101). This camera was in operation from July 7-September 12.

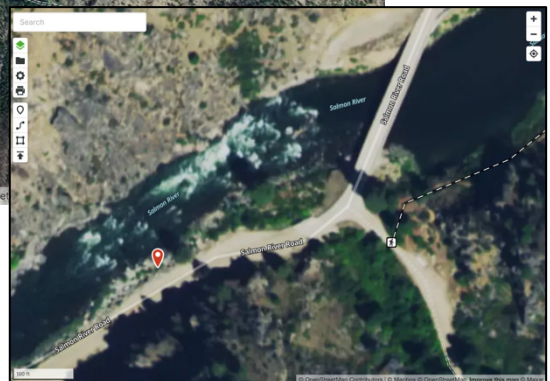
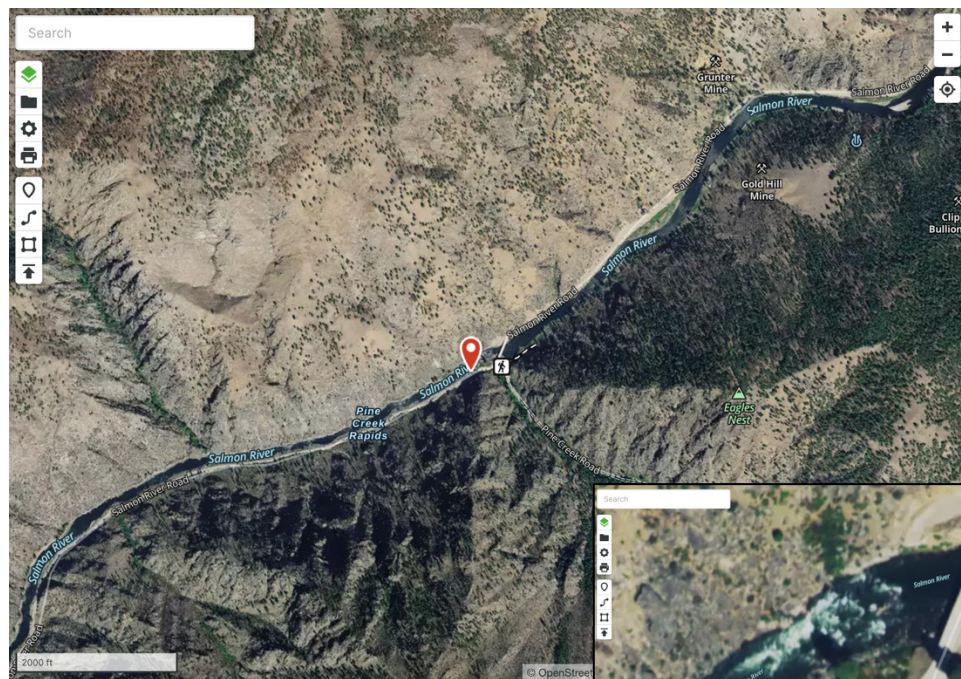
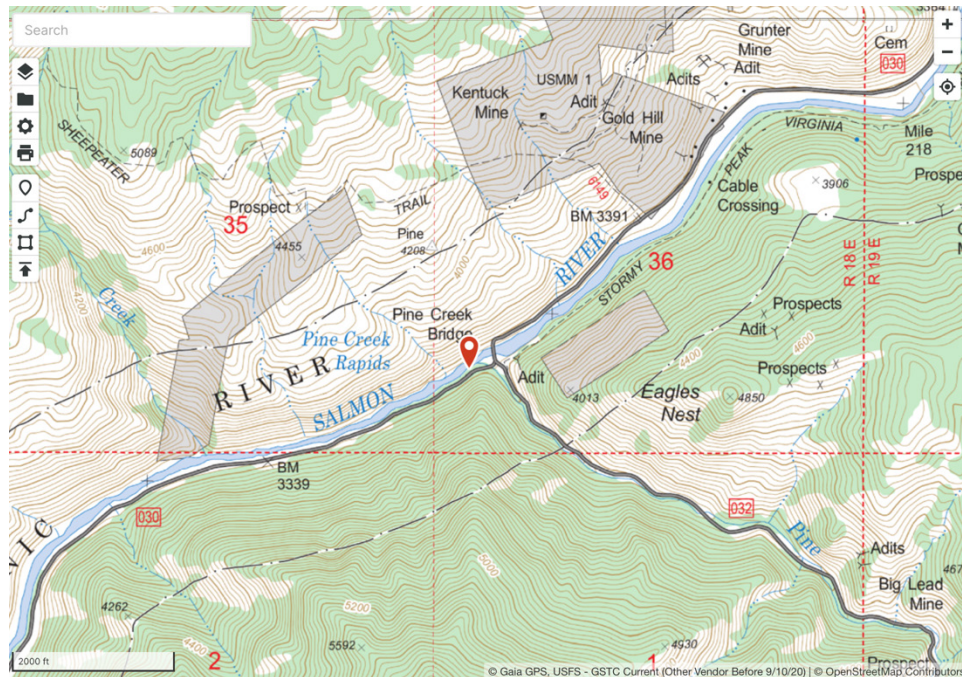


Figure 36. Pine Creek Rapids site map

The following graphs describe the crafts and users observed passing by the Pine Creek Rapids camera during the monitoring period. This site saw high activity all summer, with pronounced peaks each weekend.

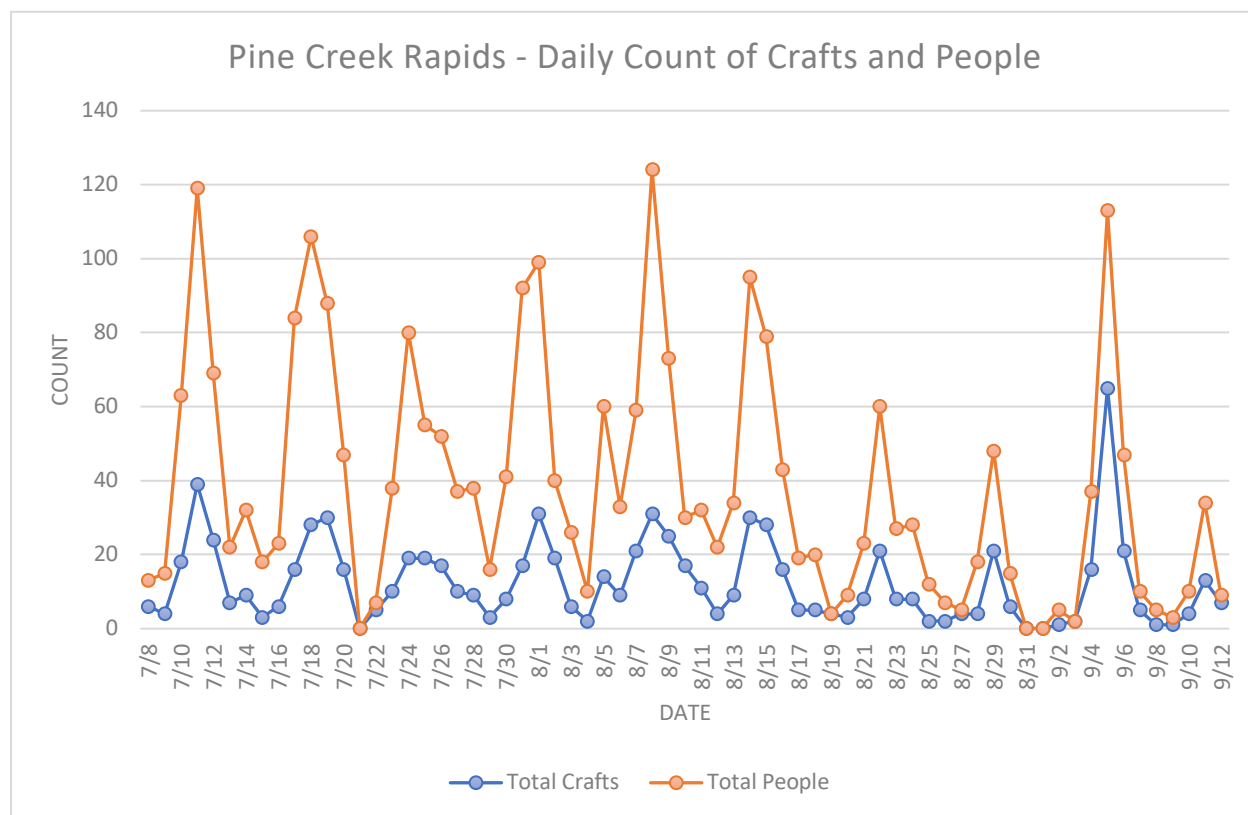


Figure 37. Pine Creek Rapids - daily counts of crafts and people. Not shown: July 1 (five crafts and 29 people).

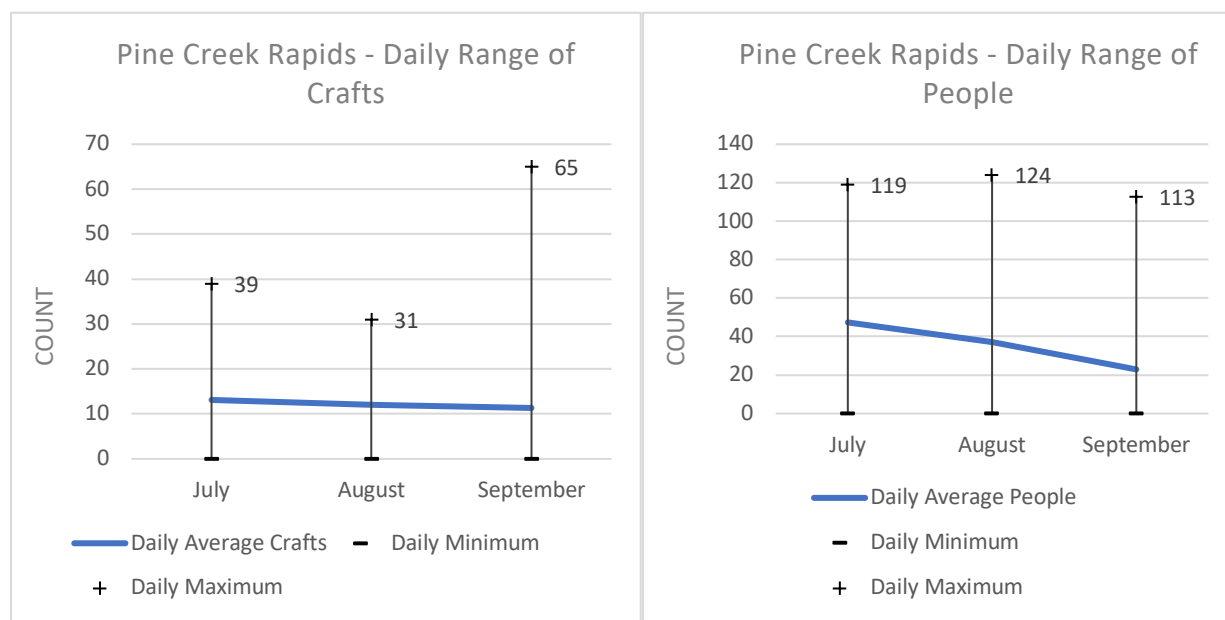


Figure 38. Pine Creek Rapids - daily ranges of crafts (left) and people (right)

At these rapids, most activity occurred on the weekend (especially Friday and Saturday). Boaters were mostly observed from 11:00am to 1:00pm.

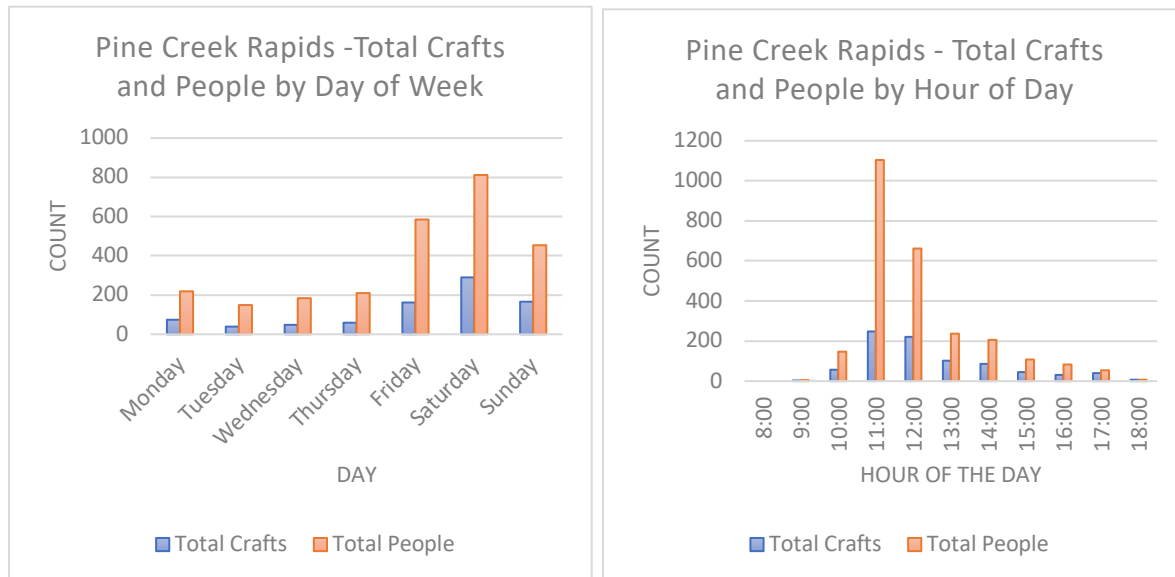


Figure 39. Pine Creek Rapids - total crafts and total people by day of week (left) and hour of day (right)

In July and August, rafts were the most common craft. In September, kayaks far outnumbered all other craft types.

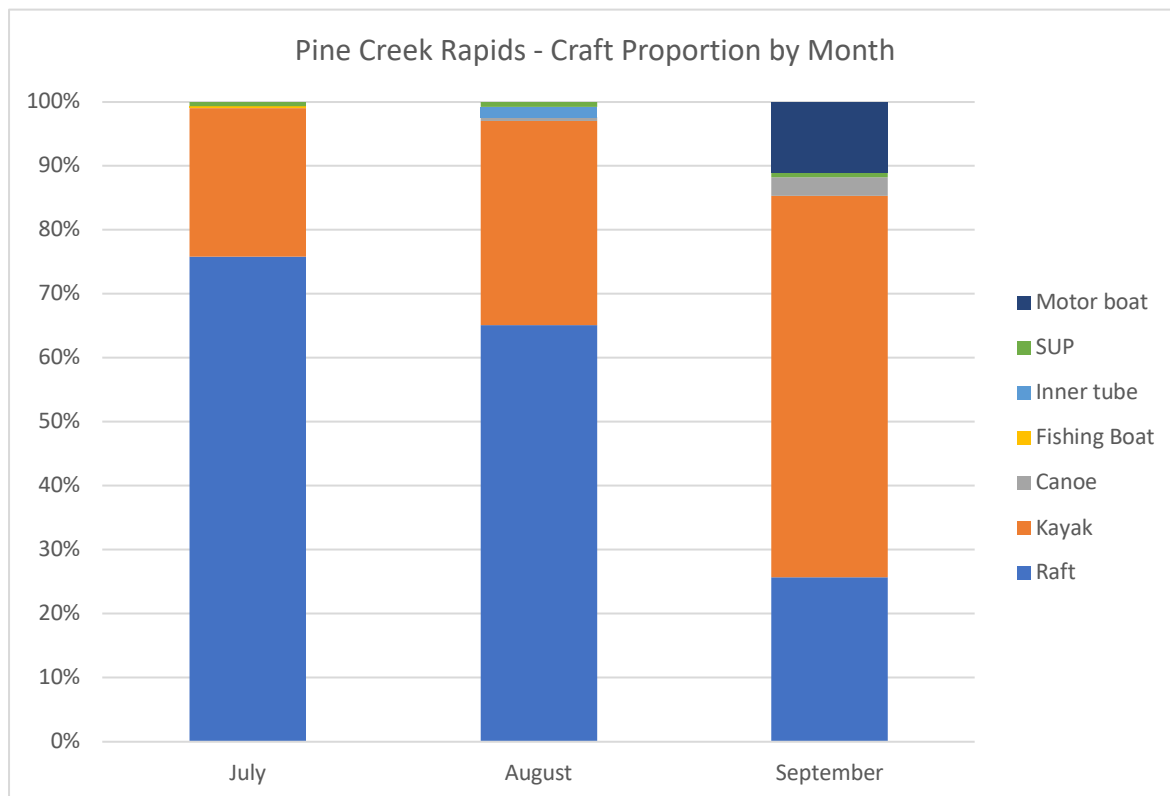


Figure 40. Pine Creek Rapids - craft proportion by month

Cove Creek

The Cove Creek site is located about 1000 feet west of the Cove Creek Boat Ramp. This camera was mounted to large pine tree (GPS coordinates 45.32666, -114.43087). This camera was in operation from July 8-September 12.

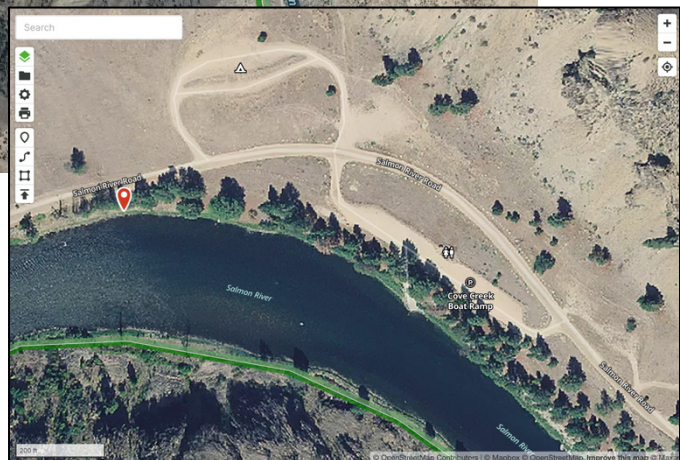
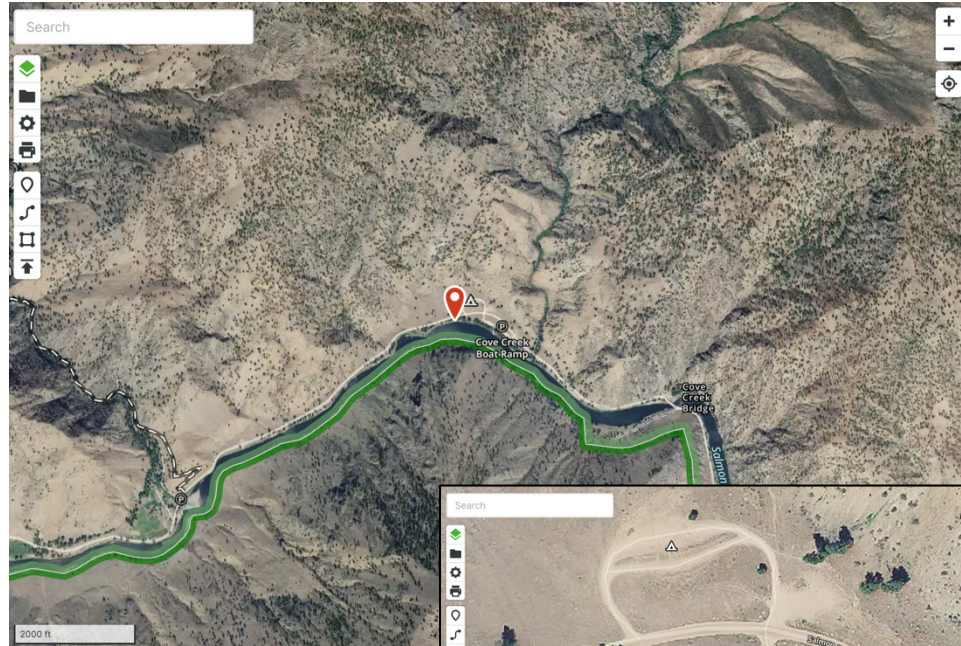


Figure 41. Cove Creek site map

The following graphs describe the crafts and users observed passing by the Cove Creek camera during the monitoring period. This site saw moderate, yet relatively consistent activity all summer, with pronounced peaks each weekend.

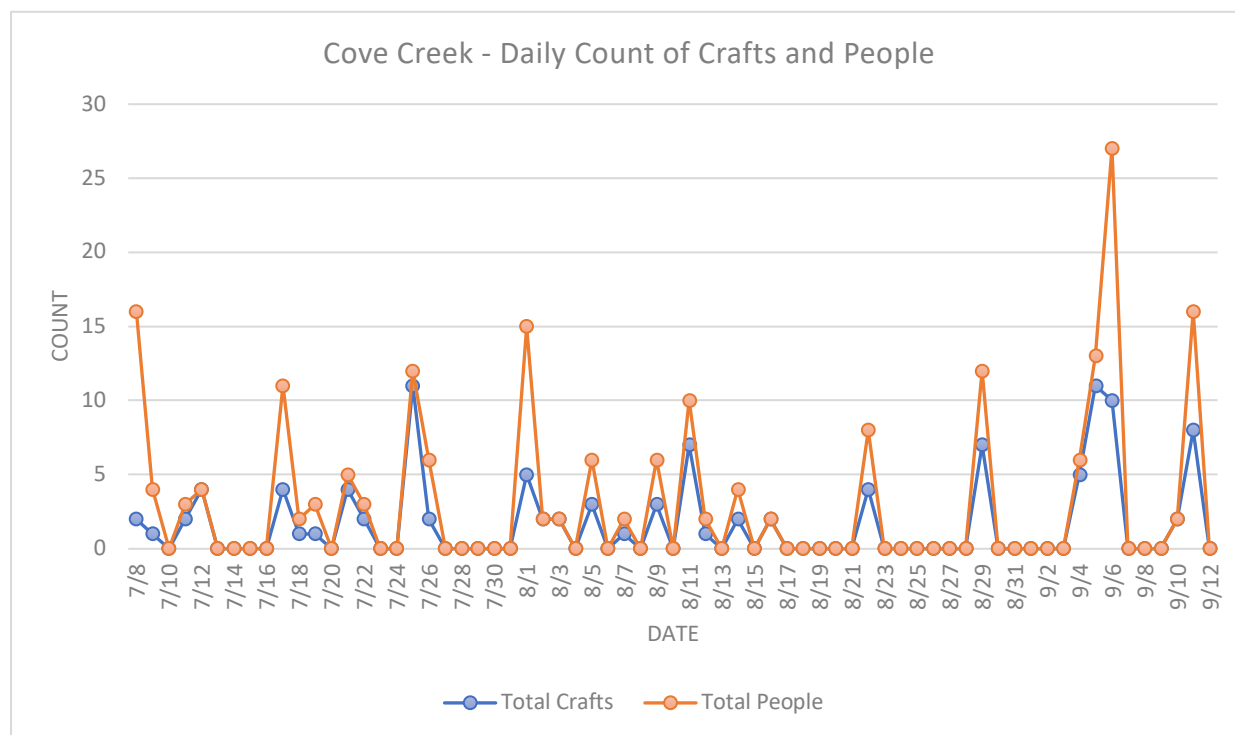


Figure 42. Cove Creek - daily counts of crafts and people

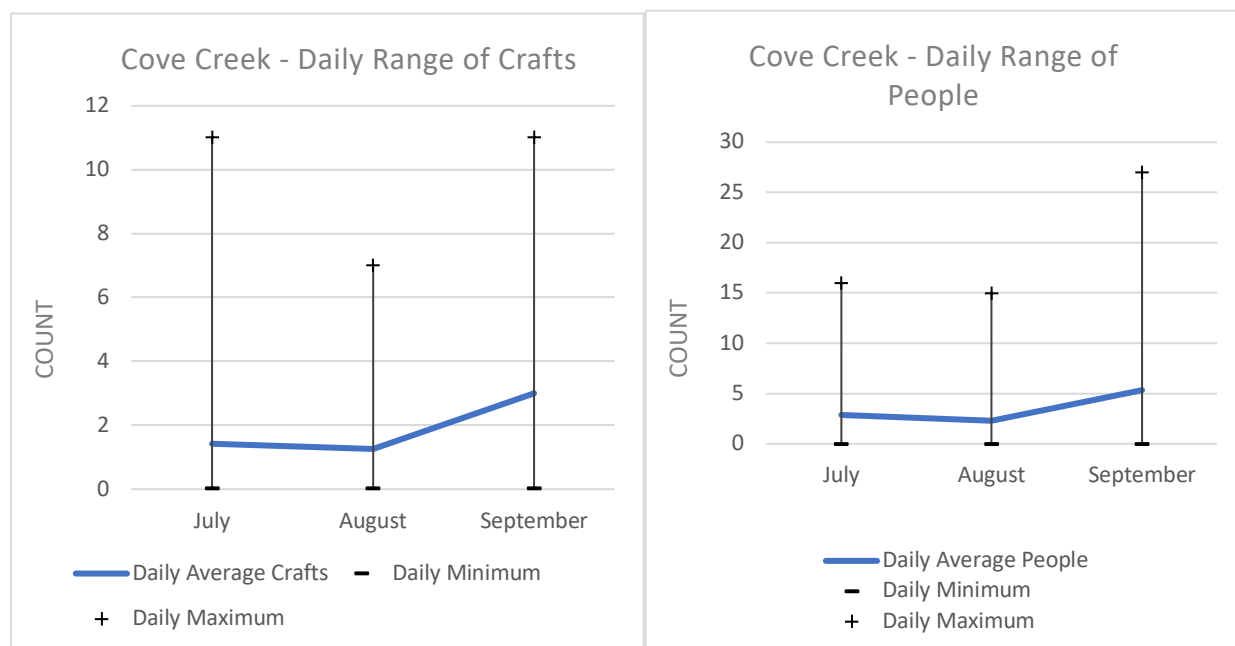


Figure 43. Cove Creek - daily ranges of crafts (left) and people (right)

Crafts were observed at Cove Creek most frequently on the weekend. Broadly speaking, users passed in three waves, a small morning wave, a larger mid-day wave, and final, small afternoon wave.

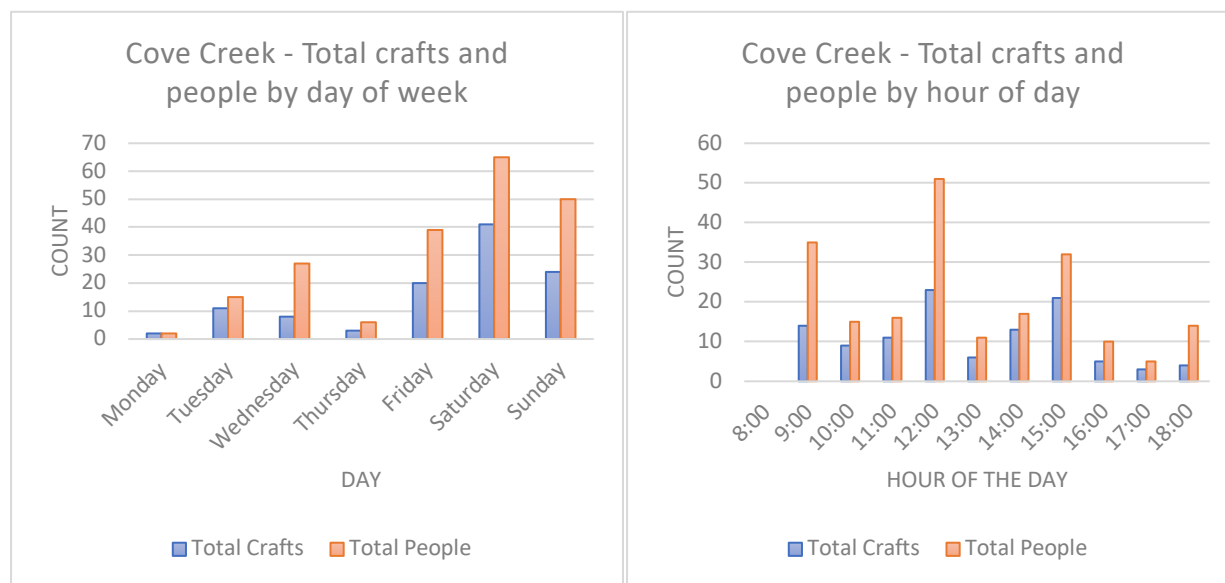


Figure 44. Cove Creek - total crafts and people by day of week (left) and hour of day (right)

In July, crafts were near evenly split between kayaks and rafts, with a smaller number of inner tubes, and a handful of fishing boats and canoes. In August, rafts formed the majority of crafts. In September, a wide diversity of crafts passed through Cove Creek.

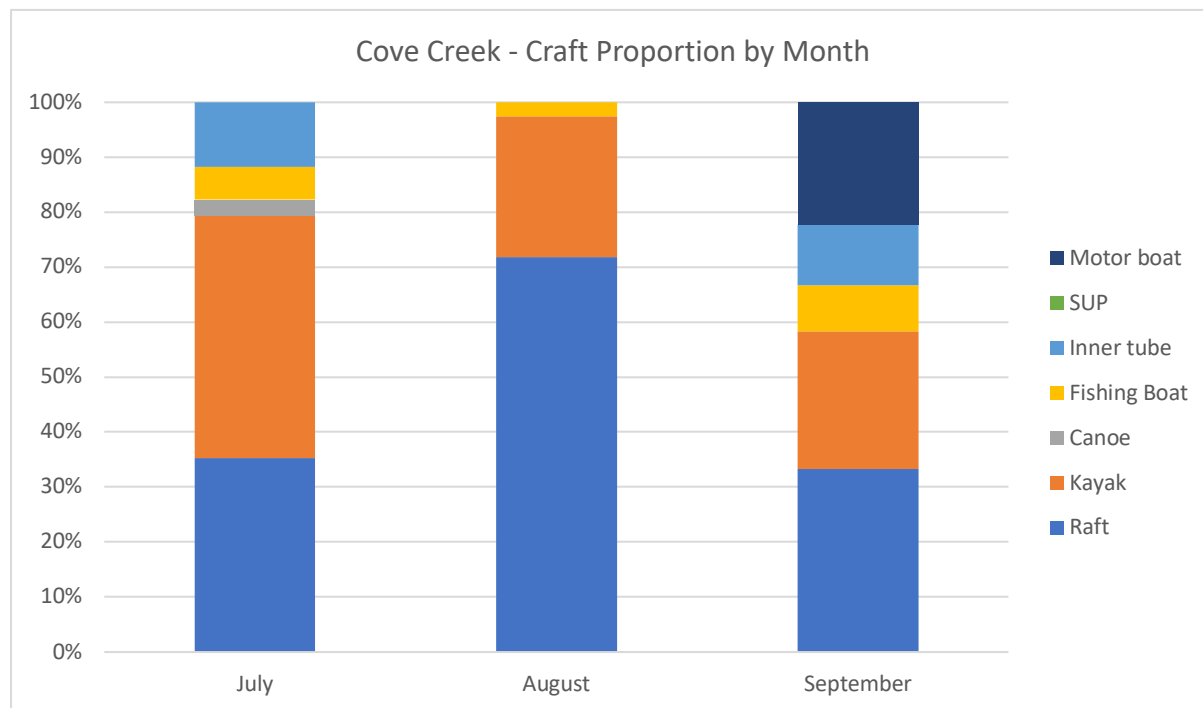


Figure 45. Cove Creek - craft proportion by month

Confluence Upstream

The Confluence Upstream site is located at the upstream side of the main Salmon's confluence with the Middle Fork of the Salmon River, approximately 300 feet east of the log marker that reads "Middle Fork of the Salmon - Yonder Lies the Idaho Wilderness". This camera was mounted to a small tree midway down the bank, and pointed slightly upstream, so as to avoid capturing crafts arriving from the Middle Fork (GPS coordinates 45.29762, -114.59255). This camera was in operation from July 8-September 12, except for a period from August 18-29, when the camera was inadvertently set to shut off for several hours in the middle of the day. Data from these 12 days has been removed from the analysis.

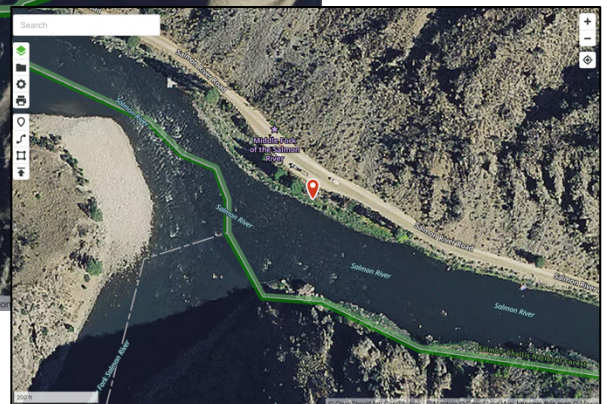
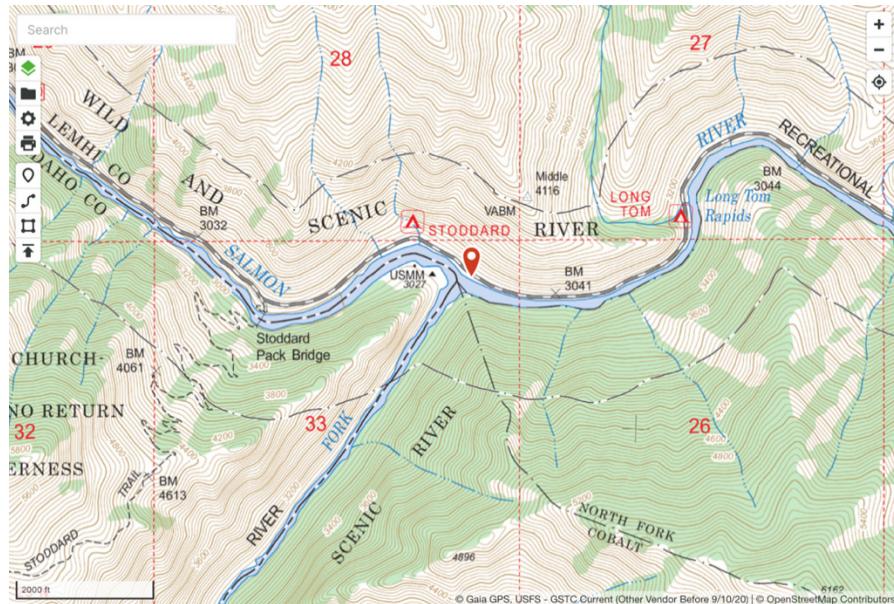


Figure 46. Confluence Upstream site map

The following graphs describe the crafts and users observed passing by the Confluence Upstream camera during the monitoring period. This site saw generally low activity, except for a few discreet high-intensity days (for example, a large group of rafts in July and an even larger fleet of kayaks in early September. As described above, the data gap from Aug. 18-29 was due to camera malfunction.

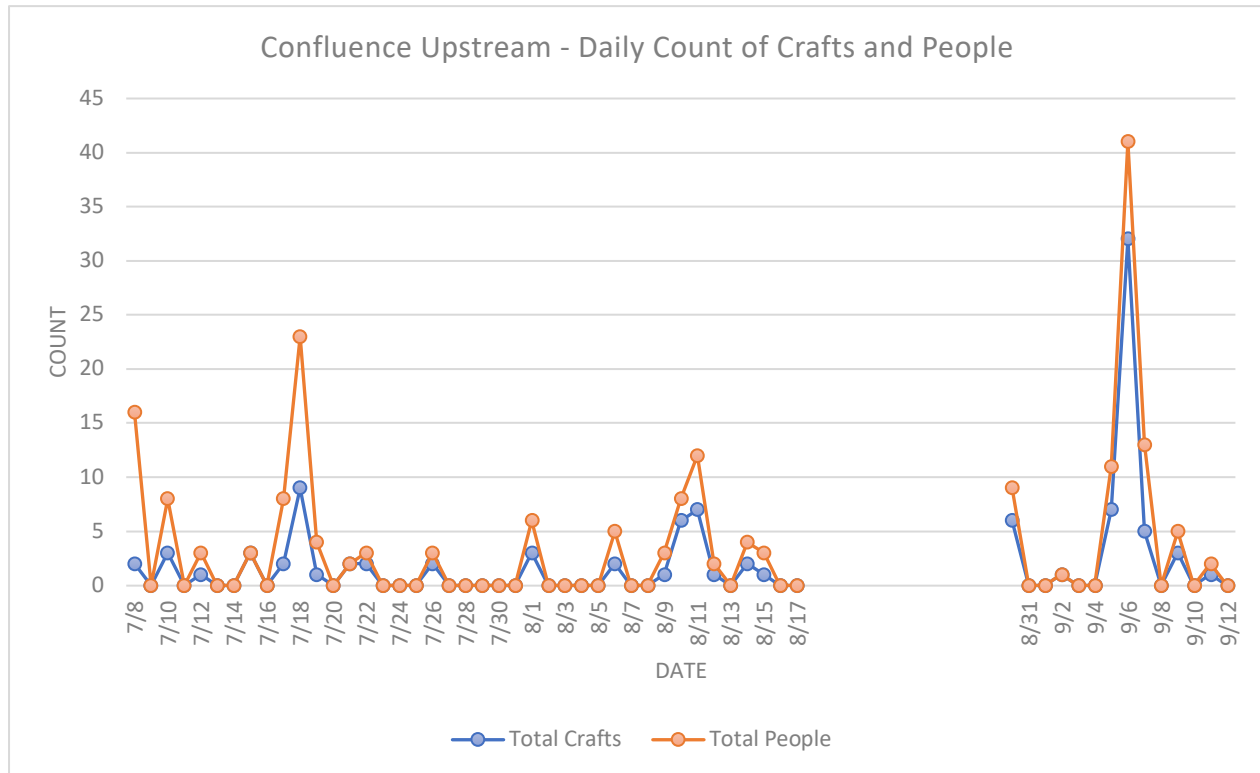


Figure 47. Confluence Upstream - daily counts of crafts and people. Not shown: June 30-July 2 (0 crafts).

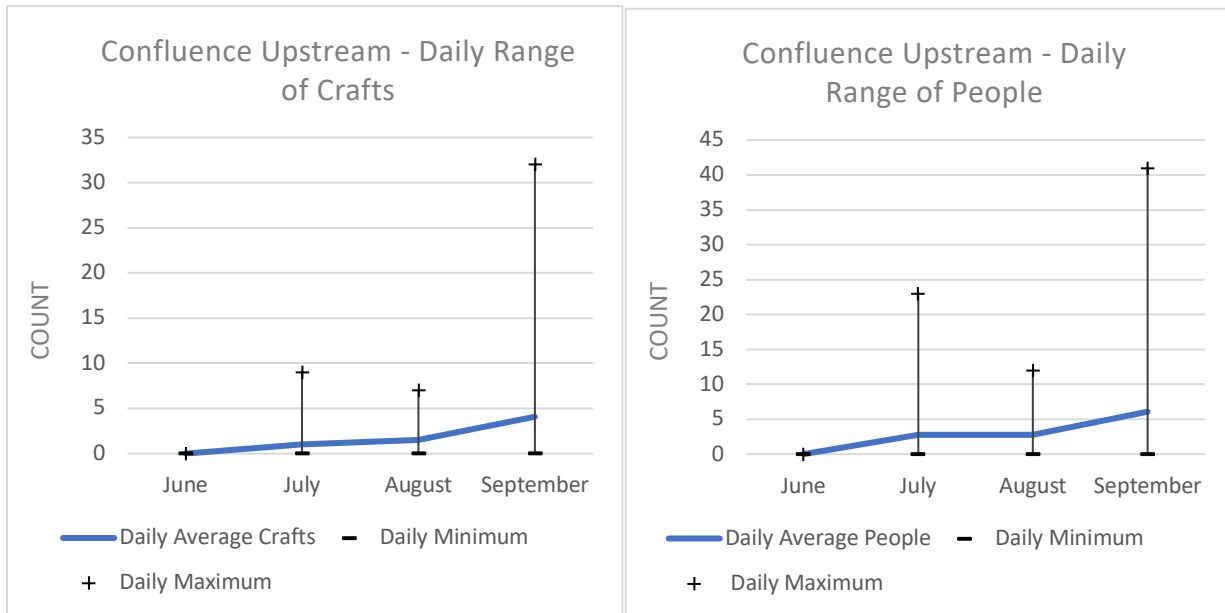


Figure 48. Confluence Upstream - daily ranges of crafts (left) and people (right)

At this site, the greatest number of crafts and people were observed on Saturday and Sunday. Usage was dispersed relatively evenly from 11:00am to 6:00pm.

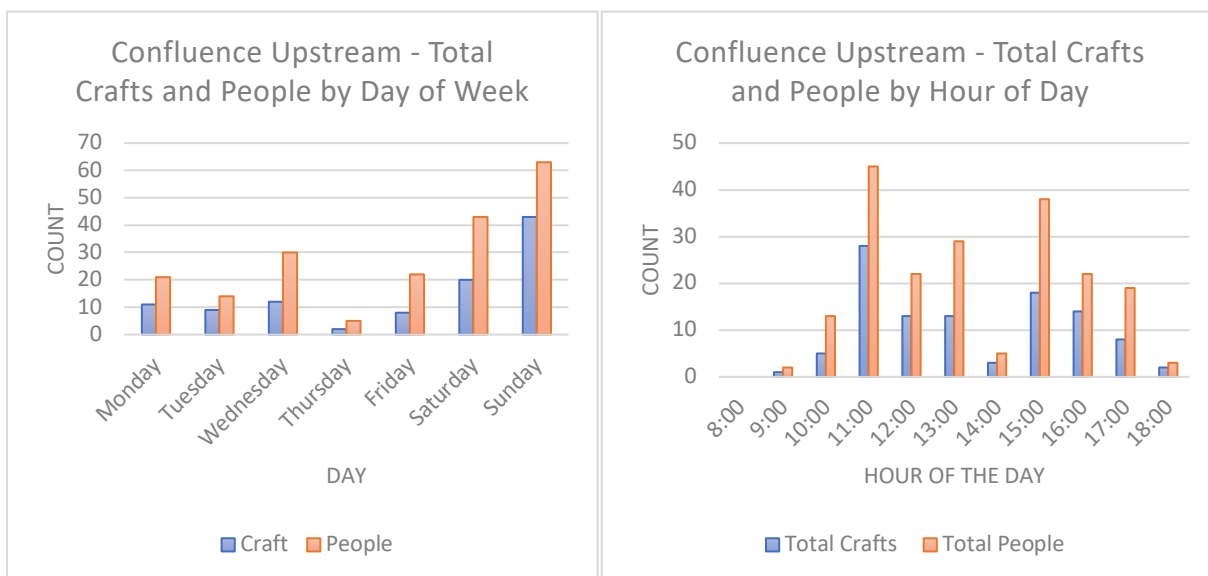


Figure 49. Confluence Upstream - total crafts and people by day of week (left) and hour of day (right)

Rafts were the most common craft in July and August but were surpassed by kayaks in September.

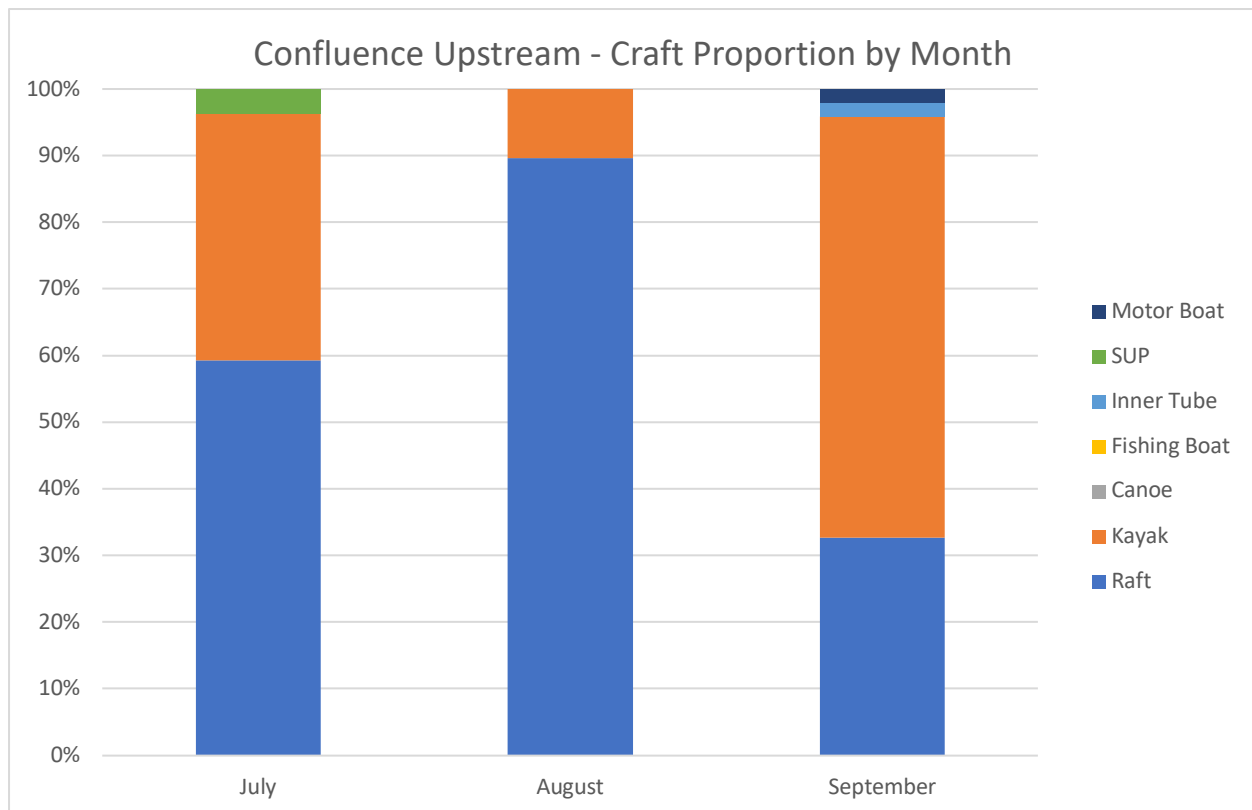


Figure 50. Confluence Upstream - craft proportion by month

Confluence Downstream

The Confluence Downstream site is located about one mile downstream of the main Salmon's confluence with the Middle Fork of the Salmon River. This camera was mounted to a rock about 20 feet below the road surface (*GPS coordinates 45.29930, -114.60895*). At this site, observed crafts include those newly arrived to the main Salmon from the Middle Fork. This camera was in operation from July 8-September 12, except for a gap from August 7-17. During this period, the angle of the camera lens was set too high and photos do not show the river surface. Data from these 11 days has been removed from the analysis.

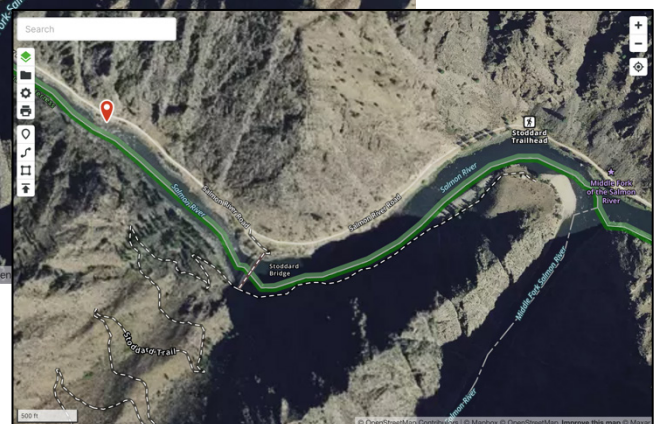
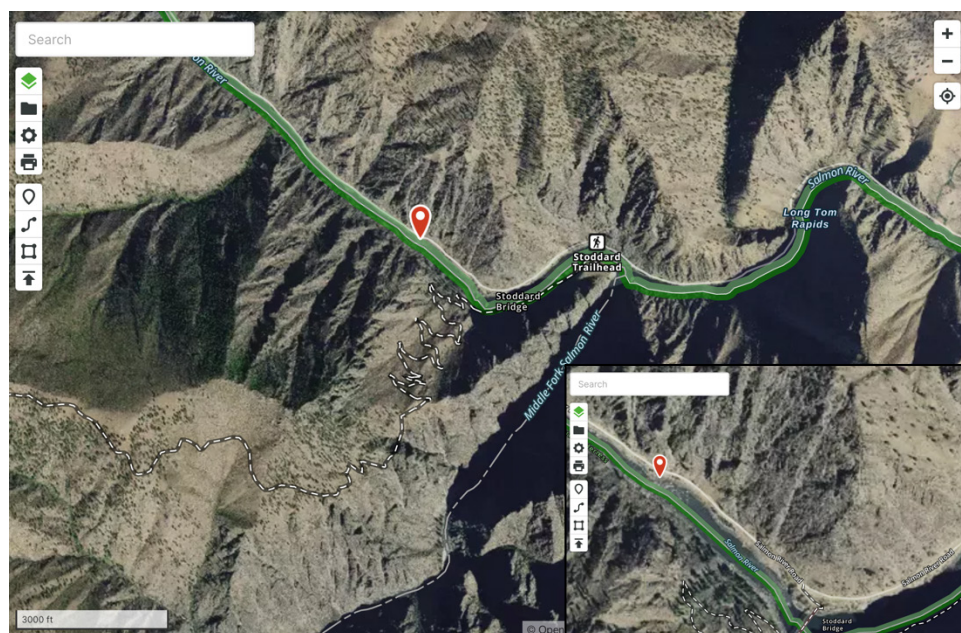
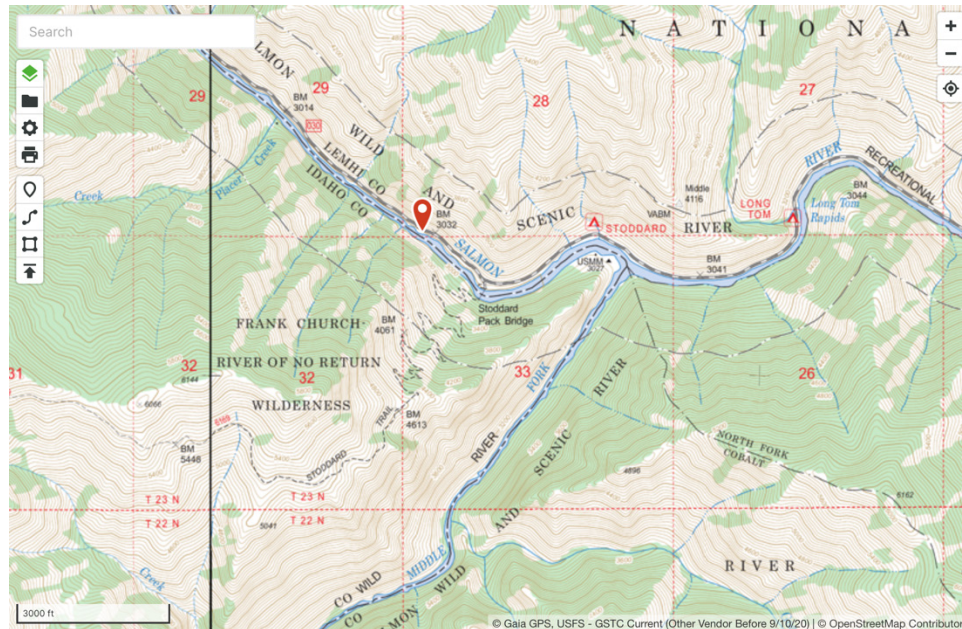


Figure 51. Confluence Downstream site map

The following graphs describe the crafts and users observed passing by the Confluence Downstream camera during the monitoring period. This site saw, by far, the most activity of any in the study. In July, an average of 50 crafts and 100 people were floating by the site every day. By September, this rate dropped by about half. By comparing these numbers to the sites upstream, it can be inferred that the vast majority of these river uses were emerging from the Middle Fork of the Salmon. The busiest day of the monitoring period was Wednesday July 29th, when 90 boats carrying 184 people floated this section. As described above, the gap from August 7-17 is due to camera malfunction.

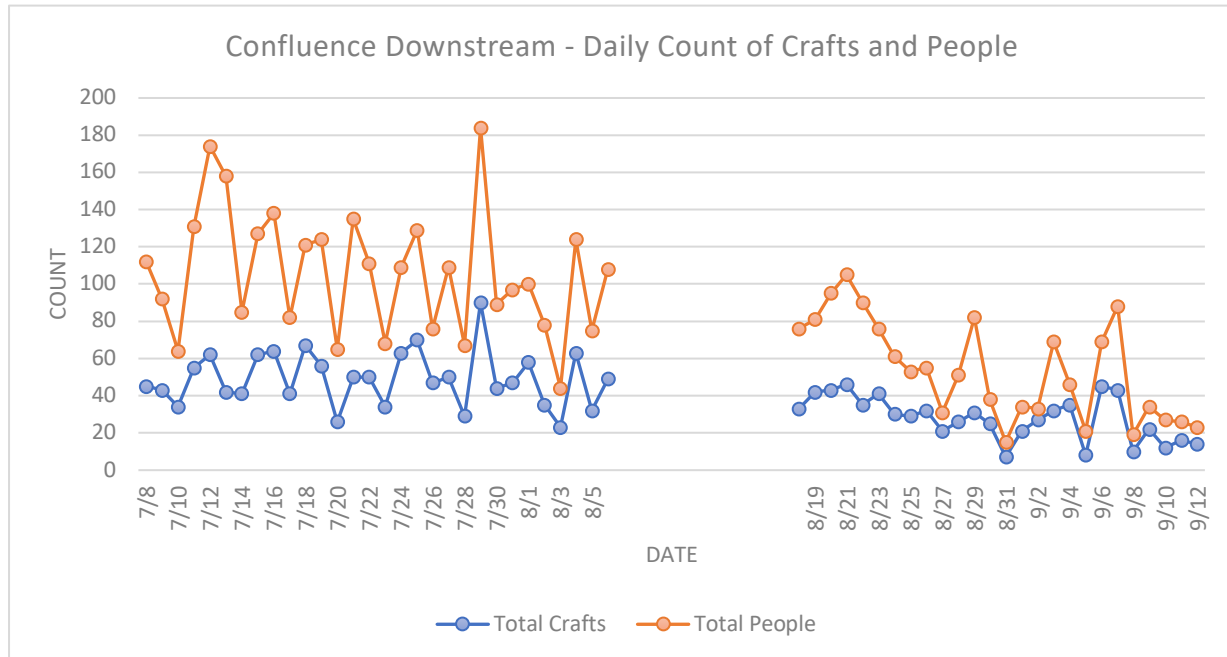


Figure 52. Confluence Downstream - daily count of crafts and people

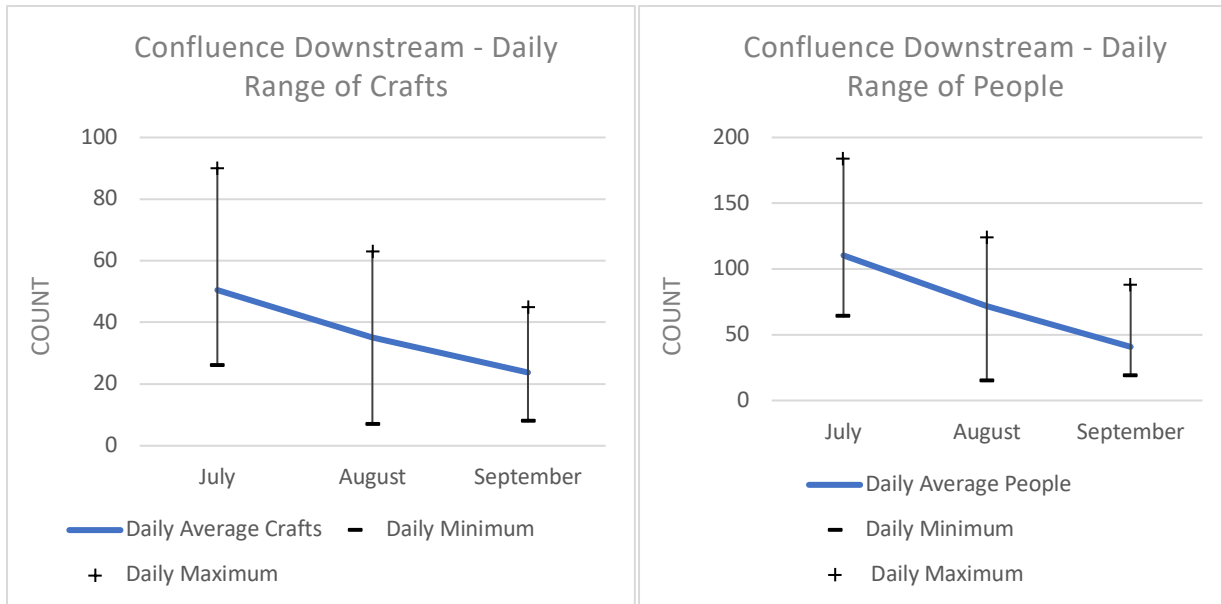


Figure 53. Confluence Downstream - daily ranges of crafts (left) and people (right)

In contrast to all other sites, there is no clear trend in usage across the week – this is consistent with the inference that most of these floaters are on permitted, multi-day trips through the Middle Fork. At Confluence Downstream, most crafts were observed from 10:00-11:00am, then tapering off through the afternoon.

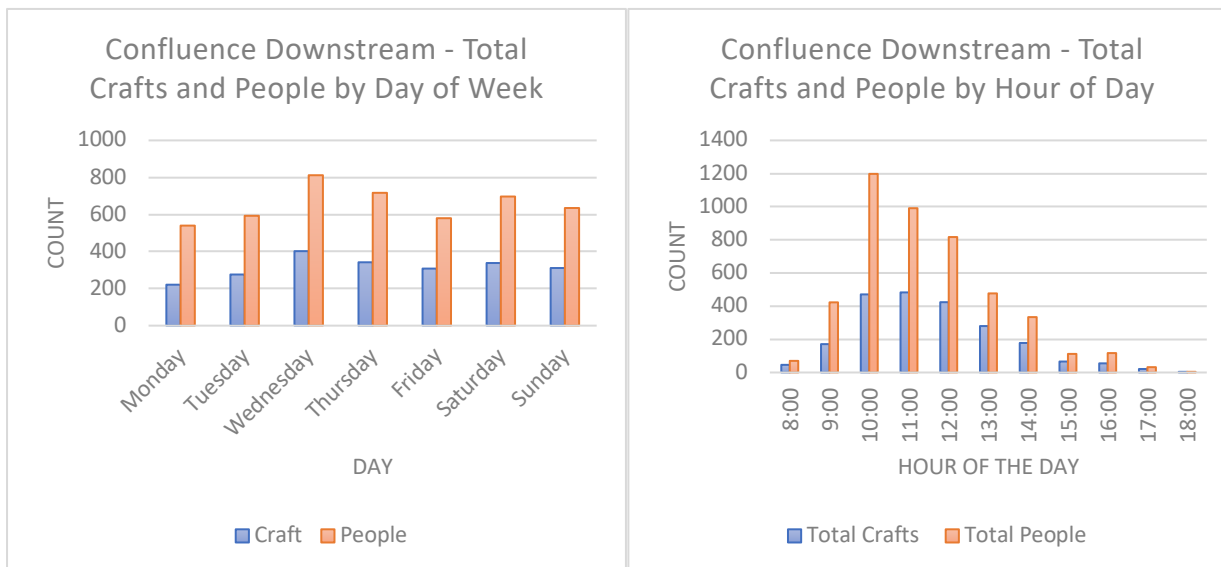


Figure 54. Confluence Downstream - total crafts and people by day of week (left) and hour of day (right)

About three quarters of all crafts here were rafts. Kayaks were consistently the second most common craft type.

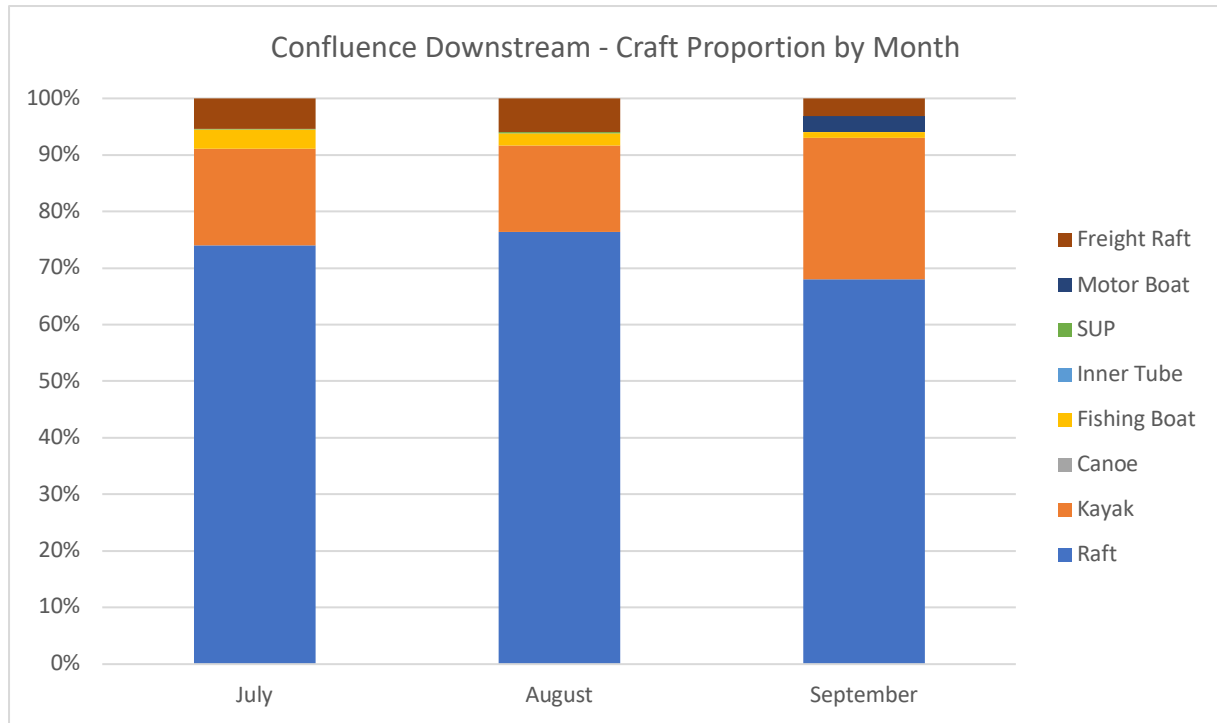


Figure 55. Confluence Downstream - craft proportion by month

Cache Bar

The final downstream site monitored for this study is Cache Bar, located about 1000 feet downstream of the Cache Bar Boat Ramp. This camera was mounted to a small tree about 20 feet below the road surface (GPS coordinates 45.31911, -114.63960). This camera was in operation from July 8-September 12.

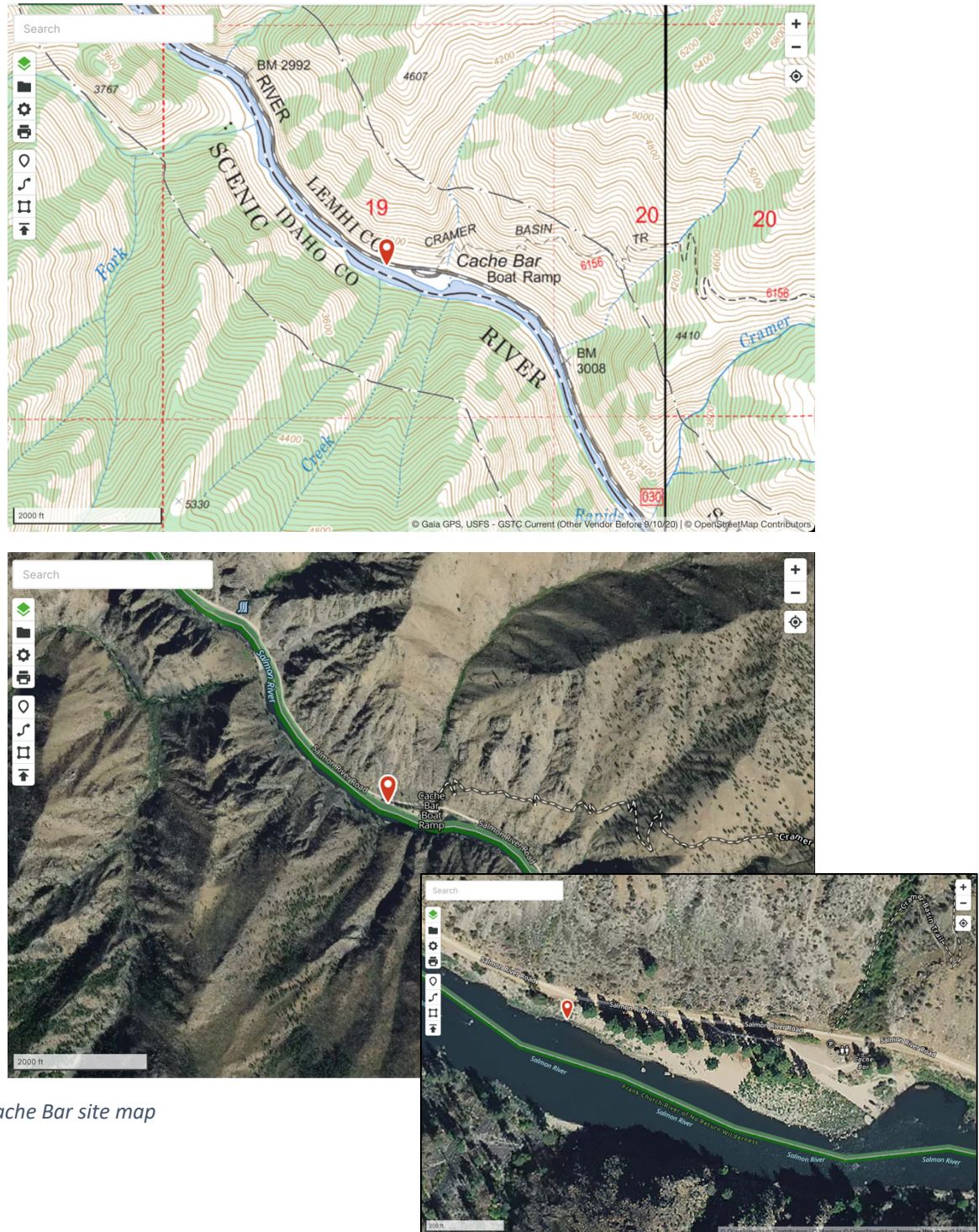


Figure 56. Cache Bar site map

The following graphs describe the crafts and users observed passing by the Cache Bar camera during the monitoring period. Observations at this site were highly variable. Throughout the summer, certain days experienced spikes of usage far above the average, yet these days were not always the same day of the week.

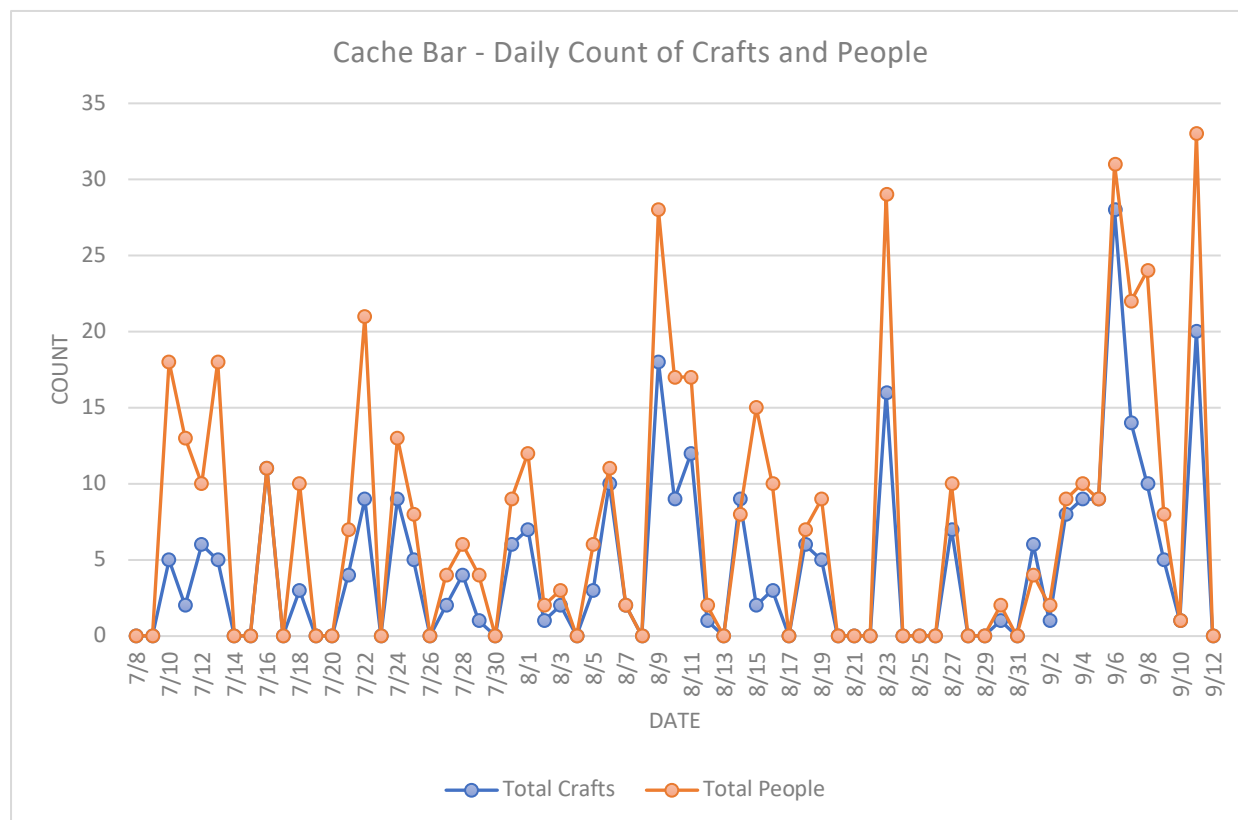


Figure 57. Cache Bar - daily count of crafts and people

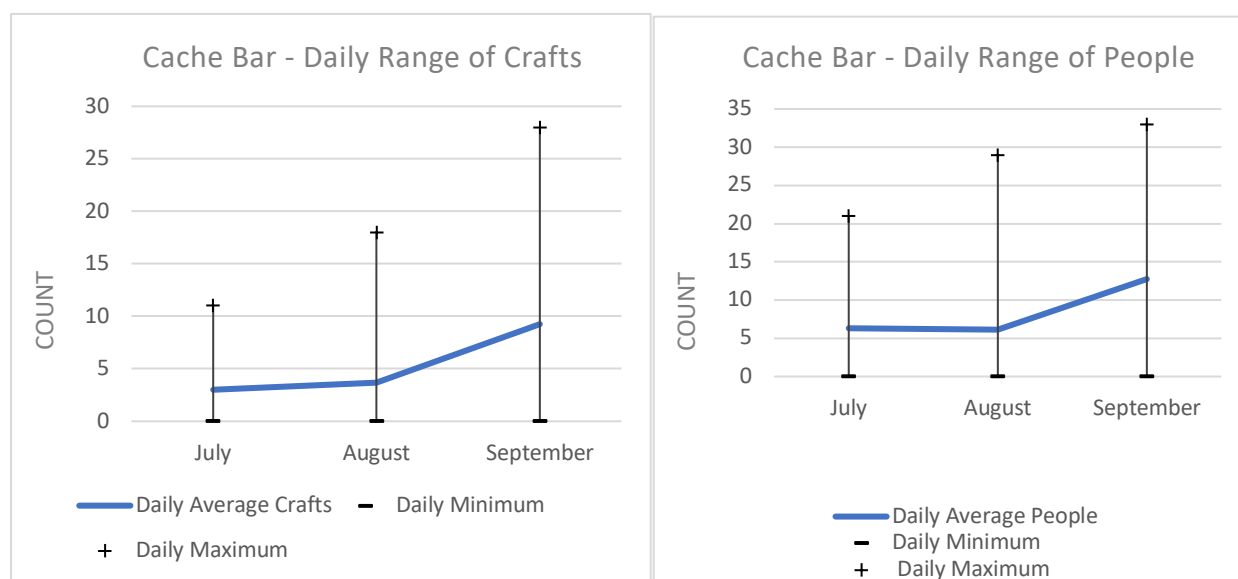


Figure 58. Cache Bar - daily ranges of crafts (left) and people (right)

Observations were slightly higher on the weekends. Boats generally passed this site in two separate waves. A morning wave (9:00am-noon) was likely composed of parties completing their Middle Fork floats who chose to take out at Corn Creek rather than Cache Bar Boat Ramp. The afternoon wave (1:00pm-5:00pm) was likely composed of new trips putting in at Cache Bar.

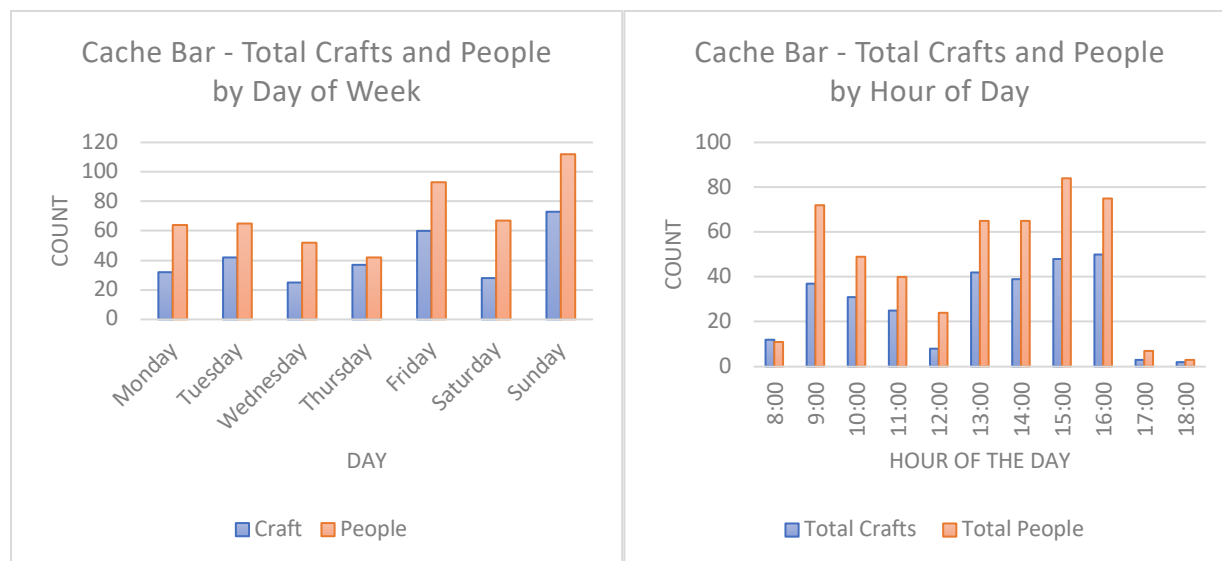


Figure 59. Cache Bar - total crafts and people by day of week (left) and hour of day (right)

Similar to several of the upstream sites, rafts were the dominant craft type in July and August but were largely replaced by kayaks in September.

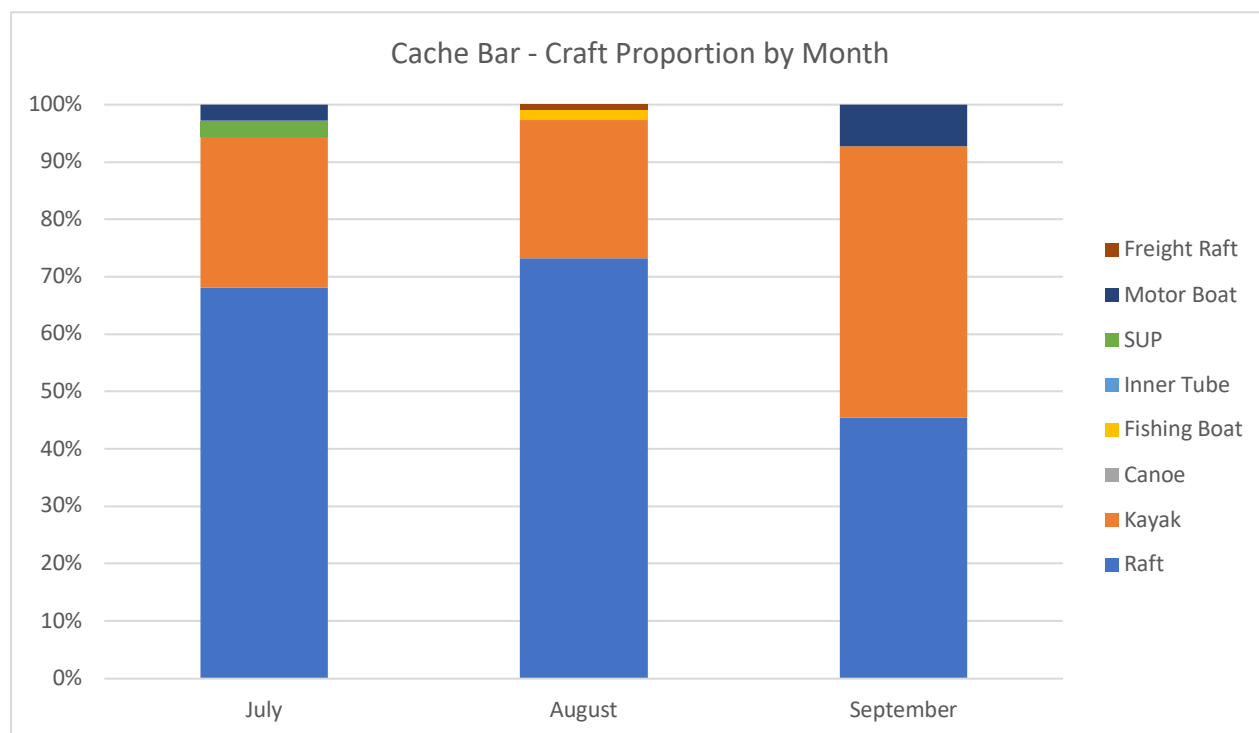


Figure 60. Cache Bar - craft proportion by month

Traffic Counters

Spring Creek Campground

The traffic counter at Spring Creek Campground is located on the entrance road to the campground complex. Data was recorded from June 18-September 12. A grand total of 5708 vehicles were counted during the monitoring period. Note that the traffic counters recorded vehicles moving in both directions (entrances and exits); total traffic was determined by averaging these two values.



Figure 61. Spring Creek Campground site map

The following graphs illustrate vehicle traffic at Spring Creek Campground. The first displays total daily vehicles at this location. Clearly recognizable peaks correspond to weekends (particularly Saturdays).

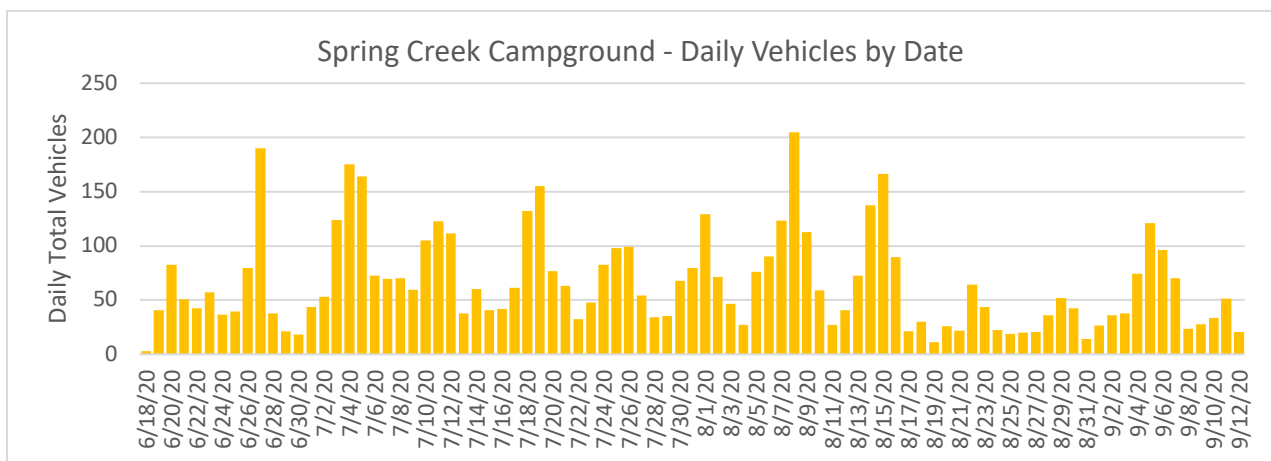


Figure 62. Spring Creek Campground - daily vehicles by date

The second graph displays total traffic pooled by time of day.

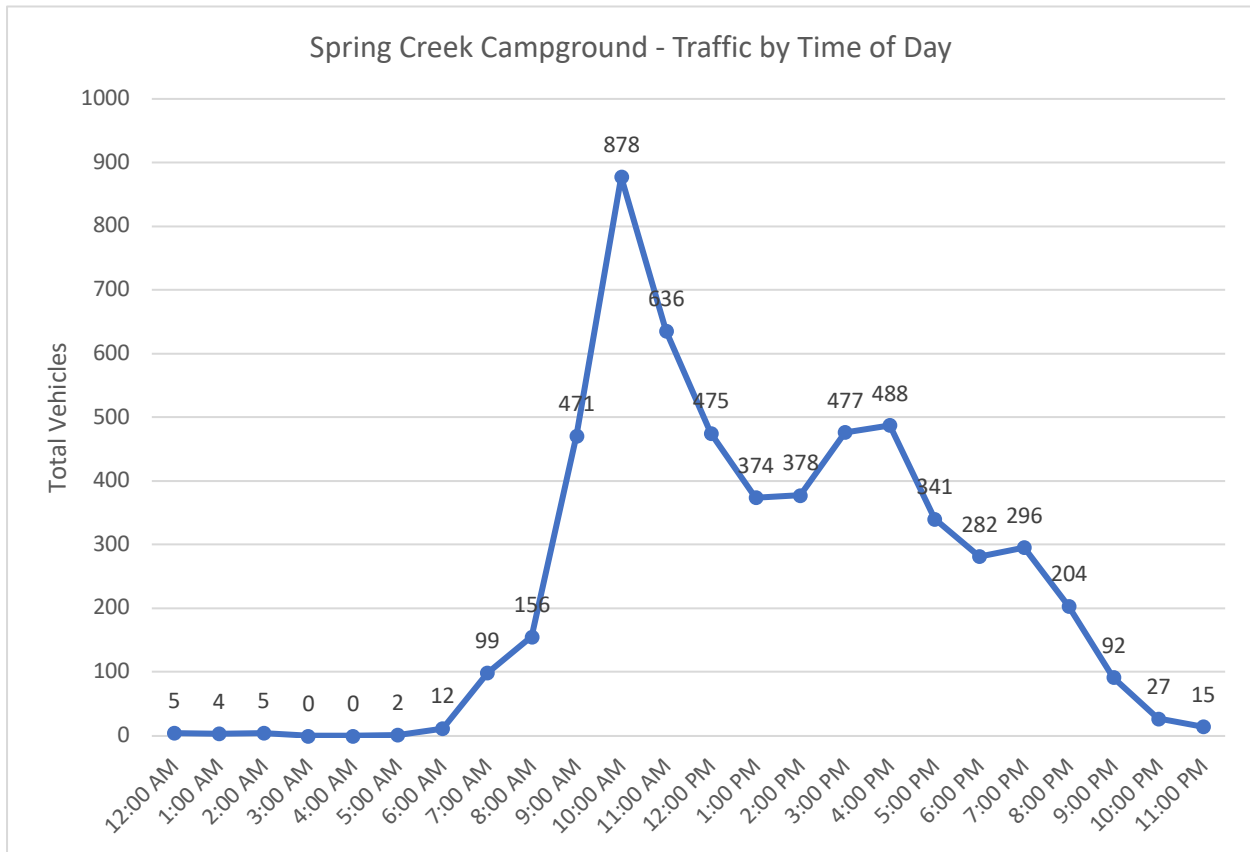


Figure 63. Spring Creek Campground - traffic by time of day

Panther Creek Road

The traffic counter at Panther Creek Road is located about 100 feet south of the intersection of Panther Creek Road and Salmon River Road. Data was recorded from June 19-September 12. A grand total of 3096 vehicles were counted during the monitoring period.

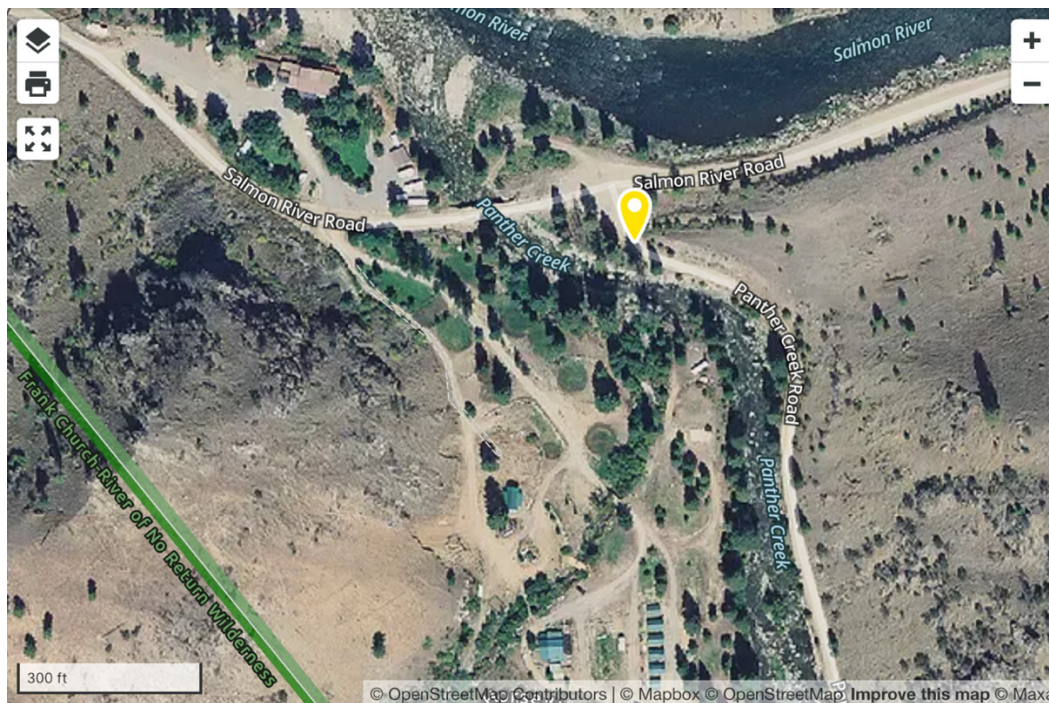


Figure 64. Panther Creek Road site map

The following graphs illustrate vehicle traffic at Panther Creek Road. The first displays total daily vehicles at this location. Traffic was generally consistent throughout the summer and heaviest on Fridays and Saturdays.

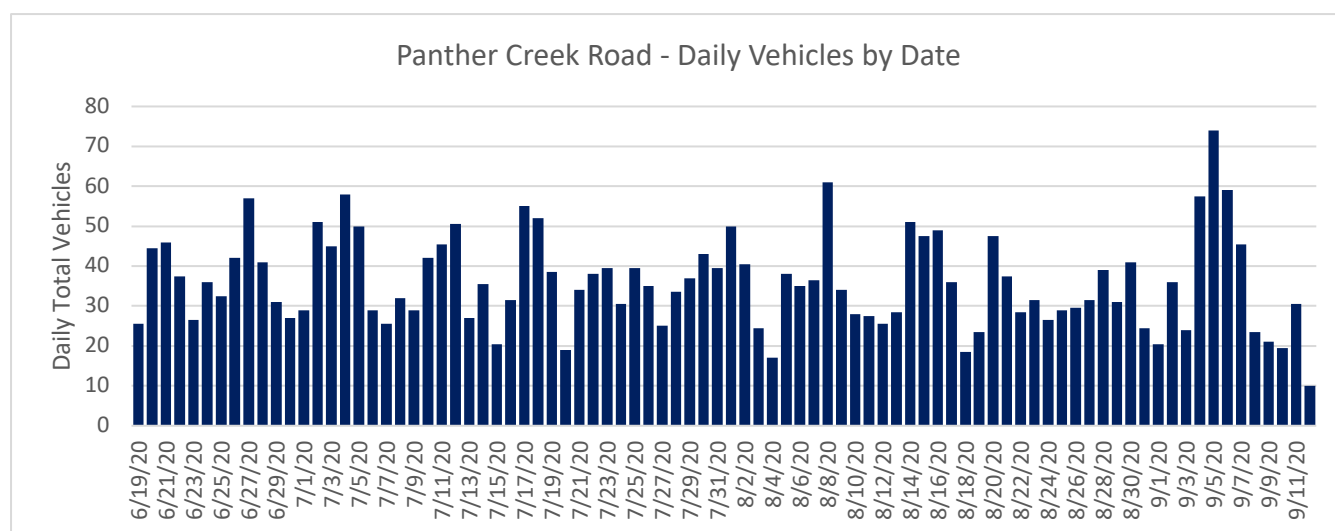


Figure 65. Panther Creek Road - daily vehicles by date

The second graph displays total traffic pooled by time of day.

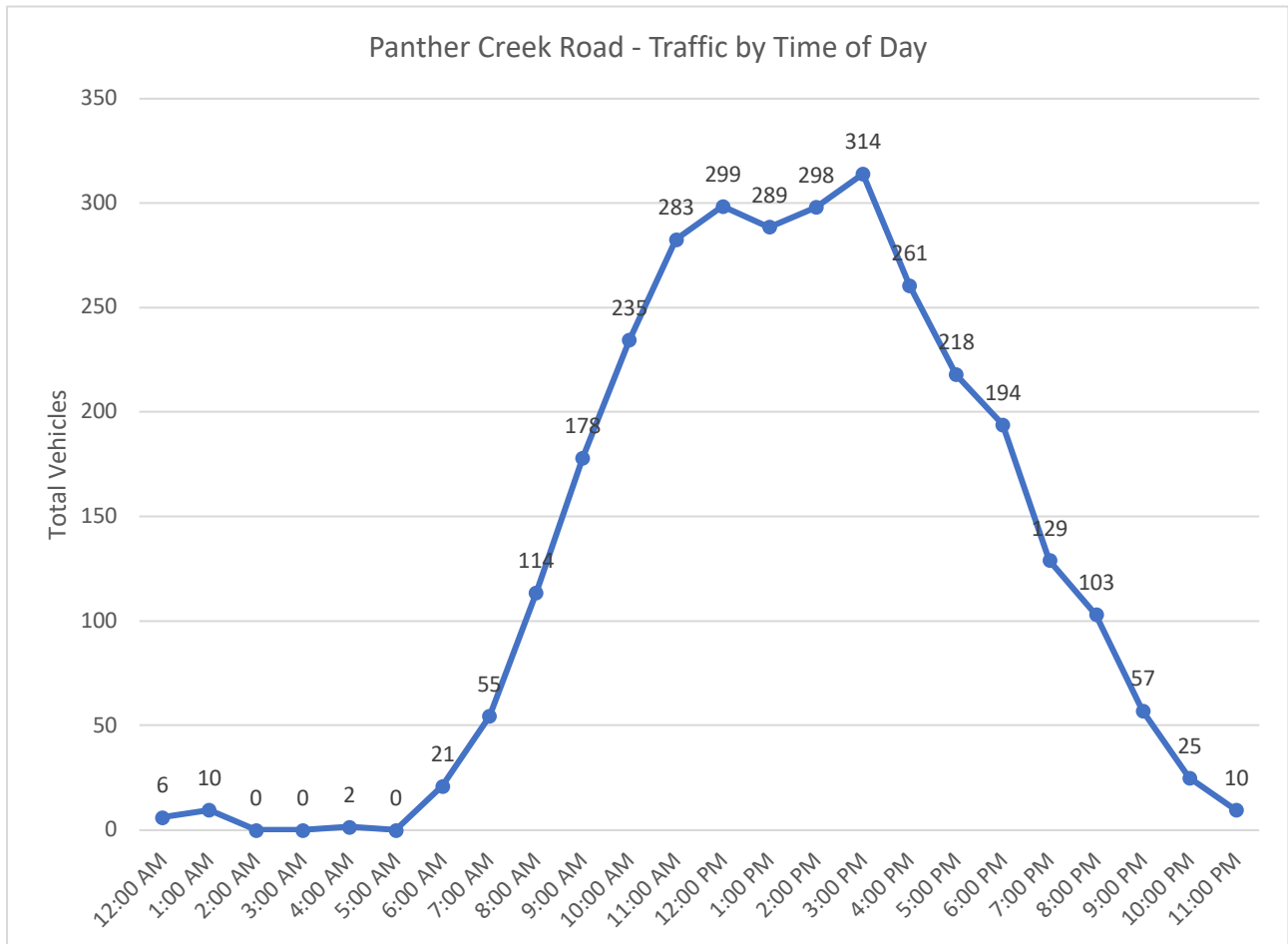


Figure 66. Panther Creek Road - traffic by time of day

Cache Bar Boat Ramp

The traffic counter at Cache Bar Boat Ramp is located on the entrance road to the boat launch area. Data was recorded from June 18-September 12. A grand total of 5075 vehicles were counted during the monitoring period.



Figure 67. Cache Bar Boat Ramp site map

The following graphs illustrate vehicle traffic at Cache Bar Boat Ramp. The first displays total daily vehicles at this location. Peaks of maximum traffic do not show a pattern with regard to day of the week, suggesting that these vehicles are largely correlated to Middle Fork raft trip take-outs. This trend also mirrors the July to September decline of river usage observed at Confluence Downstream (see Fig. 52-53).

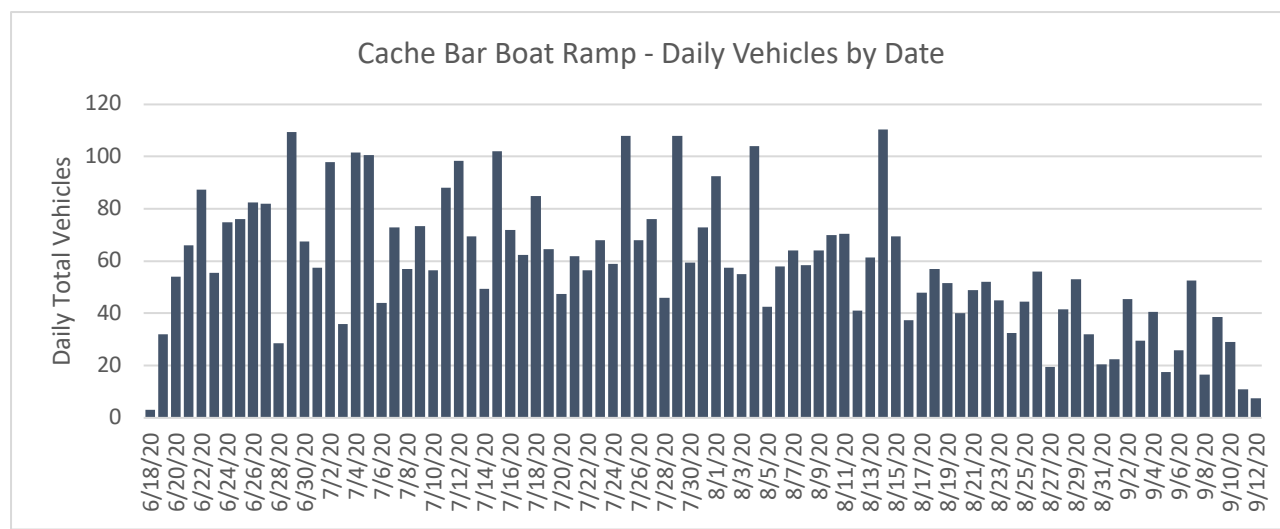


Figure 68. Cache Bar Boat Ramp - daily vehicles by date

The second graph displays total traffic pooled by time of day.

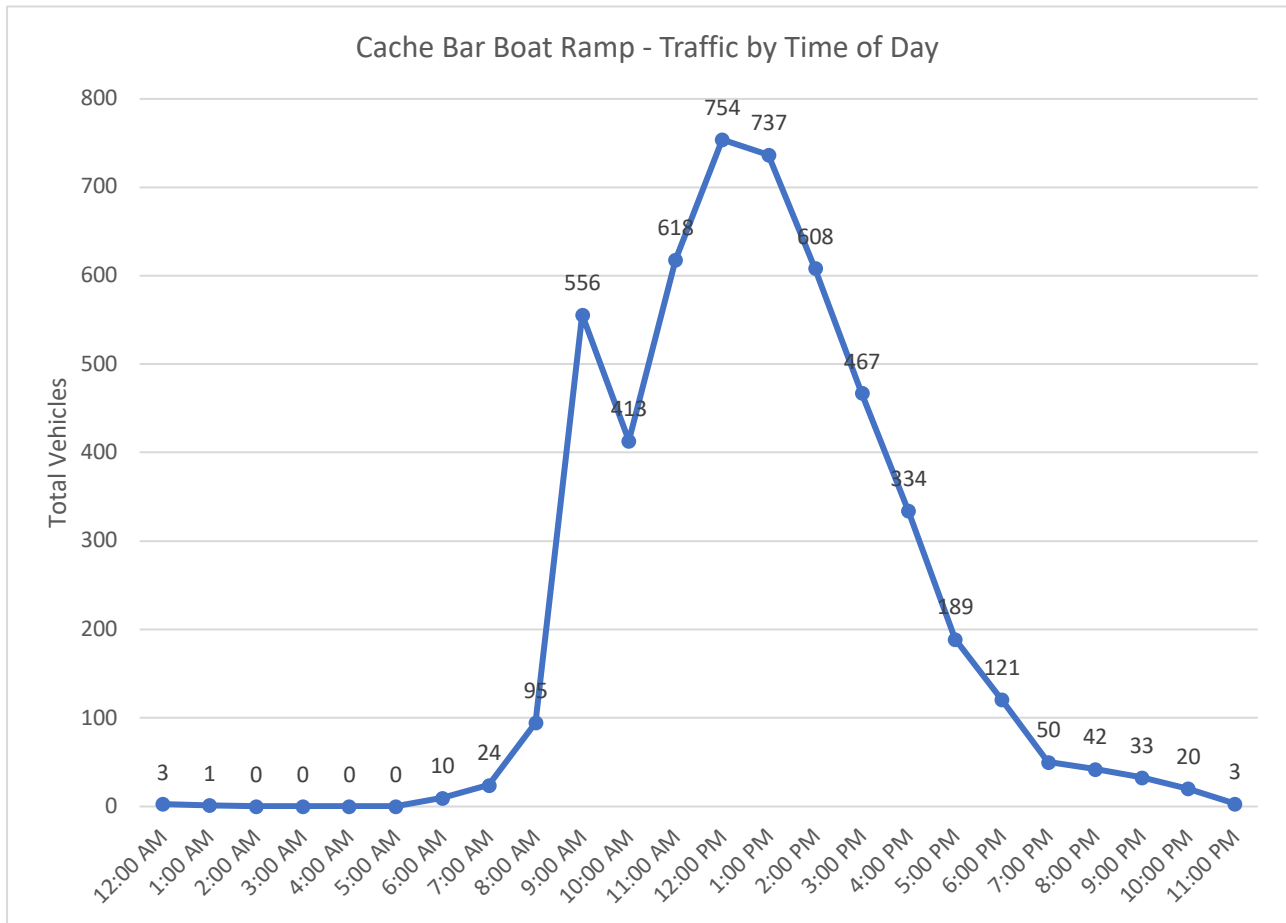


Figure 69. Cache Bar Boat Ramp - traffic by time of day

Salmon River Road at Indian Creek Bridge

As noted in the introduction, traffic data was collected at four bridges along Salmon River Road as part of a separate study conducted by the USFS. Forest Service staff shared this data with the authors to supplement the present report. The traffic counter at Indian Creek Bridge recorded traffic from October 1, 2019 to August 27, 2020 except for a gap from Oct. 16 to Dec. 4, 2019 when dead batteries prevented recording. In the figures below, data from the 2020 summer field season (from June 1 onwards) is presented. See Appendix 1 for a presentation of year-round data. These counters recorded vehicles travelling in both directions. To avoid double counting, each day's count was divided by two to arrive at our best estimate of daily unique vehicles.

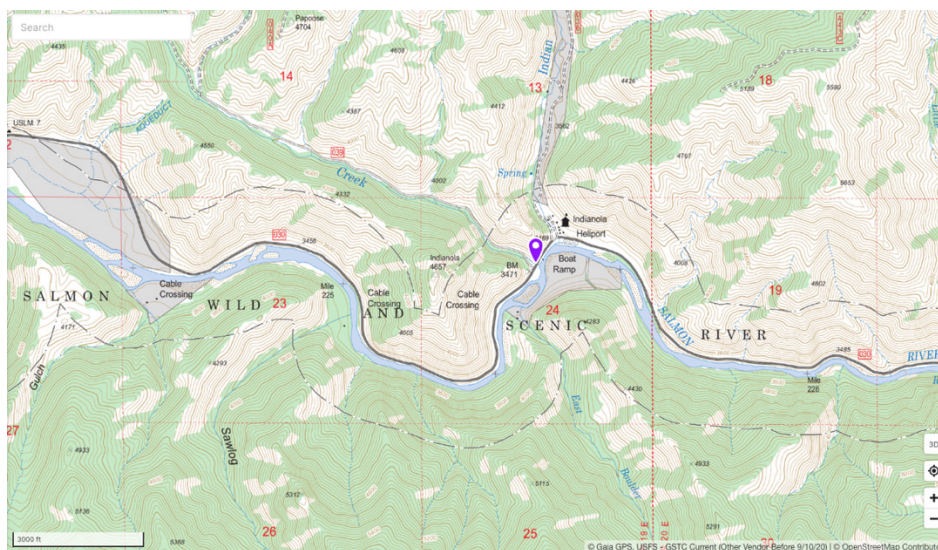


Figure 70. Indian Creek Bridge site map

The following graphs illustrate vehicle traffic at Indian Creek Bridge. The first displays total daily vehicles at this location. As seen in the other traffic counters, usage along Salmon River Road increases at the beginning of the summer, peaks in July and gradually declines through August.

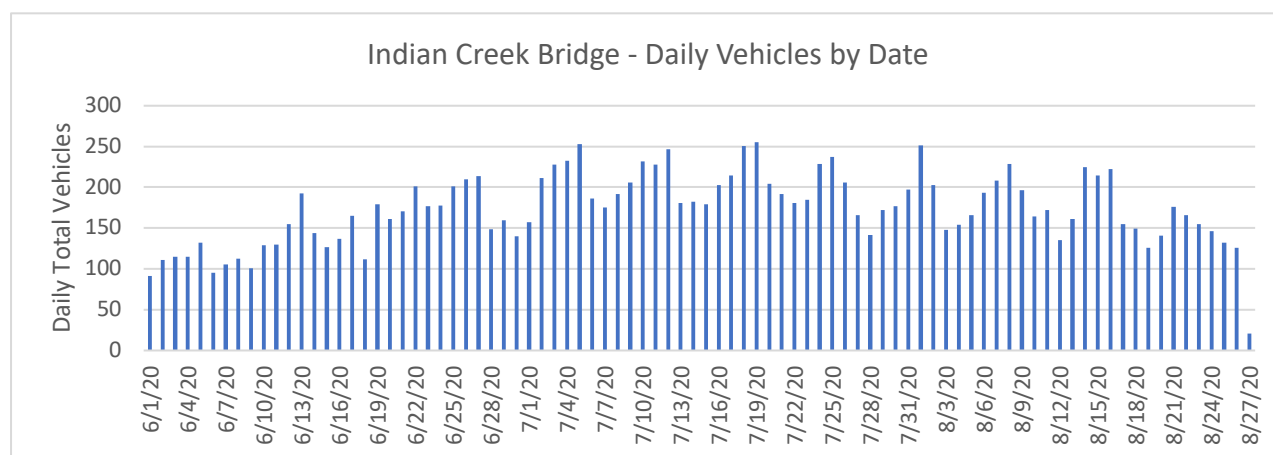


Figure 71. Indian Creek Bridge - daily vehicles by date

Unsurprisingly, traffic peaked during the daytime hours and fell to zero late at night.

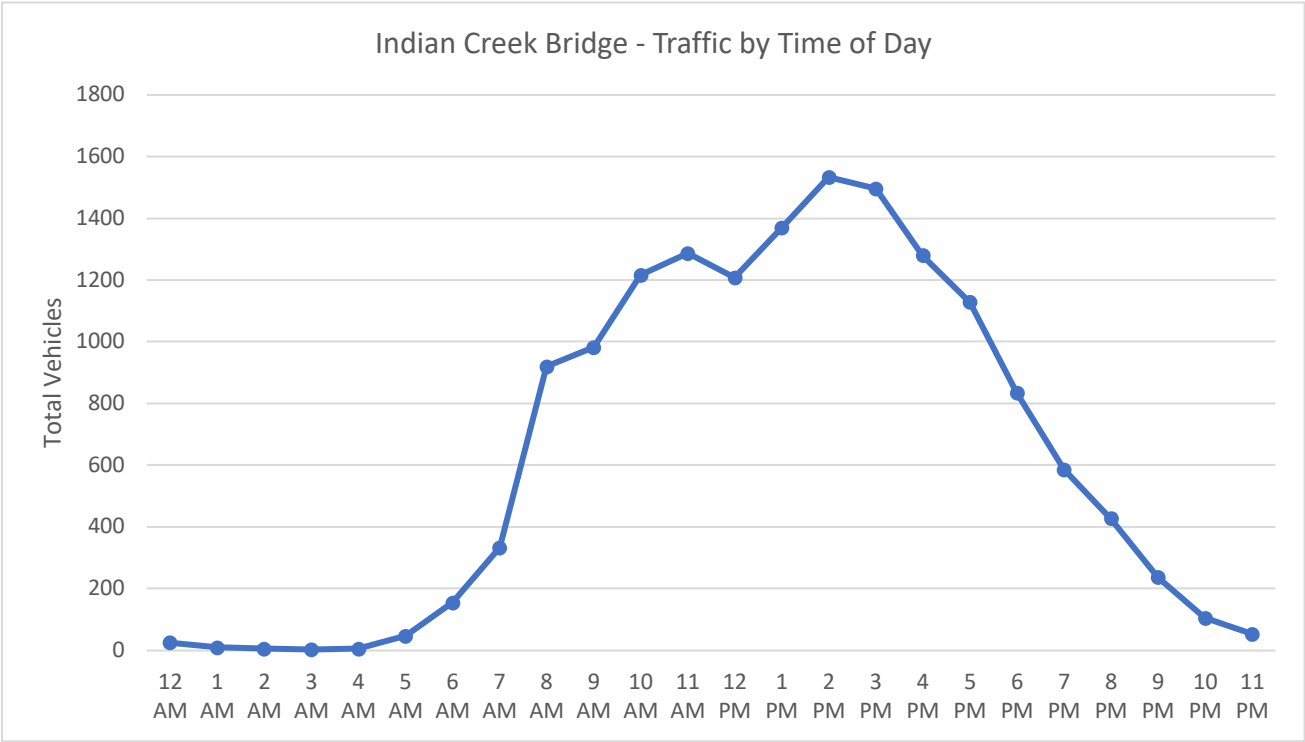


Figure 72. Indian Creek Bridge – traffic by time of day

Salmon River Road at Boulder Creek Bridge

The traffic counter at Boulder Creek Bridge recorded traffic from October 1, 2019 to August 27, 2020 except for a gap from April 11 to June 18, 2020 when dead batteries prevented recording. In the figures below, data from the 2020 summer field season (from June 18 onwards) is presented. See Appendix 1 for a presentation of year-round data. These counters recorded vehicles travelling in both directions. To avoid double counting, each day's count was divided by two to arrive at our best estimate of daily unique vehicles.



Figure 73. Boulder Creek Bridge site map

As the other traffic data has shown, traffic here increased in July and tapered off in August, and was highest during daytime hours.

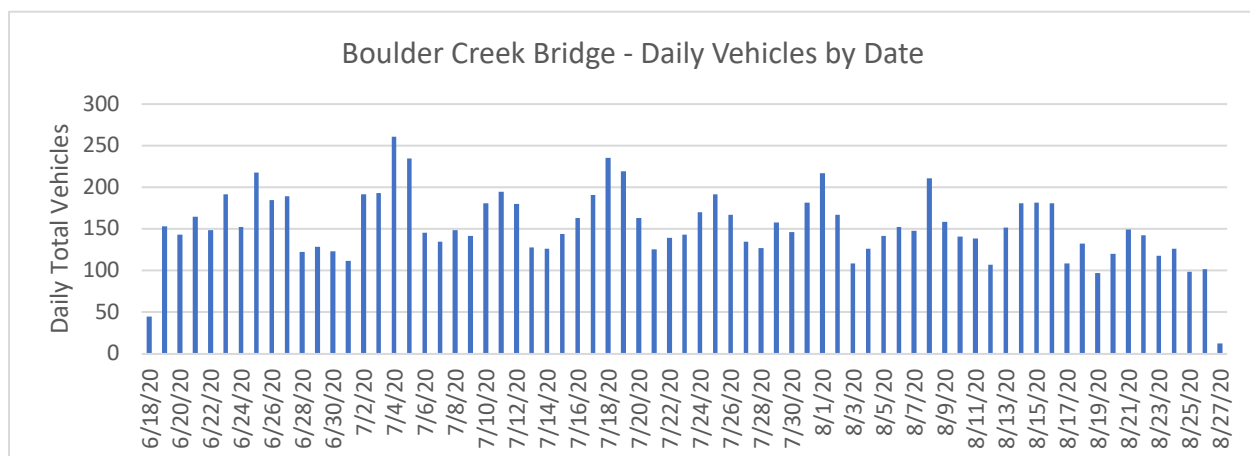


Figure 74. Boulder Creek Bridge - daily traffic by date

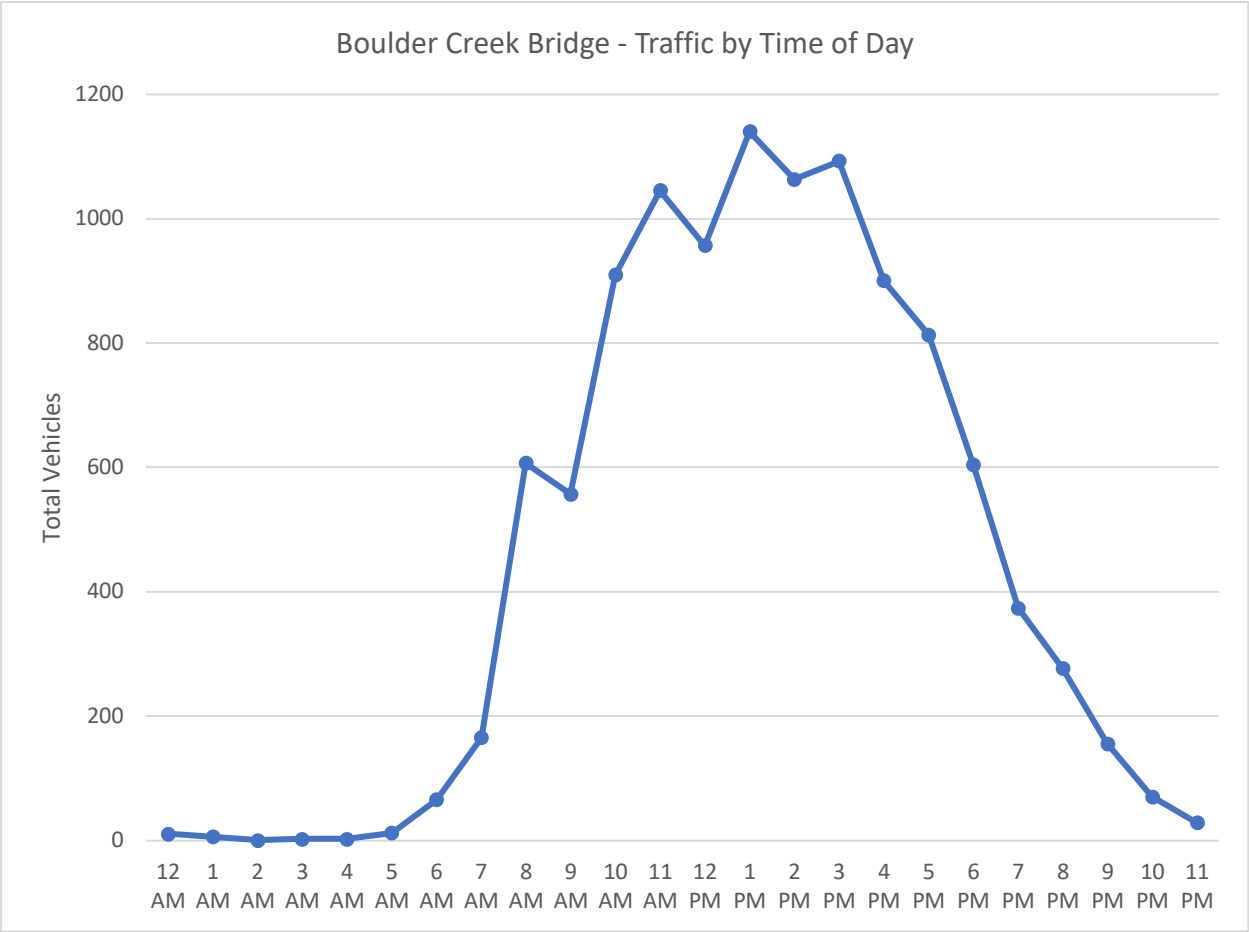


Figure 75. Boulder Creek Bridge – traffic by time of day

Salmon River Road at Owl Creek Bridge

The traffic counter at Owl Creek Bridge recorded traffic from October 1, 2019 to August 27, 2020 except for a gap from March 31 to May 20, 2020 when dead batteries prevented recording. In the figures below, data from the 2020 summer field season (from June 1 onwards) is presented. See Appendix 1 for a presentation of year-round data. These counters recorded vehicles travelling in both directions. To avoid double counting, each day's count was divided by two to arrive at our best estimate of daily unique vehicles.



Figure 76. Owl Creek Bridge site map

As with the other bridges, traffic was greatest here during July and August and during the day.

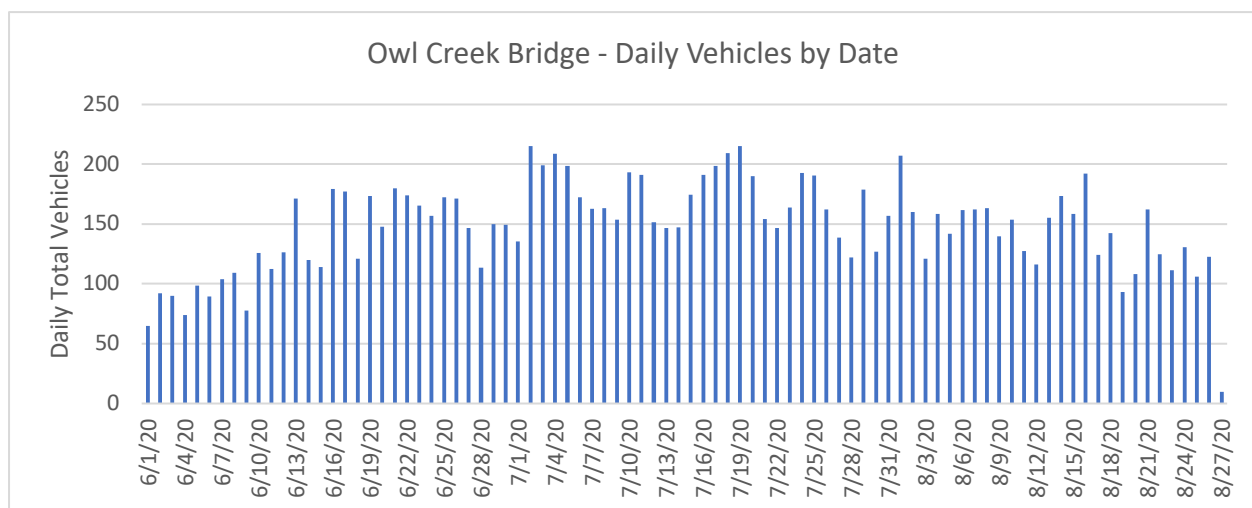


Figure 77. Owl Creek Bridge - daily vehicles by date

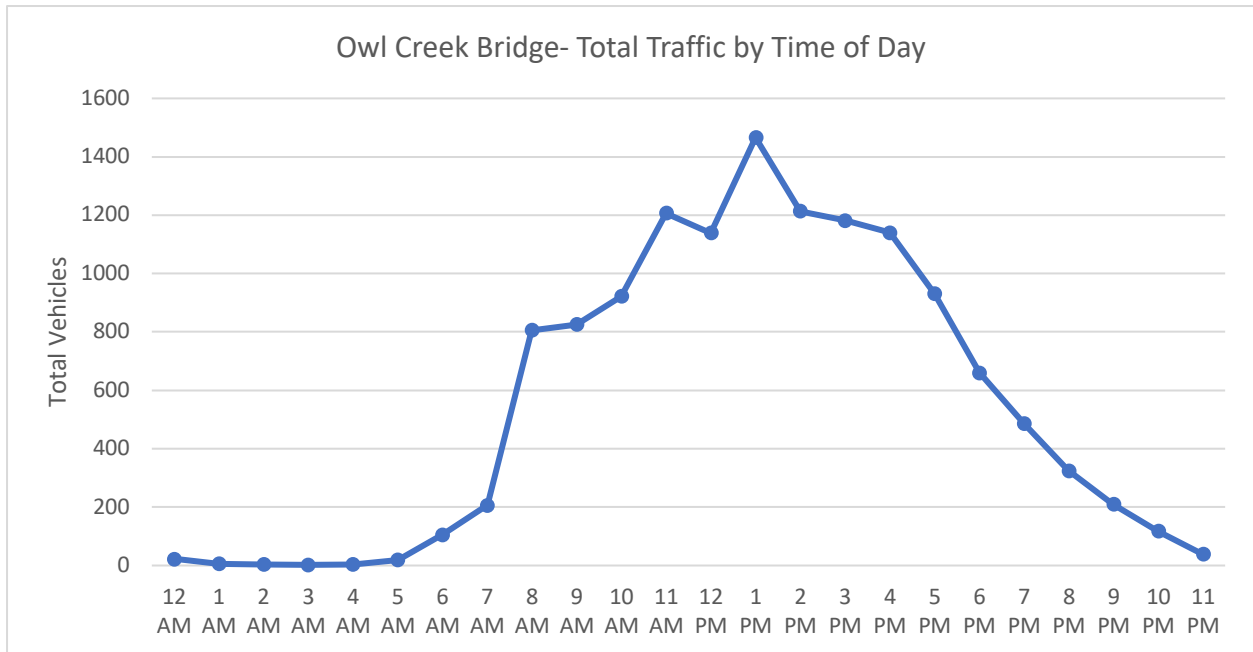


Figure 78. Owl Creek Bridge - traffic by time of day

Salmon River Road at Colson Creek Bridge

The traffic counter at Colson Creek Bridge recorded traffic from October 1, 2019 to August 27, 2020 except for a gap from March 15 to May 20, 2020 when dead batteries prevented recording. In the figures below, data from the 2020 summer field season (from June 1 onwards) is presented. See Appendix 1 for a presentation of year-round data. These counters recorded vehicles travelling in both directions. To avoid double counting, each day's count was divided by two to arrive at our best estimate of daily unique vehicles.

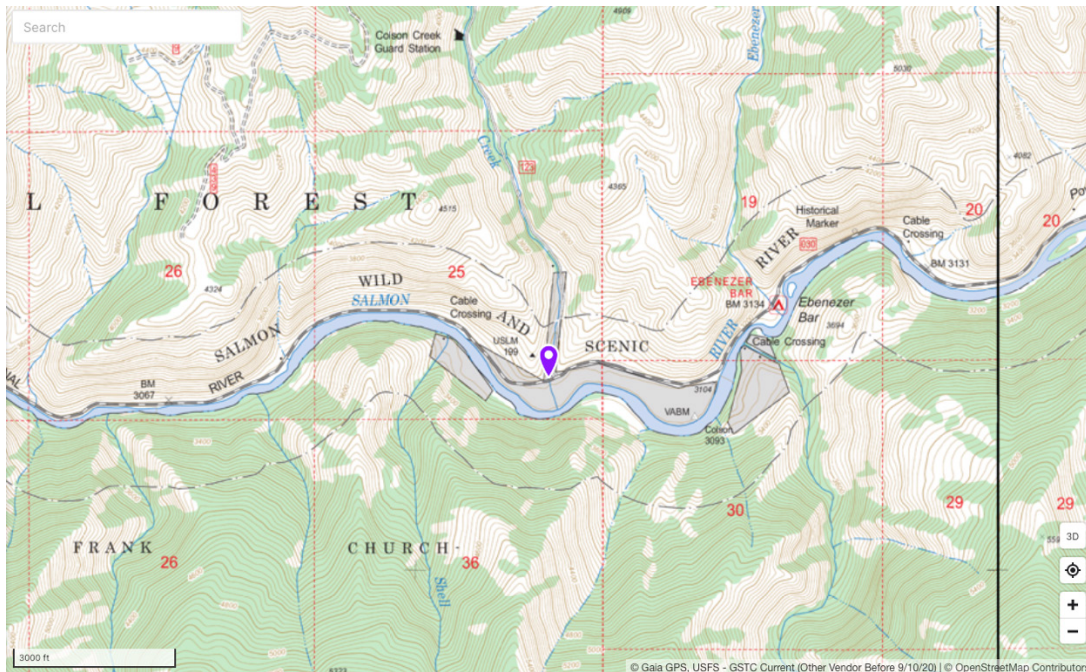


Figure 79. Colson Creek Bridge site map

Again, traffic was relatively consistent but highest during July and August, and certainly peaked during mid-day.

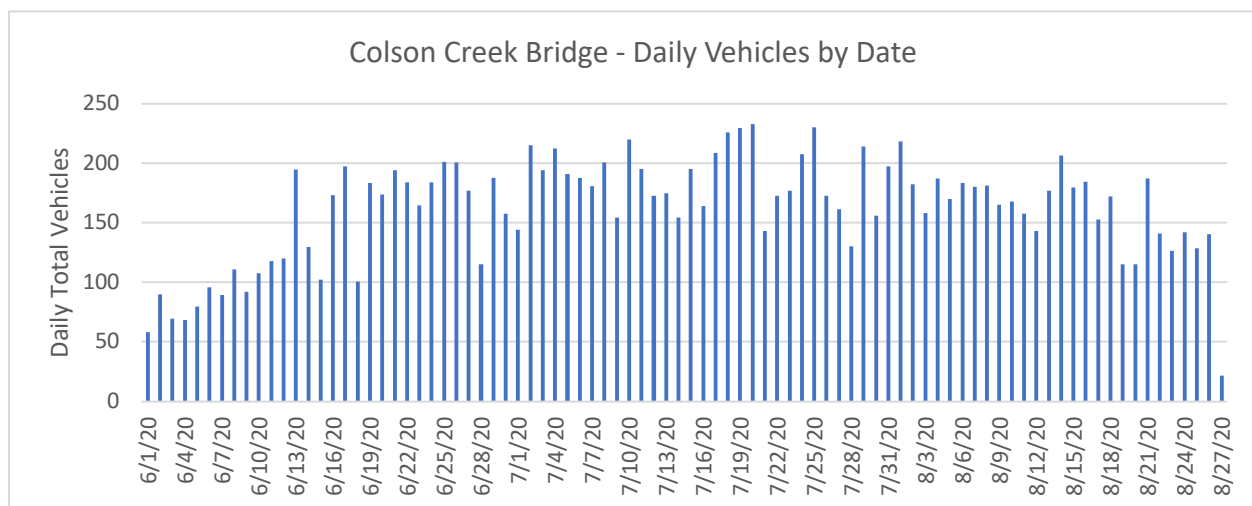


Figure 80. Colson Creek Bridge - daily vehicles by date

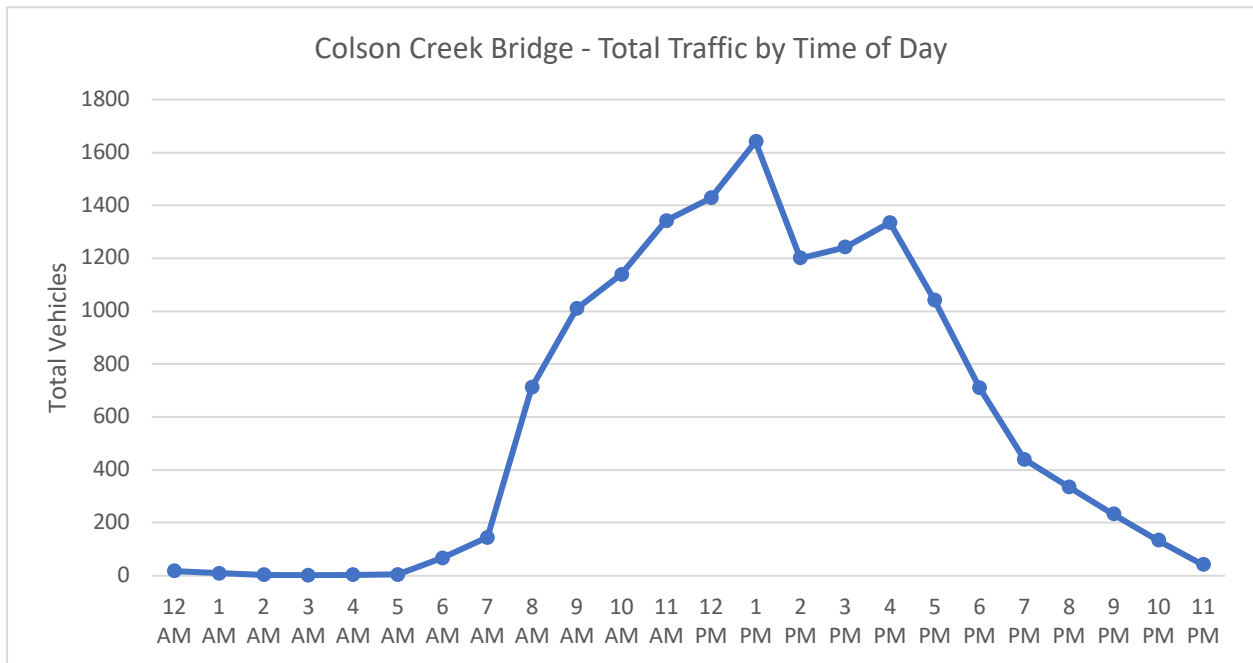


Figure 81. Colson Creek Bridge - traffic by time of day

Research Reflections

Data Collection

- Choosing camera locations was a critical step in this process and most of the sites were selected directly downstream of the boat launch locations. Pine Creek Rapids is a special case, chosen to observe how some users, particularly kayakers, approach the rapids. The data here does not show that kayakers put in above the rapids and circle back several times per day, as was predicted. The Confluence Upstream and Downstream sites were selected to differentiate users who were coming from the Middle Fork from those on the recreation segment. All cameras were set up at the optimal angle to view the river surface.
- It was decided to put cameras in hidden sites at least a hundred yards from the trail or road. From past experience with vandalism on other projects, we wanted to make the cameras were in discrete positions. This often entailed placing cameras deeper in foliage which after the summer growth, would occasionally block some of the frame. The cameras themselves were padlocked shut and then a cable lock was used to secure most cameras to a tree or shrub. Some of the cameras were in locations that could not easily be accessed and were not locked using both methods. If an adequate tree or shrub was not located, the camera was placed among rocks and there was no use of the cable lock.
- Early camera and SD card issues detracted from data completeness in late June. Using new cameras with higher resolution quality filled 32GB SD cards too quickly. This resulted in cameras filling up in approximately two days, without a researcher coming to check on them for one to two weeks (Researchers were based in Missoula, Montana). We attempted to use larger SD cards only to find that the cameras had a memory card size limit which forced us to use the 32GB SDs again until new cameras could be brought down to replace them. These trial and errors resulted in a loss of data for the last two weeks of June, at which point we switched to older cameras that took low resolution pictures and could hold the full two weeks of footage on a 32 GB SD. Making sure any new equipment is compatible with the research methods should be factored in going forward. Although the current cameras work well in the field, the software has been discontinued by the manufacturer. While low resolution camera shots are smaller, they are also lower quality; being able to accurately assess how many people were on a raft or how many were wearing helmets was significantly strained when using lower resolution pictures.
- From July through September, cameras recorded data smoothly and researchers were able to visit sites approximately every other week to replace batteries and SD cards.

Close proximity of cameras to safe parking areas along the road was important for safe navigation.

- In future years, researchers should consider that water levels will drop throughout the summer. Cameras that are set up far from the riverbank will only become farther from passing crafts as the waters recede.
- Additionally, those setting up cameras should pay attention to vegetation growth. Willows grow especially quickly and nearly blocked camera views later in the summer.
- Due to limitations of the field season and COVID-19, the team was not able to assess river usage from September to December which is when steelhead season is popular. In the future, it is recommended to coordinate some sampling in those months to gain a better understanding of river use in the shoulder seasons for fishing.

Data Analysis

- Reviewing camera footage in GameFinder was time intensive. At most sites, the photos could be scanned at the fastest speed and passing crafts could still be identified. In some cases (for example, Pine Creek Rapids, where the water was most turbulent), footage had to be reviewed more slowly in order to see crafts. With advances in technology, there may be programs in the future that can support a more efficient analysis of the data. If use exponentially increases on the river, it may be necessary to analyze samples of data instead of the entire camera footage for each site.
- Although managers initially requested that helmet usage be recorded, this may not be feasible with the cameras used in this study. Low resolution photos from a great distance are not the most reliable tools for viewing helmets on individual users (especially when helmets are any color other than bright yellow). On the other hand, higher resolution photos take up much more SD space and require much more intensive fieldwork. Field observations (point counts) may be a better tool for surveying helmet usage.

Trends in River Use

- The data demonstrate that some parts of the river experience extremely high usage relative to other parts. The most notable example of this trend can be seen downstream from the Confluence with the Middle Fork of the Salmon. An important takeaway is that recreationists joining the main river from the Middle Fork should be treated as a distinct subset of users. These users were very commonly in large rafts, accompanied by freight rafts, arriving during all days of the week throughout the summer. On average, 38 crafts

per day arrive from the Middle Fork, of which 35 take out at Cache Bar (see. Fig. 5). This most intensely floated section is three miles in length (6.5% of the 46-mile-long recreation segment). In July, the month with highest usage, an average of 50 craft (108 people) per day join from the Middle Fork, of whom 94% take out at Cache Bar. This short section is by far the most heavily used of the entire recreation segment. Across the remainder of the recreation segment, usage is very low.

- For reference, the second most heavily used section appears to be Spring Creek to Cove Creek (approximately 10 craft per day over the course of 11 miles).
- Other sites experienced more discreet trends. For example, upstream flatwater areas around Deadwater were popular with kayakers and tubers in the early season. Pine Creek Rapids has a unique user base, including some recreationists who seem to make several round trips through the rapids (primarily on kayaks), though it is difficult to confirm how many kayakers are unique individuals versus round trip repeaters.
- Motorized usage presents a unique challenge for managers. This study observed several users traveling upstream in speedboats. Future studies could further evaluate the impact of high-speed travel on the river.
- With several notable exceptions described earlier in this report, river activity was heaviest in July, mostly concentrated on the weekends around mid-day. Monitoring for changes over time will be important and the river user survey in 2021 can shed light to other use trends and perspectives.
- Future studies may cross-reference weather data such as temperature, precipitation, cloud cover, air quality, and water flow data to assess for other influencing factors to river use.

Trends in Vehicle Use

- Primary road data is already being collected at bridges along the river. Our locations were selected to count users at two popular boat launches as well as up Panther Creek Road. Cache Bar was selected because it is known to be the busiest boat launch, while Spring Creek was selected as one of the more popular camping locations along the river. Panther Creek Road was selected to better understand how many users enter or exit the river along that route. Since the data collection period did not extend into steelhead season, there may be different vehicle trends depending on time of year and type of recreation.
- Given the limited availability of equipment, it was important that sites be chosen with single entrance/exit points. Some of the campgrounds and boat ramps have separate

entrances that would have greatly complicated monitoring efforts. Observational data may be helpful to incorporate in the future to better understand patterns at put-in and take-outs along the river segment.

- Spring Creek Campground was the most heavily trafficked of the three sites, followed by Cache Bar Boat Ramp and then Panther Creek Road. For the 2021 survey, questions specific to where river users are putting in and taking out on the river will be helpful to better understand travel patterns and congestion at these sites.

Appendix 1: Insights into Fall and Spring Fishing Seasons

While this study was not able to actively monitor the fall and spring fishing seasons, we recognize that these periods are an important time for recreation along the Salmon River. Knowing that fishing during these months is largely a shore-based activity, we present here the full data on road usage during this time, collected at four bridges along Salmon River Road. It is implied that overall traffic along Salmon River Road is roughly correlated with the level of fishing on the river.

As noted in the main report, data was not collected during certain periods when device batteries died (10/16/19-12/4/20 at Indian Creek, 4/11/20-6/18/20 at Boulder Creek, 3/31/20-5/20/20 at Owl Creek, 3/15/20-5/20/20 at Colson Creek). Nonetheless, a relative increase in traffic is visible during periods from October-November and March-May (in addition to the large surge over the summer months).

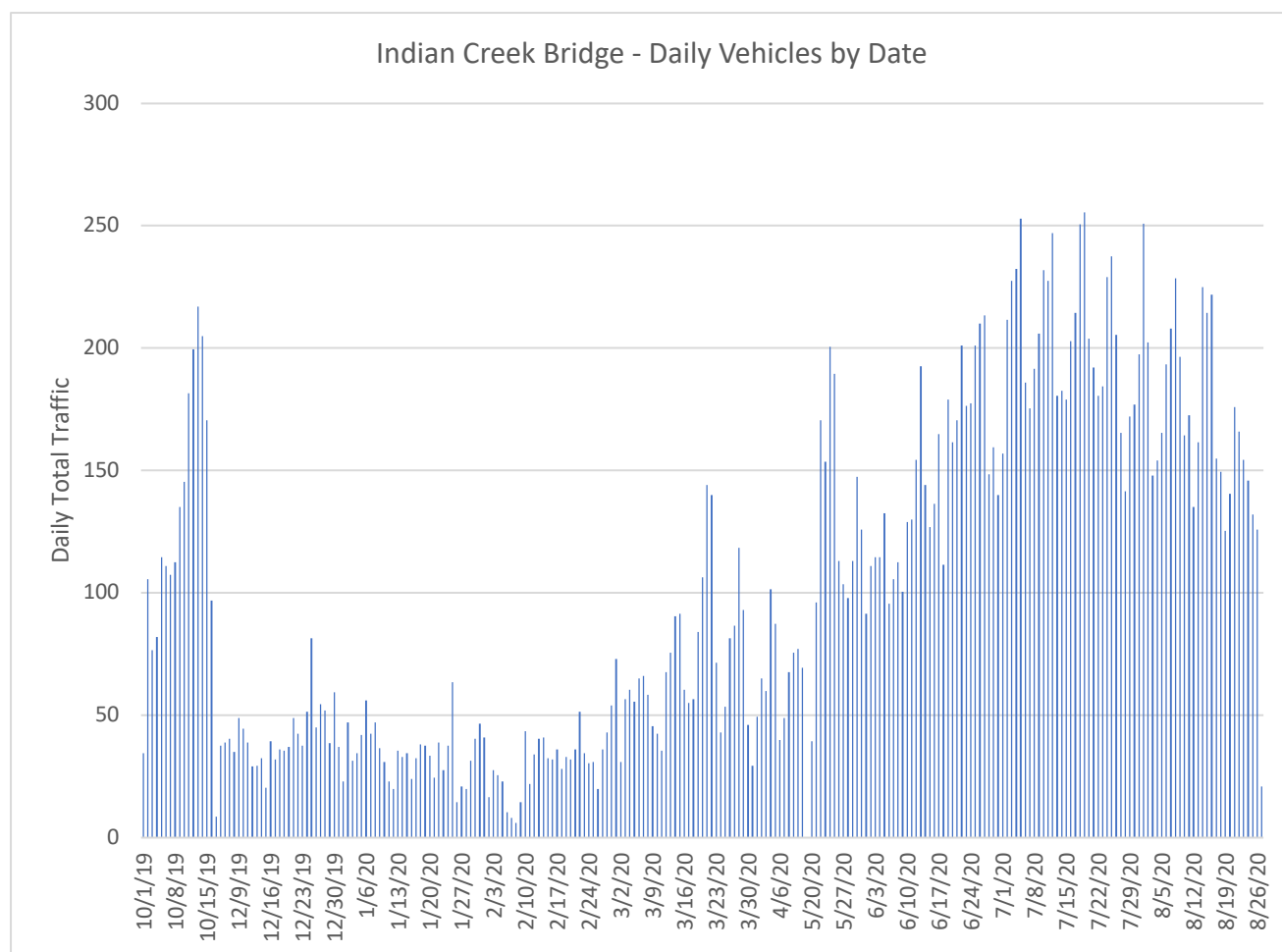


Figure 82. Indian Creek Bridge - full dataset

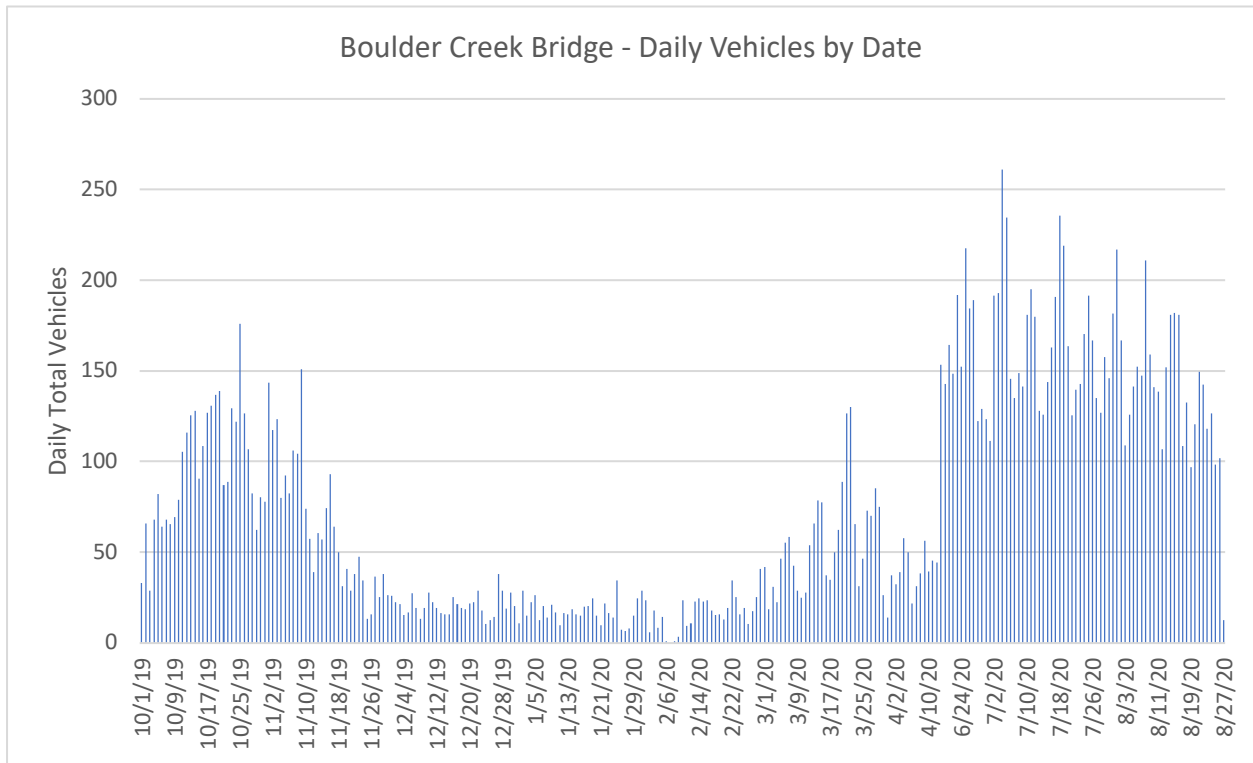


Figure 83. Boulder Creek Bridge - full dataset

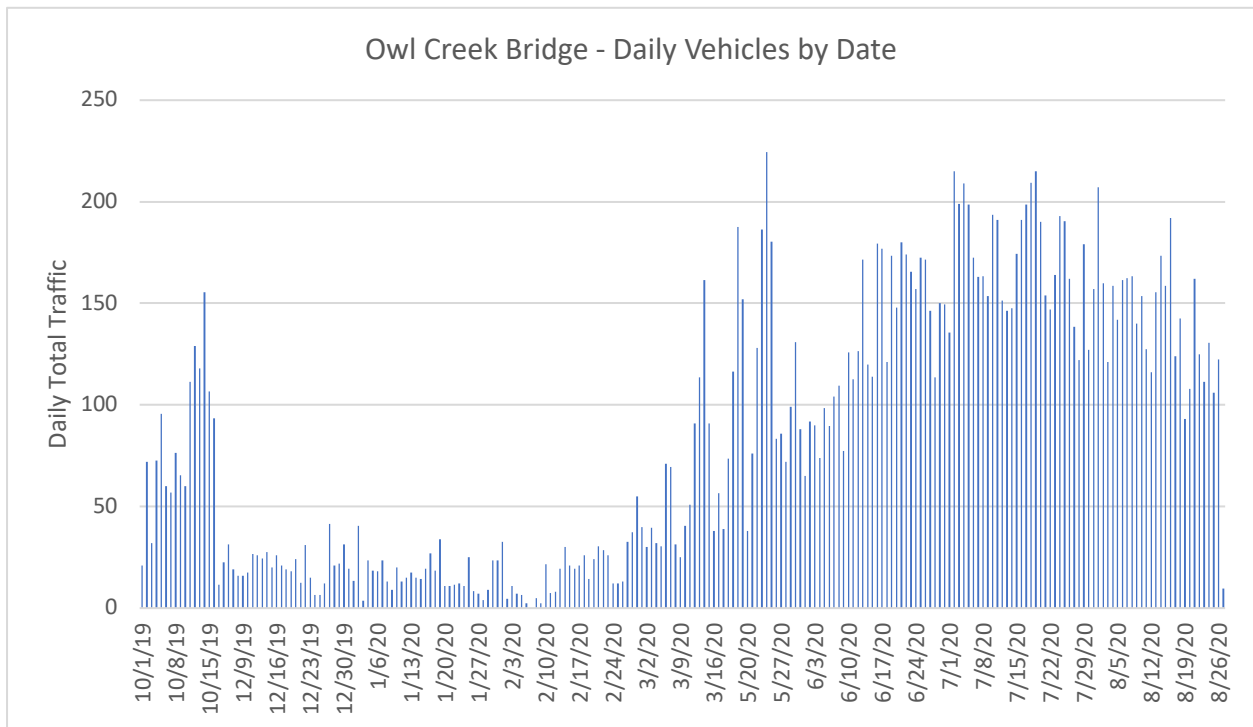


Figure 84. Owl Creek Bridge - full dataset

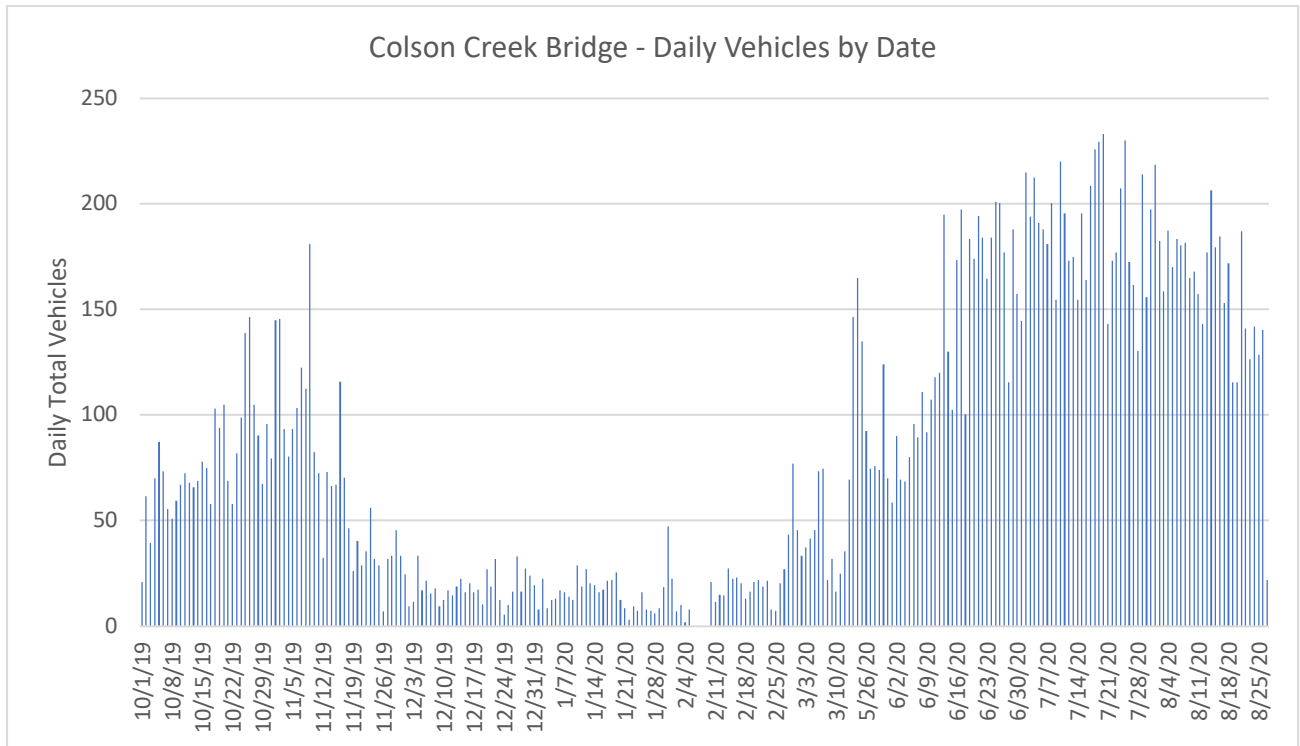


Figure 85. Colson Creek Bridge - full dataset