

# Visitor Use and Wilderness Trends at the White Mountain National Forest

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## **Introduction**

The White Mountain National Forest (WMNF) provides a unique and important recreational opportunity and experience for visitors from around New England and beyond. The WMNF is classified as an Urban Forest drawing in millions of visitors each year since it is within a day's drive of Boston, New York and Montreal. As a National Forest its mandate is to manage for multiple uses including water quality, wildlife, timber and recreation. While recreation is a vital use of the forest it must be balanced with protecting its beautiful and valuable natural resources.

There are several different recreational experiences available on the White Mountain National Forest. The area has an extensive non-motorized trail system, including six Wilderness areas, which focuses on hiking, backpacking, snowshoeing and skiing. Amenities such as shelters, camping areas, and huts are available for backcountry use. Car-accessed campgrounds are open both seasonally and year round across the Forest for tent and RV camping. There are scenic byways that cross the Forest allowing for scenic drives with pull offs for views and picnics. A number of developed day use areas with short walks to waterfalls, swimming areas, and other beautiful natural features. Rock climbing and mountain biking have become popular and appear to be growing uses of the Forest. In addition, the Forest works with the States of New Hampshire and Maine to allow for a snowmobile trail system throughout the winter.

Each National Forest managed by the USDA Forest Service creates a Forest Plan that outlines the goals, objectives, and management direction. This document is revised approximately every 15 years with significant public input to help shape both the long and short term outlook. The

WMNF current Forest Plan was finalized and implemented in 2005 after years of input and revising. So much effort goes into creating this document it becomes the grounding document for future project. Therefore it is important for each management sector of the Forest to periodically check in to make sure they are moving along the path set forth in the Plan.

Monitoring use is one aspect of the Forest Plan and a necessary step to assess recreation use trends, resource impacts, and visitor experience. This monitoring can help inform management actions to better adapt to use levels, anticipate future trends and mitigate resource concerns. Annually the WMNF produces a monitoring report that helps synthesize developments and monitoring efforts in the past year. The purpose and goal of the monitoring is to see how the Forest is doing with respect to the goals and objectives set forth in the Forest Plan and the Monitoring Guide.

Wilderness and recreation use data was collected from monitoring during the past ten years (or further if possible). This data was used to examine trends in visitor and wilderness use on the WMNF. The trends lines were then analyzed to see if they reflect the goals and objectives of the Forest Plan and Monitoring Guide. The trends are also compared with National Outdoor Recreation Trends to learn about how the WMNF fits into the broader picture of public land use in the US. This information will help to provide some insight for improvement, whether the data is answering the monitoring questions and recommendations for future monitoring efforts.

## **Forest Plan Goals**

One of the primary goals set forth for recreation on the WMNF is providing “a range of quality recreation activities and opportunities.” In connection with this goal the Forest Plan Monitoring sections asks “To what extent are we maintaining an appropriate range and quality of recreation opportunities?” The White Mountains currently provide four-season recreational opportunities in both developed and dispersed use.

Another of the Forest Plan Monitoring goals is to assess “to what extent is Wilderness managed to preserve its Wilderness character?” The Wilderness areas are designated by Congress and are to be managed in accordance with the Wilderness Act of 1964. Some aspects of Wilderness character include naturalness, a feeling of solitude, being untrammelled by humans, and primitive recreation opportunities.

## **Monitoring Guide Questions**

While the Forest Plan provides some broad goals of recreation and visitor use, it does not provide specific questions or targets. To help define more specific objectives, a Monitoring Guide was developed in accordance with the Forest Plan. This guide is more flexible than the Forest Plan and can be adjusted more readily.

The overall monitoring guide asks many important questions that dig deeper into how the Forest can responsibly and sustainably provide the range of quality of recreation opportunities. The recreation portion of the Monitoring Guide has 12 items which cover both developed and dispersed recreational activities and Wilderness.

<b>Monitoring Guide Recreation Questions</b>		
	Item Number	Currently Addressed
<b>Visitor Use</b>		
Rock Climbing Use	11	No
Outfitter/Guide Use on Forest	35	Yes, Needs Improvement
Off Road Vehicles Effects	36	Work in progress
Use at Developed Campgrounds, Day Use Areas, and Ski Areas	37	Yes
Use at Backcountry Facilities	38	Yes
Use on Forest Trails	39	Yes, Needs Improvement
Perceived Quality and Crowding	40	No
<b>Wilderness</b>		
Wilderness Trail Use Trends	43	Yes
Wilderness Destination Use	44	Yes
Satisfaction of Wilderness Visitor	45	Yes, Needs Improvement
Wilderness Campsite Density and Size	46	Yes, Needs Improvement
Human Litter and Waste In Wilderness	34	Yes

## **Methods**

Two Access databases, one for Wilderness monitoring and one for general visitor use monitoring, were created to centrally house both historical and future data collection. Previously the data for visitor use such as campground numbers and backcountry shelter report numbers were scattered around the office at various desks, emails and filing cabinets. The Wilderness monitoring data was reported by district through separate spreadsheets with different formats that made year to year and Wilderness Area to Area comparison very difficult. In addition each database has several queries and reports to help summarize the data and illustrate trends at a glance. As long as data continues to be input and stored in the databases the information will be valuable for the next forest planning effort.

Within several important recreation sectors the historical data was used to analyze and model trends lines. The areas of analysis included developed campground use, backcountry hut and shelter use, alpine skiing, and cross-country skiing. The statistical program STATA 10 was used to regress visitor use data across the years to find trends. The analysis utilized dummy variables for each site to allow for the differing season lengths, capacities and popularity. These trends are then used to assess the goals set forth in the Monitoring Guide and Forest Plan.

Summer non-motorized trail use was calculated using a sampling scheme and methodology described more thoroughly a section below. Wilderness monitoring focuses on a set of indicators rather than total use. The data collected was analyzed to illustrate trends. There are some guidelines that do not have sufficient data or are not currently being monitored. In these cases, an assessment of what needs to be improved or collected is outlined.

### **Visitor Use Monitoring**

The overall method of data collection currently is very opportunistic. Tight budgets, limited personnel and time make keeping up with monitoring a challenge. There are several recreational opportunities that are provided through concessionaires and special use permits including developed campgrounds, backcountry huts, and developed ski areas. Each of these outside parties running facilities report their annual use and/or sales. These annual or quarterly reports have been the main method of collecting visitor use on the WMNF. In addition, the Forest keeps track of the number of people that come to the visitor centers and the fees collected through the Recreation Enhancement Act. The Forest also collects self-reported trail registers at select trailheads approximately every ten years for three years in a row.

## **Use at Developed Campgrounds, Day Use Areas, and Ski Areas**

Monitoring Item 37 explores trends of use levels at developed recreation areas including campgrounds, ski areas, and visitor centers. Most of the data available comes from the annual reports of special use permit holders. Currently, there is no data collected at developed day use sites such as Lower Falls, Diana's Bath or Sabbaday Falls. A proxy for the future could be systematic vehicle counts or use of REA fee collection to help indicate trends in busy developed day use areas.

### **Developed Campground Use**

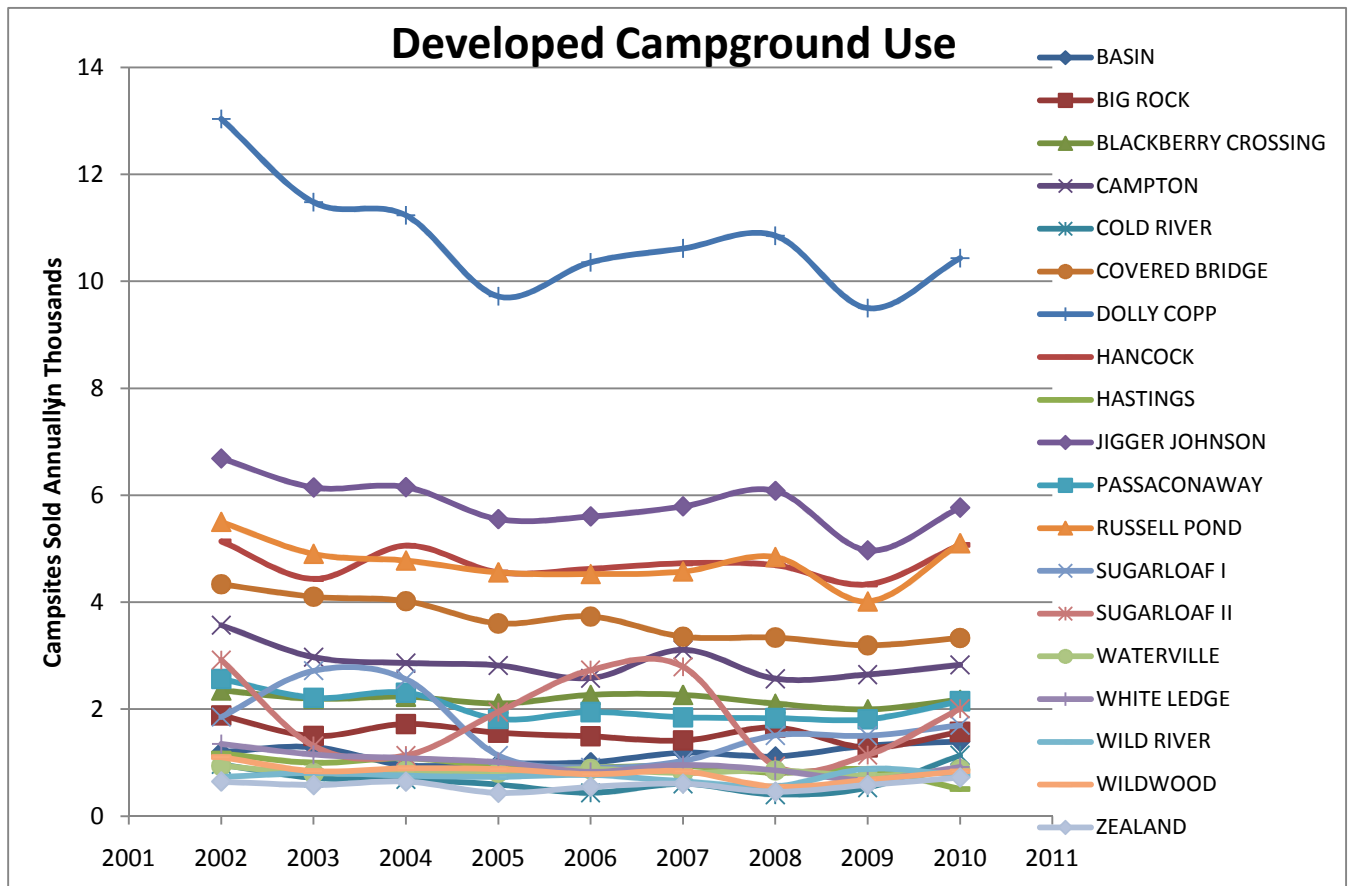
The White Mountain National Forest currently has 23 developed campgrounds for use by both RVs and tent users. Most sites are only open during the summer season with only three areas operating year-round. Twenty-two of the campgrounds are run by a concessionaire who reports the revenue at each campground each year. The campsite revenue was divided by the cost of a campsite, adjusting for senior pass users, to obtain the number of campsites that were sold at the campground each year. In the future, it would be more accurate and easier to have the concessionaire report the number of campsites sold in addition to revenue in the annual summary. The developed campgrounds have data going back to 2002. There is only one campground run by the Forest Service and the number of sites sold is recorded on daily basis.

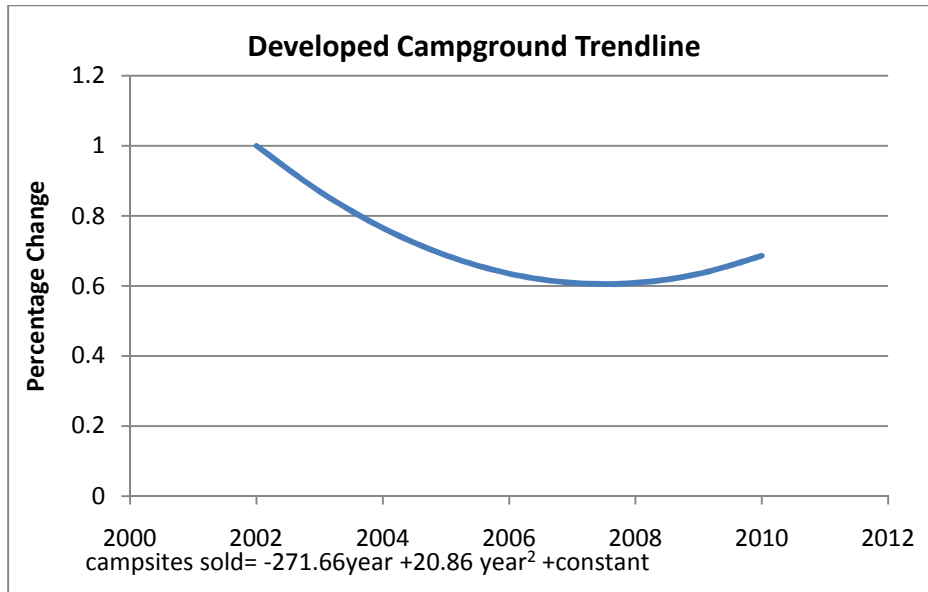
The number of campsites sold each season was used to find a trend across the years using dummy variables for each campground. The dummy variable allows the trend line to adjust for the differing capacities, season lengths, and popularities of each campground. From 2002 to



2007 there was a large drop of almost 40% in campsites sold across the Forest. Since 2007 there has been an upward swing in sales with 2010 being a record year for some campgrounds.

Across the US, there has been a bit of a debate as to whether camping is increasing or decreasing. According the National Recreation Survey conducted by the Forest Service and partners, camping in the United States appears to be increasing slightly (Cordell, Betx, Green, & Mou, Sept. 2008). Other researchers have found there to be a decrease in camping over the past decade using datasets from the National Park Service and US Forest Service (Pergams & Zaradic, 2008). The data from the WMNF may reflect part of the larger trends of both a longer term decline with some increases in recent years.





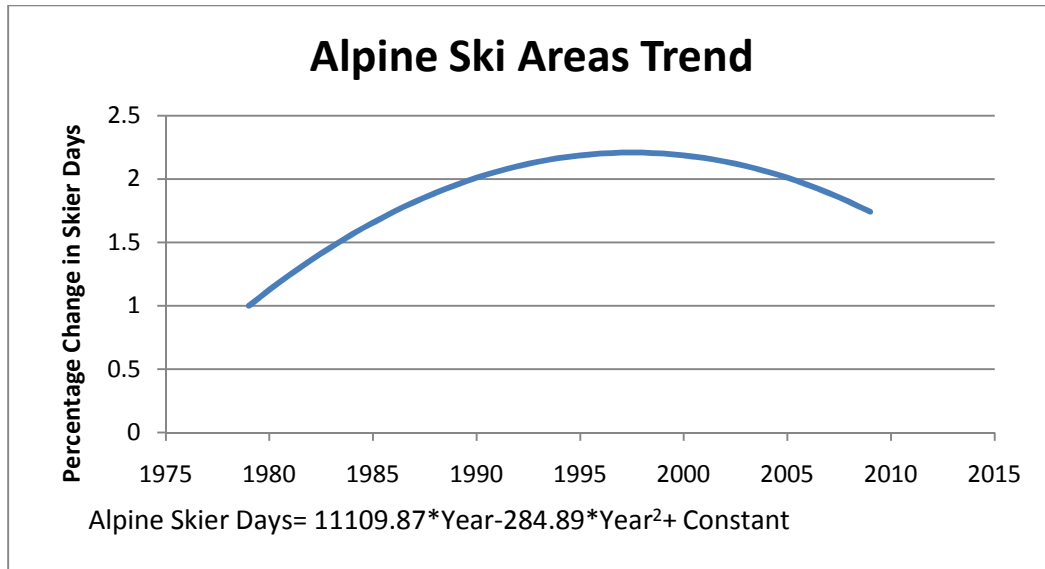
This graph illustrates the rate of change in campsites sold from 2002 to 2010. It is a general trendline without reference to specific numbers of campsites sold since each campground has a different capacity and popularity.

Variables	Coefficient	P
YEAR	-271.6689	0.000
YEAR SQUARED	20.86119	0.000
BIG ROCK	405.2222	0.019
BLACKBERRY CROSSING	1027.778	0.000
CAMPTON CAMPGROUND	1722.889	0.000
COLD RIVER	-480.3333	0.005
COVERED BRIDGE	2507.444	0.000
DOLLY COPP	9520.778	0.000
HANCOCK	3523.222	0.000
HASTINGS	-232.6667	0.174
JIGGER JOHNSON	4634.444	0.000
PASSACONAWAY	894.6667	0.000
RUSSELL POND	3541.111	0.000
SUGARLOAF I	497.8889	0.004
SUGARLOAF II	732.2222	0.000
WATERVILLE	-324.6667	0.059
WHITE LEDGE	-168	0.326
WILD RIVER	-413.1111	0.016
WILDWOOD	-327.6667	0.056
ZEALAND	-574	0.001
CONSTANT	1858.074	0.000

\*All Campgrounds are dummy variables with Basin Campground as the omitted site.

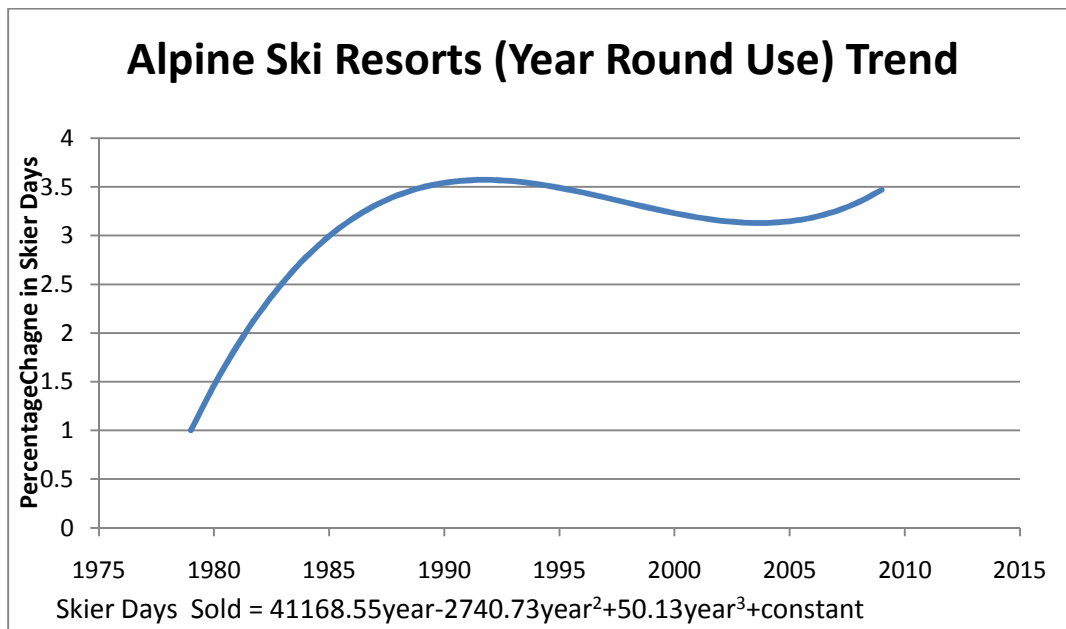
## **Alpine Skiing (and Snowboarding)**

The White Mountain National Forest has four special-use permitted developed alpine ski areas. While there are other developed alpine ski resorts in the area only Attitash, Loon, Waterville Valley and Wildcat Ski Areas are located on White Mountain National Forest land. Each of the alpine ski areas annually report the number of skier days sold. These numbers reflect both alpine skiing and snowboarding since no distinction is made during ticket sales at the resorts. In addition, some of the resorts also have summer operations that include mountain biking, zip lines and other attractions. The skier days in the year round graph also includes these summer sales. The breakdown between summer and winter use was not available for all years. Generally, there was increase in downhill winter sports on the White Mountains from approximately the late 1970s to the late 1990s. In the 2000s, there appears to be a downward in the number of skiers days sold. National trends appear to confirm this recent downward trend at ski resorts (Cordell, Betx, Green, & Mou, Sept. 2008). Ski resorts seem to be making up the difference in lost ski revenues by extending into summer operation of their facilities.



Variables	Coefficient	P
Year	11109.87	0.000
Year Squared	-284.8909	0.000
Loon Mtn	134869.8	0.000
Waterville Valley	83782.45	0.000
Wildcat Mtn	-49526.23	0.000
Constant	69856.16	0.000

\*All Ski Mountains are dummy variables with Attitash Ski Area as the omitted site.

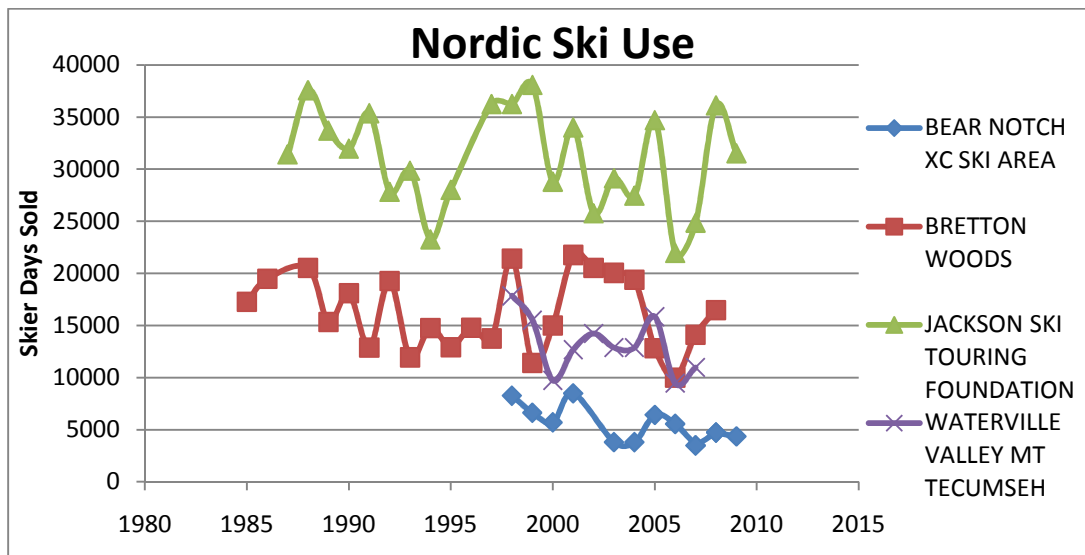


Variables	Coefficient	P
Year	27098.36	0.000
Year Squared	-1514.38	0.000
Year Cubed	25.61438	0.001
Loon Mtn	134869.8	0.000
Waterville Valley	83782.45	0.000
Wildcat Mtn	-49526.2	0.000
Constant	23873.23	0.243

\*All Ski Mountains are dummy variables with Attitash Ski Area as the omitted site.

### Cross-country Skiing

The White Mountain National Forest also has special use permits for a number of cross-country ski areas. These areas typically maintain a system of groomed trails that require purchasing a ticket to use. These ticket sales are reported annually with some records going back to 1985. As shown in the graph of skier days sold, the data is variable from year to year. For this reason it is difficult to get a trend of Nordic ski use on the Forest. Unlike alpine ski areas, cross country ski areas do not typically make snow and are more reliant on natural weather conditions which could account for some of this variability.



## Outfitter/Guide Use

The Monitoring Guide Item 25 asks where and how much backcountry use is attributed to outfitter/guide use. All outfitters and guides who charge visitors a fee for a service they provide on the Forest are required to obtain a type of special use permit. As part of the permit outfitter/guides submit a summary of when and where their trips will take place. This information includes the type of activity, trails and overnights sites visited. The information is entered into a database that has this information going back to 2001. There are currently over 150 outfitter/guides operating with permits on the WMNF. The number of outfitter/guides operating on the WMNF has stayed between 150 and 165 permit holders in the past decade.

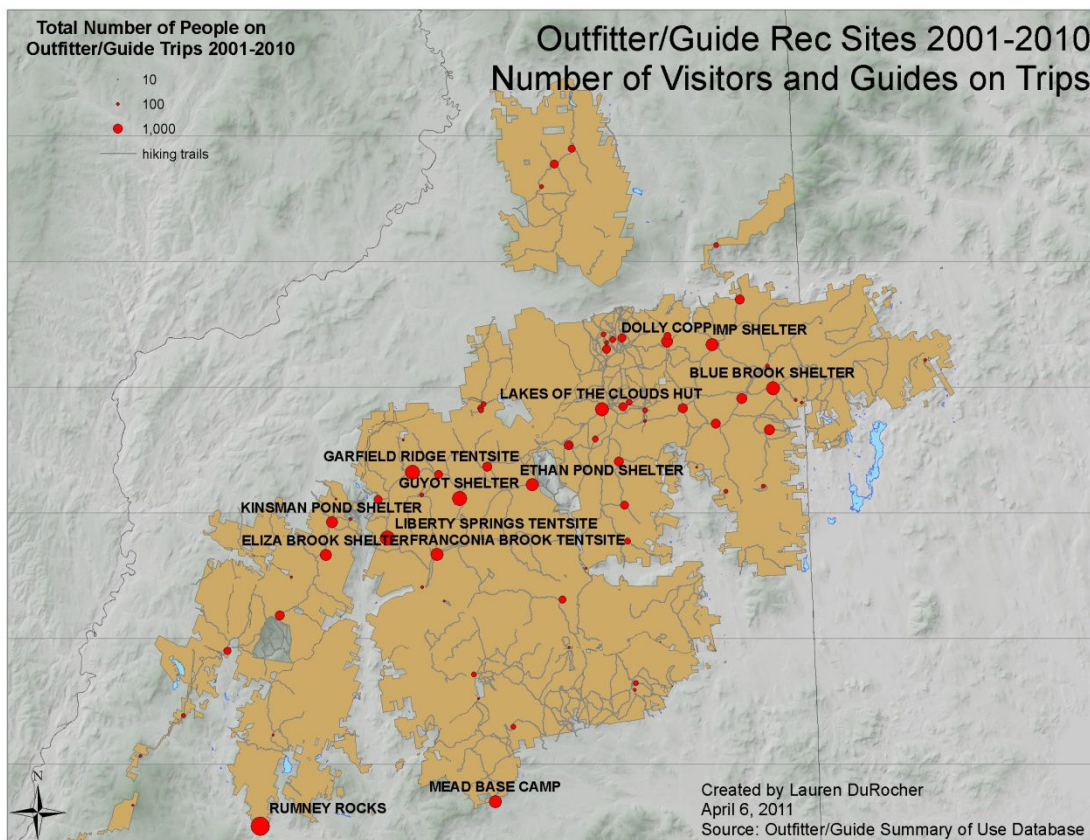
The process of inputting all the summary of use information is a time consuming task so a backlog of forms have been stacking overtime that needed to be input. In the winter of 2011, a seasonal employee was able to take on this task of inputting the past data. Going forward a new strategy to keep up with this workload will need to be assessed.

While examining this data, it is important to remember that this data is only the outfitter/guide use. The WMNF does not have a data that show where and how much general recreation use is being contributed by the general public. An area could be a high use outfitter/guide area but might not necessarily receive the same level of high use by the general public.

## Outfitter/Guide Use of Recreation Sites

On the summary of use forms, outfitter/guides report which recreation sites, particularly overnight camping spots, they will be visiting. Using this information, the total

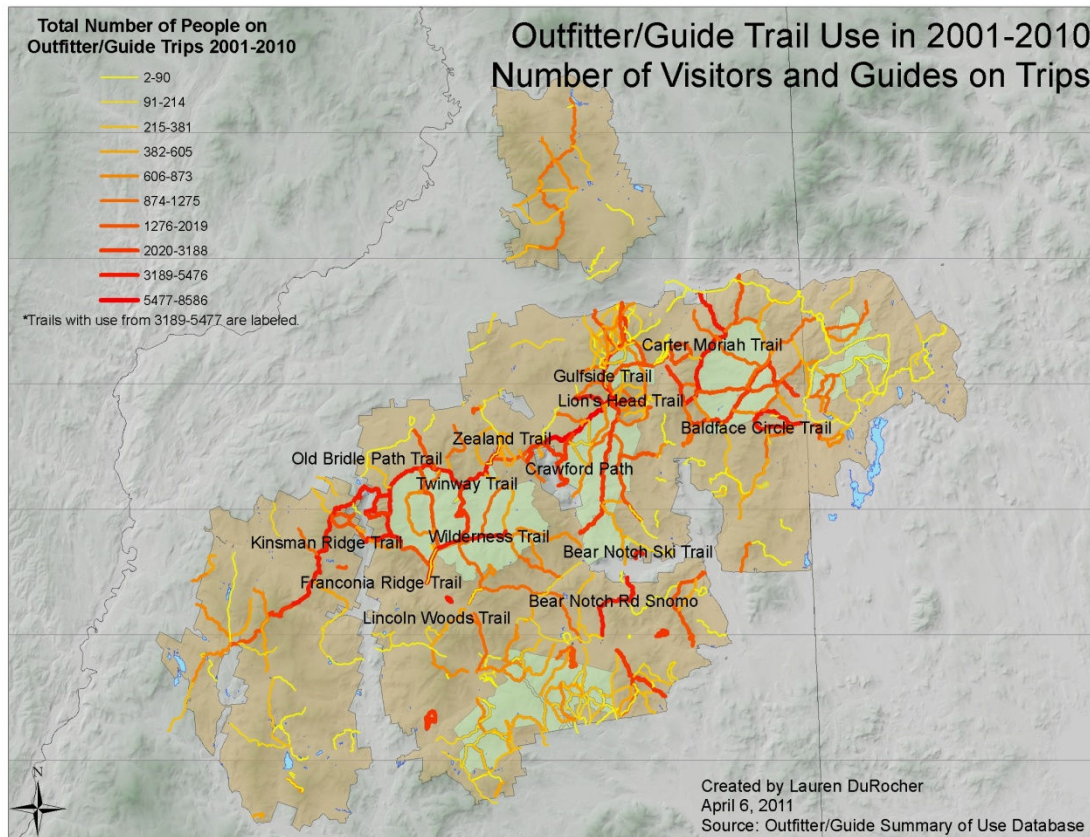
number people (clients and leaders) on trips from 2001-2010 was summed by recreation sites. In the map below, recreation sites are shown with their proportional use. The sites with the most use are labeled on the map. Generally, the sites listed are known to be popular areas on the Forest. Blue brook shelter no longer exists and is now currently a platform tent area which could change the amount of outfitter/guide use in the future. Another area that stands out is the rock climbing area Rumney Rocks. It receives by far the most use by outfitter/guide groups of any recreation site. Annually there are between 120,000 and 200,000 people visiting recreation sites on outfitter/guide trips.



## Outfitter/Guide Use of Trail

The trails that are used during outfitter/guide trips are also recorded on the summary of use forms. Using this information, the total number people (clients and leaders) on trips from 2001-2010 was summed by trail. This includes all types of trail use such as hiking, mountaineering, cross country skiing and snowmobiling. The numbers are broken into ten classifications based on the natural breaks of the data. The trails with the most use are labeled on the map. The trails listed are once again not particularly surprising and are generally recognized as higher use trails on the Forest. There are a few discrepancies with the trail use level designations. From looking at past reports and talking with Forest recreation staff, these trail level designations were determined in the late 1990s from District knowledge of the trails. It appears from both the trail register data and the outfitter/guide data that some of the initial classification was off. Particular trails that should be re-examined based on the outfitter data include kinsman ridge (currently listed as low use), bondcliff trail and wilderness trail. Each year approximately 200,000 to 300,000 people are on outfitter/guide trips that include using the trail system.





### Use at Backcountry Facilities

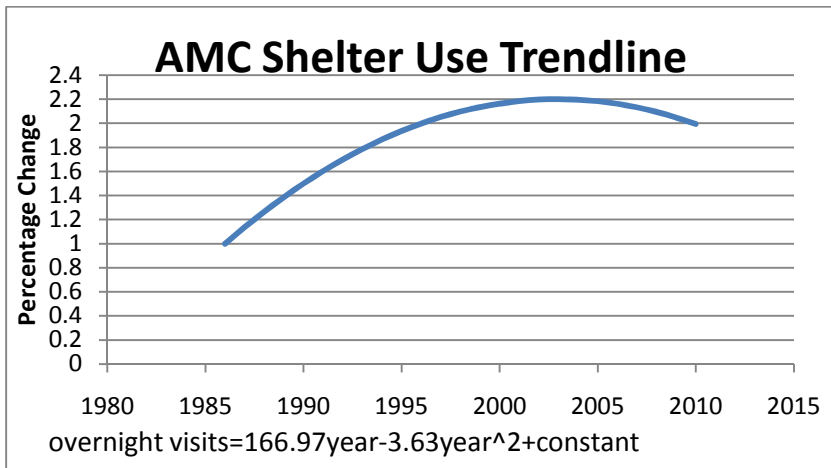
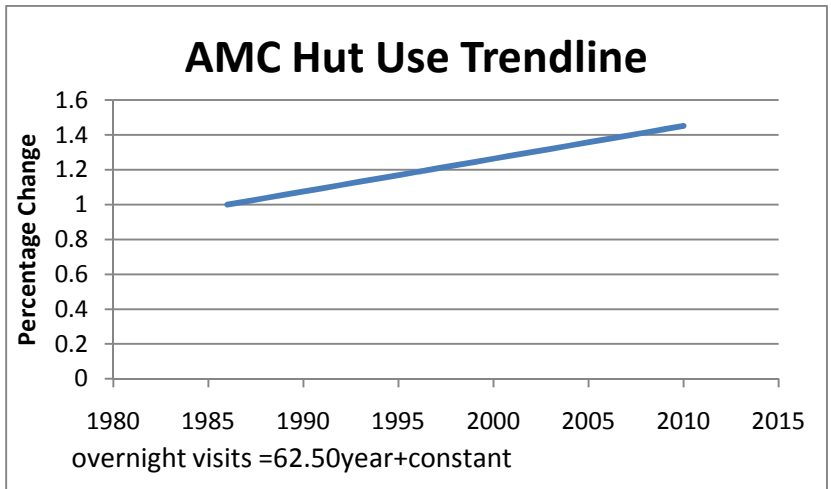
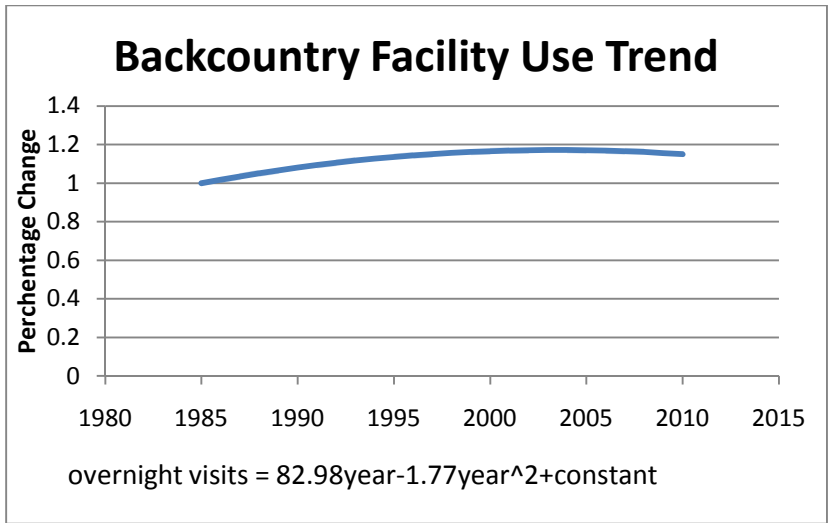
Monitoring item 38 explores changes in use at permitted backcountry facilities. By understanding changes in backcountry use, managers can get a better sense if traditionally low and high use facilities have any major patterns of change. The Forest Plan outlines that low use should be kept at low use and not to spread high use to low use areas.

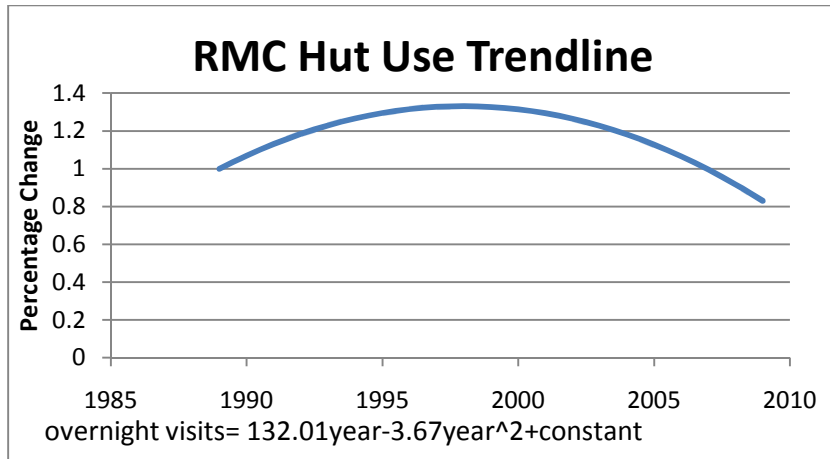
The WMNF has a range of overnight and day use facilities in the backcountry available to visitors, including a network of huts, shelters, and designated camping areas. There is a unique backcountry hut system consisting of seven full service huts that is run by the Appalachian Mountain Club (AMC) through a special use permit. In addition, the AMC also has a special use

permit to manage and charge fees at select lean-to shelters and campsites in the backcountry. The Randolph Mountain Club (RMC) operates four huts with basic amenities in a northern area of the WMNF.

Use at backcountry facilities overall increased in the 1980s and 1990s but has reached a plateau in the last ten years. This increase has varied among the different types of backcountry facilities. The AMC huts, which have several amenities including bunkrooms, bathrooms, and full-service cooked meal, have steadily increased by almost 50% in the past 25 years. The more primitive shelter or backcountry camping areas, often with 3 sided lean-tos, tent platforms, and outhouses, almost doubled in use from 1985 to 2000. The past decade has shown a steady decrease in use at these sites. RMC huts are a mix of well-maintained shelters and basic huts that include bunks, outhouses and some kitchen facilities. These more primitive huts peaked in usage around 2000 and have been declining in use since.

The shift in backcountry facility use opens up more questions about changing patterns in visitor use preferences. The AMC huts provide a large number of amenities suggesting that a portion of backcountry users prefer to have those amenities available. These use numbers do not reflect all of the backcountry overnight visits since visitors are also camping in dispersed backcountry areas around the Forest or at shelters without a fee. Perhaps there could be a shift from the shelters and camping areas that have fees to shelters and camping areas that are free. These types of use preferences could be explored through future backcountry surveys and general outreach with the public.





Variable	All Backcountry Sites		RMC Hut		AMC Hut		Shelter	
	Coefficient	P	Coefficient	P	Coefficient	P	Coefficient	P
<b>YEAR</b>	82.98812	0.007	132.0117	0.002	62.50926	0.000	166.9738	0.000
<b>YEAR SQUARED</b>	-1.7714	0.034	-3.67202	0.001	-	-	-3.63541	0.000
<b>CARTER NOTCH HUT</b>	omitted	-	-	-	omitted	-	-	-
<b>MADISON HUT</b>	79.5	0.745	-	-	59.000	0.827	-	-
<b>ETHAN POND SHELTER</b>	-3217.96	0.000	-	-	-	-	omitted	-
<b>GALEHEAD HUT</b>	-614.417	0.012	-	-	-635.565	0.019	-	-
<b>GARFIELD RIDGE SHELTER</b>	-2358.3	0.000	-	-	-	-	879.0967	0.000
<b>GREENLEAF HUT</b>	198.7083	0.417	-	-	188.1304	0.485	-	-
<b>GUYOT SHELTER</b>	-2329.38	0.000	-	-	-	-	908.0167	0.000
<b>HERMIT LAKE COMPLEX</b>	3736.089	0.000	-	-	-	-	-	-
<b>IMP SHELTER</b>	-2942.27	0.000	-	-	-	-	195.1869	0.016
<b>KINSMAN POND</b>	-3314.72	0.000	-	-	-	-	-	-
<b>LAKE OF THE CLOUDS HUT</b>	4029.083	0.000	-	-	4094.739	0.000	-180.419	0.029
<b>LONESOME LAKE HUT</b>	-2444.06	0.000	-	-	-515.545	0.230	-	-
<b>LIBERTY SPRINGS</b>	-188.784	0.608	-	-	-	-	793.3367	0.000
<b>MIZPAH SPRING HUT</b>	1095.875	0.000	-	-	1109.391	0.000	-	-
<b>NAUMAN TENTSITE</b>	-2871.38	0.000	-	-	-	-	366.0167	0.000
<b>RMC CRAG CAMP</b>	-2692.03	0.000	omitted	-	-	-	-	-
<b>RMC GRAY KNOB</b>	-2689.32	0.000	2.714286	0.976	-	-	-	-
<b>RMC LOG CABIN</b>	-3857.79	0.000	-1100.08	0.000	-	-	-	-
<b>RMC THE PERCH</b>	-3004.23	0.000	-313.844	0.001	-	-	-	-
<b>THIRTEEN FALLS SHELTER</b>	-3112.46	0.000	-	-	-	-	124.9367	0.076
<b>ZEALAND FALLS HUT</b>	1862.208	0.000	-	-	1888.13	0.000	-	-
<b>CONSTANT</b>	3130.68	0.000	263.0194	0.491	2945.792	0.000	-917.59	0.000

## **Trail Use Monitoring**

Monitoring Item 39 discusses use on Forest trails. Currently, only summer use of non-motorized trails is monitored. At this time there does not appear to be the capacity to monitor winter motorized and non-motorized trail use. The summer non-motorized use monitoring only captures a portion of the trail use on the Forest. The data collected at summer trail registers was analyzed as described below.

The summer trail monitoring is completed in three year cycles approximately every ten years. Trails were sampled from 1998-2000 and 2008-2010. The monitoring provides insight on how trail use is changing over time. Monitoring is conducted across very high, high, moderate and low use trails to indicate if there are changes in the balance of the recreation opportunities in differing use areas. In addition, the monitoring will help determine the proper use level of the sampled trails.

The trailhead register stations are planned to be in place from Memorial Day weekend through Columbus Day. Each year, several of the registers are placed at the sites on slightly different dates in late May with some starting in June and picked on slightly differing days in October. When installation and removal dates were not available the start and end dates on the registration forms were used to determine how many days the registers were present.

The estimates of non-motorized summer use are reliant on the data collected. Since a number of assumptions has to be made about trail use levels and non-compliance rates, these estimates should be taken as very rough estimates.

## Data collection

The registers rely on visitors to stop and record their information. The trail register sheets include areas for people to write their name, date, time, zip code, number of people in group, hours spent on trail, overnight or day use, and destination.

Data collections errors can occur in a number of different places and should be taken into consideration. People in the same group may record their information multiple times which would double (or triple) count the group of visitors. There also appear to be some entries that might have been made up. Since there is no way of knowing the numbers were counted to keep consistency. The registers need to be regularly collected and stocked with fresh sheets. In several of the registers there was water damage, tearing, and missing sheets. In addition, visitors resorted to writing in the margins and backsides of the paper when registration sheets ran out. It is possible when the sheets were full that visitors who might have registered did not sign in due to lack of space.

## Non-Compliance

These registers are reliant on self-reporting by those visiting the trail. To adjust for those who do not self-register, each sampled trail should also have compliance monitoring. The compliance monitoring estimates the percentage of visitor who do not register. Compliance for self-registering appears to differ across the use levels (high, moderate, low) of the trail with high use trails having higher non-compliance rates. Each trail is supposed to have 2 weekday and 2 weekend compliance checks of at least 2 hours per check. These compliance checks have only been completed sparingly. One district (8 trails) completed them in 2008 and 2009, and

two districts (14 trails) completed them in 2010. Of the 14 trails with compliance checks in 2010, several trails had 3 days of checks which were administered in slower time period of September and October.

This lack of compliance information affects the final estimate hiker visits on the forest.

Compliance rates are anywhere from 100% to 20% depending on the trail and use level.

Without this information, it is difficult to estimate an accurate number of hikers using the trails on the Forest. For this reason, there were multiple scenarios created using different compliance rates to estimates hiker visits.

### Sampling Framework

A random sampling framework selects 20-24 trailheads from 181 trailheads each year. During the 2008-2010 sampling four use levels were used to stratify the trail sampling

Very High: 51+ people per day

High: 25-50 people per day

Moderate: 7-25 people per day

Low: less than 7 people per day

Note: During the 1998-2000 the trails were divided into 3 use levels: High, Moderate and Low.

The sampled trails are used to statistically represent the following number of trails the Forest:

Very High: 25 trails

High: 45 trails

Moderate: 131 trails

Low: 131 trails

Note: These numbers come from Gary Davis' 2008 report. I have not been able to identify the list that he used to determine the trails use levels. My understanding is that trails were

categorized by District staff based on their knowledge. From the trailhead data that has been collected there appear to be some trails that are categorized incorrectly.

### Analysis

For each trail, the total number of visitors recorded is summed by month and for the whole season. This sum was divided by the number of day the register was installed to provide an average number of people per day on the trail. The average people per day is calculated by trail use level. The trail use level average people per day is multiplied by the number of trails within that use level and by the number of days within the summer season (145 days) to produce the extrapolated number of visits across the Forest. It is important to note that this number does not include the non-compliance rate. Different non-compliance scenarios were used to estimate actual hiker visits on the Forest.

There is more information such as zip codes and destination information that could be used in the future. Unfortunately, inputting and analyzing this data has been time prohibitive during this cycle of monitoring. These fields in the self registers are not always completed by groups limiting the amount of data available.

### Compliance Scenarios

#### 25% Non-Compliance Rate

In 2008 limited compliance checks were completed. Gary Davis used a 25% non-compliance rate across all trails to estimate total visits. This non-compliance is probably low and underestimates use but would be the estimate used if there were no compliance checks completed.

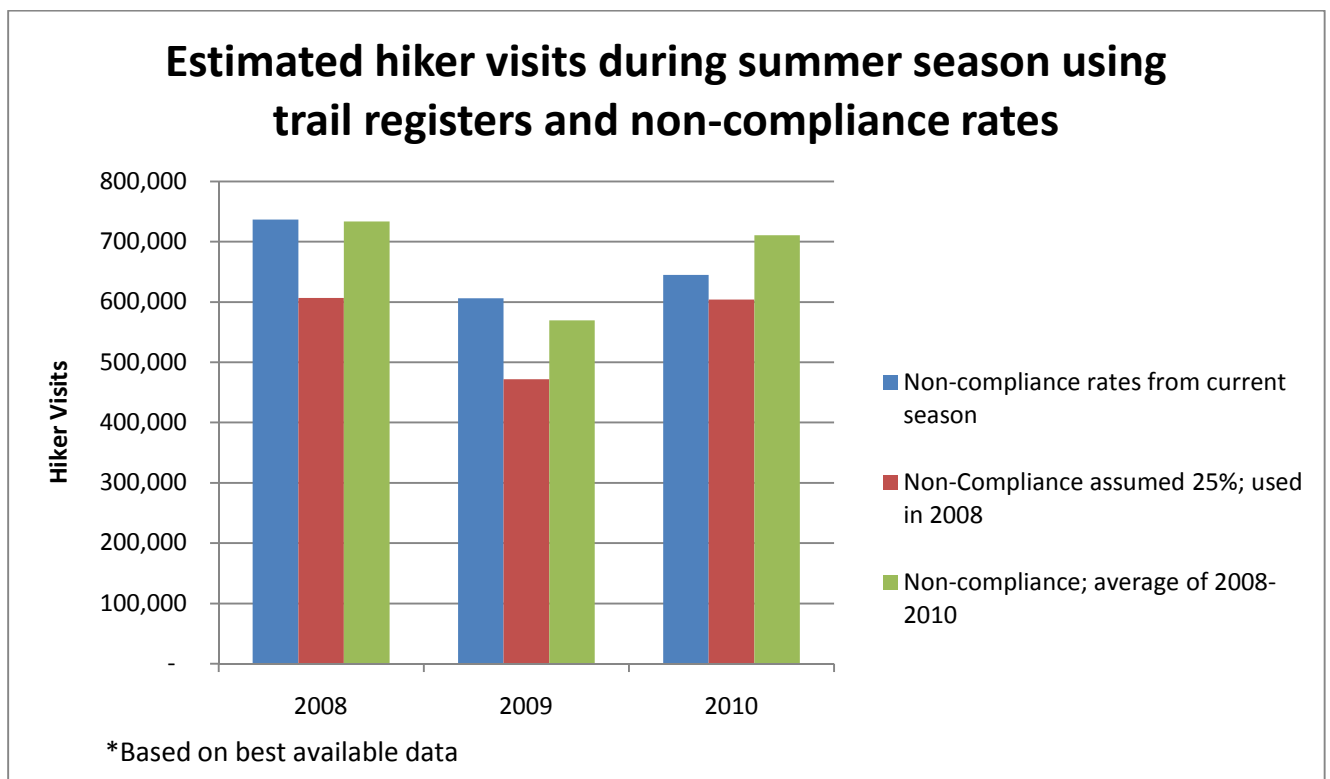


### Non-Compliance Rate from current year

In the years that some compliance checks were completed the rates from that year were used to calculate the total hiker estimate. For example, 2009 compliance checks were used to calculate total visitors in 2009. Unfortunately, there has not been a year with fully completed compliance checks.

### Non-Compliance from average of 2008-2010 non-compliance checks

Due to the limited amount of the non-compliance checks, all of the non-compliance checks from 2008, 2009 and 2010 were averaged by use level and used to estimate total visits. This is probably the best estimate so far since it uses all the available data.



	Using 2008 assumed non-compliance	Estimated Hiker Visits for Summer Season	Average 2008-2010 Non-Compliance Rates	Estimated Hiker Visits for Summer Season
<b>2010</b>				
Very High Use	25%	183,388	72%	252,168
High Use	25%	149,611	42%	170,329
Moderate Use	25%	205,186	34%	220,194
Low Use	25%	65,811	29%	67,917
	Total	<b><u>603,996</u></b>	Total	<b><u>710,607</u></b>
<b>2009</b>				
Very High Use	25%	204,911	72%	281,762
High Use	25%	79,939	42%	91,009
Moderate Use	25%	88,753	34%	95,244
Low Use	25%	98,203	29%	101,345
	Total	<b><u>471,805</u></b>	Total	<b><u>569,360</u></b>
<b>2008</b>				
Very High Use	25%	302,541	72%	367,931
High Use	25%	97,001	42%	97,671
Moderate Use	25%	186,578	34%	177,085
Low Use	25%	99,547	29%	90,860
	Total	<b><u>685,666</u></b>	Total	<b><u>733,548</u></b>

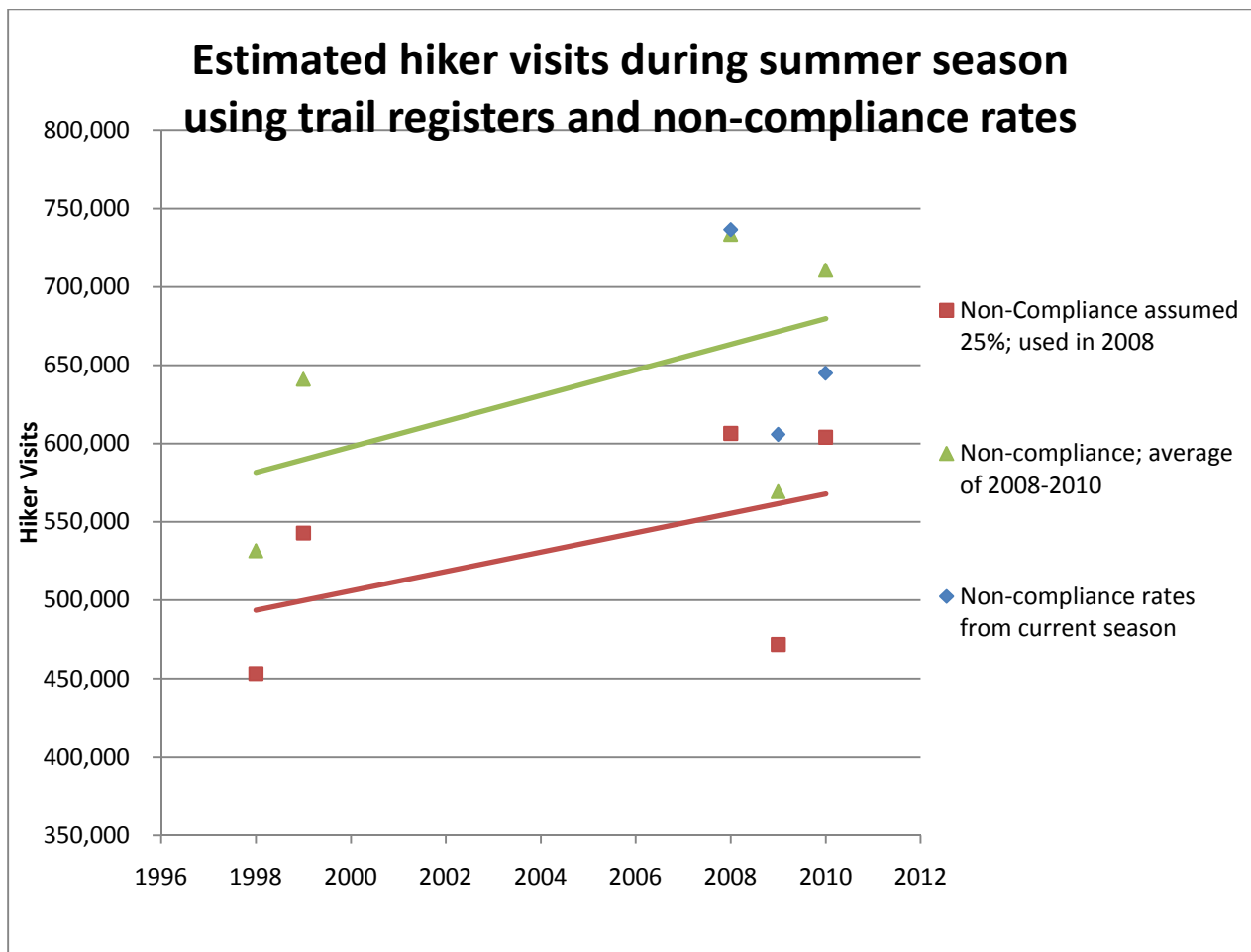
\*Note: These numbers are indicative of use on the forest but are not statistically significant

#### Comparison between 1998/1999 and 2008-2010 trail register data

In order to provide a comparable numbers between the two monitoring time frames, the 1998/1999 data was reanalyzed using the same methodology as the 2008-2010 analysis. The 2000 trail register data is incomplete, so it was not used for analysis. For each of the trail use levels an average people per day was calculated. To extrapolate the data forest-wide the average people per day by use level was multiplied by the number of trails in the use level on the forest and by the average season length of 145 days. While each year the season from

Memorial Day to Columbus Day changes slightly, keeping the season length consistent for extrapolation allows a more even comparison among years.

Two different non-compliance scenarios were assessed for the 1998/1999 data. Compliance checks were not completed in the 1998/1999. A 25% non-compliance was used across all trails to represent the extrapolation without any compliance data. The averaged compliance checks by trail use level from 2008-2010 were used for extrapolation. This is the best estimate we have of what non-compliance really looks like on the Forest.

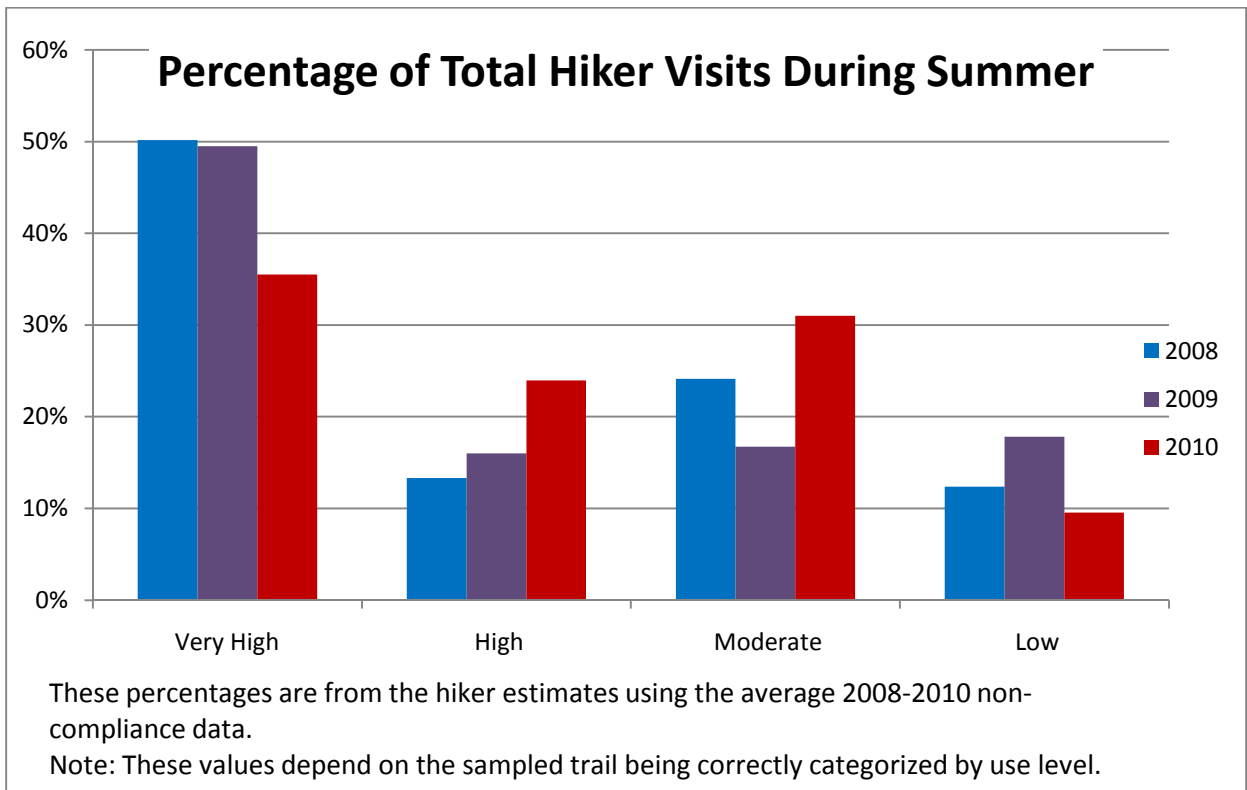
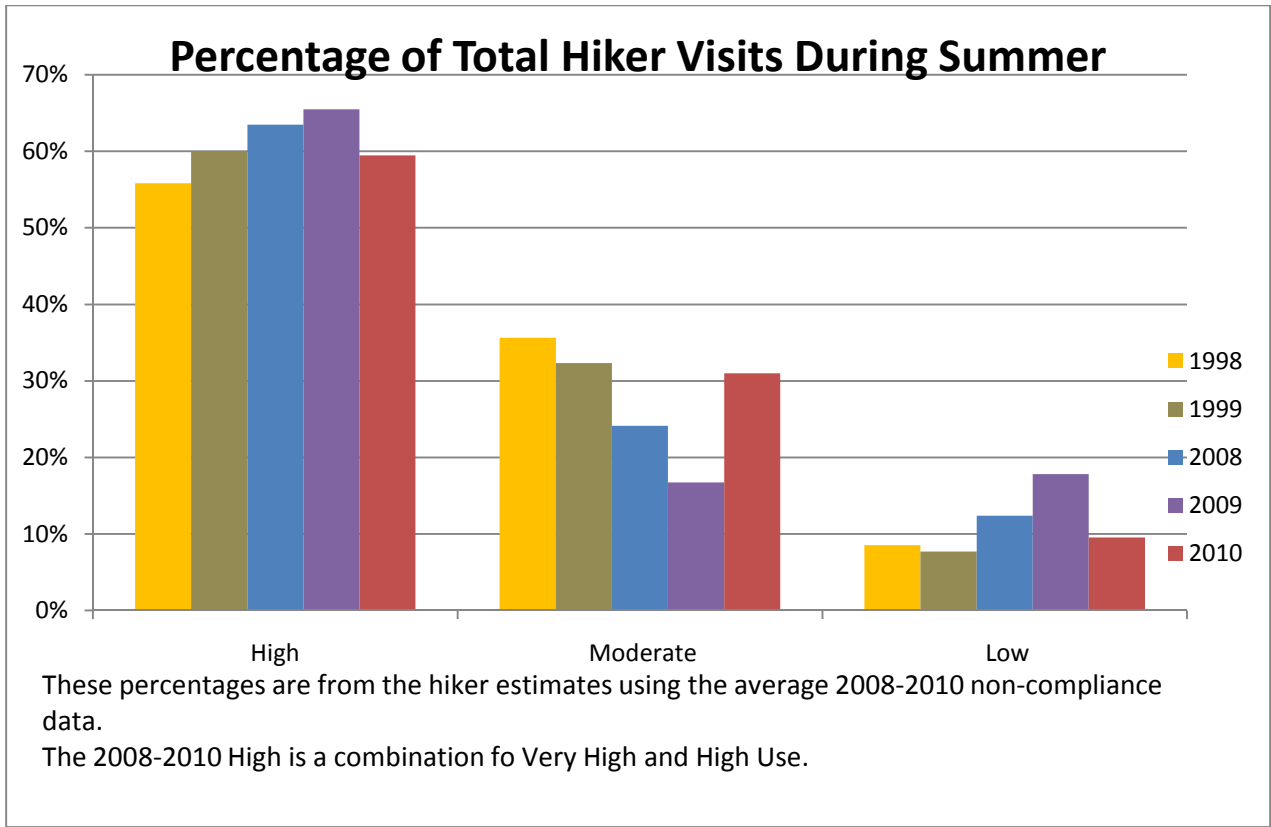


<b>Changes in Hiker Visits from 1998 to 2010</b>		
	25% Non-Compliance	2008-2010 Average Non-Compliance
<b><u>From Trendline</u></b>		
<b>Change in number of hiker visits</b>	74,091	98,006
<b>% Change since 1998</b>	15.01%	16.85%
<b><u>From Extrapolated Data</u></b>		
<b>Change in number of hiker visits</b>	150,762	179,040
<b>% Change since 1998</b>	33.26%	33.68%

\*Note: These numbers are indicative of use on the forest but are not statistically significant

#### Balance of Use Levels across the Forest

The balance of hikers visits on the Forest appears to be staying consistent with use level across the Forest. The Forest Plan outlines that the Forest should try to keep use levels at their current balance. The only shifts might be that some high use trails are being used more heavily. This is consistent with the Forest Plan. In 2010 there was an increase in use on moderate use trails. This should be examined further, particularly with the next round of trail monitoring. It is possible that some of the moderate trails sampled are classified incorrectly and should really be classified as high use trails. The Very High and High Use categories were combined in the 2008-2010 data so that it could be compared with the 1998/1999 data.



## Recommendations

Compliance checks need to be completed for the sampling system to properly estimate the number of hikers. These compliance checks should occur during the summer. Without this data, the collected information from the registers is limited in its use.

The use levels appear to be assigned incorrectly for some trails. Using trail register data from 2008-2010 and current district knowledge the lists need to be updated. Having a more accurate list would provide a more accurate extrapolation of the data.

On Very High and High use trails data sheets need to be collected and restocked more often. Many of the very high use trails clearly did not have enough sheets since people had started recording entries in the margins, back of the paper, and cover sheet. Given that this is a challenge to keep up with during the busy summer season, alternative approaches should be considered. It might be worth looking into infra-red trail counters, especially at very high and high use trailheads. These counters do take time and effort to set up properly but I think they might be a more efficient method for collecting this information.

## Calculations

Non-Compliance Rates:

For each trail, there are ideally at least four compliance checks conducted, two on the weekends and two on the weekdays. From 2008 to 2010, only some trails had compliance checks completed. The 2009 non-compliance rates were calculated from the compliance checks by Gary Davis. His exact methodology for converting the three or four compliance checks per

trail to non-compliance rates is not known. The following method was used to calculate non-compliance rates in 2008 and 2010.

To calculate the overall non-compliance rates from these checks the following calculations were made. Average weekend and average weekday compliance rates were calculated per trail based on the checks completed. Any compliance checks where no one was observed were thrown out as no data. These two rates were averaged using a weighted system to account for two weekend days and five weekdays. All trails non-compliance rates within the same use strata (i.e. high, moderate, low) were averaged.

### **Off Road Vehicles Effects**

#### **Snowmobiling**

Monitoring Item 36 requires the WMNF to look at the resource impacts of off road vehicle use in early or late winter and assessing management based on a higher risk of damage. Currently, the WMNF is only open to winter snowmobile, or other over-the-snow vehicles. The Forest does not currently appear to be monitoring snowmobiling in a systematic form. The districts work with local snowmobile clubs and the New Hampshire and Maine State Trail Bureaus to manage snowmobile use and trails. District staffs have been informally monitoring snowmobile impacts as issues arise.

The process of setting up protocols to fulfill this monitoring item is currently being worked on. The protocol focuses on spending three days, per district area, on the ground looking for resource concerns or damage from the shoulder season snowmobile use. This monitoring will be recorded in a central database to track incidents over time.

## **ATV usage**

Within the Record of Decision (ROD) for the Forest Plan the issues of ATV use are specifically discussed. The current Forest Plan excludes summer ATV use on the WMNF. The ROD specifically asks that the Forest monitors ATV accommodations on nearby public and private to learn more for future Forest Plans. Understanding whether other lands are providing enough of this recreational activity as well as the benefits and impacts of summer ATV use is important. Questions about ATV usage on the Forest will likely come up again during the next Forest Plan development. It will be important to understand the dynamic of ATV use in the surrounding areas as well as the impacts on public lands to better prepare for discussions with the public and interest groups.

## **Mountain Biking – Assessing Travel Corridors**

The Forest Plan decided on keeping all trails (except the Appalachian Trail and those in Wilderness areas) open to mountain biking unless specifically closed. According to both the Forest Plan Record of the Decision and the Forest Plan, the WMNF has committed to completing a site specific travel corridor assessment. This assessment would include meeting with mountain bike groups and other interested parties to help designate which travel corridors will be maintained and managed. By designating areas as appropriate for mountain bike use the Forest would be meeting its goal of providing a range of quality recreation opportunities.

The WMNF has started along this process with projects such as starting to develop the Moat Mountain trail area with mountain biking as the designated use. By assessing other travel corridors, the Forest would inform and direct mountain bikers to appropriate areas on the



Forest trails system. The Forest can then target specific trails for the maintenance and impacts from mountain bikes.

### **Rock Climbing Use**

Monitoring guide item 35 refers to rock climbing use on the WMNF. Specifically, the monitoring item asks “What is the rock climbing use on the Forest?” In addition, the item makes note to combine this information with monitoring efforts about impacts to the cliffs including plants and peregrine falcons.

Currently, there has not been specific monitoring of rock climbing use on the Forest. The only data currently collected is rock climbing use by outfitter/guides as reported in their summary of use forms.

The most widely known rock climbing sight that has received attention is the Rumney Rocks area. There are a number of sport climbing routes and according to District staff and local residents it has boomed in popularity over the past decade. While this area could be the focus of pilot look of rock climbing use on the Forest, it should not be the only location monitored. A forest-wide approach to rock climbing should be addressed.

The monitoring question itself needs to be clarified. The monitoring could go into different directions. If the question refers to where and how much rock climbing use is on the Forest then the question should be reworded to reflect that. Monitoring that could be used there would be system counts at parking areas or at the access trails to the climbing areas. Since areas such as Rumney appear to be high use, I think there would be limited ability to capture usable data from self-registers. High use trails, as shown in the trail use section, have a higher

rate of non-compliance and there is a challenge with keeping up with enough paper registers. A more intensive survey of rock climbing areas could be conducted every 3 or 5 years to understand the changing use.

An alternative would be monitoring for an indicator of overall use of rock climbing on the Forest. This would not capture how much rock climbing is occurring on the Forest. Instead, an indicator would highlight how rock climbing might be shifting. Similar to the Wilderness monitoring, a selection of sites could be monitoring a few times each year. This could then be compared year after year to show an indication for changes in use levels.

### **Wilderness Monitoring**

The WMNF started collecting Wilderness monitoring data in 2006; the year after the Forest Plan went into action. The Forest monitors Wilderness character through five main indicators following forest-wide protocols. Even with a decreasing workforce each of the districts has done a great job with keeping up with completing wilderness monitoring each year.

The five areas of monitoring include trail use, destination use, campsite density, campsite size and litter/waste incident reporting. Protocols have been established for each indicator to try to ensure consistency with data among Districts.

For the visitor use monitoring, each Wilderness has established four destinations and three trail locations to monitor for one day each year. The locations are stratified across different zones of primitiveness in the Wilderness. At each established locations the monitoring is conducted on

the same relative day each year. For example, for one site the monitoring would always be done on the 2<sup>nd</sup> Saturday of July.

The main challenge thus far has been that this information was stored in separate spreadsheets in varying formats which has not facilitated comparison year to year or wilderness to wilderness. The creation of a wilderness database will resolve this and provide a mechanism for seeing trends in wilderness areas. The current protocols help answer the monitoring guide questions on changes in trail and destination use along with tracking dispersed camping.

Yet even with those protocols there are some slight discrepancies among the districts. For example, trail and destination monitoring in Wilderness areas on the Androscoggin and Pemigewasset Districts occur exclusively on the weekends while the Saco monitoring days include weekdays. In addition, on district with multiple Wilderness areas one area is monitored in July and another is area is monitored in August. These differences between monitoring around the Forest will work well as long the data is used within these constraints. The collected data should really only be used to indicate changes within that particular Wilderness area and not used to show relative that one Wilderness area is used more or less than other places on the Forest.

### **Wilderness Visitor Use Trends**

Both visitor trail and destination use monitoring in the Forest Plan are considered a social indicator for Wilderness character. The social indicator is assessing the “outstanding opportunities for solitude or.... unconfined type of recreation.” The monitoring items wish to

assess changes in use of the Wilderness and if the Forest is meeting desired conditions for Wilderness.

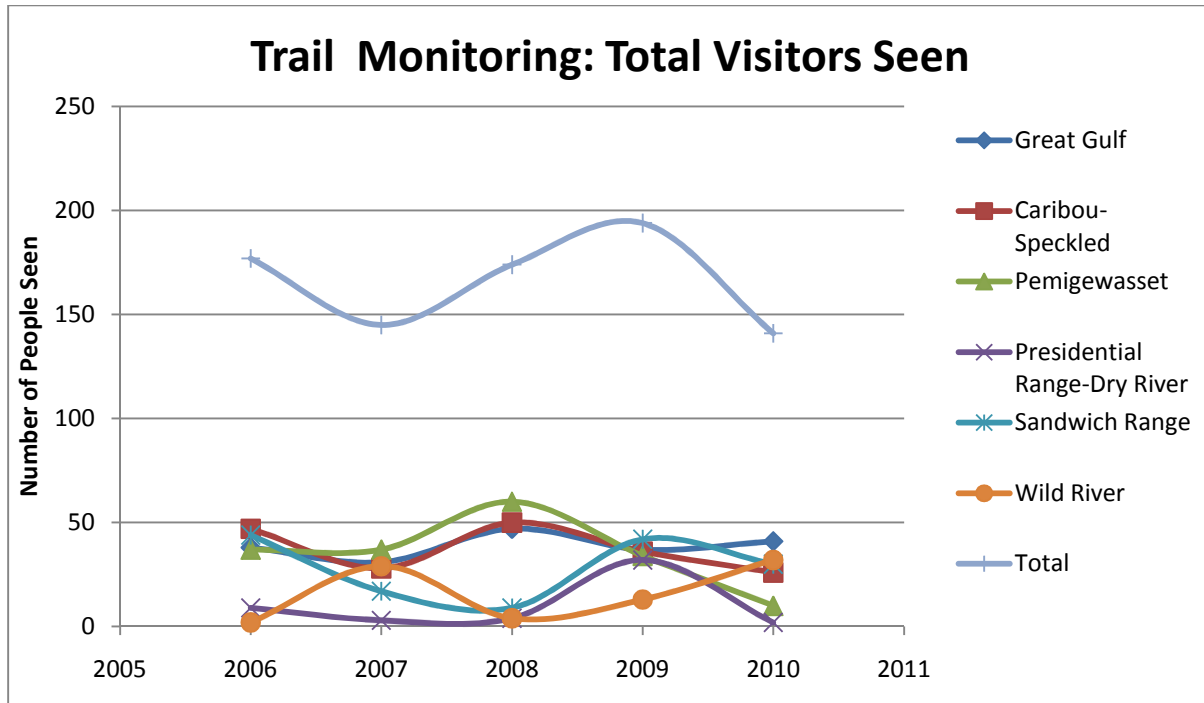
From 2006-2010, during almost half (46%) of the monitoring days no visitors were seen over the 5 hour time block. The numbers for the other half of the time is reported below. This alone suggests that there are some opportunities for solitude in each of the Wilderness areas.

With data collection beginning in 2006 there is currently five years worth of data. With limited data, it is a little early to start to see statically significant trends. The data collected thus far is variable but with time wilderness use trends should emerge.

### **Wilderness Trail Use Trends**

Trail use monitoring is done on all six Wilderness areas. Three trail locations, from zones B, C, and D, on each Wilderness area were initially selected and the same sites are monitored every year. A person is stationed for five hours at the same location each year along the selected wilderness trail and counts the total number of people they see as well as the group size of the parties. Management action such as more education and information delivery should occur if three consecutive years show an increase in total use.

There are no significant trends in the total number of people seen per trail use monitoring trip over the past five years. Each Wilderness area has a wide range of variability from year to year since there are only three monitoring days per area each year. If one of those days has extreme weather (favorable or not) or other conditions affecting visitors decisions to come to the Wilderness this can skew the totals for the area.



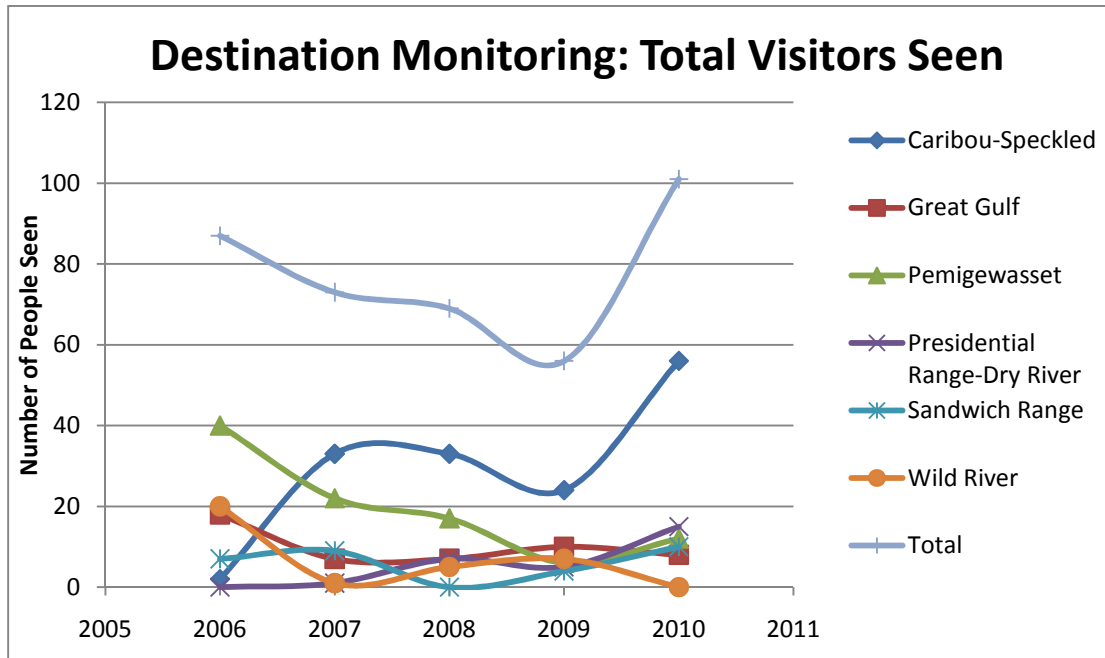
Total number of visitors over summer season during destination monitoring trips.

### Wilderness Destination Use Trends

Destination monitoring is completed in each of the Wilderness areas at four locations, one in each of the zones. Sites such as mountain peaks and waterfalls were selected. Each summer these same areas are monitored for a day by a person who stays at that location for five hours and counts the number of visitors seen and the size of the groups of visitors. Management action such as more education and information delivery should occur if three consecutive years show an increase in total use.

There are no significant trends in the total number of people seen per destination use monitoring trip over the past five years. Each Wilderness area has a wide range of variability from year to year since there are only four monitoring days per area each year. If one of those

days has extreme weather (favorable or not) or other conditions affecting visitors decisions to come to the Wilderness this can skew the totals for the area.



Total number of visitors over summer season during destination monitoring trips.

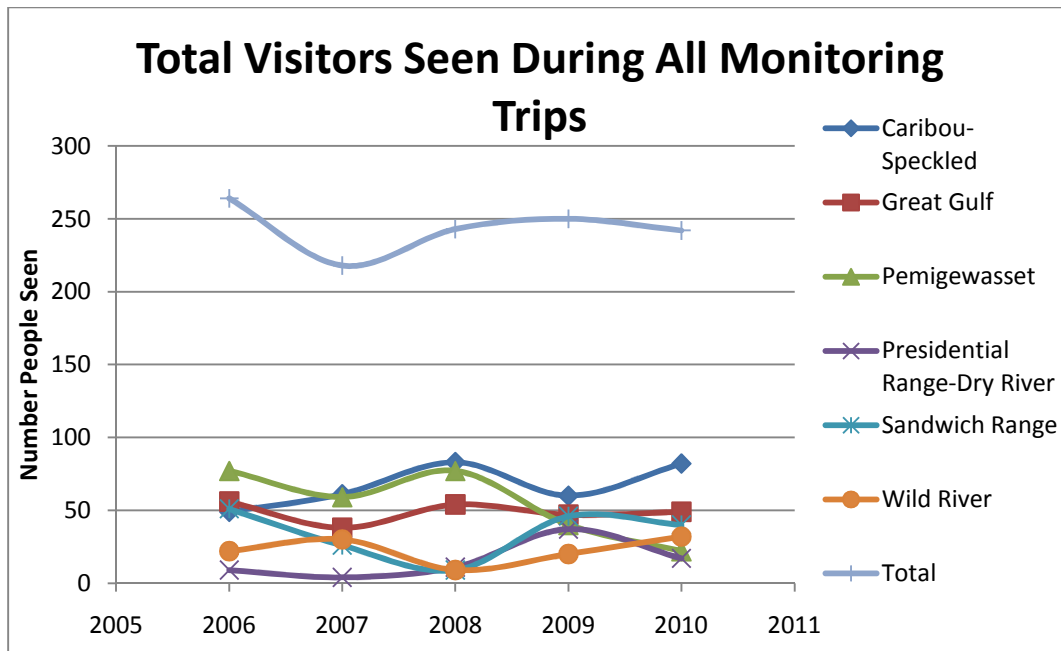
### Total Wilderness Visitor Monitoring

The monitoring guide lists separate monitoring items for destination and trail use monitoring. Distinguishing the sites of monitoring is important to understand the type of area the monitor is stationed but for analysis combining both forms of visitors monitoring provides a better picture. In future monitoring guides, I would recommend that the trail and destination use monitoring become combined into one item since the protocols, data, analysis and goals of both monitoring are essentially identical. The full 7 sites with the categorical distinction of

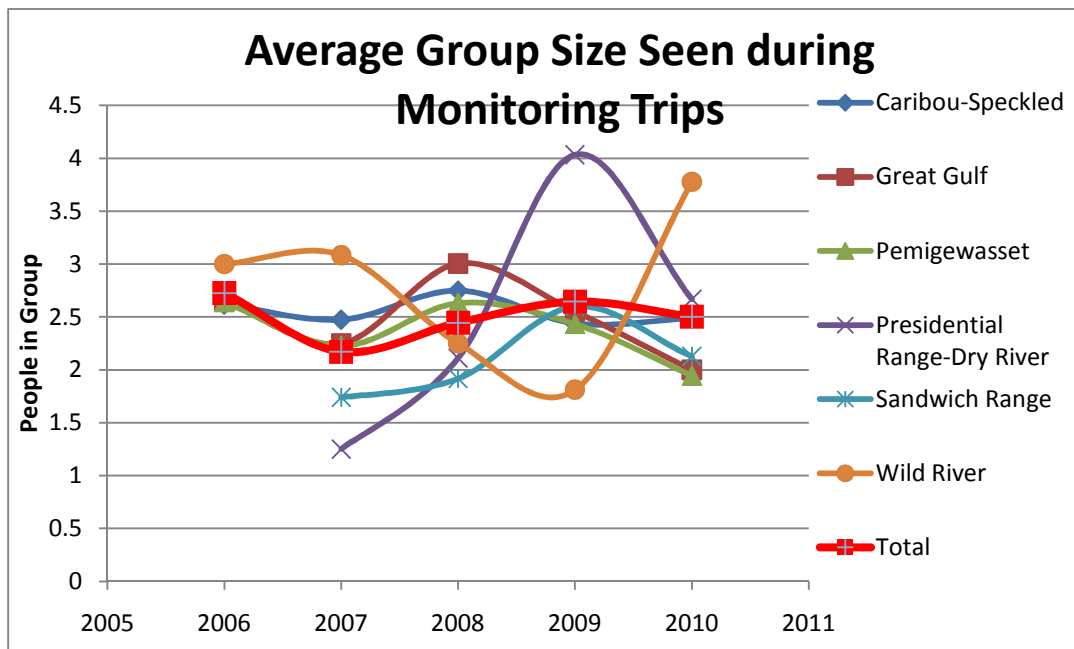
location would remain the same. The two data sets were combined in the analysis below to show a clearer picture of the monitoring in the Wilderness areas.

Group sizes were also recorded during sampling days. During the past five years, on average, wilderness visitor group sizes are around 2.5 persons, not including days when no visitors were seen. In a survey conducted in the backcountry and Wilderness areas in 2000, an average group size of 3.2 adults and .9 children was recorded in primitive areas (Dawson, Oreskes, Kacprzyński, & More, 2002). During this survey, respondents in primitive areas reported being satisfied with “solitude” and “exploration and remoteness.” The current monitoring indicates that group size has not increased since the 2000 survey.

Another study conducted in 2005 in the Great Gulf Wilderness area asked Wilderness users about their sense of crowded in addition to the number of groups they saw. Respondents reported seeing an average 5.2 groups on their trips (Schuster, Cole, Hall, Jennifer, & Oreskes, 2006). In addition, visitors reported not feeling crowded and generally saw fewer groups than they had expected to see. During the monitoring days when people were seen, there were, on average, between 3 and 5 groups seen. Considering the results of that survey, current Wilderness conditions appear to be in line with still providing a recreational experience without crowding.



Total number of visitors seen during all monitoring trips over summer season.



Average group size recorded during monitoring trips on days when visitors were seen.



Year	Average number of groups seen during one monitoring day	Average number of groups seen during one monitoring day (including days with no visitors)
2006	4.17	1.21
2007	3.47	1.88
2008	4.79	1.88
2009	3.99	2.58
2010	4.50	2.53

Average number of groups encountered during one monitoring day across all Wilderness areas

### **Perceived Quality, Crowding and Satisfaction of Visitors**

There are two monitoring guide items, 40 and 45, that discuss visitor experience and perception of crowding in recreation and Wilderness areas. While some of this information has been broadly captured through the National Visitor Use Monitoring (NVUM) survey, the monitoring guide seeks to go further. NVUM surveys focus more on the amenities provided and does not really touch upon perception of crowding.

The monitoring guide called for a baseline survey that should have been conducted in Wilderness at the beginning of the life of the plan with a follow up survey once during the life of the Plan. In addition, every 3-5 years a survey on visitor experience, information and education conducted by a contracted party was targeted to happen throughout the Forest.

In 2000, a visitor satisfaction survey of backcountry and Wilderness users was conducted. The survey completed by SUNY College of Environmental Science and Forestry (Dawson, Oreskes, Kacprzyński, & More, 2002). This survey helped establish overall satisfaction with backcountry users on specific categories such as a feeling of crowdedness and solitude. The survey only established that people generally felt satisfied but did not establish how many encounters with other people would start to diminish the feeling of solitude.

Another, smaller scale survey was completed in 2005 within the Great Gulf Wilderness (Schuster, Cole, Hall, Jennifer, & Oreskes, 2006). This survey was conducted in just one of the six Wilderness areas. Visitors were asked to rank how crowded they felt as well as how many other groups they saw and how it compared to the number of groups they expected to see. On a scale from one (not crowded) to nine (crowded), visitors averaged a score of 1.7. Generally, visitors saw about 5 other groups of people, which was less than they had expected. The survey supports that Wilderness visitors are not feeling crowded suggesting they gain a sense of solitude. In addition, visitors reported seeing slightly less groups than they had expected with an average sighting of 5.2 groups.

Within both of the surveys, and future surveys, it is important to get a sense of visitor's expectations from Wilderness character. Visitors might adjust their satisfaction regarding crowdedness and solitude based on their knowledge of the popularity of the White Mountain NF Wilderness areas instead of basing their satisfaction on an expectation of Wilderness character. The areas should be managed to provide Wilderness character.

There has not been a comprehensive visitor satisfaction survey completed for non-backcountry uses. Many Forest visitors only come to the developed sites such as campgrounds, day use areas, and visitor centers. Understanding their site-specific satisfaction is just as important and valuable as backcountry and Wilderness users.

Due to the constraints of time and money, one strategy would be to combine the Wilderness and recreation surveys into one larger survey in the next few years. A forest-wide survey could include more site specific information on visitor satisfaction and crowdedness across

Wilderness, backcountry and frontcountry. This type of survey could provide great information and insight for more comprehensive recreation planning on the WMNF.

### **Recommendations for the Monitoring Guide**

While working through the recreation and wilderness monitoring guidelines there are a few monitoring questions that I would recommend need some clarification or changes. In general, the questions provide a targeted approach to the larger questions if the WMNF is meeting its goals to provide a range of quality recreation opportunities.

Within the recreation section clarification on the rock climbing use item and slight changes to the outfitter/guide item would be helpful. As discussed in the above section, the rock climbing question is vague and could be interpreted differently. The question should clarify if indicators of use change or if total use should be monitored. The outfitter/guide question specifically refers to backcountry use. While the majority of use reported is in the backcountry there are some frontcountry sites such as Rumney Rocks or Mead Base Camp that are also important to track. The outfitter/guide monitoring question should change to reflect both front country and backcountry use from outfitter/guides.

The Wilderness monitoring questions follow the outline of management indicators listed in the Forest Plan. In the future, I believe it makes more sense to analyze the data from trail use and destination use monitoring together. The information collected is the same with the only the

site location differing. When put together the data provides a stronger indicator of how total use in the Wilderness areas as a whole is changing.

Overall, I would suggest adding a section to the monitoring items that describes the next steps to be taken after monitoring. Many of the monitoring items aim to get use trends for different sectors of recreation. While making a value judgment on whether increases or decreases are good or bad for the Forest can be difficult, it would be great to have some next steps of utilizing the use trend data. For example, if there is a change in use at developed campgrounds, perhaps the next steps outlined would be to examine the outreach of information to the public about the campgrounds and visitor satisfaction with the areas. This could help explain why use levels have changed and provide a clearer picture for any management changes needed.

### **Works Cited**

Cordell, K., Betx, C., Green, G., & Mou, S. H. (Sept. 2008). *Outdoor Recreation Activity Trends: What's Growing, What's Slowing?* Athens: A Recreation Research Report in the IRIS Series.

Dawson, C. P., Oreskes, R., Kacprzyński, F., & More, T. (2002). Visitor Satisfaction: Backcountry and Wilderness Users in the White Mountain National Forest. *Proceeding of the 2001 Northeastern recreation Reserach Symposium* (pp. 144-152). Newton Town, PA: USDA Forest Service, Northeastern Research Station.

Pergams, O. R., & Zaradic, P. A. (2008). Evidence for a fundamental and pervasive shift away from nature-based recreation. *PNAS* , 2295-2300.

Schuster, R. M., Cole, D., Hall, T., Jennifer, B., & Oreskes, R. (2006). Appraisal of and Response to Social Conditions in The Great Gulf Wilderness: Relationships Among Perceived crowding, Rationalization, Product Shift, Satisfaction, and Future Behavioral Intentions. *Proceedings of the 2006 Northeastern Recreation Research Symposium* (pp. 488-496). Newtown, PA: USDA Forest Service, Northeastern Research Station.