A Novel Approach to Measuring Peak Traffic on the Fourteeners

By Nathan Kowalski, Middlebury College/CFI CLIMB Intern (2013)

Introduction and Previous Work

Over the past few decades, Colorado's "Fourteeners," peaks that rise at least 14,000 feet above sea level, have experienced increasingly intense traffic as hikers, both native and tourist, take to the backcountry in search of their own Rocky Mountain High. This comes partly as a collateral effect of Denver's growth – the population of Metro Denver has exploded from 1.9 million in 1991 to 2.9 million today (www.metrodenver.org). In addition, outdoor recreation is the second largest segment of Colorado's tourism economy and over 40% of visitors visit the mountains during their stay in Colorado (14ers.org).

There does not yet exist a well-founded estimate for the number of people who climb Fourteeners each year, but it is clear that increased traffic has caused damage to alpine ecosystems and depreciation of existing trails. The oft-cited number of 500,000 annual hikers is so ingrained in the conventional wisdom that it appears frequently on official websites and funding appeals (14ers.org); however, this is a dated number that is the result of guesswork, rather than sound analysis.

Previous attempts at discerning the magnitude of Fourteener traffic have looked primarily at two data sources: summit registers and trailhead registers. One study looked at ten years of data from registries that allow hikers to check in upon summiting a Fourteener (Kedrowski 2006, 2008). The downside to this method is that it relies on voluntary compliance, assuming that everyone who summited a given peak signed in; this is especially problematic on very crowded summits. In addition, summit registers can be hidden under brush or snow, or even nonexistent. Kedrowski acknowledges these limitations in his studies.

Several other undertakings analyzed data from trailhead registers to track the number of visitors to Fourteeners (USFS 1996, 2001). This method encounters the same roadblock, however: voluntary compliance. The aforementioned studies assumed compliance rates of anywhere from 50% to 100% in order to extrapolate and arrive at a final estimate; without significant manpower, however, there is no way to gauge actual compliance rates and thereby produce solid estimates.

A more precise method to record raw contact data to date has been employed by the Forest Service on Mt. Bierstsadt; here, rangers have set up an electronic counter that tallies visitors as they disrupt an infrared beam. In 2011, visitor counts from mid-July to mid-August were extrapolated to produce an estimate of 33,400 Bierstadt hikers from mid-June to mid-September, during the busy summer period. Though seemingly precise, these data can be inflated by people milling about at the registration box and by non-summit hikers using the same trailhead. In addition, insufficient data were collected to produce a good seasonal estimate – mid-July to mid-August tends to be the busiest hiking month (R. Bradt, 2001).

A few studies have relied on humans to manually collect data on peak traffic by recording the number of hikers they see while hiking or standing at the trailhead. Such a method was used to estimate traffic on Quandary Peak in a 2010 study on the willingness of hikers to pay for mountain access; however, only a few observations were used to generate the estimate. (Lohman 2010). If employed correctly, this method seems to be the most reliable as it provides a comprehensive picture of how many hikers are on the

peak without double counting. The main limitation of this method is that it requires a lot of manpower to accumulate the volume of data necessary for accurate statistical analysis.

Methods

The raw data for our study were collected from 2009 to 2012 through direct observation, both by trail crew members and volunteer "peak stewards" who serve as ambassadors to aid and educate Fourteener hikers. These data come in two forms: visitor contacts and hikers seen. The visitor contacts metric represents the number of people spoken to or "contacted" by crew members and peak stewards. The hikers seen statistic is self-explanatory and gives a clearer picture of the actual mountain traffic on any given day; as such, we primarily used this variable to come up with estimates for Fourteener traffic.

Several other variables were recorded in each observation of hiker traffic, notably weather and date. Weather was judged on a scale from 1 (poor) to 3 (excellent).

This model only looks at hiker traffic during peak climbing season, defined here as mid-June to mid-September. During the winter months, high alpine trails are buried under several feet of snow and plants experience little adverse impact because they are dormant; thus, we did not think that the negligible number of winter hikers that produce negligible impact was a very important statistic.

For hiker traffic on Mt. Bierstadt, we cite a Forest Service study conducted in 2012 in which both direct observation and electronic counters were used to measure traffic.

Analysis

Past estimates of peak traffic using direct observation have taken a few days of peak traffic, averaged and expanded them to come up with an estimate for yearly/seasonal hiker traffic. The problem with this method is that there is drastic fluctuation in hiker traffic on Fourteeners during any given week. The expanded estimate from weekday sample days would hugely underestimate the number of visits while an estimate from sampled weekend days would produce an inflated estimate. For this reason, separate averages were taken for weekdays without Fridays, Fridays, and weekend days. These averages were then expanded by the number of each type of day in peak season (once again, defined as mid-June to mid-September) for the year with the most comprehensive data.

Our data for each peak are not comprehensive; as such, some calculations required less precise estimates and averages. Peaks without sufficient data to produce a solid estimate of hiker traffic during one year incorporated averaged data from the years 2009-2012. If these data were not sufficient, no estimate was made, or estimates were generated based on "hiker contact" data. The "hiker contact" method was only employed in special cases, such as North Maroon, where a low number of hikers lessened the likely disparity between hikers seen and hikers contacted.

Conclusions

Our study finds that Fourteeners experience about 150,000 hiker days of traffic each year. The most well-traveled peak was Mount Bierstadt, which experienced 26,213 hiker days of traffic; the least traveled peak that we measured was North Maroon Peak, which experienced 324 hiker days of traffic.

The numbers we have produced could be slightly deflated for several reasons. Our study employed human observation as a data collection technique; however, the people collecting data also performed other duties, such as hiker education, and may have therefore missed several hikers. Many of these volunteers stayed at each peak for most of the hiking day; however, they were not required to, so a few of their hiker counts could have been further deflated.

In addition, there is a scarcity of hiker data on certain peaks and trails. Notable trails missing from the study include: McCullough Gulch on Quandary, the South Ridge of Grays and Torreys, Guanella Pass on Mount Evans, Pikes Peak, and Longs Peak. We possess little to no data on many peaks in the Sangre de Christo range; however, the traffic on these peaks is not significant compared to the aforementioned trails. An improved study would engage in more extensive data collection in order to produce a more solid estimate of seasonal traffic for certain peaks.

In addition, future studies can employ more involved data collection methods. Our estimate for Bierstadt comes from a 2012 Forest Service study that used both electronic counters and human observation in conjunction. These are the most accurate data collected on hiker traffic yet, and they produce an estimate that accurately reflects seasonal traffic on Mount Bierstadt.

Peak Name	Number of Hikers	Year
Greys & Torreys	18,217	2010
Evans	9,158	2010
Bierstadt	26,213	2012
N. Elbert	7,042	2010
S. Elbert	2,198	2012
Massive	1,722	2009-2012
Massive - N. Halfmoon	2,374	2009
Harvard/Columbia	1,228	2012
La Plata	1,819	2009-2012
Antero	2,164	2009
Shavano/Tabegauche	2,887	2009-2012
Belford/Oxford	3,314	2009-2012
Princeton	2,449	2010
Yale	4,237	2010
Missouri	1,233	2009-2012
Holy Cross	3,152	2010
Huron	3,346	2010
Quandary	18,699	2012
LDB	9,350	2010
Sherman	3,907	2010
Capitol	1,043	2012
N. Maroon	324	2012
Uncompahgre	1,405	2009
Sneffels	4,107	2012
Windom/Sunlight	2,082	2012
Handies	1,362	2009
Redcloud/Sunshine	1,625	2009-2012
Wetterhorn	885	2009-2012
San Luis	896	2012
Kit Carson/Challenger	1,973	2012
Humboldt	1,931	2009-2012
Lindsay	1,652	2009-2012
Little Bear	782	2012

Figure 1: Peak Season Totals

Quandary Peak

Hikers	Day	Date	Year	Peak Season	Holiday	Friday	Weekend
58	Fri	24-Aug	2012	1	0	1	0
178	Fri	6-Jul	2012	1	0	1	0
203	Fri	3-Aug	2012	1	0	1	0
339	Sat	4-Aug	2012	1	0	0	1
147	Thu	16-Aug	2012	1	0	0	0
87	Fri	5-Aug	2011	1	0	1	0
56	Fri	27-Aug	2010	1	0	1	0
57	Fri	18-Jun	2010	1	0	1	0
135	Fri	2-Jul	2010	1	0	1	0
110	Mon	12-Jul	2010	1	0	0	0
155	Sat	26-Jun	2010	1	0	0	1
320	Sat	7-Aug	2010	1	0	0	1
162	Sun	18-Jul	2010	1	0	0	1
213	Sun	22-Aug	2010	1	0	0	1
103	Tue	10-Aug	2010	1	0	0	0
156	Tue	20-Jul	2010	1	0	0	0
116	Wed	7-Jul	2010	1	0	0	0
130	Wed	30-Jun	2010	1	0	0	0
210	Wed	21-Jul	2010	1	0	0	0
65	Sun	26-Sep	2010	0	0	0	1
159	Sun	26-Jul	2009	1	0	0	1
54	Wed	22-Jul	2009	1	0	0	0

Figure 2.2: Example Data Sheet

Category	Average	2012	2011	2010	2009
Peak Season Weekend Hikers	224.7	339.0	#DIV/0!	212.5	159
Peak Season Friday Hikers	110.6	146.3	87	82.7	#DIV/0!
Peak Season Weekday Hikers	128.3	147.0	#DIV/0!	137.5	54
Total Weekend	6066.0	9153.0	#DIV/0!	5525.0	4134.0
Total Friday	1437.4	1902.3	1131.0	1074.7	#DIV/0!
Total Weekday	6669.0	7644.0	#DIV/0!	7287.5	2862.0
TOTAL PEAK SEASON	**14172.4**	**18699.3**	**#DIV/0!**	**13887.2**	**#DIV/0!**

Figure 2.2: Example Calculations