U.S. Department of the Interior
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Development of Visitor Use Pattern Monitoring Programs for NCPN Parks
Northern Colorado Plateau Inventory and Monitoring Network

FINAL REPORT

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Abstract

This report summarizes the results of an inventory of current visitor monitoring programs currently in use in the 16 National Park Service (NPS) units that are included in the Northern Colorado Plateau Inventory and Monitoring Network (NCPN), summarizes the results of a survey and workshop with NCPN park staff that identified needed visitor monitoring needs, provides guidance on expanded and improved methods and monitoring programs and develops protocols for trail counters. NCPN park staff noted a strong need for a social science component in the inventory and monitoring efforts of the NPS. While mangers and park staff have some information about overall visitor numbers, it was found that a lack of data on the number and behaviors of visitors once they enter parks hinders our understanding of the relationship between visitor use and specific resource impacts. Many NCPN park staff identified specific resource impacts occurring in their parks that were related to visitor use but noted they were in many cases unable to characterize the relationship or more importantly how to mitigate those impacts. It was plainly clear that having a basic understanding of visitor motivations, expectations, and spatial patterns would go a long way in understanding the relationship between visitor use and specific impacts to wildlife, water, terrestrial and social resources in the NCPN Parks.

Introduction

The purpose of this project was to conduct an inventory of current visitor monitoring programs currently in use in the 16 National Park Service (NPS) units that are included in the Northern Colorado Plateau Inventory and Monitoring Network (NCPN) (Table 1) to provide guidance on expanded and improved methods and monitoring programs and to develop protocols for trail and vehicle counters. This report is presented in three Phases. Phase One documents the inventory of the current monitoring methods used within the NCPN units (Appendix F). Phase Two reports on the results of a workshop with NCPN and park staff that identified additional visitor monitoring needs. Phase Three outlines recommended monitoring strategies to be implemented based on the information needs identified by NCPN and park staff. In addition, Protocols for Using Trail Counters (Standard Operating Procedures) will be developed as a standalone document.

Table 1. National Park Service Units within the Northern Colorado Plateau Network and Park Code with state and hectares.

Park	Code	State	Size (ha)
Arches National Park SEUG	ARCH	UT	30,966
Black Canyon of the Gunnison National Park	BLCA	CO	12,159
Bryce Canyon National Park	BRCA	UT	14,502
Canyonlands National Park SEUG	CANY	UT	136,610
Capitol Reef National Park	CARE	UT	97,895
Cedar Breaks National Monument	CEBR	UT	2,491
Colorado National Monument	COLM	CO	8,310
Curecanti National Recreation Area	CURE	CO	17,433
Dinosaur National Monument	DINO	CO/UT	85,097
Fossil Butte National Monument	FOBU	WY	3,318
Golden Spike National Historic Site	GOSP	UT	1,107
Hovenweep National Monument SEUG	HOVE	CO/UT	318
Natural Bridges National Monument SEUG	NABR	UT	3,009
Pipe Spring National Monument	PISP	AZ	16
Timpanogos Cave National Monument	TICA	UT	101
Zion National Park	ZION	UT	59,900
		TOTAL	**474,709**

SEUG - Southeast Utah Group of Parks

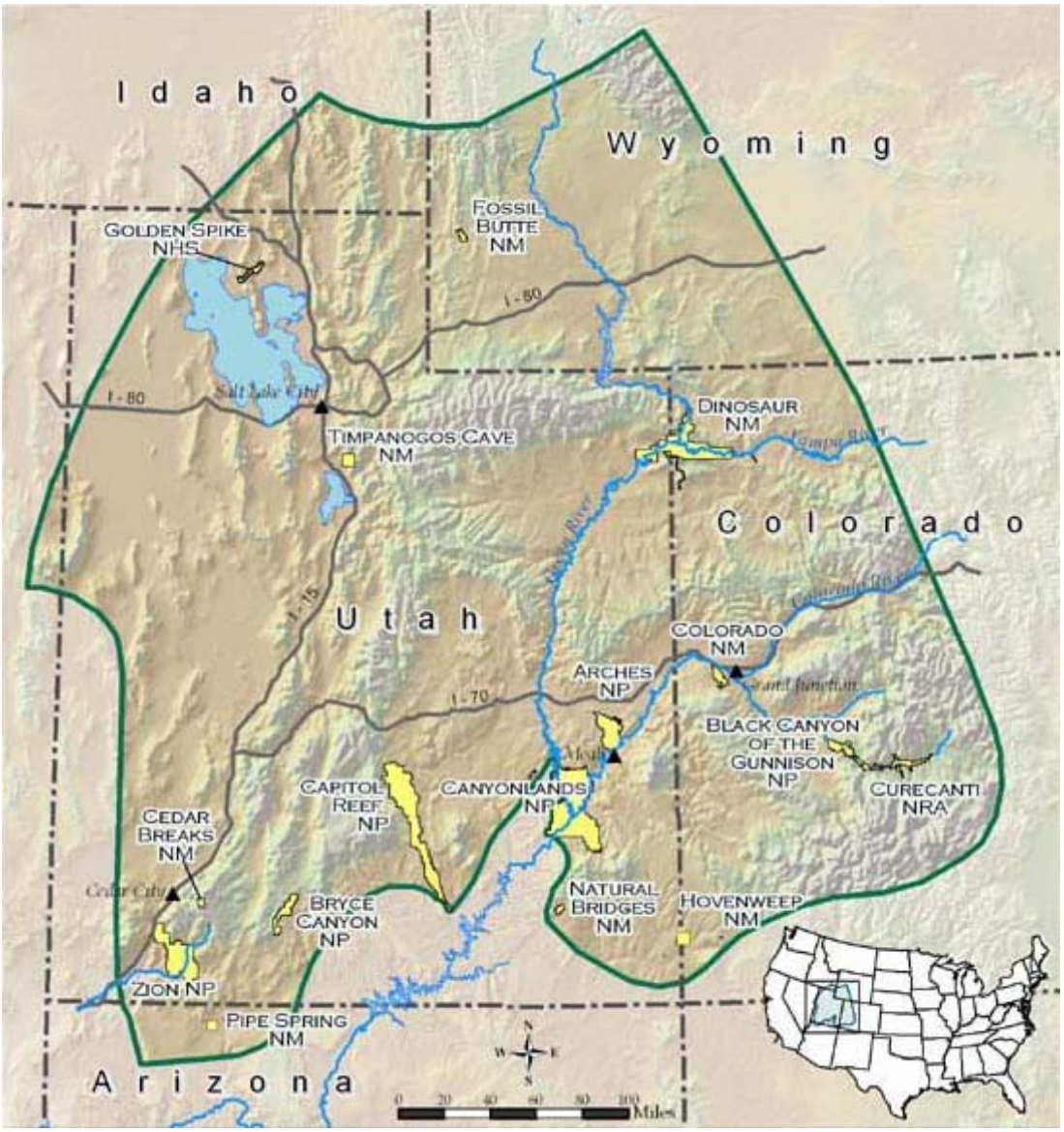


Figure 1. Northern Colorado Plateau Network

Background:

National Park Service, Northern Colorado Plateau Network

The NCPN parks are tasked with developing a monitoring program to assess park natural resources. The NCPN is one of 32 vital signs monitoring networks nationwide in the NPS. The network is comprised of 16 NPS administered units (Table 1, Figure 1) in the states of Colorado, Utah, Arizona and Wyoming.

Vital Signs

As defined by the NPS, vital signs are a subset of physical, chemical, and biological elements and processes of park ecosystems that are selected to represent the overall health or condition of park resources, known or hypothesized effects of stressors, or elements that have important

human values. The elements and processes that are monitored are a subset of the total suite of natural resources that park managers are directed to preserve "unimpaired for future generations," including water, air, geological resources, plants and animals, and the various ecological, biological, and physical processes that act on those resources. Vital signs may occur at any level of organization including landscape, community, population, or genetic level, and may be compositional (referring to the variety of elements in the system), structural (referring to the organization or pattern of the system), or functional (referring to ecological processes) (NPS 2006a).

Miller et al. (2003) identified park use by visitors as one of the major stressors to park ecosystems and one of the "high-priority vital signs" in NCPN parks. They noted that understanding the role that human activities play in driving ecosystem processes and changes is vital to managing these resources. Through a Delphi process that involved over 230 scientists and resource-management specialists, measurable ecosystem indicators were identified. Potential resource impacts associated with visitor-use include trampling effects on soils, vegetation and aquatic resources (Cole 1990; Shakarjian and Stanford 1998), and impacts to wildlife (Swarthout and Steidl 2001). It is therefore critical to identify the relationship between park visitor use and resource and social impacts. The NCPN vital signs pertinent to this project identified by Miller et al. (2003) are identified in Table 2.

Table 2. NCPN vital signs pertinent to visitation and potential measures that should be considered in this project (Evenden et al. 2002; Miller et al. 2003).

Vital signs	*Potential Measures**
Park use by visitors	Terrestrial visitor-use days by location, month, and type of activity
	Watercraft-use days by month and type of watercraft
	Park visitation by month (total no. of visitors)
	Frequency, location and nature of reported human-wildlife interactions

Visitor Monitoring Programs

Visitor monitoring programs track overall visitation to each park unit and provide information about visitor patterns within each park. The majority of National Park visitors confine their activities to formal trails, park facilities, and front country areas with developed infrastructure (bathrooms, parking lots, etc). However, the pursuit of backcountry wilderness experiences such as solitude, wildlife viewing, hiking, and other activities that bring visitors to less developed areas of parks are also very popular. Depending on the type and intensity of activity, and the fragility of the habitats affected, dispersed recreational activities can have adverse impacts to both the ecosystem elements and processes and the visitor experience.

Several years ago, the National Park Service began developing a carrying capacity framework titled Visitor Experience and Resource Protection (VERP) (NPS 1997). As the name suggests, this planning framework is aimed at maintaining the quality of the visitor experience and protecting natural and cultural resources in the face of increasing visitor use. VERP is built upon the same basic principles and concepts that drive other contemporary carrying capacity and related planning/management frameworks, including Limits of Acceptable Change (Stankey et al.1985), and Visitor Impact Management (Graefe et al. 1990).

Freimund et.al. (2002) developed a methodology to support application of VERP in Zion National Park. Their monitoring project focused on the four elements of the VERP framework that can benefit the most from empirical data: 1) collecting baseline data on visitor use and associated resource and social impacts, 2) identifying indicators and standards of quality, 3) monitoring indicator variables, and 4) management of visitor use to ensure that the standards of quality are maintained.

Phase One - Inventory of current visitor monitoring programs

Introduction and Overview

This section of the report addresses how visitor monitoring data were collected, a summary of the information gathered during interviews, including the types of data NCPN parks are collecting, and a summary of other pertinent information regarding visitor monitoring programs at the 16 NCPN parks.

Visitor use impacts were identified by NCPN parks as a high priority vital sign. Monitoring visitor use is critical to managing impacts on park resources. The purpose of the first phase of this project was to inventory the visitor monitoring methods that the 16 NCPN parks currently use. Through visitor monitoring, information such as trends in numbers of visitors (seasonal, yearly) and where visitor use is concentrated can be gathered. The NCPN hopes to accomplish some of this monitoring through repeat aerial photography and photo interpretation. These monitoring techniques will allow for an understanding of the linkage between spatial and temporal use patterns. This will inform management and help to determine change in the resources. Visitor use information is also valuable for decisions regarding budgets, staff allocation, etc.

All 16 NCPN parks conduct some type of visitor monitoring, but methods are not necessarily consistent throughout the network. In the second phase of this project, future monitoring needs will be identified and standard methods to expand or improve visitor monitoring will be recommended.

Inventory Data Collection

A list of contacts for the 16 NCPN parks was provided by the NCPN (Appendices B&F). Park staff was contacted to gather information regarding visitor monitoring at each park between September 2004 and March 2005. In most cases, people were contacted first by e-mail to let them know they would be receiving a telephone call to talk about visitor monitoring at their park. In several cases, the person listed as a contact redirected us to a different person for the information (the listed contact may have been on leave or working off-site).

A standard list of questions guided the telephone interviews (see Appendix A). Questions related to monitoring category, what type of data are collected, the data collection time frame, how data are analyzed, how data are applied, etc. In several cases, the listed contact could only provide part of the desired information, and suggested another person (or people) to call for more information. Notes were taken during the telephone interview and summarized in Appendix F. In some cases, park staff were contacted a second time by phone or e-mail to follow up on comments made during the first interview or to get more information.

Summary of Information Gathered

Monitoring Category-- Is the general category of monitoring that occurs. Visitor center counts are conducted at 14 of the 16 NCPN parks. Backcountry permit counts are done at 6 parks, while frontcountry permit counts are done at 3 parks. Counts are done during ranger-led talks or other interpretive programs at 7 parks. Trail counters (infrared) are used at 6 parks, and trail registers are used at 2 parks. Data from outfitters and guides provides monitoring information at 3 parks. Underground traffic counters or counters that use a cable across the road are used at 12 parks, and infrared traffic counters are used at 1 park (CEBR). Campground counts are done at 2 parks. Entrance gate/fee station counts are conducted at 3 parks. One park (FOBU) does a count of visitors watching the orientation video in the visitor center. Observational counts are done at 2 parks (ZION) and (ARCH) in canyon and backcountry areas.

Table 3- Number of NCPN Units that Monitor Use in each Category.

Monitoring Category	Number of NCPN Units with each Category
Visitor Center Count	14
Backcountry Permit	6
Frontcountry Permit	3
Underground Traffic Counter	12
Infrared Traffic Counter	1
Orientation video/interpretive video head counts	1
Head Count at Ranger led talks	7
Backcountry Observation	2
Trail Register	2
Trail Counters	6
Reports from Outfitters and Guides	3
Campground Counts	2
Entrance gate/fee station counts	3

Physical or Reported Count-- is each monitoring method is a reported count (such as from a permit or secondary source) or whether it is a physical count. Some parks (ARCH, BLCA, BRCA, CEBR, COLM, DINO, FOBU, HOVE, NABR, PISP, ZION) employ a mix of methods that supply both reported and physical counts, while others (reported-- BRCA, CANY, CARE, CURE; physical--TICA) employ a method or methods that supply only one type of count.

Description of Monitoring-- is general description of how visitor monitoring is conducted. Monitoring varies from park to park; however, there is a degree of continuity between parks using the same methods. For example, parks that are employing a visitor center count are doing so in very similar ways. Please see the NCPN database for details.

General or Site Specific-- is data collected is specific to a certain area of the park or is park-wide data. Some parks (ARCH, BLCA, BRCA, CANY, CARE, CEBR, COLM, DINO, FOBU, PISP, TICA, ZION) employ methods that provide both park-wide and site specific information, while

other parks (park-wide--GOSP; site-specific--BRCA, CURE, HOVE, NABR) employ a method or methods that provide only one type of information.

Staff Required-- is any specialized or additional staff are required for the collection of visitor monitoring information. The majority of the parks did not report needing any additional or specialized staff for the visitor monitoring conducted. At Zion National Park, it was reported that a staff member spends 30 minutes each week checking the accuracy of underground traffic counters. Also, observational monitoring at ZION is done by seasonal backcountry rangers, and additional duties are required of fee collection rangers during the non-peak season to monitor campgrounds. During peak season, seasonal rangers are employed to monitor a campground.

Equipment Description-- is any specific information about monitoring equipment used by park staff. Many people did not have specific information available during the interviews. Some specific information was provided for mechanical counters, traffic counters, and computer software. Please see the NCPN database for details.

Equipment Cost-- is the actual cost of any monitoring equipment. Again, most people did not have specific information available during the interviews, or did not know the cost because the equipment was purchased before their employment began. Also, some parks (FOBU, HOVE, NABR) had equipment provided for them by the Denver office so there was no cost involved for them. Please see the NCPN database for details.

Required for NPS Annual Reporting-- is whether or not the data collected for each monitoring method is used in NPS annual reports. According to Butch Street from the Denver Public Use Statistics Office, all parks and monuments are required to do some form of visitor monitoring with the preferred method being underground traffic counters. This data is used for annual reporting. GOSP and TICA, who do not have underground traffic counters, use their other method to report visitation for the annual report.

Used in Natural Resource Monitoring-- is whether or not data collected for each monitoring method is used to aid in natural resource monitoring within the park. Several parks indicated that visitor monitoring data is used in natural resource monitoring. At BRCA and PISP, it was indicated that monitoring data are used to determine if ranger-led talks are popular. At BRCA, FOBU and ZION, monitoring data are used to determine intensity of backcountry use or trail use. Also at ZION, monitoring data are used to monitor social conditions in canyons. At TICA, monitoring data are used to protect the cave resource and visitor experiences. NABR uses monitoring data to determine how many visitors receive natural resource education through presented programs. Please see the NCPN database for specific details.

Person Responsible-- The information related to this item can be found in Appendix B and the NCPN database.

Start Date-- is the date each specific monitoring method was implemented within the park. Many people contacted did not know when specific visitor monitoring programs began in the park. Parks may keep such records, but staff did not seem to be aware of this information. Please see the NCPN database for details.

End Date-- is the date each specific monitoring method may have ended within the park. All monitoring methods that we spoke to interviewees about are ongoing.

Date Comments-- is whether each monitoring method is continuous or seasonal, and any other remarks related to date. Most monitoring methods were reported as continuous. Seasonal monitoring methods included visitor center counts, use of trail counters, counts at ranger-led talks, observational counts, and campground counts. Weather seems to be the determining factor. Trail counters may not be used if certain trails are closed during the winter or to protect the counters from freezing conditions. During the winter season, activities and access to facilities may be discontinued or limited, resulting in a discontinuation of visitor monitoring during those times.

Location-- is the specific location where monitoring equipment is located or where monitoring is conducted. Monitoring is typical conducted at visitor centers and entrance stations/fee stations throughout the network. Monitoring is also frequently conducted on busy trails or trails with sensitive vegetation or formations.

Data Format-- is what form the data for each monitoring method are kept in by the parks. Seven parks reported keeping hard copies of monitoring data. Seven parks reported keeping monitoring data in a spreadsheet and 5 parks reported entering monitoring data into a database.

How Managed-- is how data are assembled, verified, entered, and/or distributed. Please see the NCPN database for details.

How Analyzed-- is any analysis conducted on data gathered through various monitoring methods. Several parks (ARCH, ZION) indicated specific analyses that were done. Please see the NCPN database for details.

How Applied-- is how the data are used by each park. Many parks reported using this information to monitor visitor trends (yearly or seasonally), to justify funding increases and/or new programs, and to determine visitor use in some areas. Please see the NCPN database for details.

Perceived Benefits-- is any benefits of each monitoring method as perceived by the person contacted. The responses to this question varied widely and the NCPN database should be referenced for details.

Perceived Drawbacks-- is any drawbacks of each monitoring method as perceived by the person contacted. It was reported that occasionally equipment used for visitor monitoring malfunctioned resulting in potentially inaccurate data (i.e. traffic counters over or under counting).

Summary of Additional Information From Interviews

Some information related through the interviews did not lend itself to entry in the spreadsheet database (e.g., the type of information included things such as general comments or thoughts of those interviewed or observations made by the interviewers). Such information is summarized in this section.

A discrepancy exists in visitor monitoring in the NCPN between the methods used by large parks and the methods used by smaller parks or monuments. This result was expected considering smaller units often have fewer resources available to them. However, small parks or monuments can be just as fragile or subject to negative impacts from visitation as the larger units. Some form of continuity in monitoring among the units in the network would be useful and it appears that this may be possible with assistance.

It seems that in larger parks, particularly, it was often difficult to track down all of the information we were looking for. Upon contacting one person, we may have been referred to several other people, who in turn may have referred us to someone else. In some cases, one person we spoke to may have given us some information, which was later contradicted by another person at the same park. For example, at one park, the first person contacted was under the impression that some sort of head counts are conducted at the visitor center and museum, but suggested that another individual be contacted for detailed information. This person was contacted via e-mail and said that there is no visitor monitoring conducted. However, while speaking to a third person about other front country monitoring, it came up that he believes they use a hand counter to do head counts at the visitor center and museum. It is possible that the individuals we spoke with may have differing ideas about what constitutes visitor monitoring but this may also signal a breakdown in communication among park staff. It is not surprising that there might be some confusion when there are many people involved in different aspects of visitor monitoring. Due to time constraints or possibly staff turnover, it is not always possible for all staff to stay updated on changes in monitoring procedures.

Also, there were several times when park staff were not sure of answers to questions such as how long monitoring has been conducted or what other divisions might do with monitoring data collected (how data are managed or applied). It seems that often this is because the person we talked to did not have records to supply this type of information. Accurate records of visitor monitoring may not have been kept in the past making it quite difficult for current employees to find some types of information. (Because of these occasional discrepancies, some information contained in the database may be slightly inaccurate.)

With regard to smaller parks, it was a fairly common sentiment that a project such as this one should be quite useful because the staff at these parks feel they do not get enough information about their visitors, and would like ideas as to methods that might achieve this. The smaller parks tend to have less diverse methods of visitor monitoring, and may only do entrance/fee station counts of cars or visitors (depending on whether or not it's a walk-up fee station). If more is known about park visitors, they can be better served by the park staff.

Many of the NCPN park staff that were interviewed mentioned barriers that are present and keeping them from fully utilizing the information they have gathered. One commonly expressed thought is that there simply is not enough time to collect and properly manage, analyze, or apply the data as effectively as park staff would like. Time constraints limit the amount and type of visitor monitoring data gathered and also limits the usefulness of the data that park staff are able to collect because they simply cannot dedicate as much time to visitor monitoring as they would like. Park staff would like to see the data that is collected being more effectively utilized. Increasing the efficiency of the monitoring techniques may aid park staff in fully utilizing the data collected.

The majority of NCPN parks are not performing any additional analyses of the data they collect and a barrier that might be responsible for this was a lack of full understanding of some of the software and equipment that is being utilized in monitoring. This limits the amount of analysis that a park can perform on the data collected thereby limiting the understanding of visitor use patterns.

The NCPN parks are mandated by the National Park Service to monitor the number of visitors that they receive. The challenge that the NCPN parks face is to monitor visitor use in a way that will give a full understanding of the spatial and temporal patterns of visitor use. This may be achieved through effective and efficient data collection and analysis. Standard protocols will be developed to aid NCPN parks in expanding and improving the monitoring of visitor use patterns.

Phase Two – Identification of visitor information needs

The purpose of this phase was to identify current and future visitor monitoring needs within the NCPN parks. Monitoring of visitors use is critical and can provide information such as trends in numbers of visitors (seasonal, yearly) and where visitor use is concentrated. This information can then be used by park staff to help mitigate physical and social impacts.

To meet this objective, a Workshop on Monitoring Visitor Use Patterns was held in August, 2005 in Fruita, Colorado. Representatives from the 16 NCPN park units helped identify common visitor information monitoring needs. Prior to the workshop, NCPN park staff responded to a survey eliciting their concerns regarding visitor use monitoring, what additional forms of monitoring data needed to be collected, any additional visitor monitoring needs that are not being met, what more could be done with the existing collected visitor monitoring data, and what barriers keep the data that is collected from being used. The questions and the responses are listed in Appendix C.

An agenda for the workshop was sent to all participants prior to the meeting (Appendix D). During the workshop, the results of the inventory phase were presented including examples representing the range of existing visitor monitoring programs and the costs and benefits of each. Participants then identified existing and future monitoring needs and identified potential barriers to their implementation.

Pre-Workshop Survey Results

Park staff from each of the 16 NCPN parks was contacted in June 2005 to participate in a workshop in Fruita, Colorado during August 2005. Prior to the workshop, participants were asked to respond via email to a series of questions related to current and future visitor monitoring needs that were specific to issues of visitor use in their specific park. The collection of this information would prompt each participant to evaluate the unique issues relevant to their park and to identify common themes across all NCPN parks. The survey questions and responses by park are listed in Appendix C.

Concerns Regarding Visitor Use Impacts

The most commonly identified concern across parks were the impacts to resources from multiple trails or "social trails." The impacts discussed ranged from trampling vegetation, soil erosion, introduction and spreading of exotic plants, litter, graffiti, and impacts to wildlife. Other concerns noted were the impacts of motorized use, impacts to backcountry/wilderness areas, archeological sites and cave resources, and social impacts that include noise impacts on the natural soundscapes and visual impacts to the resources.

Additional forms of Monitoring Data Needed

An understanding of both the distribution and concentration of visitors was the most commonly cited additional monitoring data needed. Most parks collect overall visitor numbers, but the need for understanding where these visitors go in the parks especially in the backcountry was noted by

each park. Additionally, many mentioned understanding where and why visitors concentrate (typically at attraction sites and/or popular trails) that would be useful to understand impacts on resources. This was cited as especially relevant in already heavily impacted areas. Trail counter data was cited as one method to understand the distributional patterns. Other information needs noted were an understanding of visitor expectations, attitudes and their understanding of resource issues.

Additional Monitoring Resources

Additional staff and expertise to evaluate existing data and to initiate future data collection efforts were the most common additional monitoring resources cited by park staff. Specific needs included traffic and trail counters, methodologies to monitor backcountry use, remotely sensed data, and an on-going commitment to monitor the key data needs.

Capitalizing on Existing Monitoring Data

Current monitoring data needs to be better organized, made more accessible to users, and needs far more analysis to answer basic visitor monitoring questions. Additional analysis of data to understand the linkages between use, visitor characteristics, and impacts was also noted.

Barriers to Implementation

Lack of resources such as time, money, and expertise were the most commonly cited reasons for not using currently collected data. More specific responses included having personnel with specific technical expertise dedicated to analysis or at least to have a percentage of their time available for these tasks. Other barriers noted were propriety databases that were costly to access and fears that data would affect funding.

Role of Office of Public Use Statistics

Most respondents noted that the database maintained by this office provide historical visitation data that illustrates trends in visitation. Some parks note that this data is their primary source of visitor use data while others rely less on this data.

Workshop on Monitoring Visitor Use Patterns

The workshop was held August 2, 2005 at the La Quinta Inn, Fruita CO. Twenty one attendees representing each of the units in the NCPN, the Office of Public Use Statistics and The University of Montana (see Appendix D for the Agenda and list of attendees). A brief overview of the existing visitor monitoring conducted at the 16 NCPN parks was presented from Phase One. Presentations from Arches, Cedar Breaks, Zion, and the Office of Public Use Statistics outlined the variety of visitor use monitoring that was currently on-going in the NCPN. Examples of monitoring trail use in Yellowstone with the use of GPS and GIS technology then followed. These presentations were designed to illustrate a range of potential visitor use monitoring techniques from simple entrance counts to more involved and sophisticated methods of modeling backcountry visitor patterns.

A nominal group process was used to identify information needs. The workshop attendees were divided into two groups and were asked as individuals to make a list of responses to the following questions: "What are your park's information needs regarding visitor monitoring? What more use can be made of the data that are already collected"? People were given ten minutes for this task. Going around one-by-one, each person then read their first response which was written on a flip chart. This process continued from person to person until everyone had exhausted their list. Each response was then discussed to clarify what was meant or to combine several responses that were similar (see Appendix E). Next the responses were ranked in terms of their importance. Each person ranked their top five information needs and then placed their ranking number (5-highest to 1-lowest)) next to a response based on how important they considered it to be. At the end of this process the ranking numbers for each information need was tallied and a final ranked list was made for each of the two groups (Table 4). The lists were then discussed and similarities between groups were identified.

Table 4 - Ranked Results from Nominal Group Process

"What are your park's information needs regarding visitor monitoring? What more use can be made of the data that are already collected?"
Bolded numbers indicate total rank points.

Group 1

1. How can we get visitors to help protect the park's resources and become advocates for parks? **21**
2. Understanding visitors and their associated impacts. **12**
3. Tie between following:
    a. Do visitors understand the park's mission and what park expectations are? **10**
    b. Does data ever go bad or does it just get stale? **10**
    c. Are there practical uses for historical data and current visitor use data? **10**
    d. What kind(s) of experiences are visitors expecting? **10**
    e. How do local communities value the integrity of park resources and become park advocates? **10**
4. Tie between following:
    a. Are visitors going to tolerate the loss of NPS programs that are not core to individual parks' purposes? **6**
    b. What would influence visitors to make behavioral changes to protect/benefit the resource? **6**
    c. What percentage of visitors have an emotional connection to the resource? How can we increase this? **6**
5. Are use limits appropriate for resource protection and visitor needs? **5**
6. NPS visitor use patterns and expectations. **4**

Group 2

1. Effective ways of social engineering (modifying visitor behavior – the role of education), visitor expectations and behavior. **20**
2. How many people are going to different areas of the parks and their distribution? **16**
3. Connect visitor numbers to types of impact. **14**
4. What are the impacts? **11**
5. Tie between following:
    a. Gather experiences and expectations both in front and backcountry. **10**
    b. Visitation profiles/demographics. **10**
6. Demonstrate and track cumulative impacts. **9**
7. Winter use in high elevation areas (e.g. CEBR) **8**
8. Where are high impact areas located? **5**
9. Develop protocols in conjunction with other monitoring efforts. **2**

The workshop participants identified social science data as their most important data need. These focused on educating visitors and communities so they understand the natural resources of parks, how visitor use impacts these resources, and how to change visitor behavior to mitigate the impacts of visitor use so that visitors can advocate for the protection of Park resources. Implicit in this is not only having good visitor counts, but also to be better able to understand visitor spatial and temporal distribution within parks. And then to relate these variables to resource impacts.

Having visitors and local communities become advocates for parks and park resources is not a new idea. Historically, the role of public advocacy for National Parks and the protection of the resources is what many attribute to the formation of the "National Park Ideal" in the fictionalized 1870 campfire conference at the junction of the Firehole and Gibbon Rivers, by members of the Washburn-Langford-Doane Expedition. Early efforts focused on bringing the public into the National Parks via railways, luxury but rustic hotels, and later on with the automobile. It was the success of these early efforts in introducing Americans' to their National Parks that led to the creation of National Park Service and later Park advocacy groups such as the National Parks Conservation Association. Education and interpretive programs can provide visitors with the knowledge and understanding of Park resources, how visitor use can impair those resources, and suggest behaviors that can minimize or mitigate impacts to Park resources. But this requires an understanding of how visitor use relates to resource impacts. There is a wealth of research that provides some guidance in achieving these goals (Orams 1995; Olson et al, 1984; Kuo 2002; Hammitt and Cole 1998).

Information needs more specific to this project involve quantifying the overall number of visitors in each park within the NCPN. The NPS Public Use Statistics Office maintains an on-line accessible database of monthly visitation by Park that includes recreation visits, lodging by type, and number of overnight stays. This information is available across the NPS system and the methodology used at each unit can be accessed (NPS 2006b).

Resource impacts tend to be fairly site specific; therefore, it is critical to be able to identify the extent and the characteristics of visitor use at the same spatial scale. Understanding overall Park

visitor use provides some insight into the magnitude of potential visitor resource impacts. But where and to what degree visitors disperse and then congregate in a park largely determines where impacts occur and to some degree whether or not serious impacts occur at all. In addition, visitor characteristics (e.g., group size, mode of travel, overnight/day use, etc.), preferences, motivations and expectations to a large extend defines the spatial distribution of visitors within a park and the specific types of impacts.

The results of the workshop indicate the need for a strong social science component in the inventory and monitoring efforts of the NPS. The impact of visitor use is one of the major system stressors identified as a vital sign of park resource health (Miller at al. 2003). But while mangers and park staff have some information about overall visitor numbers, there is a dearth of data on the number and behaviors of visitors once they are in the parks and how these relate to resource impacts. During the course of the workshop, many participants identified specific resource impacts occurring in their parks that were related to visitor use but noted they were in many cases unable to characterize the relationship or more importantly how to mitigate those impacts. It was plainly clear that having a basic understanding of visitor motivations, expectations, and spatial patterns would go a long way in understanding the relationship between visitor use and specific impacts to wildlife, water, terrestrial and social resources in the NCPN Parks.

Phase Three - Visitor Monitoring Methods to Address NCPN Needs

Introduction

In this section, recommendations to address the information needs identified in Phase Two are presented. The need to monitor visitor use patterns can range from the collection of entrance figures to the modeling and simulation of visitor use patterns and their effects on visitor experience and resource impacts.

While most parks in the NCPN currently have total visitor count data available by month (NPS 2006b), the information gathered during the workshop (Phase Two) indicated that the primary concern involved the proliferation of "social trails" and other trail related impacts. The primary data need identified was to understand the spatial patterns of visitors in the park. There are a variety of methodologies that can be utilized to provide this information including the use of trail counters, vehicle counters, visitor registration systems, permit systems, direct observation, and visitor surveys.

Background: Managing Visitor Impacts

Managing the impacts of visitor use requires a decision making framework. The VERP (NPS 1997) framework is based on maintaining the quality of the visitor experience and protecting natural and cultural resources in the face of increasing visitor use. Anderson et al. (1998) outline a useful decision process for managing social and biophysical impacts of recreation use that consists of five major stages: (1) problem awareness, (2) problem specification, (3) strategy and tactic selection, (4) plan implementation, and (5) monitoring.

In the problem awareness and specification stages, managers identify specific unacceptable impacts, document existing conditions, and identify the underlying causes of the impacts. The VERP management framework gives guidance to managers in determining levels of unacceptable impacts through the use of indicators and standards (Lime et al. 2004). Examples of the many types of impacts that can occur from recreational use are shown in Table 5. Identifying the causes of these impacts is critical before management can implement strategies to address the problem. The impacts from visitor use can be directly attributed to visitor use (e.g., trail deterioration due to heavy use by hikers) or indirectly attributed (e.g., water quality issues due to water runoff from soil compaction). In addition, the impacts from visitor use are related to other visitor characteristics such as visitor distribution, type of user group, group size, visitor behavior, mode of travel, and the environmental durability (resiliency and resistance) of the resources (Hammitt and Cole 1998).

There are four broad management strategies that can be applied to address the unacceptable impacts of visitor use on park resources and visitor experiences (Manning 1999). Specific strategies can focus on increasing the supply of opportunities (greater array of places, more access to areas, additional facilities, shifting use to off-peak times, etc.), decreasing demand (use limits, access restrictions, etc.), reducing the impacts of use (disperse or concentrate use patterns, zoning, group size limits, etc.), and increasing the durability of resources (develop facilities and site hardening such as trail paving, building walkways, etc.).

Table 5 – Examples of Resource and Visitor Experience Impacts.

Resource Impacts

Trail deterioration, trail erosion, excessive trail muddiness, excessive trail width, excessive trail depth/development of tread ruts or grooves; development of social trails.

Campsite deterioration, excessive campsite size, loss of vegetation, erosion of campsite soils, proliferation of tent sites, depletion of dead and downed wood for campfires, proliferation of fire rings; proliferation of campsites.

Cultural resource deterioration, defacement of cultural resources, theft of cultural resources. Improper disposal of *human body waste*, unacceptable amounts of human body waste at site.

Water pollution, contamination of water body with fecal material, soap residue, chemical substances, or food and animal remains.

Unacceptable levels or types of *litter*, improper disposal of garbage, unacceptable evidence of humans (e.g., trail markers, cairns).

Trampling of *vegetation*, loss of herbaceous vegetation or seedlings, change in species composition, introduction of exotic species, improper collection of specimens, deterioration of grazing areas, trampling of tree roots, nails in trees, peeling of bark, carving initials/words into bark, felling of live trees.

Soil compaction, erosion of organic litter and soil, excessive muddiness, disturbance of cryptobiotic crust.

Wildlife and fishery impacts, destruction or loss of habitat, change in species composition, introduction of exotic fauna, harassment or disturbance of wildlife, competition for food sources, attraction of wildlife, illegal hunting or fishing.

Visitor Experience Impacts

Unacceptable levels of *crowding* at attraction sites; unacceptable number of encounters at trailheads, in visitor centers, on trails, or at campsites; congestion, unacceptable traffic conditions on park roads, lack of available parking spaces.

Visitor conflicts due to incompatible uses, encounters with large groups or parties dissimilar to one's own, rowdiness by itself or in combination with excessive consumption of alcohol, visitor displacement (spatial, temporal, or total).

Noncompliant behavior, vandalism, resource destructive behavior.

Inadequate or inappropriate levels of access to facilities, natural areas, or cultural resources; facility design that fails to accommodate the needs of the broadest possible spectrum of people, including persons with disabilities.

Threats to *visitor safety*, behavior that jeopardizes the safety of the individual or of other visitors, failure to maintain a safe environment through facility design, maintenance, or other means.

From (Anderson et al. 1998).

An effective visitor monitoring system will provide managers with not only data on how many visitors, where they go, or what they do, but is a broader system driven largely by a set of management objectives. Watson et al. (2000) notes that an effective system is a conceptual structure that is driven by five sequential and interrelated steps:

1. A statement of objectives.
2. Identification of the specific use characteristics to be measured.
3. Choice of appropriate visitor use measurement techniques.
4. Choice of the appropriate strategy for sampling.
5. Choice of a specific technique and/or procedure for data analysis and summary.

In the following sections, several methods of collecting data to help estimate the spatial patterns of visitor use are described. These include the use of vehicle counters, trail counters (includes an example of utilizing Global Positioning System (GPS) and a Geographic Information System (GIS) in several backcounty areas in Yellowstone National Park), visitor registration and permit systems, direct observation methods, and visitor surveys. An additional example report on preliminary findings of soundscape monitoring for Zion National Park is included.

Vehicle Counters

Mechanical traffic counters typically are used to measure entrance gate visitation or to collect data on specific road use. But vehicle counters can also be used to collect data at specific trailhead parking lots. While these types of counts do not provide direct trail use figures, they can provide and estimate of the numbers of visitors using the trails. This type of application requires observation or other sampling techniques (visitor surveys, etc.) to estimate the average number of people per car, the number of people that actually use the trail, and trail usage characteristics.

The three most common types of vehicle counters are photoelectric, sensor-plate, and loop-type counters. Costs vary from $180 to well over $2,000 depending on the type and complexity of the counter, the setup, and the data retrieval system. (For a complete discussion of costs, see Watson et al. 2000).

Vehicle counters once calibrated (direct observation through sampling of the accuracy of counts), provide full time accurate counts of vehicles. Site selection and periodic maintenance increase the accuracy as issues such as battery usage, data downloading, and changes in visitor characteristics can seriously affect accuracy of the counts and estimates. Watson et al. (2000) stress the importance of consistent calibration as key to ensure the quality of the data from vehicle counters but also add to the cost of implementing this strategy.

Trail Counters

The use of trail counters provides the best estimate of actual trail use. The placement of trail counters on a trail network can give very accurate counts of the number of people on each section of the trail. Counters can be left permanently in one location or can be moved around to provide sample estimates for trail use. Sampling at a variety of locations can reduce equipment costs, but generally increases the cost of installation, calibration, and the statistical procedures to estimate overall trail system use. It also reduces the precision of estimated use.

Trail counters function similarly to vehicle counters and are typically photo-electric or infra-red beam, loop-type counters and pressure-sensor counters. The cost of acquiring the counters is similar to vehicle counters but the costs to calibrate can be much higher. Counters have to be hidden to reduce the chances of vandalism to or theft of the counter. Trail counters have proven to be less accurate than vehicle counters due to the type of use on trails and the sensitivity of the counters (e.g., animals using the trails, groups of people, etc.).

Trail Counter Example: Day use monitoring in Yellowstone National Park

Gracia-Longaas (2005) tested the accuracy of mechanical trail counters in the Slough Creek and Hellroaring Drainages of Yellowstone National Park. She monitored trail counters near the trailheads and again approximately a mile down the trail. Observations of the trail counters were made on a random schedule throughout the summer of 2003. Via observations, visitors were classified during those observations on readily apparent categories (gender, equipment, ages, group size etc.). GPS units were also distributed to a sample of the trail users throughout the summer. These results allowed assessment of the accuracy of the mechanical counters, the type of users on the trials and the geographic distribution of day visitors to these two drainages.

Accuracy of trial counters

By comparing visual observations and mechanical counts, Gracia-Longares determined that mechanical trail counters were accurate at determining when there were no people present 95 percent of the time or more.

When people were present, the correlations were quite high when relationships were assessed in one or four hour blocks. In shorter time intervals, there was considerable error associated with the precise times that the counter logged a visitor relative to when the observer logged a visitor. Since the counters logged visitors per minute, the observer could have seen the person in the previous or next minute.

Using the visual observations to calibrate the error within the mechanical counts, the estimates of error on use levels per four hour period were calculated and are presented in (Table 6). Based on these estimates, it was possible to calculate total use over the season (Table 7) and to fit the error of each counter over the season. Consequently, while the estimated use presented by counter one was 3908 visitors per season, managers would need to see over 4445 (a 13% increase) visitors within a season to be 95% sure that use of the trail had actually increased.

Table 6- Estimated amount of visitor use / 4 hours and its confidence intervals at different levels of confidence.

Unit #	Visitors per four hour period	*Confidence Intervals*			
		95%	90%	80%	70%
2	12.92	9.82 – 12.96	10.11 – 12.67	10.42 - 12.36	10.61 – 12.17
4	11.60	10.41 – 13.99	10.83 – 13.57	11.21 – 13.19	11.43 – 12.97
5	21.33	19.49 – 21.83	19.73 – 21.59	19.97 - 21.35	20.12 – 21.20
6	14.25	10.59 – 15.41	11.05 – 14.95	11.54 – 14.46	11.84 – 1416

Table 7- Estimated total use (visitors per season) and its confidence intervals at different levels of confidence (values estimated from # visitors per 4 hours).

Unit #	$\hat{Y}$	Total use Estimate	# days season	Confidence Intervals			
				95%	90%	80%	70%
2	12.92	3908	98	3368 - 4445	3468 – 4346	3574 – 4239	3639 – 4174
4	11.60	4185	98	3571 - 4799	3715 - 4655	3845 – 4524	3920 – 4449
5	22.50	7087	98	6685- 7488	6767 – 7405	6850 – 7323	6901– 7272
6	14.25	4459	98	3632 – 5286	3790 - 5128	6850 - 4960	4061 – 4857

Note: 1 day has 3.5 periods of 4 hours

Using GPS to estimate travel patterns

GPS units set to record routes were handed out at the parking areas of the Slough Creek and Hellroaring trailheads. The working day started at 7:00 am, 8:00 am or 9:00 am and finished at 5:00 or later, depending on whether all units were already returned to the researcher by that time. The routes were downloaded onto a laptop immediately after the researcher got the GPS unit back. Once downloaded, the units were once again ready to hand out.

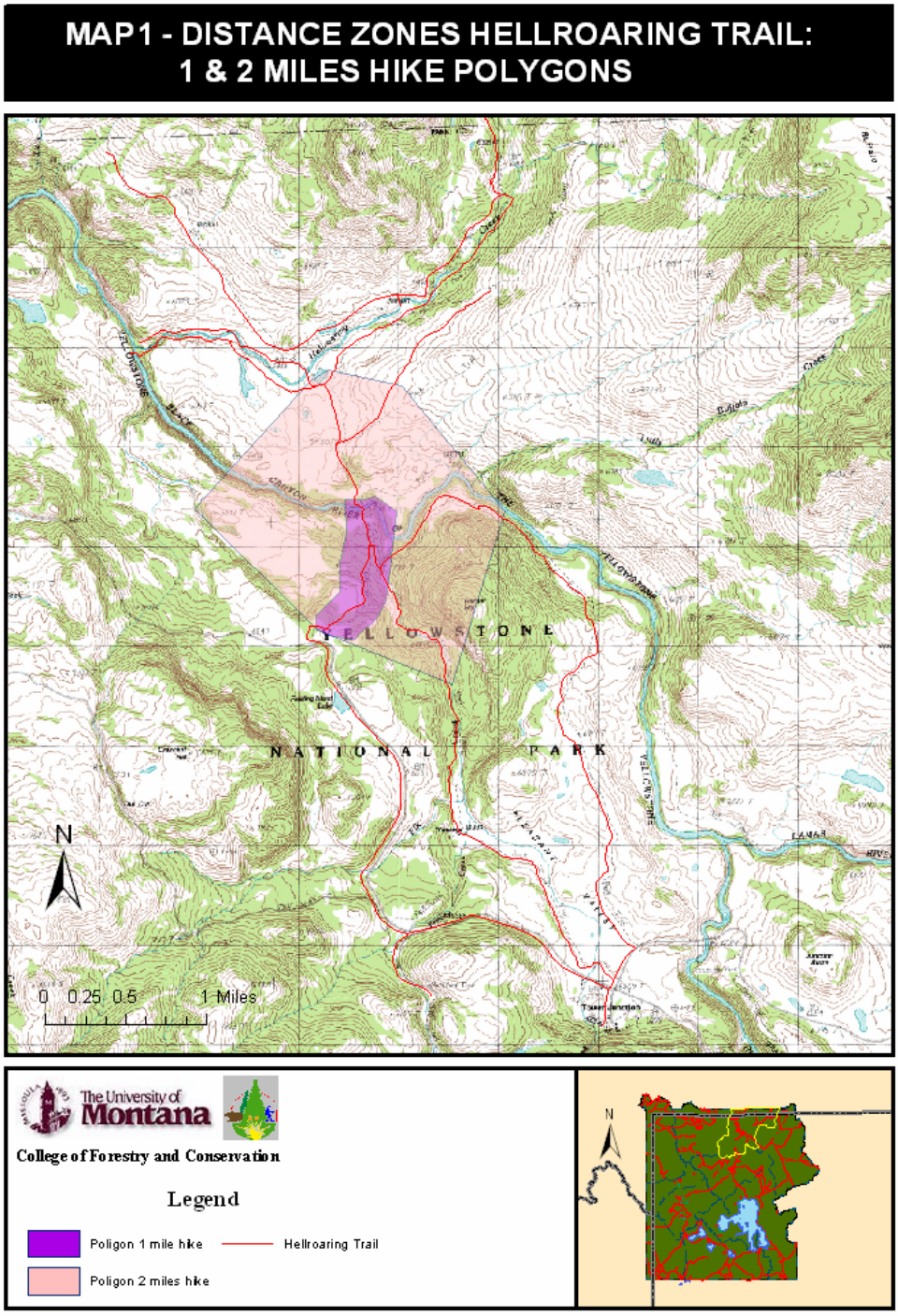
The resulting information allowed managers to assess where visitors went and the pace in which they did so. The routes were compiled with the Topofusion and ArcGIS mapping programs. Observations of the visitors allowed the comparisons of visitor routes by category (gender, activity, group size etc.). Distance zones were identifiable by looking the geography of interest and visitor use patterns. Profiles were developed of the visitors who walked stayed within the distance zones and who stayed on or left the trails (Figure 2).

The profile of the day-hiker that hikes up to 1 mile on the Hellroaring trail gather the following characteristics: man or woman most likely between 31 and 45 years old; the party size is usually two people most likely friends or family; hikers travel mainly by foot; and generally, hikers carry a camera or a pair of binoculars.

The profile of the day-hiker that hikes up to 2 miles into the Hellroaring tend to be males (15 years old or less); the party size is usually 2-3 people, most likely friends or family; hikers travel mainly by foot; and generally, hikers carry a camera or a fishing pool as a second option.

The profile of the day-hiker that hikes more than 2 miles are dominantly men between 16 and 30 years old; the party size is usually 2-3 people, most likely friends or family; hikers travel mainly by foot; and generally, hikers carry a fishing pool or a camera as a second option. It seems that there are no differences in groups of age depending on distance covered. The 31-45 generally predominates at all distances, followed closely by the youngest groups (the 16-30 group and the "under 16" group). Just the group "over 55", although being the least numerous group in all the distances, seems to grow with increased distance. Age and distance seem to be inversely related. The percentage of fishermen seems to increase the further people hike into the wilderness, and the average speed shows a slight increase when the distance is bigger. The number of fishermen and average speed seem to be directly related with distance.

Figure 2. Distance zones Hellroaring Trail: 1 and 2 miles hike polygons.



Visitor Registration And Permit Systems

Visitor registration systems are typically voluntary stations that are unstaffed. Visitor registration can provide information on visitor characteristics, destination and travel patterns, and activities but are limited by how many questions visitors are willing to answer. The inclusion of too many questions provides a greater burden on visitors and results in incomplete surveys and data. Visitor compliance with registration is voluntary and can vary widely. Research has shown that the location of registration stations affect compliance as does having an attractive well marked sign that provides visitors with clear directions and the purpose for the data collection (Petersen 1985).

Permit systems can be self-issue (and as such have similar issues as visitor registration systems) or can be issued by agency personnel (costs and visitor compliance are both higher). Permits issued by agency personnel generally provide much more accurate information as both visitor compliance is higher and the completeness of the permit can be ensured. Mandatory permits also provide much more accurate information than voluntary permits.

Direct Observation

This involves counting visitors based on a periodic sampling of trails or other areas of interest. This can provide accurate estimates of visitor use but requires careful sampling techniques to ensure random sample times and requires expertise to estimate population counts based on samples. Costs can vary based on personnel availability and cost. The use of volunteers can reduce costs but can also introduce bias into sample. In some areas with high use it might be difficult to count accurately and in low use areas, observer fatigue and boredom might reduce accuracy of results. Other types of observation systems include the use of cameras that are triggered by movement or are set to periodically photograph an area. Mechanical failure and theft of equipment can also be issues.

Direct observation when combined with trail counters provides a fairly cost efficient and accurate method of measuring trail use. Random sampling of direct observation can be combined with trail counters to both calibrate the counters and to provide additional information such as group size and composition (age, gender, etc.), type of equipment used, method of travel, and specific behavioral observations (e.g., depreciative behavior, off-trail use, etc.).

Visitor Surveys

The use of visitor surveys can provide detailed information of visitor characteristics, travel patterns, preferences, behaviors, etc. This method involves sampling a group of visitors to an area of interest. It requires the development of sampling design to ensure a representative sample of the population of interest (e.g., visitors to the AB trailhead). Visitors must first be identified and contacted and then either given an on-site survey or provided a mail back survey that they fill in at some later date. On-site surveys are limited in the information that can be collected as they impose a time burden on visitors. Mail back questionnaires allow visitors to fill them in at their convenience but suffer from visitor recall bias (not remembering the specifics of their visit) or some level of non-respondent bias (not everyone mails back the survey).

Soundscape Monitoring

Studies of sound and its effect on people have focused primarily on the effects of sounds from aircraft overflights, the sounds of traffic, and the annoyance and intrusiveness of sounds during completion of tasks. Information regarding the effect the sounds other humans on people is limited. Grau (2005) studied the effect of the sounds of visitors in a slot canyon of Zion National Park. The study was conducted in a laboratory setting with 197 college undergraduates at the University of Montana.

A multi-sensory approach was developed by incorporating sound into a previously-used visual crowding research method. Survey respondents assessed the acceptability of 16 settings which included various combinations of images depicting three different numbers of people in a slot canyon setting and three different levels of sound recorded in the area.

Analysis of the data showed that human sounds of over 50 decibels had a significant effect on sound acceptability as well as overall setting acceptability (Table 8). This suggests that wildland recreation managers should consider and perhaps monitor the sounds of visitors (emanating from machines or people themselves) as an important part of visitor experiences. Study findings suggest that a multi-sensory research approach may be extremely useful in the development of standards of quality for crowding and levels of human sound.

Table 8. Mean people acceptability rating (on a scale of 1-9) at each sound level with number of people held constant

	Mean acceptability of 4 people	Mean acceptability of 16 people
Natural sound at 40-50 decibels	6.97	3.93
Natural sound at 40-50 decibels and human sound at 50-60 decibels	5.98	3.51
Natural sound at 40-50 decibels and human sound at 60-70 decibels		2.96

Sound level does affect the acceptability ratings of the number of people in a setting. By holding the number of people in the settings constant, it is possible to observe the significant difference in the mean acceptability rating of people at each sound level could be removed, even if it was only a fraction of a second.

Recommendations for Visitor Monitoring Methods in NCPN Parks

The preceding sections briefly outlined several methods to count trail use. Each method provides varying degrees of precision, cost and reliability. Typically there is a tradeoff between accuracy, ease of implementation and cost (both in terms of equipment costs and personnel costs). While permanent trail counters potentially provide the most precise and cost efficient method, they do not provide information on visitor behaviors, motivations, etc. A visitor use survey on the other hand can provide this type of data, but typically is a fairly costly undertaking. Trail registration methods can provide some information on visitor characteristics and visitor numbers, but typically tradeoff overall precision.

Ultimately the decision of which methodologies to utilize should be driven by the planning objectives articulated by park planners and managers. It is critical to identify the specific resource impacts that can be attributed to visitor use. In the NCPN parks, these specific impacts varied depending on use levels, visitor use characteristics, park policies, and the resistance and resiliency of park resources. The planning and decision framework used should provide guidance as to the appropriate monitoring methods chosen specific to the type and extent of visitor use and visitor characteristics.

The following decision framework for collecting visitor use information can provides NCPN staff with a clear step-by-step process to identify the specific resource/visitor use problem and determine the appropriate techniques to collect visitor use data. This framework is based on the decision process outlined by Anderson et al. (1998) and Watson et al. (2000).

Visitor Use Monitoring Decision Framework

1. Problem awareness – Recognition that specific unacceptable resource impacts exist that must be addressed. This information can be derived from public input, resource managers, or ongoing monitoring programs.
2. Problem specification – Identify the specific impacts that are currently occurring and the root cause of the impact. The resource and visitor experience impacts shown in Table 5 provide a good starting point to help articulate the relationship between impacts and visitor use.
3. A statement of objectives. This step involves articulating the type of information to be collected and the purpose for which it is collected.
4. Identification of the specific use characteristics to be measured. This involves whether visitor count data are sufficient or if visitor attribute data are also needed. Visitor attribute date provide information on length of stay, group size, activity participation, mode of travel, experience levels, demographic characteristics, visitor preferences, and other variables (use of commercial services, temporal and spatial distribution, etc.).
5. Choice of appropriate visitor use measurement techniques. This step is involves identifying the technique that provides the needed data with an acceptable level of precision with acceptable management costs and visitor burden. Table 9 provides a quick overview of the types of data that can be collected, visitor burden involved, management costs and the level of accuracy of each of the visitor use estimation techniques.
6. Choice of the appropriate strategy for sampling. Random or systematic random sampling methods provide the highest level of accuracy over “convenience sampling” methods.

7. Choice of a specific technique and/or procedure for data analysis and summary.

Table 9 Summary of visitor use estimation techniques (Watson et al 2000).

Technique	Use characteristics[a]	Visitor burden	Management costs	Accuracy
External visual observation	1 2 3 5	None	High	Variable
Stationary internal observation	1 2 3 5 6	None	Variable	Variable
Roaming internal observation	1 2 3 5 6	None	Low	Low
Mechanical counters	1, 6	None	High	High
Registration	All	Low	Moderate	Variable
Permits	All	Moderate to high	Variable	High
Surveys	All	Moderate	High	Variable
Indirect estimation	1, 5	High → low	High → low	Variable
Aerial surveys	1, 2?, 3?, 5?, 6?	High	High	?

[a]Specific use characteristics are indicated as follows: 1 = Individual/group counts; 2 = Group size; 3 = Method of travel; 4 = Length of stay; 5 = Activity type; 6 = Use patterns; 7 = Nonobservable characteristics (sociodemographics, attitudes, experience, etc.); ? = Unknown

Within the NCPN parks and the resource problems articulated through the workshop and surveys of current and future visitor monitoring needs, the use of trail counters to provide visitor counts would provide the most cost effective and accurate technique. The data provided by trail counters that are either positioned in permanent locations or moved in a systematic random sampling procedure would allow managers to understand both the temporal and spatial distribution of park visitors within defined areas of each park. This technique would also require the use of visual calibration of the trail counters to ensure their accuracy. In addition, the personnel performing the trail counter calibration can observe specific visitor characteristics such as group size, method of travel, general activity types, and use patterns. A system that also included trail registration data (and included a random sampling compliance check of visitor registration rates) could provide other visitor characteristics.

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Appendix A--Interview Questions for Development of Visitor Monitoring Programs for NCPN Parks

1. Which Park?
2. Monitoring category/What type of monitoring is used? (visitor center, back country permits, trail counter, ranger led talks, data from outfitters?)
3. Physical count or number from permit or concession report?
4. Description of monitoring:
5. General/Park wide or specific?
6. Staff Required? Any specialized or additional staff required?
7. Equipment description?
8. Equipment cost?
9. Required for NPS annual reporting?
10. Used in natural resource management? How so?
11. Who is the person responsible for information/contact for additional information?
12. Start date? Date the monitoring started?
13. End date? Or ongoing?
14. Is monitoring seasonal/continuous?
15. Location: Specific location where monitoring occurs? Specific trails? River permits?
16. Data format? What format is the data in? (spreadsheet, database, hard copies?)
17. How is the data managed? How are data assembled, verified, entered, distributed?
18. How is the data analyzed? Describe any analysis that is conducted?
19. How is the data applied? How is it used by the park?
20. What are the benefits of the monitoring, as perceived by park personnel?
21. What are any drawbacks, as perceived by park personnel?
22. Overall assessment of the utility of monitoring?

Appendix B- NCPN Contacts

Park Unit	Person	Division/Position	Phone
ARCH	Charlie Schelz	Biologist	(435)719-2135
ARCH	Gary Marsh	Chief Ranger	(435)719-2221
BLCA	Ken Stahlnecker	Chief of Resources	(970) 641-3127
BLCA	Linda Alick	*not sure of her position	(970)-641-2337X221
BRCA	Merna Winters	Ranger Activities	(435) 834-4801
BRCA	Kristen Legg	Chief of Resources	(435)834-4900
CANY	Peter Fitzmaurice	Chief Ranger	(435)719-2221
CANY	Mike Hill	Interpretation	(435)719-2141
CANY	Karen Sloan	Interpretation (Needles)	(435)259-4711
CANY	Nancy Holman	Interpretation (Island in the Sky)	(435)259-4712
CANY	Laura Lusk	Statistics	(435)259-4712
CANY	Dave Wood	Planner	(435)719-2133
CARE	Tom Clark	Chief of Resources	(435)425-3791X44
CEBR	Steve Robinson	Chief Ranger	(435)586-9451
COLM	Dave Price	Natural Resources Specialist	(970)858-0372
COLM	Ron Young	Supervisory Park Ranger	(970)858-3617X312
DINO	Phil Akers	Chief Ranger	(970)374-3022
DINO	Tamara Naumann	Botanist	(970)374-2501X1
FOBU	Clayton Kite	Biologist	(307)877-4455
FOBU	Dave McGinnis	Superintendent	(307)877-4455
FOBU	Marcia Fagnant	Lead Park Ranger	(307)877-4455
GOSP	Melissa Cobern	Chief Ranger	(435)471-2209 ext. 13
GOSP	Mary Risser	Superintendent	(435)471-2209 ext. 12
HOVE	Ralph Jones	Chief Ranger	(435)692-1234 x13
NABR	Ralph Jones	Chief Ranger	(435)692-1234 x13
PISP	Andrea Bornemeier	Chief Ranger	(928)643-7105
TICA	Mike Gosse	Chief Ranger	(801)756-5239
ZION	Jeff Bradybough	Chief of Resources	(435)772-0208
ZION	Rick Delappe	Front Country	(435)772-7816

Appendix C- Pre-Workshop Survey Questions and Responses

* When responses are not listed for a park, no response was given.

1. What are your biggest concerns regarding visitor use impacts?

ARCH Developing and maintaining a monitoring program.

BLCA Need reliable boat and personal watercraft use numbers for reservoir planning. We need reliable methods for monitoring visitor use and associated impacts in backcountry/wilderness areas. We also have a major US Highway going right through the recreation area that brings with it associated impacts to park resources (e.g. wildlife road kill, threats from hazard materials, etc.). We need a way to evaluate the impacts from this use.

BRCA Wildlife concerns (includes habituation, approaching wildlife too closely, and road kill). Resource damage that may result from social trailing especially if there are impacts to sensitive species or habitats . This leads to the question of assessing the social trails and are there ones we should permanently establish. The park did an assessment and did establish some barrier fencing to reduce the social trails near the heavily impacted rim view points and prevent visitors from accessing a Utah prairie dog habitat (threatened species). Safety: Rangers are concerned that with increased numbers of visitors on trails there is an increase in emergency responses and searches. Overflow in parking lots affects the visitor experience. Need to figure out ways to increase Shuttle rider ship, is there some sort of incentive that we can provide. Messaging: what are the best ways to effectively communicate to visitors from around the world especially with closures or access to certain areas.

CARE Soil impacts that degrade habitat for listed or rare species.

COLM Social trails are a big concern. Lack of signage to properly direct visitors is a related problem. Litter is a big concern too. We removed most trash cans a few years ago as part of a "trash reduction" plan, but we don't really do enough to promote "pack it in, pack it out" behavior. People driving vehicles off cliffs and into park canyons is another concern. Multiple social trails, soils erosion, exotic plant invasion.

HOVE Unknown, but presumed increased, impacts within the Goodman Point unit caused by research conducted over the next six summers by Crow Canyon Archeological Center.

NABR Impacts on Bear Ladder, Kiva and other archeological sites; formation of social trails in the canyon bottoms (natural habitat usually is restored in this location by periodic flash floods).

SE Impacts from motorized activities including impacts on vegetation and soils from off-road use, noise impacts on the natural soundscape, visual impacts from illegal off-road incursions, impacts to wildlife (direct mortality, increased stress, loss of habitat, displacement from preferred habitat). Many of these same concerns stem from off-trail hiking. Impacts on veg. and soils and wildlife resources around campsites-especially on the river corridors. Impacts of boating on river wildlife.

TICA Protecting the non-renewable cave resources while providing cave tours.

ZION Multiple extraneous trailing, human waste, feeding wildlife, graffiti, noise.

2. What additional forms of monitoring data need to be collected at your park?

BRCA	Collecting the numbers of people accessing high use trails such as Navajo, Sunset, Mossy Cave, and Bristlecone. These numbers are valuable in that they could then be used during the development of funding proposals. A good understanding of how visitors use the main amphitheater trails would be beneficial. It would be good to understand how often are the main view point parking lots full and do people waiting for parking, There is most likely a difference depending upon when the shuttle is running or not. It seemed that this spring the parking lots were getting near full when the shuttle was not running. We do not have a good percentage of where visitors are going although know that most of them stay within the main amphitheater. Do not have a good idea on the percentage that hike on any of the trail both front country or back country.
CARE	Visitor use levels in areas with heavy impacts. We are doing some data collection but analysis of data has not been done and sensors malfunction problems are issues.
COLM	My sense is that we don't have good numbers telling us how many people are in the back country. We could use some trail counters at spots where people can access the park without passing through one of the entrance stations. Visitor use #'s and patterns in the WUI area along east boundary. What are the visitor attitudes and understanding about resource issues (natural and cultural). What are the visitor expectations?
HOVE	Unknown, but presumed increased, impacts within the Goodman Point unit caused by research conducted over the next six summers by Crow Canyon Archeological Center.
NABR	Visitor use monitoring at both Natural Bridges and Hovenweep is limited primarily to the collection of visitor use statistics. Would help to know number visiting specific sites which are vulnerable to damage through use and misuse.
SE	Use levels in the backcountry by visitors on foot and in vehicles; map of "sensitive" areas; spatial change of impacted areas over time; condition of cryptobiotic soils.

3. What additional visitor monitoring needs does your park have that are not being met (i.e. additional equipment, software, statistical expertise, etc.)?

ARCH	Test existing standards.
BLCA	Overall lack of capability to address the needs identified in #2 above. Equipment is old, unreliable and time consuming to read.
BRCA	Trail Counters; software, statistical expertise; Collect Statistics on ranger visitor contacts. Only information captured is if there is an incident with a visitor (search and rescue, traffic stop, etc.) but no information is tracked if a ranger talks to visitors is out assisting visitors that does not need a report. Glen Canyon has a system (CAD) that is used to produce end of the year reports. A Visitor Survey was completed in 1997 that documented the type of visitor that comes to the park and their activities in the park. Provides some insight but needs to be repeated. This was completed through the University of Idaho. Traffic Counters There are traffic counters on Highway 12 and just above the Entrance Station. There was one that was used to count the number of vehicles that went out towards Rainbow Point but it was removed in 2003 during the road construction and not replaced. Possibly need an outbound counter; Visitor Center needs to better use and track Backcountry use. This will become especially important during the development of a backcountry management plan.
CARE	Monitoring is not adequate to determine accurate visitor counts due to placement of sensors and number of sensors.
COLM	Whatever would be effective for monitoring the above besides trailhead registers that are ineffective/inaccurate at best.
SE	Repeat aerial photography or satellite photography; remote trail counters and vehicle counters; researcher to link use levels to associated impacts; ground based historic photos; dedicated, qualified person to analyze data to detect trends, show associations, etc.
TICA	Staff to conduct the monitoring, and a high speed computer to run the spreadsheets.

4. What more could be done with the visitor monitoring data that your park collects?

COLM	I'm not sure we collect much visitor monitoring data, other than the numbers passing through the entrance station. I'm not sure we can do much more with it. The data really doesn't tell us much of anything about resource impacts except for number of visitors and some general use patterns (front country, backcountry). Origin of visitors, method of transportation, program attendance really don't provide much insight into resource use.
BRCA	Needs to be better organized by putting data into one location & synthesizing information, currently nothing is being done except to file it away. The park really needs to have a good system to access visitor use data so these data can be used to support needs in future project/funding requests.
CARE	Analyze it and determine better data collection protocols.
SE	Analyze for visitor use patterns and trends data from backcountry permit system at CANY needs analysis.
TICA	Gather more detailed information such as what ages are the visitors who cause most of the resource impacts, where are they from, and why they chose that behavior. This would allow us to come up with an improved resource protection message and maybe other resource mitigative measures.

5. What are some barriers that keep the data that is collected from being used?

ARCH	Personnel, time and expertise to analyze the data.
BLCA	Data shows trends but is unreliable for true statistics due to age and condition of equipment.
BRCA	The park does not have the staff available to synthesize data and make it more usable. If a user friendly system were developed this probably could be incorporated into someone's position fairly easily as long as it did not require a large amount of time.
COLM	Probably the typical things like the lack of time and money. In this case, time would be the biggest factor. Perhaps we also lack a certain amount of knowledge needed to know what questions can be answered through the available data. Lack of foresight, assumptions that we know it all and that visitor use, attitudes and understanding doesn't change much over time.
SE	Time and budget are the limiting factors at this point- qualified person dedicated to the job of data analysis is needed, backcountry permit database is proprietary and difficult/expensive to get useful data from.
TICA	Fears from other divisions and staff on how the data collected will be used, funding.

6. What role does the office of public use statistics play in visitor monitoring at your unit?

ARCH	None
BLCA	They provide technical expertise when needed.
BRCA	The parks collects the usual data for this office (trafficcounters, entrance station numbers, etc.) which is submitted to the NPS program manager (Butch Street) who then enters these data on the public use website (hopefully this is correct). The information is used to produce public use reports which really only shows the changes in visitor numbers using the parks. There is a new computer program to track Law Enforcement contacts whether search and rescue, traffic stops, or other activities and is called the Incident Management Action Review System (IMARS) program replacing CIRS (Case Incident Reporting System). This will help to improve the rangers tracking system.
CARE	They determine the formulas and analysis used to calculate monthly visitation.
COLM	I have gotten historical visitation data through their web site. The folks in that office are very responsive and the web site is helpful. There are some wild swings in the visitor data that don't quite ring true to me though. I'm assuming the sampling strategy was changed somewhere along the line; Unknown by me, I didn't know there was an Office of Public Use Statistics!
HOVE	Currently, the public use statistics are our primary source of visitor use information.
SE	Stores visitor use figures and detects visitation trends.
TICA	Limited, just overall park visitation.

Appendix D. Agenda and Attendees for Northern Colorado Plateau Network Workshop on Monitoring Visitor Use Patterns

Agenda
NORTHERN COLORADO PLATEAU NETWORK
Workshop on Monitoring Visitor Use Patterns
August 2, 2005
La Quinta Inn, 570 Raptor Rd., Fruita, CO

Expected participants: Tom O Clark(CARE), Dave Fox (BRCA), Wayne Freimund (UMT), Michael Gosse (TICA), Kristin Legg (BRCA), Karen McKinlay-Jones (ARCH), Ralph Jones (NABR), Clayton Kyte (FOBU), Denise Louie (ZION), Neil Moisey (UMT), Tamara Naumann (DINO), Bruce Noble (COLM), Thom O'Dell (NCPN), Christine Oschell (UMT), Dave Price (COLM), Steve Robinson (CEBR), Charlie Schelz (SEUG), Tony Schetzsle (CANY), Ken Stahlnecker (CURE), Butch Street (DENVER), Jeff Troutman (SEUG), Dave Worthington (CARE).

8:00 – 8:30	Purpose, Logistics, agenda, Introductions.
8:30 - 8:45	UM presentation of overview of current network monitoring
8:45 – 10:00	Park presentations on monitoring visitation Mike Goss – TICA Karen M. McKinlay-Jones – Arches Steve Robinson – Cedar Breaks (not yet confirmed) TBD - ZION Butch Street - Overview of Use Stats
10:00 – 10:30	Break
10:30 – 11:00	Dr. Wayne Freimund, UM, an overview of available methods for monitoring trail use
11:00 – 12:15	Nominal group process - Brainstorm monitoring needs for additional monitoring
12:15 -1:15	Lunch
1:15 – 3:00	Nominal group process - Elaborate, refine, discuss and prioritize monitoring needs ideas
3:00 – 3:30	Break
3:30 – 5:00	Network and park roles, partnering opportunities next steps, recap, discuss UM products, review by some park reps

Attendees of Northern Colorado Plateau Network Workshop on Monitoring Visitor Use Patterns

Park Unit	Person	Division/Position	Phone
ARCH	Charlie Schelz	Biologist	(435)-719-2135
BLCA/CURE	Ken Stahlnecker	Chief of Resources	(970) 641-3127
BRCA	Kristen Legg	Chief of Resources	(435)834-4900
CARE	Tom Clark	Chief of Resources	(435)425-3791x44
CEBR	Steve Robinson	Chief Ranger	(435)586-9451
COLM	Dave Price	Natural Resources Specialist	(970)858-0372
DINO	Tamara Naumann	Botanist	(970)374-2501X1
FOBU	Clayton Kyte	Biologist	(307)877-4455
TICA	Mike Gosse	Chief Ranger	(801)756-5239
BRCA	Dave Fox	Operations Branch Chief, Ranger Division	(435)834-4900
UMT	Wayne Friemund	Professor	(406)243-
UMT	Neil Moisey	Principal Investigator NCPN Project	(406)243-6673
UMT	Christine Oschell	PhD Student	(406)243-4325
CARE	Dave Worthington	Biologist	(435)425-3791X145
SEUG	Jeff Troutman	Chief of Resources	(435)719-2130
CANY	Tony Schetzsle	Superintendent	
DENVER	Butch Street	Public Use Statistics	(303)751-3727
ZION	Denise Louie	Vegetation Program Manager	(435)772-0216
COLM	Bruce Noble	Superintendent	(970)858-3617
NCPN	Thom O'Dell	Inventory and Monitoring Coordinator	(435)719-2358
ARCH	Karen McKinlay-Jones	Park Ranger	(435) 719-2222

Appendix E. Results of Nominal Group Process at Northern Colorado Plateau Network Workshop on Monitoring Visitor Use Patterns

"**What are your park's information needs regarding visitor monitoring? What more use can be made of the data that are already collected?**

Group 1:

- NPS visitor use patterns and expectations
- What would influence visitors to make behavioral changes to protect/benefit the resource?
- What percentage of visitors have an emotional connection to the resource? How can we increase this?
- Understanding the non-recreational visitor and their associated impacts.
- What is the extent of use that is compatible with enabling legislation?
- Are visitors going to tolerate the loss of NPS programs that are not core to individual park purpose?
- Does increasing park usage (permits, infrastructure, opportunities) decrease visitor satisfaction?
- How do local communities value the integrity of park resources and become park advocates?
- Does data ever go bad or does it just get stale? Are there practical uses for historical data and current visitor use data?
- How can we determine if our actions are effective?
- Why do visitors come to national parks and what other alternatives are they aware of?
- Visitor use trends and temporal displacement of park wildlife
- Can we learn from Disneyland how to manage large crowds?
- How do we go about revalidating data and standards and indicators? Do we do this at all?
- How can we get visitors to help protect the park's resources and become advocates for parks?
- Understanding temporal displacement of visitors due to certain use patterns
- How do we determine the threshold b/t spatial and temporal displacement and permanent displacement?
- Understanding visitors and their associated impacts?
- Do visitors understand the park's mission and what park expectations are?
- Understanding day hiker use (#'s)
- What kind(s) of experiences are visitors expecting?
- What questions do we want to ask? What questions do we need to ask?
- Are use limits appropriate for resource protection and visitor needs?
- What is the extent of unauthorized or illegal activities?
- Did visitor experiences meet expectations and where did they originate?

Group 2:

- Understanding visitor expectations/needs
- Networking with other I&M networks
- Local attitudes towards the park (i.e. hostility, destructive behavior) and what drives this behavior?
- Impacts vary with biotic types
- Gather visitor experience/expectation both in front and backcountry
- Visitation profiles/demographics
- Where are high impact areas located?
- Overlay of visitor use corridors on sensitive areas of parks
- Overflights: Number of flights/people? How to regulate?
- Front country trail use (CEBR)
- Can we develop standards of acceptable conditions?
- Can standards be enforced?
- What are impacts to rare (TES) species?
- Establish holistic approach to monitoring
- How to monitor impact from visitors not just counting people
- How to obtain political backing/will to achieve goals?
- Connect visitor numbers to ecological impacts
- How to demonstrate and track cumulative impacts
- Backcountry use: how many, from where, to where
- What are the historical and desired states of the environment?
- What are people doing in high impact areas?
- River use patterns
- Distribution of daily use by motorized vehicles
- Why are visitors being bad?
- Number of people on trails/patterns on specific trails (Yellowstone study)
- What are river users doing at the end of the day?
- Winter use in high elevation parks
- How to measure without causing impacts ourselves?
- How to analyze existing data
- Develop protocols in conjunction with other monitoring efforts
- Natural resource management vs. social engineering (behavior modification)- need more integrative approach.

Appendix F. Existing Monitoring Survey Results - NCPN Parks

Park	Monitoring Category	Physical count or number from permit or concession report	Description of Monitoring	General/park wide or site specific	Staff Required	Equipment Description	Equipment Cost	Required for NPS annual reporting?	Used in natural resource mgt. or monitoring?	Person Responsible	Start Date
Park where monitoring occurs	General monitoring categories (for record sorting)	physical count or reported count (from permit or secondary source)	General description of how monitoring is conducted	Indicate whether visit location is general (park-wide) or site-specific	Indicate any specialized or additional staff needed to conduct monitoring.	Describe any specific equipment used. Include brand name, if possible.	Indicate purchase price of specific equipment used	Indicate if monitoring is required to be conducted by park	Describe if and how data collected are applied in park natural resource management	Name of contact person for additional information on monitoring project	Date monitoring project started
ARCH	Visitor Center Count	Laser counter	A counter at the door of the visitor center counts visitors as they enter	general	No additional staff required;	unknown brand	unknown	no	no	Gary Marsh 435-719-2221	unknown
ARCH	Underground traffic counter	reported count	underground counters monitor vehicle traffic	general	No additional staff required	unknown brand	unknown	yes	no	Gary Marsh 435-719-2221	unknown
ARCH	Backcountry Permits	reported count	Backcountry use permits are required	general	No additional staff required;	none	n/a	no	no	Gary Marsh 435-719-2221	unknown
ARCH	Ranger-led talks	physical count	The number of people attending ranger led talks are counted	site specific	No additional staff required;	none	n/a	no	no	Gary Marsh 435-719-2221	unknown
ARCH	Front country permits	reported count	Fiery furnace day use permits are issued at the ARCH VC	site specific	No additional staff required;	none	n/a	no	Yes. Used to enforce allocation, keep numbers of visitors low and inform them of leave no trace practices	Gary Marsh 435-719-2221	unknown
BLCA	Underground traffic counter	reported count	underground counters monitor vehicle traffic	site specific	No additional staff required;	unknown brand	unknown	yes	no	Gary Marsh 435-719-2221	early 1980's
BLCA	Backcountry Permits	reported count	permits are required to use the canyon and visitor numbers are kept track of using these permits	general	No additional staff required;	none	n/a	no	no	Gary Marsh 435-719-2221	early 1980s
BLCA	Visitor Center Count	physical count	Personnel at Visitor Center count visitors as they enter the center. A mechanical counter is attached to the front desk and is incremented as each visitor enters the center.	site specific	No additional staff required;	AmTek brand Mechanical counter	$20.00	no	no	Linda Alick 970-641-2337	unknown
BRCA	Ranger-led talks	physical count	The number of people attending ranger led talks are counted	site specific	No additional staff required;	none	n/a	no	To determine if talks are popular	Linda Alick 970-641-2337	when ranger led talks began
BRCA	Underground traffic counter	reported count	underground counters monitor vehicle traffic	site specific	No additional staff required;	K-Hill Controlled Impulse Counter	unknown	yes	no	Merna Winters	unknown
BRCA	Backcountry Permits	reported count	backcountry use permits	site specific	No additional staff required;	none	n/a	no	To determine which backcountry areas are most heavily used	Merna Winters	unknown

Park	End Date	Date Comments	Location	Data Format	How managed	How analyzed	How applied	Perceived Benefits	Perceived Drawbacks	Comments
Park where monitoring occurs	Date monitoring project ended. Enter "ongoing" if the project is still active.	Enter comments on dates, e.g., if monitoring is seasonal	Describe the location where monitoring occurs. Be as specific as possible.	In what format are the data? (e.g., spreadsheet, Access database, hard copies)	Describe how data are assembled, verified, entered, distributed.	Describe any analysis that is conducted on data	Describe how the data are used by the park	What seem to be the benefits of the monitoring, as perceived by park personnel	What seem to be the drawbacks of the monitoring, as perceived by park personnel	Other comments
ARCH	ongoing	year-round	Arches visitor center	Paper tally sheets and Excel spreadsheet	Supervisory ranger obtains daily totals and enters into spreadsheet at the end of each week	Used for VERP (Visitor Experience and Resource Protection)	Numbers are part of base funding determination; are integrated into national visitation data. Increase in numbers are used to justify facility expansion	no response	no reponse	none
ARCH	ongoing	year-round	unknown	unknown	unknown	Used for VERP (Visitor Experience and Resource Protection)	no reponse	no response	no reponse	none
ARCH	ongoing	year-round	n/a	unknown	unknown	Used for VERP (Visitor Experience and Resource Protection)	no reponse	no response	no reponse	none
ARCH	ongoing	year-round	n/a	unknown	unknown	Used for VERP (Visitor Experience and Resource Protection)	no reponse	no response	no reponse	none
ARCH	ongoing	year-round	n/a	unknown	unknown	Used for VERP (Visitor Experience and Resource Protection)	no reponse	no response	no reponse	none
BLCA	ongoing	year-round	Entrance to south rim and entrance to north rim	spreadsheet	unknown	none	no reponse	no response	no reponse	none
BLCA	ongoing	year-round	n/a	hard copies are kept for 2 years; database	filed	none	no reponse	no response	no reponse	none
BLCA	ongoing	year-round	BLCA Visitor Center	unknown	unknown	none	no reponse	no response	no reponse	none
BRCA	ongoing	year-round	n/a	unknown	unknown	none	no reponse	no response	no reponse	none
BRCA	ongoing	year-round	HWY 12; 1/4 mile from entrance stations; Rainbow gate(inoperable at the moment)	unknown	unknown	none	no reponse	no response	no reponse	none
BRCA	ongoing	year-round	n/a	unknown	unknown	none	no reponse	no response	no reponse	none

Park	Monitoring Category	Physical count or number from permit or concession report	Description of Monitoring	General/park wide or site specific	Staff Required	Equipment Description	Equipment Cost	Required for NPS annual reporting?	Used in natural resource mgt. or monitoring?	Person Responsible	Start Date
Park where monitoring occurs	General monitoring categories (for record sorting)	physical count or reported count (from permit or secondary source)	General description of how monitoring is conducted	Indicate whether visit location is general (park-wide) or site-specific	Indicate any specialized or additional staff needed to conduct monitoring.	Describe any specific equipment used. Include brand name, if possible.	Indicate purchase price of specific equipment used	Indicate if monitoring is required to be conducted by park	Describe if and how data collected are applied in park natural resource management	Name of contact person for additional information on monitoring project	Date monitoring project started
BRCA	Entrance Gate Count	reported count	receipts from entrance fees are used to track visitation	general	No additional staff required;	none	n/a	yes	no	Merna Winters	unknown
BRCA	Data from outfitters and guides	reported count	numbers of participants on trail rides	site specific	No additional staff required;	none	n/a	no	no		unknown
BRCA	Visitor Center Count	reported count	An infrared counter counts visitors as they enter the visitor center	site specific	No additional staff required;	infrared counter	unknown	no	no	Merna Winters	unknown
CANY	Data from outfitters and guides	reported count	Participant counts from river trips	site specific	No additional staff required;	none	none	no	Determines the number of commercial users. Helps reduce possible negative side effects of commercial group numbers		unknown
CANY	River permits	reported count	Overnight river runners must obtain a permit	general	No additional stafff required	none	none	no	Resource management uses these numbers to assure that the river is not being overused. Trends and popular areas can also be determined	Mike Hill, Peter Fitzmaurice, Karen Sloan, Nancy Holman	unknown
CANY	Backcountry Permits	reported count	Overnight backpackers must obtain a permit	general	No additional staff required	Trakker computer software	none	no	Resource management uses these numbers to track visitors to the backcountry. Often used sites can be monitored	Dave Wood	unknown
CANY	Underground traffic counter	reported count	underground counters monitor vehicle traffic	general	No additional staff required	unknown brand	unknown	yes	no	Mike Hill	unknown
CANY	Trail counters	reported count	underground counters monitor foot traffic	site specific	no additional staff required	unknown brand	unknown	no	determines popularity of trails;often used trails and sensitive areas can be monitored	Dave Wood	unknown
CANY	Day use permits	reported count	permits are only given to a certain number of users	site specific	no additional staff required	Trakker computer software	none	no	protects sensitive areas	Dave Wood	unknown

Park	End Date	Date Comments	Location	Data Format	How managed	How analyzed	How applied	Perceived Benefits	Perceived Drawbacks	Comments
Park where monitoring occurs	Date monitoring project ended. Enter "ongoing" if the project is still active.	Enter comments on dates, e.g., if monitoring is seasonal	Describe the location where monitoring occurs. Be as specific as possible.	In what format are the data? (e.g., spreadsheet, Access database, hard copies)	Describe how data are assembled, verified, entered, distributed.	Describe any analysis that is conducted on data	Describe how the data are used by the park	What seem to be the benefits of the monitoring, as perceived by park personnel	What seem to be the drawbacks of the monitoring, as perceived by park personnel	Other comments
BRCA	ongoing	year-round	entrance gate	unknown	unknown	none	no reponse	no response	no reponse	none
BRCA	ongoing	year-round	n/a	unknown	unknown	none	no reponse	no response	no reponse	none
BRCA	ongoing	year-round	Bryce Canyon Visitor Center	spreadsheet	unknown	none	Stats are compiled and used in an annual interpretive report	justify programs	no reponse	none
CANY	ongoing	year-round	n/a	hardcopy	unknown	none	To determine commercial use	no response	no reponse	none
CANY	ongoing	year-round	n/a	spreadsheet	unknown	none	To determine river use	determines trends and controls use	visitors are not reliable- they may say there are 20 in their party but only 10 show up- result is unused permit space	none
CANY	ongoing	year-round	n/a	hard copy and database	unknown	none	no reponse	no response	No analysis can be done because no one knows how to use the software that is available to the park; can generate reports but they are generic and do not answer all of the relevant questions	none
CANY	ongoing	year-round	At entrance gates	hard copy and database	The data are taken from the unit and the numbers are recorded. A formula is used to determine the number of people	none	Monthly and yearly use reports	no response	no reponse	none
CANY	ongoing	year-round	White Rim and the maze	hard copy and database	The data are taken from the unit and the numbers are recorded.	none	no reponse	To determine the popularity of trails	Numbers are inaccurate	More trail counters are going to be put in place
CANY	ongoing	year-round	At reservation desk	hard copy and database	The data are entered into Trakker	queries are made and reports are written	to determine trends	no response	no reponse	day use permits limit use to hike-in only in some areas (no overnight) and ATV use

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CANY	Visitor Center Count	physical count	hand clicker is incremented as visitors enter	site specific	no additional staff required	unknown brand	unknown	no	no	Karen Sloan(Needles District) and Nancy Holman (Island in the Sky)	unknown
CARE	Visitor Center Count	reported count	visitors counted as the enter or exit the vc.	site specific	No additional staff required;	beam counter	unknown	yes, official stats	no	Tom Clark	
CARE	Underground traffic counter	reported count	Counters at 3 locations: 3 in central HQ area; 3 in southern end of park; 3 in northern end of park. Formula allows count to equate to people in park	general	No additional staff required;	unknown brand	unknown	yes	no	Tom Clark	Over 10 years ag0
CARE	Trail counters	reported count	3 counters at trail heads	site specific	No additional staff required;	beam counter	$700?	no	yes, monitored in conjunction with rare plant monitoring	Tom Clark	3-4 years ago
CEBR	Infrared traffic counter	reported count	counters at 3 entrances	general	No additional staff required;	TC-Cuesta RS501, infrared beam	$400	yes, monthly public use	no	Steve Robinson	Over 15 years ago
CEBR	Visitor Center Count	physical	head count	general	No additional staff required;	none	n/a	yes, monthly public use	no	Steve Robinson	unknown
CEBR	Ranger-led talks, campfire programs	physical	numbers from ranger-led talks and campfire programs recorded	site specific	No additional staff required;	none	n/a	yes, monthly public use	no	Steve Robinson	unknown

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CANY	ongoing	year-round	The three visitor centers in the park	hard copy	unknown	none	To help determine popularity of visitor centers	no response	no reponse	none
CARE	ongoing	year-round	visitor center	Downloaded to Spreadsheet	unknown	used in official stats	used in official stats	no response	no reponse	none
CARE	ongoing	year-round	Central HQ area-Hwy 24 East, Hwy 24 West, Scenic Drive; Southern end of park-Notom Rd, West Berr trail, East Berr trail; Northern end of park-Hartnet Road, Cathedral Valley Road, Polk Creek Road	Downloaded to Spreadsheet	Downloaded	none	Used to calculate number of people in the park	no response	no reponse	none
CARE	ongoing	year-round	3 trail counters: Hickman Bridge Trail, Golden Throne Trail, one lesser used canyon (rare plants in all three areas).	Downloaded to Spreadsheet	unknown	none	Can explain cause-effect relationship between condition of rare plants and visitor use.	Can help with protection of rare plants. Can be used to justify any necessary trail closures to protect rare plants.	Not enough time to sit down with spreadsheet data to analyze it.	none
CEBR	ongoing	year-round	3 entrances to the park	database	entered into monthly public use report	general trends	To monitor general trends	It does show upward and downward trends year to year	Doesn't give info as to who the visitors are, where they're from, etc./infrared beams triggered by animals, snow, etc.	Recently ordered more state-of-the-art counters that will provide better winter use data and more accurate visitor count overall.
CEBR	ongoing	seasonal, June-October	Visitor center	hard copy, monthly public use statistics database	entered into monthly public use report	none	no reponse	no response	Doesn't give info as to who the visitors are, where they're from, what they expect, how long they stay, etc. No means of measuring use in wintertime; need something that can withstand conditions.	none
CEBR	ongoing	seasonal, June-October	Visitor center, during ranger-led talks	hard copy, monthly public use statistics database	entered into monthly public use report	none	monthly public use statistics, Annual Interpretive Report	no response	Doesn't give info as to who the visitors are, where they're from, what they expect, how long they stay, etc	none

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CEBR	Fee collection	reported count	Data collected at fee station when visitors pay; entered into computer	general	No additional staff required,	none	n/a	yes, monthly public use	no	Steve Robinson	Over 15 years ago
COLM	Underground traffic counter	reported count	underground counters monitor vehicle traffic	general	No additional staff required	unknown brand	unknown	yes	no	Ron Young- 970-858-3617 X312	unknown
COLM	Underground trail counters	reported count	undergound monitor counts number of times it is crossed	site specific	No additional staff required	unknown brand	unknown	no	To determine the popularity of trails	Ron Young- 970-858-3617 X312	unknown
COLM	Visitor Center Count	physical count	personnel count visitors as they enter the visitor center	site specific	No additional staff required	unknown brand	unknown	no	no	Ron Young- 970-858-3617 X312	unknown
CURE	Underground traffic counter	reported count	underground counters monitor vehicle traffic	site specific	No additional staff required;	unknown brand	unknown	yes	no		unknown
CURE	Front country permits	reported count	personal watercraft permits or registration	site specific	No additional staff required;	none	n/a	no	no		unknown
DINO	Underground traffic counter	reported count	underground counters monitor vehicle traffic	general	No additional staff required	unknown brand	unknown	yes	no	Phil Akers	unknown
DINO	Visitor Center Count	physical count	Personnel at Visitor Center count visitors as they enter the center.	site specific	No additional staff	unknown brand	unknown	no	no	Phil Akers	unknown
DINO	Backcountry Permits	reported count	permits are required to use the backcountry and visitor numbers are kept track of using these permits	site specific	No additional staff required	none	none	no	Determines the number of people using different areas of the backcountry; areas may be getting overused	Phil Akers	unknown
DINO	River permits	reported count	permits are required to use the rivers and visitor numbers are kept track of using these permits	site specific	No additional staff required	none	none	no	Determines the number of people using the rivers; may be getting overused	Phil Akers	unknown
DINO	Trail counters	reported count	Infrared beam counts people passing on the trail	site specific	No additional staff required	unknown brand	unknown	no	Monitors the popularity and use of trails in the monument	Phil Akers	unknown
FOBU	Underground traffic counter	reported count	underground counters monitor vehicle traffic	site specific	No additional staff required;	Diamond traffic counter	no cost;given by Denver office	yes	no	Marcia Fagnant 307-877-4455	1990

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Park where monitoring occurs	Date monitoring project ended. Enter "ongoing" if the project is still active.	Enter comments on dates, e.g., if monitoring is seasonal	Describe the location where monitoring occurs. Be as specific as possible.	In what format are the data? (e.g., spreadsheet, Access database, hard copies)	Describe how data are assembled, verified, entered, distributed.	Describe any analysis that is conducted on data	Describe how the data are used by the park	What seem to be the benefits of the monitoring, as perceived by park personnel	What seem to be the drawbacks of the monitoring, as perceived by park personnel	Other comments
CEBR	ongoing	seasonal, June-October	Fee collection station	database	used for revenue management and accounting purposes	none	used for revenue management and accounting purposes	no response	Doesn't give info as to who the visitors are, where they're from, what they expect, how long they stay, etc	none
COLM	ongoing	year-round	4 road entrances to park	hard copy and database	numbers are retrieved from the unit and recorded	none	To look at yearly and seasonal trends in park visitation	The numbers are useful in determining visitation numbers	the formula used to calculate people per car may change more often than it is measured	none
COLM	ongoing	year-round	2 popular trails in the monument; locations vary	hard copy	numbers are retrieved from the unit and recorded	none	To determine the popularity and use levels of trails	Gives some idea of numbers of people using the trail	the counters do not seem very reliable	none
COLM	ongoing	year-round	visitor center	hard copy	numbers of people entering the visitor center are recorded	none	To determine use levels and popularity of visitor centers	Determines the numbers of people that choose to use the visitor centers	no response	none
CURE	ongoing	year-round	unknown	unknown	unknown	none	no reponse		no response	none
CURE	ongoing	year-round	unknown	unknown	unknown	none	no reponse		no response	none
DINO	ongoing	year-round	Gates of Lador, Deerlodge, Elk Springs, Harpers Corner, Cub Creek, Rainbow Park.	hard copy and database	numbers are retrieved from the unit and recorded	none	Data is used to track use and to determine trends.	Determining trends	the formula used to calculate people per car may be inaccurate	none
DINO	ongoing	year-round	Both visitor centers	hard-copy	number on clicker is recorded	none	determines how the visitor centers are being used	Determining trends	no response	none
DINO	ongoing	year-round	none	hard copy and database	permits are kept and referenced	none	used in resource management	determining popular areas	no response	none
DINO	ongoing	year-round	none	hard copy and database	permits are kept and referenced	none	used in resource management	determining river use	no response	none
DINO	ongoing	year-round	Jones Hole	hard copy and database	numbers are retrieved from the unit and recorded	none	no response	no response	no response	none
FOBU	ongoing	seasonal; the counter is removed in November and put back in spring to avoid freezing and thawing of the unit	located 50 yards north of the upper road gate;	hard copies	numbers are retrieved from the unit and recorded	none	determine trends	tracking use	no response	plans are underway to add another counter this spring

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Park where monitoring occurs	General monitoring categories (for record sorting)	physical count or reported count (from permit or secondary source)	General description of how monitoring is conducted	Indicate whether visit location is general (park-wide) or site-specific	Indicate any specialized or additional staff needed to conduct monitoring.	Describe any specific equipment used. Include brand name, if possible.	Indicate purchase price of specific equipment used	Indicate if monitoring is required to be conducted by park	Describe if and how data collected are applied in park natural resource management	Name of contact person for additional information on monitoring project	Date monitoring project started
FOBU	Visitor Center Count	physical count	Personnel at Visitor Center count visitors as they enter the center. A mechanical counter is attached to the front desk and is incremented as each visitor enters the center.	site specific	No additional staff required;	AmTek brand Mechanical counter	$20.00	no	no	Marcia Fagnant 307-877-4455	unknown
FOBU	Orientation count	physical count	personnel at visitor center count individuals watching the orientation video	site specific	No additional staff required;	none	n/a	no	no	Marcia Fagnant 307-877-4455	unknown
FOBU	Trail or site register	reported count	visitors who use the trails are asked to voluntarily enter into a register the trails that they used	general	No additional staff required;	none	n/a	no	to ascertain which trails are most heavily used	Marcia Fagnant 307-877-4455	unknown
GOSP	Visitor Center Count	reported count	When visitors pay fees they are asked how many are in their group. The number is entered into the cash register and then downloaded to a computer.	general	No additional staff required;	Advantage System	unknown	yes, monthly public use	no, primarily used for interp report	Melissa Cobern	unknown
HOVE	Visitor Center Count	physical count	visitors that enter the visitor are counted by incrementing a hand-help counter	site specific	No additional staff required;	mechanical counter (brand unknown)	provided by regional office	no	no	Ralph Jones	1936
HOVE	Underground traffic counter	reported count	underground counters monitor vehicle traffic	site specific	No additional staff required;	Black Diamond traffic counter	provided by regional office	yes	no	Ralph Jones	unknown
HOVE	Ranger-led talks	physical count	park ranger counts the number of people at a ranger talk or presentation	site specific	No additional staff required;	none	n/a	no	no	Ralph Jones	monitoring began when the ranger led talks began
NABR	Visitor Center Count	reported count	Infrared counter is installed in visitor center entryway; counter increments each time beam is broken by person passing	site specific	No additional staff required;	Watchman brand counter	provided by regional office	no	no	Ralph Jones	1936

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FOBU	ongoing	monitoring occurs whenever the visitor center is open	Fossil Butte Visitor Center	hard copies	unknown	none	trend data	no response	no response	none
FOBU	ongoing	monitoring occurs whenever the visitor center is open	Fossil Butte Visitor Center	hard copies	unknown	none	usefullness of programs	no response	no response	none
FOBU	ongoing	year-round	register is at the visitor center	hard copies	unknown	none	trail use	no response	no response	none
GOSP	ongoing	year-round	visitor center	spreadsheet?	entered into monthly public use report and service-wide interp report	none	Used for interp efforts	Advantage System is very efficient and convenient	Don't collect info regarding visitor age, where they're from, why they're visiting, etc--such info would allow them to be better served.	none
HOVE	ongoing	year-round	Hovenweep visitor center	entered into website that is then checked by the regional office	unknown	none	to determine the number of brochures to order for the following season;there is no entrance gate so this gives the monument an idea of how many people that visit use the visitor center	no response	no response	none
HOVE	ongoing	year-round	The counter is located just outside the visitor center parking lot	database	unknown	none	monitoring visitor traffic gives the monument an idea of how many visitors are entering the monument	determining visitor trends	no response	none
HOVE	ongoing	year-round	visitor center	hard copies	unknown	none	counting visitors helps decide if programs are successful	Determining the popularity of ranger-led talks	no response	none
NABR	ongoing	year-round	Natural Bridges Visitor Center	website	unknown	none	with no entrance gate this is the only was that the monument can ascertain visitor numbers	Determining visitor trends and popularity of the visitor center	no response	none

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NABR	Underground traffic counter	reported count	underground counters monitor vehicle traffic	site specific	No additional staff required;	Diamond traffic counter	provided by regional office	yes	no	Ralph Jones	unknown
NABR	Ranger-led talks	physical count	park ranger counts the number of people at a ranger talk or presentation	site specific	No additional staff required;	none	none	no	Ranger led talks can educate the public regarding natural resources and counting the number of visitors that attend these allows us to know what percentage of visitors are getting this education	Ralph Jones	monitoring began when the ranger led talks began
PISP	Underground traffic counter	reported count	underground counters monitor vehicle traffic	general	No additional staff required;	unknown brand	unknown	yes	no	Andrea Bornemeier	unknown
PISP	Visitor Center Count	reported count	Infrared counter is installed in visitor center entryway; counter increments each time beam is broken by person passing		No additional staff required;	unknown brand	unknown	no	no	Andrea Bornemeier	unknown
PISP	Ranger-led talks	physical count	numbers of participants on ranger led talks	site specific	No additional staff required;	none	none	no	to determine if programs are popular	Andrea Bornemeier	when ranger led talks began to be instituted
TICA	Ranger-led talks	physical	20 people per tour, number of tours per day recorded: M-F, 40-45 tours; S & S, 50-55 tours.	site specific	No additional staff required;	none	none	yes, monthly public use	yes, higher number per tour results in resource degradation	Mike Gosse	unknown
TICA	General Visitation Formula	physical	Regional office provided a formula to figure out visitation at monument, picnic area, visitor center.	general	No additional staff required;	none	n/a	yes, monthly public use	no	Mike Gosse	unknown
ZION	Underground traffic counter	reported count	Car counter at both entrance stations. Count multiplied by 2.6 people/car.	general	No additional staff required; 30 minutes/week a staff member counts cars to make sure system is accurate.	wire buried in or sitting on road--Diamond Traffic Products	unknown	yes, monthly public use	no	Rick DeLappe	Well over 4 years ago.

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NABR	ongoing	year-round	Just outside the visitor center parking area	website	data are taken from the counters and entered	none	with no entrance gate this is the only was that the monument can ascertain visitor numbers	Determining visitor trends	maintenance of the units	none
NABR	ongoing	year-round	n/a	hard copies	They are filed	none	counting these visitors helps determine the popularity of the programs.	Determining the popularity of ranger-led talks	no response	none
PISP	ongoing	year-round	entrance	unknown	unknown	none	no response	no response	no response	none
PISP	ongoing	year-round	visitor center	unknown	unknown	none	no response	no response	no response	none
PISP	ongoing	year-round	n/a	unknown	unknown	none	no response	History Association uses these numbers also.	no response	none
TICA	ongoing	seasonal	visitor center/ cave trail	unknown	entered into monthly public use report	none	To insure resource protection and visitor enjoyment	It provides a clear number of visitors which helps with the important missions of resource protection and visitor enjoyment	no response	none
TICA	ongoing	seasonal	general	unknown	unknown	none	no response	Gives estimate of general park use	Current formula under-represents visitation	none
ZION	ongoing	year-round	3 counters at South entrance (one in each lane); 1 counter at East entrance (further down road to capture all traffic);	hard copies (log book updated daily), entered into monthly use reports	Counts are entered into a log book daily. Traffic counter accuracy is checked weekly.	Trends are monitored	Affects entrance station staffing	Give a relatively accurate count of vehicles through entrance stations.	If the counter malfunctions, it might not be caught for several days; does not provide accurate number of visitors. Rranger using hand counter forget to tally each person, may provide number higher or lower than actual number.	none

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ZION	Walk-in Entrance Gate count	physical	Hand count at walk-in entrance.	general	No additional staff required	hand counter	n/a	yes, monthly public use	no	Rick DeLappe	unknwon
ZION	Observation	physical count	Seasonal rangers observe use of canyons. They sit in a canyon and document how many people are seen and heard during the day.	site specific	No additional staff required; performed by seasonal employees	none	0	no	yes, provides baseline data for bc planning (trail use) and monitors social conditions	Cindy Purcell	summer, 2004
ZION	Trail counters and campsite observation	physical count	trail counters in several areas and	site specific	No additional staff required	beam counter	n/a		yes	Cindy Purcell	unknown
ZION	Backcountry Permits	reported count	Permits required to enter backcountry	site specific	No additional staff required;	Permits	n/a	yes	yes, to monitor bc use	Cindy Purcell	Some bc monitoring since 1970. Current methods since about 2000.
ZION	Campground count	reported count	Either counted when fees are paid and entered into accounting system, or counted via self-pay system.	site specific	No additional staff required during off-season (fee collectors gather self-pay envelopes; During summer (April-October) 2 additional staff plus one supervisor to staff campground.	Reservation system connected to Spirex system (hooked up to NPS database). Self-pay system: envelopes left in drop boxes.	n/a	yes, monthly public use	no	Rick DeLappe	unknown
ZION	Visitor Center Count	physical count	staff use hand counter to tally visitors	site specific	No additional staff required	hand counters	unknown		no		

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ZION	ongoing	year-round	hand counter used by ranger at walk-in entrance.	hard copies (log book updated daily), entered into monthly use reports	Counts are entered into a log book daily. Traffic counter accuracy is checked weekly.	Trends are monitored	no response	At walk-in station, gives idea of # of people.	Ranger using hand counter might forget to tally each person, may provide number higher or lower than actual number.	none
ZION	ongoing	seasonal	canyons	hard copies	Not yet decided	Not yet decided, need to find a method that everyone will understand	Plan to use data for VERP study	Can begin to understand social conditions in canyons	Not sure what to do with data yet; not enough time to enter and analyze. How to measure when enough (rec use) is enough is hard.	none
ZION	ongoing	seasonal	West Rim and Narrows campsites (monitored biannually), Observation point (counter connected in spring)	hard copies	not currently managed	None currently	no response	some monitoring is better than none	There is not enough time to enter the data into a spreadsheet and properly analyze it	none
ZION	ongoing	seasonal	Permits issued at VC	Data from 2000 to present stored in Microsoft Access database. Data before 2000 is spotty.	Data from 1970 to 1990 was gathered from trail registers. From 1990 to 2000, permits were handwritten. From 2000-2003, in house permit system (trakker) was used. Currently, an internet based program is used.	Since 2000, Rick O'Neil has developed yearly trend reports and has attempted to compare trends for the past 25 years.	Can use as budget justification to congress, understand backcountry visitor trends	Helps to explain pressure on bc resources	Data from before 2000 is spotty.	none
ZION	ongoing	reservation system: seasonal; self-pay:continuous	At both campgrounds. One campground is open year round, with reservation system April-October. One campground is open April-October as self-pay.	Reservation system: entered automatically into NPS-wide database through Spirex system. Self-pay: hard copies, then entered into accounting system.	Reservation system: when people pay, data is automatically entered into database. Self-pay: campers fill out form and drop envelope into box. Envelopes collected, tallied, and recorded, then entered into accounting system. Recorded as revenue.	none	no response	no response	Sphirex system is cumbersome, and it's not easy to find the information you need. Don't have a good data gathering system for campgrounds. Accounting system only keeps track of how many sites are paid for/occupied, not how many people.	none
ZION	ongoing		Visitor Center and Human History Museum	unknown	unknown	none	no response	no response	no response	none