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Managing Dispersed Recreation in the Allegheny National Forest

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MANAGING DISPERSED RECREATION IN THE ALLEGHENY NATIONAL FOREST

by

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In the Allegheny National Forest, an unregulated dispersed camping policy has led to significant impacts to the natural environment. This study used data gathered from visitor surveys, interviews with managers, and environmental conditions of campsites to recommend management actions for campsites along seven roads in the National Forest. The seven road areas fell into two categories. Primitive recreation was more common in some areas and solitude was more highly valued by campers. Other areas had more frequent visitor use, motorized camping, and solitude was less important to campers. These factors influenced management recommendations, which include designing and constructing campsites to minimize amount of area affected by camper activities, closing and rehabilitating campsites, and visitor education. Results from the visitors surveyed indicate that campers were less bothered by resource impacts than managers and that impact to campsites was influenced by type and frequency of visitor use. These results will aid in the development of dispersed campsite management plans for the Allegheny National Forest.

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Anne Santa Maria

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CHAPTER 1

INTRODUCTION

America's national forests were first established in 1891, since that time the number of visitors has been steadily increasing. In 2011, approximately 165,880,000 million Americans visited a national forest to camp, hunt, fish, or hike (United States Department of Agriculture [USDA] 2011). Although Americans are often advised about how to camp without damaging the environment, those who do not practice proper camping techniques often leave their campsites scarred by human waste, litter, felled trees, compacted soil, and trampled vegetation which potentially affects the people who arrive next at the campsite. Depending upon the fragility of the ecosystem, camping behaviors may leave a lasting adverse impact on the land and watershed.

The Allegheny National Forest (ANF), located in northwestern Pennsylvania, currently has a dispersed recreation campsite policy allowing users to camp anywhere along any road open to the public for up to fourteen days. Dispersed camping is common across many USDA Forest Service lands and provides a primitive and unconfined recreation opportunity for visitors. The policy in the ANF has led to the establishment of numerous unofficial or informal campsites. As opposed to formal campsites, informal campsites have limited development meaning people camp in existing cleared areas, are user developed, and are not marked by signs. No fees are charged, and limited or no maintenance is provided (Newsome et al. 2002). The ill-

informed behavior of some campers has caused environmental degradation of soils and vegetation leading to decreased quality in the recreational experiences of subsequent visitors to these dispersed campsites.

United States Forest Service (USFS) personnel have identified dispersed camping as a management concern, but a lack of funding, time, and personnel to handle the problem has pushed the issue to the bottom of the list in terms of management priorities. Although recreation is very important to many visitors and affects a wide range of people, anecdotal evidence suggests that timber, oil and gas management have become top management priorities in the ANF. In 2007, the ANF updated their forest wide management plan. Management of dispersed camping is listed as a priority, but the topic is briefly discussed. The management plan provides some options for management of dispersed campsites, but no specific guidelines as to when and where these management options should be used in the ANF (USDA 2007). According to the recreation manager of the ANF, dispersed camping is the most important issue to address (White 2012, personal communication). Data and feedback from visitors are needed to help guide management.

Research Objectives

This research was developed to aid the ANF Recreation Manager's understanding of both the environmental characteristics of dispersed campsites and the characteristics of the campers who use them. The results will help managers understand what they desire both in their campsites and in the resource conditions surrounding their campsites. This research was developed with USFS needs in mind,

and with the aid of the recreation manager, Linda White. Data were acquired via informal interviews with USFS personnel, assessments of biophysical conditions of campsites, and by surveys of visitors. These three sources were used to help answer the question, "What are the best management practices to handle high-use dispersed campsites in seven popular locations in the Allegheny National Forest?" This research contributes to knowledge about campers outside of formal campgrounds and wilderness areas, and provides a set of baseline data for USFS personnel to as they begin to tackle the problem of dispersed camping.

Chapter Descriptions

This thesis has six additional chapters. Chapter 2, the literature review, details the specifics of recreation planning and campsite management techniques used elsewhere. Chapter 3 describes the human and physical geography of the ANF and dispersed camping across the national forest. Chapter 4 describes the survey methodology and analysis techniques used to aid in answering the research question. Chapter 5 discusses the results of the survey and the analysis of the data used to aid in the development of the best management practices. Chapter 6 summarizes the best management practices for the surveyed road areas where analysis was focused on. Future methodological considerations of the study and directions for further research are also detailed in the final chapter.

CHAPTER 2

LITERATURE REVIEW

Front Country Dispersed Recreation and Recreation Planning

Recreation management plans required by the USFS, the National Park Service, and other national agencies generally include programs to monitor impacts and management techniques to handle dispersed campsites. Planning involves setting goals and defining the steps or actions that are needed to achieve them. This allows managers to identify the kind of experiences they want visitors to have and to establish the limits to environmental modifications caused by visitors (Newsome et al. 2002). Managers identify indicators that describe the quality of natural area resources and visitor experiences and then set standards that establish the minimum acceptable condition of these indicators. In recreation planning, managers monitor indicators and when the standards for an indicator are violated, management action is taken (Newsome et al. 2002; Moore & Polley 2007; Dawson & Hendee 2009).

There are many different planning techniques that are used in recreation management. One of these techniques involves determining a carrying capacity, or the maximum level of recreation an area can sustain for optimum social and environmental qualities, and limiting the number of visitors to this threshold (Newsome et al. 2002; Dawson & Hendee 2009). Typically, recreation planners either use limits of acceptable change or visitor impact monitoring plans to monitor recreational activities in natural areas. The limits of acceptable change planning involves identifying what environmental and social conditions are acceptable and

then setting standards for these conditions beyond which further change is considered unacceptable and at which point a management action must be taken (Newsome et al. 2002; Foti et al. 2006; Dawson & Hendee 2009). Visitor impact monitoring plans recognize that management is part science and part subjective judgment. This planning technique involves developing strategies to keep visitor impacts within acceptable levels (Chin et al. 2000; Newsome et al. 2002).

The ANF Management Plan is based on the recreation opportunity spectrum (ROS) in which managers delineate zones in a natural area and then allocate activities to certain zones based on intensity of use and other factors (Newsome et al. 2002; Dawson & Hendee 2009). All recreation plans recognize that visitor use is consumptive in nature and that resource impacts are inevitable. It is the goal of most recreation plans to identify the level the change in resource conditions becomes unacceptable (Newsome & Smith 2002; Foti et al. 2006).

Planning and management activities in national forests is governed by several laws and regulations. Initially, forests were established under the Organic Act for the protection of forests, water flow, and for the provision of a continuous timber supply (Organic Act of 1897.). The Multiple Use and Sustained Yield Act of 1960, secured the idea that USFS lands were to be used for outdoor recreation, range, timber, watershed, and wildlife and fish purposes (Multiple Use and Sustained Yield Act of 1960). Among others, management in the ANF must follow the National Environmental Policy Act, the Endangered Species Act, the National Historic Preservation Act, and the Clean Water Act (National Historic Preservation Act of

1966; National Environmental Policy Act of 1970; Clean Water Act of 1972; Endangered Species Act of 1973). These laws and regulations affect what actions can be taken to manage dispersed campsites. For example, any activity to manage dispersed camping that significantly affects the quality of the human environment has to be put through the NEPA process (National Environmental Policy Act of 1970).

Management in the ANF is guided by the 2007, Land and Resource Management Plan which is an amended version of a 1986, Management Plan. The objectives for dispersed camping in the 2007, plan are as follows:

> "Increase the number of inventoried dispersed sites and concentrated use areas (CUAs) managed to standard to reduce health, safety, and resource impacts caused by unmanaged recreation use in the general forest area. (To) provide ancillary support facilities, such as parking areas and toilets, as needed, to protect resources and the environment. (To) manage for desired ROS settings across the ANF as indicated in each management area's desired condition description" (USDA 2007, page 3-313).

In the ANF, the ROS is used to determine how specific management actions can be carried out and to what degree management can interfere to protect resources. There are five ROS classes including urban, rural, roaded natural, semi-primitive, and primitive. Most dispersed camping occurs in the roaded natural class and semi-primitive motorized class. The ROS outlines what management activities can and

cannot be done in each of the classes. In the roaded natural and semi-primitive environments, installed facilities are equally for the protection of natural sites and for the comfort of users. Spacing of facilities such as dispersed campsites is informal and extended to minimize contacts between users (USDA 2002). It is the ROS that guides dispersed camping management plans.

Planning should be participatory in nature. By involving the general public, managers can gain an understanding of visitor perceptions and demographics, of how management decisions affect visitors, and of visitor interests or concerns (Newsome et al. 2002; McFarlane & Watson 2004). Although planning involves anticipating the needs and wants of visitors, it also includes recognizing the concerns and interest of managers (Newsome et al. 2002). The expert judgment of land managers who conduct regular patrols and are familiar with activities in their area can be the most valuable source for information on recreational impacts (Newsome et al. 2002; Neupane et al. 2007). Managers should effectively communicate planning decisions and any proposed changes that affect users so that visitors can understand why changes are occurring (McFarlane & Watson 2004).

Visitors are often the focus of management planning and can also be a valuable source of data (Chin et al. 2000; Newsome et al. 2002; Moore & Polley 2007). They can provide information about the presence and extent of impacts, their perception of the acceptability of various levels of environmental change, and the consequence of management actions (Chin et al. 2000). With information about visitor characteristics and their perceptions of environmental quality, managers can

better balance visitor satisfaction and ecological health (Chin et al. 2000; Newsome et al. 2002; Moore & Polley 2007). Questionnaires, interviews, and surveys are the most effective way to gather data on visitor perception of impacts (Chin et al. 2000; Newsome et al. 2002; Moore & Polley 2007;). Site based interviewing is especially effective as it allows visitors to focus on their current experience and assess the conditions and standards associated with this experience (Moore & Polley 2007). There can be flaws with survey question wording, biases in surveying only current visitors, and biases in the way surveys are distributed, but gathering some visitor feedback is better than developing a management plan without any information (Moore & Polley 2007).

Resource Impacts

Campsites serve as focal points for many recreational activities, and evidence of degraded conditions at campsites can detract from the quality of visitor experiences and impact natural ecosystems (Marion 1995; Leung & Marion 1999; Newsome et al. 2002; Reid & Marion 2004; Monz & Twardock 2010). Campsite impacts may not affect the large-scale ecosystem functioning of an entire forest, but the local micro-environments on sites can be deteriorated and unattractive to visitors (Cole et al. 1997). While most research associated with environmental degradation around campsites focuses on backcountry and wilderness areas, these impacts are the same in front country settings like the dispersed campsites across the ANF but are exacerbated by the presence of vehicles.

Recreational activities in an area can provide benefits such as an enhanced appreciation of natural environments, education, and economic growth, but there are also drawbacks to recreational activities like dispersed camping (Chin et al. 2000; Newsome et al. 2002). Several studies have established standards as to what qualifies as a negative impact on resources caused by humans. Ecotourism can lead to damage to vegetation, introduction of exotic species, destruction of riparian zones, erosion, soil compaction, air and water pollution, and various forms of wildlife disturbance such as habitat fragmentation and poaching (Chin et al. 2000; Newsome et al. 2002). Besides damage to the natural environment, there are also impacts to the social environment including noise, crowding, and visual impacts as well as conflicts between user types like horse back riders, mountain bikers, and hikers (Chin et al. 2000; Newsome et al. 2002; McFarlane & Watson 2004; Dawson & Hendee 2009).

Environmental effects around dispersed campsites are similar to general environmental problems caused by tourism but are localized and highly concentrated to specific areas and include, but are not limited to, root exposure, litter, erosion, mineral soil exposure, tree damage, vegetation loss, social trails, expansion of campsite area, and human waste (Cole et al. 1997; Leung & Marion 1999; Marion & Farrell 2002; Newsome & Smith 2002; Newsome et al. 2002; Cole & Ferguson 2009; Goonan et al. 2012). Although these impacts are highly localized to campsites, the effects can be long lasting and hard to reverse depending on the ecosystem type (Cole & Monz 2004). The nature of ecological systems means that one impact, such as soil erosion or compaction can lead to a multitude of other effects. Of particular concern

to researchers that study human impacts to campsites are changes to vegetation and soil (Dawson & Hendee 2009).

Vegetation around campsites is most heavily affected by trampling when people consistently walk in the same area. Trampling can lead to abrasion of vegetation, reduced plant vigor, changes in plant reproduction ability, and eventually changes in species composition, from native species to exotics, that are more tolerant to trampling (Dawson & Hendee 2009). Trampling around campsites follows a spatial pattern in which vegetation is reduced closest to campfire rings (or centers of campsites) and follows a gradient in which less vegetation is disturbed the farther one moves away from the center (Cole & Monz 2004; Dawson & Hendee 2009). Trees are also susceptible to damage by trampling of seedlings and saplings, by deliberate mutilations of trees, and by felling for firewood (Dawson & Hendee 2009).

Impacts to soil are also common around heavily used campsites. Continued use around sites compacts soil by pressing pores together, reduces oxygen, removes litter and organic matter, reduces nutrient availability, and alters soil biota (Dawson & Hendee 2009). Compaction also reduces the ability of water to infiltrate the soil which leads to water runoff and erosion into waterbodies (Dawson & Hendee 2009). Soil erosion and runoff into surrounding waterbodies creates turbidity and sedimentation problems that can degrade aquatic habitats (Marion 2003). Continued walking over campsites exposes tree roots which increases their susceptibility to mortality (Marion 2003). Erosion is also caused by user-created trails to and from waterbodies, which may be located on steep slopes and can lead to riverbank

degradation and collapse especially near popular river access locations (Newsome & Smith 2002; Marion 2003). Soils are slow to form, their health affects the functioning of plants and animals in the ecosystem, and damage to soil systems is often irreversible (Dawson & Hendee 2009).

Campfires can also affect the functioning of the local ecosystem around a campsite. As campers scavenge the area for burnable wood, they enlarge the area affected by trampling. Continued use of campsites means campers must range farther and farther to find wood. Trails for collecting wood spread the extent of trampling impacts and increase the area of disturbance around campsites (Newsome & Smith 2002). Removal of downed woody material can be a problem, especially removal of the larger branches that provide nutrients to the soil and sites for sapling growth. Campfires change the soil chemistry by increasing pH and reducing microbial activity in the soil so that plant regrowth is less likely and recovery time is slower. Campfires have a tendency to migrate around a campsite, and without a permanent fixed campfire location, the area of impact can spread (Dawson & Hendee 2009). Overall, the most common effects of campfires in undesignated places are cutting of live trees, excessive wood gathering, peeling of birch bark, scorched trash, charred wood, and burned scarred rocks (Ketchem 2002). Of course, there is always the worry that an unattended campfire could lead to a wildfire during drier summers.

Beyond impacts to vegetation and soil, there are also concerns that campers can affect wildlife and that human waste disposal could spread disease. Wildlife such as bears and raccoons, can become pests when conditioned to consume human food

and can enter campsites to find food improperly stored or left unattended (Cole 2004; Dawson & Hendee 2009; Dandy & Marzano, 2012). This creates conflicts between people and animals. Habitat changes, including the introduction of exotic species, animal behavior changes such as habituation to people, and displacement from habitat are all potential affects of recreation on wildlife (Dandy & Marzano 2012). Litter and improperly disposed human waste are unsightly and detract from the experience of visitors staying at campsites. "Pack it in Pack it out" policies are adopted on all national lands and have aided in the reduction of litter, but in some high use areas litter and human waste are still problems. Besides degrading the aesthetic quality of the environment, human waste can cause pollution of soil, ground water, and surface water (Ketchem 2002).

Waste at campsites comes in many forms such as fecal waste and urine, pet waste, food, trash and litter, and fire waste (Ketchem 2002). Managers of public lands typically use pit and composting toilets to control waste in high use remote locations so that they do not compromise drinking water, but across other, primitive areas visitors are expected to dispose of their waste in catholes (holes dug by campers with a small trowel). The instructions for these include burying waste six inches deep and over 100 feet from any water sources, trails, or developed structures (Adams 2007).

Most users make these catholes improperly, or not at all, which increases the risk of fecal matter spreading disease (Ketchem 2002). Another problem with catholes is that users create informal trails and damage vegetation walking back and forth between the campsite and popular bathroom locations. Pit and composting

toilets present their own problems especially when people throw trash and litter into them. Campers also throw food waste and litter into the woods which attracts nuisance animals or attempt to burn the trash (such as food waste or broken bottles) in the fire pit leaving it behind for the next visitor to deal with (Ketchem 2002; Marion 2003). Trash and litter are commonly cited as problems by visitors that detract from their overall recreational experience (Cole 2004; Dawson & Hendee 2009).

Although not a common problem in the ANF, there is the potential for crowding and conflicts between users to arise when campsites are too close to each other or when there are too many people in one place at one time. Visitor conflict and crowding has been more commonly studied in wilderness settings where protection of solitude is explicitly outlined in the Wilderness Act, but visitors camping in any natural environment do expect a certain degree of solitude and conflicts can arise when people's perceptions of their experience is not what they initially anticipated (Wilderness Act of 1964). These impacts to social conditions are more often perceived by visitors than impacts to resource conditions (Dawson & Hendee 2009). Conflicts typically arise between two groups of campers using the same environment for different activities (for example horseback riders and hikers) or between visitors and management activities and approaches, such as campsite closures (Cole 2004; Dawson & Hendee 2009). The most severe conflicts arise between dissimilar parties and nearby campsites. There is always a potential for conflict between users, and the degree to which visitors are impacted by the behavior of others depends on what they expected from their experience, and whether a behavior is considered intrusive

(Dawson & Hendee 2009). Managers can alter potential for conflict by separating types of campsites for certain activities, but obtrusive behavior, such loud noise or illegal activities, requires regulation and enforcement.

Monitoring Resource Impacts

It is the task of resource managers to protect natural resources and provide visitors with an enjoyable, high quality recreational experience (Martin et al. 1989; Marion 1995; Leung & Marion 1999; Reid & Marion 2004; Daniels & Marion 2006). Without information about the degree of impact on campsites, it is impossible for managers to balance these two tasks. Recreational demand for campsites will continue to grow and this is why campsite monitoring and assessment of impacts is necessary. Managers need to develop effective monitoring strategies to determine whether biophysical impacts are acceptable and to decide whether or not action needs to be taken to correct resource impacts (Marion 1995; Marion & Farrell 2002; Monz & Twardock 2010; Goonan et al. 2012). Long term monitoring can detect trends in impacts and, through monitoring, managers can set limits on what is acceptable and compare conditions to a priori standards (Marion 1995; Leung & Marion 1999; Leung & Marion 2004; Monz & Twardock 2010). Monitoring provides the information necessary to assess management effectiveness, to improve land management plans, to systematically allocate funds and resources, and to improve accountability and transparency, especially as resource management actions are increasingly scrutinized by the public (Newsome et al. 2002).

There are four general approaches taken to measuring these impacts and to classifying campsites based on degree of degradation. Simple photography is the most basic form of monitoring campsite conditions as photos are taken periodically and compared across time. Many times it is difficult to see change over time in a photograph, and this technique cannot capture the full range of impact. Another option is to assign campsites to a single class based on a few descriptive characteristics of its condition (Newsome et al. 2002). Generalizing based on condition class is subjective, and frequently does not include the types of impacts that may be present in different classes of sites (Leung & Marion 1999, Newsome et al. 2002; Monz & Twardock 2010). Two additional techniques are multiple indicator ratings and multiple indicator measurements. Multiple indicator approaches measure many different variables along different scales to arrive at an overall rating of impact for each individual sites (Leung & Marion 1999; Newsome et al. 2002; Monz & Twardock 2010). In a multiple indicator rating system, all variables are given equal weighting, even though some variables should be weighted more heavily than others based on management decisions (Newsome et al. 2002). Assessing campsites with multiple indicator measurements requires each impact to be measured directly and is highly accurate (Newsome et al. 2002).

Field work for these multiple indicator approaches is time consuming and managers have limited personnel and funding to reasonably complete these complex evaluations at regular intervals. Managers must set an appropriate balance of the time spent at each site with the number of measurements needed to accomplish their goals

so that the process does not become too involved for management personnel to reasonably handle (Newsome et al. 2002; Foti et al. 2006) Two studies conducted in Alaska and North Carolina found that it is most effective for managers to use cluster analyzes on variables derived from multiple indicator approaches to classify campsites based on levels of environmental impact (Leung & Marion 1999; Monz & Twardock 2010). These studies used factor analysis to reduce the impact measurements to a meaningful set of interpretable factors and then used K-means cluster analysis on the factor scores to come up with three groupings or clusters of campsite types. Once campsites are grouped by type of impact, it is then easier for managers to focus their impact reduction strategies on the more important issues.

Recreation Management Techniques

When levels of impact are deemed unacceptable, it then becomes the task of managers to take corrective action (Marion & Farrell 2002). Although most studies on campsite impact have been conducted in wilderness areas where the Wilderness Act mandates protection of resources as well as safeguarding intangibles such as visitor solitude and recreation, techniques developed for effective management in these conditions can also be applied to high-use recreation areas (Wilderness Act of 1964). Management of campsite impacts can either be reactive, which means management action is taken after sites are heavily impacted, or proactive, which means managers take steps to prevent problems before they occur (Leung & Marion 2004). Proactive management involves designing a site to improve its durability while reactive management involves actions such as closing a site to allow recovery before

it is used again (Cole 2009b). Management techniques can also be classified as to whether visitors experience management directly, such as through the closure of campsites, or whether the management actions are indirect and not noticeable as in campsite designs that concentrate impacts on limited areas (Daniels & Marion 2006). The best management technique for any given condition depends on the area and the level of usage.

Recreation managers can use either site management or visitor management, or a combination of both, in order to reduce environmental degradation around camping areas. Site management includes directing management activities at the campsite by controlling visitors through actions at the sites where the use occurs (Newsome et al. 2002). The most common site management strategies to minimize impacts are campsite closure, dispersal of campsites over the landscape, confinement of campsites to a limited number or area, site restoration, maintenance, signage to indicate campsite locations, and the use of rocks, tent pads, and picnic tables to spatially direct and/or concentrate activities (Marion 1995; Cole et al. 1997; Leung & Marion 1999; Marion & Farrell 2002; Leung & Marion 2004; Daniels & Marion 2006; Goonan et al. 2012).

Visitor management involves managing the visitors so that they can take corrective actions in their behavior toward the environment (Newsome et al. 2002). Visitor management techniques include "Leave No Trace" camping education, ranger patrols for enforcement, reducing visitor numbers, limiting access through fees and permits, limiting group size, limiting how long visitors can stay at a particular

location, and spatially separating users based on activities (Marion 1995; Cole et al. 1997; Leung & Marion 1999; Marion & Farrell 2002; Newsome et al. 2002; Leung & Marion 2004; Daniels & Marion 2006; Goonan et al. 2012). Intensive campsite management is expensive (Cole et al. 1997), but repeated studies where impacts were measured over several years have shown mixed management techniques to be most effective at improving site conditions, eliminating resource impacts and reducing the size of the disturbed area (Marion 1995; Marion & Farrell 2002; Leung & Marion 2004; Daniels & Marion 2006; Cole & Ferguson 2009). The ease of and the cost associated with maintenance and implementation of management actions are important to consider as the number of visitors to natural areas increase and budgets for management agencies continue to decline (Newsome et al. 2002).

Although researchers have suggested reducing use by limiting the number of visitors, this technique is not productive as the relationship between use and impact is curvilinear (Figure 2.1). The majority of impact occurs with initial use, while subsequent use adds little to continuous degradation (Marion 1995; Cole et al. 1997; Newsome et al. 2002; Leung & Marion 2004; Cole & Ferguson 2009; Goonan et al. 2012).

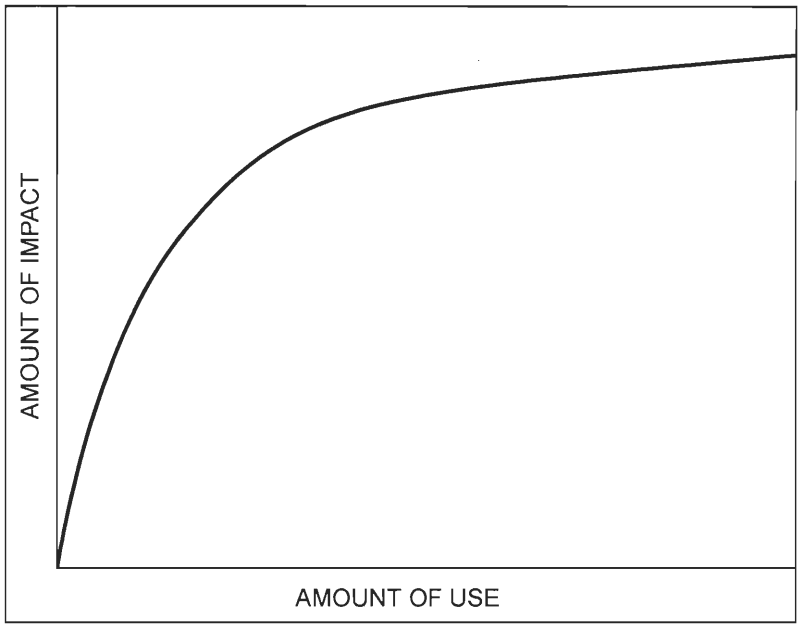


Figure 2.1 Relationship of Amount of Campsite Use to Amount of Impact (Dawson & Hendee 2009)

Numerous studies have used containment strategies and site design plans that spatially concentrate activity on sites to much success in diverse locations including Isle Royale National Park, the Great Smokey Mountains National Park, Shenandoah National Park, and along the Appalachian Trail (Leung & Marion 1999; Marion & Farrell 2002; Marion 2003; Reid & Marion 2004). Cole and Ferguson (2009) closed campsites and used rehabilitation techniques to reduce impacts in Caney Creek Wilderness in AR, and Goonan et al. (2012) found campsite dispersal along the Lake Champlain, NY paddle trail to be successful at minimizing overall environmental impacts.

Recreation Fees

Imposing fees is a way to increase revenue for needed services and maintenance to manage the social and environmental impacts caused by people at such places as campgrounds (Chung et al. 2011; Fix & Vaske 2007; Wu et al. 2010). It is important to understand how visitors view fee impositions to understand the correct rate at which to set fees, to determine the right areas to impose fees, and to design campaigns that effectively explain why the fees are important (Fix & Vaske 2007). Fees to support revenue in public recreation areas have been criticized for not being socially equitable, and people of lower socio-economic status may be less able to pay them. The advantage of fees is that they enable maintenance, monitoring programs and resource protection (Chung et al. 2011, Fix & Vaske 2007; Wu et al. 2010). Stated choice models are one method used to evaluate willingness to pay. These models ask recreationists to express their preferences for campsites that are described by a list of attributes and these choices are examined to understand how changes in fees compare to changes in other site attributes (Schroeder & Louviere 1999).

There are many determinants that affect willingness to pay recreation fees such as the level of campground development or the size of the camping party, but the most common determinant is the user's belief or attitude about the fee program (Chung et al. 2011; Christensen et al. 2003; Fix & Vaske 2007; Wu et al. 2010). If visitors understand how fees will be used and fees are used reasonably to support maintenance programs, education activities, or resource protection, visitors are

willing to pay more (Chung et al. 2011; Fix & Vaske 2007; Wu et al. 2010). Visitors will also be willing to pay higher fees if they have a sense of attachment (the sentiment that people express toward the landscape and setting) to the places where fees are imposed (Chung et al. 2011; Wu et al. 2010). Imposing fees for camping may be one way to manage the degradation caused by people and it is important to understand how visitors will respond to the initiation of such fees.

Comparing Visitor and Managers Perceptions of Resource Degradation

The more attractive a campsite, the more likely that visitors will camp there, degrade the site, and diminish the overall quality of experience for successive visitors (Hillery et al. 2001; Lawson & Manning 2001). It is well known that campers cause resource impacts, but the extent to which these impacts are noticeable to visitors and whether these impacts detract from the overall recreation experience is not clearly understood. It is certain that visitors do not perceive environmental impacts the same way that managers do, thus it is important to understand these differences so that managers can make intelligent decisions regarding time and cost effective long-term management of campsites (Martin et al. 1989; Cole et al. 1997; Farrell et al. 2001; Hillery et al. 2001; Newsome & Smith 2002; Daniels & Marion 2006; Goonan et al. 2012).

In order to compare the impacts managers view as unacceptable with visitor perception of those impacts, researchers routinely combine visitor surveys with biophysical site assessments by management officials (Hillery et al. 2001; Farrell et al. 2001; Newsome & Smith 2002; Reid and Marion 2004; Daniels & Marion 2006;

Goonan et al. 2012). There are a variety of approaches employed in this comparative research, but the following techniques are the most prevalent. Martin et al. (1989) and Goonan et al. (2012) showed visitors photos of campsites with varying levels of impact and asked visitors to rate the acceptability of those impacts on an ordinal scale from one (acceptable) to three (unacceptable). Daniels and Marion (2006), as well as Reid and Marion (2004) assessed the effectiveness of a new campsite policy through visitor surveys to help managers prioritize campsite attributes, perceptions of impacts, and visitor satisfaction of management plans.

Although visitors notice impacts, many visitors view them as necessary to accommodate recreational activities and those impacts that create aesthetically pleasing landscapes may be evaluated as attractive (Farrell et al. 2001; Daniels & Marion 2006). Visitors may not be bothered by certain specific impacts of heavy use such as vegetation loss and damaged trees, but impacts that visitors perceive as intentionally caused on the part of previous campers, such as visible human waste, litter, and vandalism, are viewed negatively (Cole et al. 1997; Chin et al. 2000; Hillery et al. 2001; Farrell et al. 2001; Newsome et al. 2002). Managers have a tendency to notice vegetation loss, soil erosion, and mineral soil exposure whereas visitors only notice the areal extent of impacts (Martin et al. 1989; Goonan et al. 2012).

There is, then, a significant disconnect between managers and visitors regarding the acceptability of impacts which makes implementing management policies difficult (Martin et al. 1989; Farrell et al. 2001; Newsome et al. 2002). This

necessitates research that compares surveys of what visitors find appealing at a campsite with what impacts managers view as acceptable and what changes they are willing to implement. If implemented correctly, some management techniques will be acceptable to visitors, especially if they are informed about why such management is occurring. Visitors support restrictions aimed at reducing the amount of impact on campsites. Such techniques include closing campsites, installing structures to contain use and educational techniques to inform campers of proper low impact camping strategies (Cole et al. 1997; Newsome & Smith 2002; Lawson & Manning 2001).

Previous Studies

Almost all of the research relating to campsite management has been focused on backcountry and wilderness campsites. Less research has been conducted on car camping environments such as those found in the ANF. Research on monitoring both resource and social conditions around campsites began prior to the 1980s, in wilderness areas. Today many national parks and forests have established campsite monitoring and inventorying programs that have guided management of visitors and natural resources. Many national lands have accumulated more than thirty years worth of monitoring data including the Selaway Bitterroot Wilderness in Montana, Sequoia Kings Canyon Wilderness in California, Eagle Cap Wilderness in Montana, Grand Canyon National Park in Arizona, Caney Creek Wilderness in Arkansas, and the Frank Church Wilderness in Idaho (Marion & Farrell 2002; Cole 2013). These areas have data showing long term trends in resource conditions around campsites, but other locations from Alaska to Maryland have started monitoring and so have

national parks in Australia (Newsome & Smith 2002; Marion & Farrell 2002). These studies have measured similar conditions including campsite area, developed structures created by campers, tree root exposure, vegetation loss, tree damage, barren area, cleanliness, social trails, and littering (Marion & Farrell 2002; Cole 2013). All studies have replicated similar techniques and have found similar results that camping alters almost all of the ecological attributes around a campsite and that similar management strategies such as concentrating use to specific areas, "Leave No Trace Education", active closing of campsites, and maintenance and cleaning of existing campsites, help to reduce impacts to natural resources and improve social conditions (Cole 2013).

There are many places, including wilderness areas, that can be pinpointed to highlight the importance of campsite monitoring and management because lessons learned in wilderness settings can be applied to areas outside of the wilderness including the frontcountry car camping environment that exists in the ANF. In Shenandoah National Park managers moved from an at-large camping environment to containing camping at designated campsites, closing and rehabilitating campsites that would not sustain heavy human use, and enforcing regulations. These techniques, plus a heavy emphasis on education from rangers, in permits and brochures, and at trailheads, helped managers reduce overall ecological impacts. Visitor survey results also indicated that educational efforts by the park had successfully conveyed the new camping policies and the reasons behind the campsite management (Reid & Marion 2004).

In Isle Royal National Park, managers and researchers were able to effectively confine camping activity to specific, durable areas by concentrating use around picnic tables and shelters, designating and limiting the overall number of campsites, limiting group size, and regular campsite maintenance (Marion & Farrell 2002). These techniques limited the overall areal extent of impacts and consistently showed the effectiveness of confinement strategies in maintaining the long term viability of campsites. These strategies are generally similar across many wilderness areas where campsite monitoring and management has been focused.

Along the Appalachian Trail in Maryland, heavy and consistent use created many dispersed campsites and led managers to designate newly created campsites, prohibit campfires, and close sites that managers considered not viable for long term use. Managers moved campsites from large, flat and highly impacted areas to well spaced campsites constructed in sloping terrain to limit areal extent of impacts. This reduced the total area impacted, and increased spacing for privacy, and lessened the potential conflict between groups (Daniels & Marion 2006).

On a larger scale, resource impacts around shelters along the entire Appalachian Trail and the social and environmental problems that come with increasing overnight visitation, were a concern to managers and researchers for the Appalachian Trail Conservancy. Various stakeholders including mangers, volunteers, and researchers for the Appalachian Trail Conservancy gathered to conduct a case study to identify problems and management solutions to camping at and around shelters. Common problems around the shelters included campsite proliferation,

vegetation, soil, and water resource degradation, litter and human waste, and a loss of solitude associated with crowding (Marion 2003). Management recommendations included inventorying and monitoring campsites, regulating and designating campsites, improving visitor education, building more facilities to help concentrate use, and splitting up large groups (Marion 2003). Although the Appalachian Trail shelters studied are accessible only by foot, they receive higher and more constant use than wilderness areas and management techniques applied here would also work in a car camping environment.

Though most of the studies on campsite management focus on wilderness areas, there are some examples of management of car or road accessible campsites. In the Payette National Forest in Idaho managers also had a problem with unregulated, dispersed camping in an area smaller than, but similar to, areas across the ANF. The dispersed campsites had compacted soils, a lack of vegetation, lots of exotic species, and a sanitation problem (USDA 2010). In the environmental assessment managers planned to address the problem by restricting parking to a paved area, placing fire rings at designated campsites, and installing a vault toilet to prevent continued degradation of resources associated with their current visitor use (USDA 2010). It is interesting to note that one alternative considered but eliminated due to impracticality was the construction of a developed campground. This was due to the high cost of installing a new site, the required maintenance, and administrative paperwork and processes needed to complete the project (USDA 2010).

Research conducted by Asher (2010), a graduate student at Central Washington University, used fences and signage to aid in the prevention of vehicle access to riparian campsites in a front country setting. She also conducted visitor surveys to understand the characteristics of users at Mt. Baker-Snoqualmie National Forest, and established baseline data on resource conditions at riparian campsites for managers to use in the future.

Finally, one of the more thorough campsite management plans was conducted by the National Park Service at St. Croix National Scenic Riverway in Wisconsin and Minnesota. Management conducted a full environmental assessment of camping before implementing management strategies. The environmental assessment arose from a need for campsite management planning due to increased littering problems, noise complaints from private landowners along the river, erosion along stream banks, lack of respect for wildlife, visitors staying beyond the length of stay limits, and managers' awareness that more visitor contact was needed (Adams 2007). The environmental assessment was implemented as managers decided that increased population in the area will lead to increased camping pressure which means the aforementioned issues would be unlikely to be resolved in the future (Adams 2007).

The plan was guided by campsite inventory and assessment of resource conditions around sites and by a visitor survey that analyzed recreational user behavior, where visitors came from, their opinions about their experience and how they viewed certain resource impacts on the waterway (Adams 2007). The National Environmental Policy Act requires public involvement be conducted before any

management actions can be taken and also means that the studies review all potential environmental effects and consequences projects. Management actions were approved in 2007 and included designating campsites, setting group size limits, setting specific tenting sites, requiring carry out toilets, permits for all visitors staying overnight, and a three night per campsite stay limit (Adams 2007). Instead of implementing management actions over one summer, managers implemented them over the course of several summers so that visitors could have time to become aware of regulations and adjust their behaviors accordingly. Enforcing these regulations is facilitated by managers at St. Croix because there is limited access to the riverway as opposed to the ANF where people can spread out across thousands of acres. Studies such as those done at St. Croix National Scenic Riverway and in other wilderness areas have provided the basis for this research and for the management recommendations to control dispersed camping in the ANF.

CHAPTER 3

THE ALLEGHENY NATIONAL FOREST

The Allegheny National Forest (ANF) is Pennsylvania's only national forest and is 208 hectares in size (USDA 2002). The ANF, located on the Allegheny Plateau, spreads across portions of Forest, Elk, McKean, and Warren Counties in northwestern Pennsylvania and is crossed by three major rivers, the Allegheny, the Tionesta, and the Clarion (Figure 3.1). It is divided into two management areas, the Bradford Ranger District and Marienville Ranger District. The latter was where most of my research was conducted. The ANF was established in 1923 for forest and watershed protection under the Weeks Act of 1911. By the time the forest was designated in the early 1900s, most of the area had been completely logged (USDA 2007). The ANF has two designated wild and scenic rivers (the Clarion River and the Allegheny River), two wilderness areas (Hickory Creek Wilderness and Allegheny Islands Wilderness), a large reservoir (the Allegheny Reservoir), and 96.3 miles of the North Country National Scenic Trail. The ANF provides ample opportunity for a variety of different types of recreation, but is still being frequently logged, and contains heavy oil and gas development. This means that managers of the ANF must balance the multiple objectives and opinions of myriad stakeholders when making any management decisions.

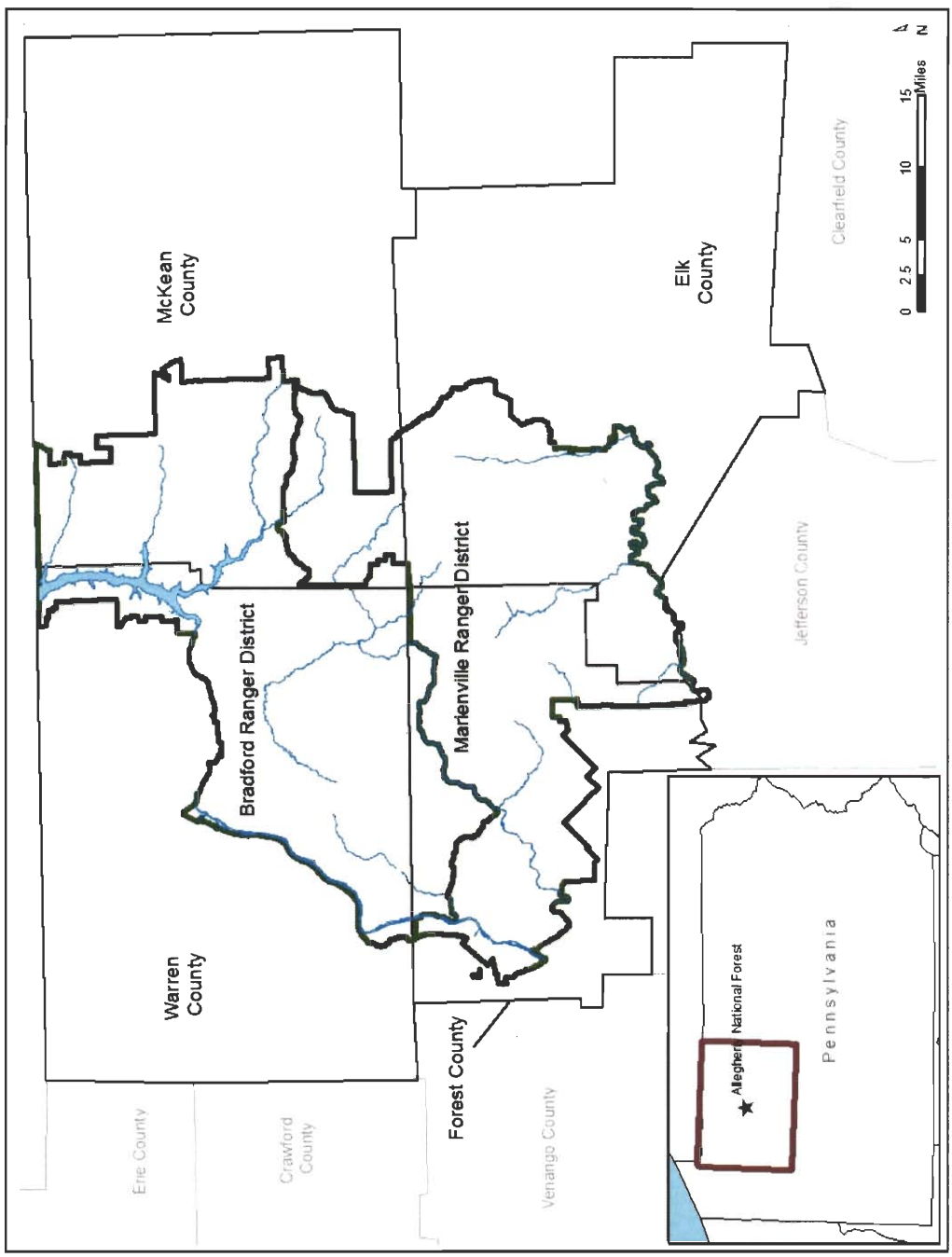


Figure 3.1 Location of the Allegheny National Forest within Pennsylvania

Physical and Biological Characteristics

Dispersed campsites are located in a variety of environments across the Allegheny Plateau, and consequently, it is difficult to describe the exact environment of any one campsite. The Allegheny Plateau is an un-glaciated region characterized by sharp ridge tops and narrow valleys with elevations ranging from 1,000 to 2,000 feet and with old, heavily weathered soils that have been subjected to high levels of acidification. Climatic conditions are characteristic of temperate environments with annual precipitation rates between 40 and 50 inches evenly distributed throughout the year. Temperatures typically average between 15 and 79 degrees Fahrenheit over the year (USDA 2007).

Due to extensive logging from the 1890s to the 1930s almost all of the ANF is even-aged second growth forest except in two places, the Hearts Content and Tionesta Scenic Areas, where old growth forest still remains. There is little dispersed camping in these two areas and they remain the largest tract of old growth forest in the eastern United States (USDA 2007). There are over 80 tree species in the region which are typical to northern and upland hardwood forests. These include black cherry, beech, yellow birch, tulip poplar, red and sugar maple, red and white oak, red and eastern white pine, and the eastern hemlock. Of all the species, black cherry is the most valuable, and almost all of the high-quality commercial black cherry lumber suited for furniture or veneer in the United States comes from the Allegheny Plateau (Che 2006). Timber management is highly focused on producing and encouraging black cherry growth. In 2004, black cherry was sold for $3,000 per thousand board

feet (USDA 2007). As in many other national forests, forest health is compromised by non-native invasive species, and of particular concern in the ANF are the beech bark disease complex, the gypsy moth (which was the greatest concern during the summer of 2013), the hemlock woody adelgid, the chestnut blight, and the pear thrips. These diseases are the ones that currently most threaten the health of the forest and are spread through firewood transport from outside the area surrounding the national forest (USDA 2007).

The diversity of the Allegheny ecosystems supports over 300 aquatic and terrestrial animal species (USDA 2007). Species perpetuation is a major concern to wildlife biologists in the USFS, and six federally threatened or endangered species are found in the ANF. These include the northern riffleshell (a mussel), the clubshell (a mussel), the Indiana bat, small whorled pogonia (an orchid), and northeastern bulrush (USDA 2007). These species and their habitats are monitored and tracked and before any management decision is made, effects on these species must be considered as dictated under the Endangered Species Act and the National Environmental Policy Act (Endangered Species Act of 1973, National Environmental Policy Act of 1970). The ANF provides recovery space for bald eagles and osprey. Game species such as white tailed deer, black bear, and turkey and fish species such as northern pike, walleye, and smallmouth bass provide hunters and fishermen with a variety of options. Pennsylvania is ranked among the top ten states for the allocation of hunting and fishing licenses (USDA 2002).

The ANF is managed for fish, wildlife, timber, water, recreation, and, of increasing importance, oil and natural gas. The region is well known for oil and gas production as the first oil well in the United States was drilled by Colonel Drake in 1859 only 15 miles southwest of national forest boundaries in Titusville (USDA 2007). This initiated the worldwide production of oil. Today the government owns only 7% of the subsurface rights beneath the ANF and the other 93% are owned by private individuals or companies (USDA 2007). This is due in part to the fact that when the ANF was established, the government thought that the minerals beneath the forest appeared to be substantially depleted and there was no need to purchase the mineral rights. Today there are 8,000 active oil and gas wells and 12 large Marcellus shale wells on national forest land (USDA 2007). The Marcellus shale formation is associated with the controversial hydrofracking practices, which was a common concern expressed by visitors completing my surveys. This activity worries many visitors, and people perceive that hydrofracking is affecting their recreational activities, although there are no data to support this belief. This is not the subject of this research, but should be noted for future considerations when managing recreation in the ANF.

Social and Economic Characteristics

Although recreation and ecotourism provide a degree of economic activity to the area, the bulk of economic activity is still highly dependent on development of natural resources such as oil, natural gas, and timber (USDA 2007). Historically, surrounding county residents have depended on the receipts from timber sales for

funding of local infrastructure, schools, and jobs (Che 2006). The four counties within the ANF have between 20 and 42 percent of their land owned by the government, hence there is a lower tax and revenue base for county residents. In areas such as this, the USDA is required to return a certain amount of funds to local governments to support roads, local schools, and other infrastructure through the Secure Rural Schools Act (Secure Rural Schools and Community Self Determination Act of 2000). Most of the money returned to Elk, Forest, McKean, and Warren Counties still comes from timber sales. As a rural area occupied by land locked up in government ownership, the four county region had a declining population, lower than average median household income, and a lower percentage of people with bachelor degrees or higher (Table 3.1) (US Census Bureau 2010; Center for Rural Pennsylvania 2013).

Employment in the region is heavily dependent on manufacturing, retail trade, and public administration jobs such as those offered by the USFS (US Census Bureau 2010). Oil and gas development provides many job opportunities, and will continue to be an important sector for the four county regional economy, especially as companies use leases under the ANF. Still, due to declining timber sales, communities in the area are turning to recreational activities and ecotourism to diversify the economy. Communities in the area continue to promote recreational activities in the ANF as an alternate source of income, and as recreational uses are expected to increase, the pressures on forest resources and campsite expansion will continue to grow (Newsome et al. 2002).

Table 3.1. General Demographic Information for Pennsylvania, the U.S., and the Four County Region within the ANF

	U.S. [1]	Pennsylvania	Elk County	Forest County	Warren County	McKean County	Four County Totals
Population, 2010[4]	308,745,538	12,702,379	31,946	7,716	41,815	43,450	124,927
% Change in population from 2000-10[4]	N/A	3.4%	-9.0%	56.0%	-4.7%	-5.4%	36.9%
Median Age, 2010[4]	37.2	40.1	45	43.0	45.1	41.5	43.6
Median Household Income, 2009[4]	$50,502	$49,501	$41,908	$33,313	$40,139	$39,097	$38,614
Poverty Rates, 2009[4]	11.7%	12.5%	10.7%	22.4%	12.2%	16.1%	15.4%
Unemployment, June 2013 [2]	7.6%	7.5%	7%	9.7%	6.8%	8%	7.9%
Land area in the ANF [3]	N/A	1.7%	21.1%	41.8%	20%	24.8%	n/a
Educational Attainment [4]	206,471,670	8,510,688	23,030	5,152	29,098	29,913	87,193
No High School [4]	15.4%	13.1%	11.0%	19.3%	11.5%	12.6%	12.2%
High School [4]	28.4%	38.1%	51.8%	49.5%	49.0%	49.3%	49.9%
Some College [4]	21.2%	15.6%	12.8%	14.8%	15.7%	15.1%	14.7%
Associates [4]	7.8%	7.2%	8.8%	6.1%	7.8%	7.2%	7.8%
Bachelors or Higher [4]	28.2%	26.0%	15.6%	10.3%	16.0%	15.8%	15.5%
Payments to Local Counties [4]	N/A	N/A	$1,401,551	$1,490,433	$1,838,572	$1,696,789	$6,427,345

1. U.S. Census Bureau 2010
2. US Bureau of Labor Statistics 2013
3. USDA 2007
4. Center for Rural Pennsylvania 2013

Recreation and Dispersed Camping in the National Forest

The ANF is less than a three hour drive from the large cities of Cleveland, OH, Pittsburgh, PA, and Buffalo, NY, and is within one day's drive of 1/3 of the nation's population (USDA 2002). In 2010, over 1.1 million people came to the ANF to participate in some sort of recreational activity. The ANF is used year-round for many recreational activities such as hunting, snowmobiling, skiing, ATV trail riding, hiking, canoeing, and horseback riding. There is also extensive boating on the Allegheny Reservoir. It is formed by the Kinzua Dam on the Allegheny River and managed by the Army Corps of Engineers. The Army Corps of Engineers, the states of Pennsylvania and New York, and the Seneca Nation of Indians also manage recreation areas, campgrounds, and public lands adjacent to the ANF. The Seneca Nation of Indians and the USFS are frequently engaged in government to government consultation about recreational activities and forest wide management (USDA 2007). There were sixteen designated USFS campgrounds open in 2013, with varying levels of fees within the ANF (Figure 2.2). There are also eight nearby campgrounds run by the states of New York and Pennsylvania and the Army Corps of Engineers, along with several private campgrounds These developed recreation areas (fees required) have amenities such as group shelters, picnic areas, pavilions, boat launches, showers, electric hookups, and paved roads. Although there are many developed recreation areas, half of the recreation use that occurs in the forest is dispersed use, like dispersed camping, that occurs outside of developed facilities (USDA 2002).

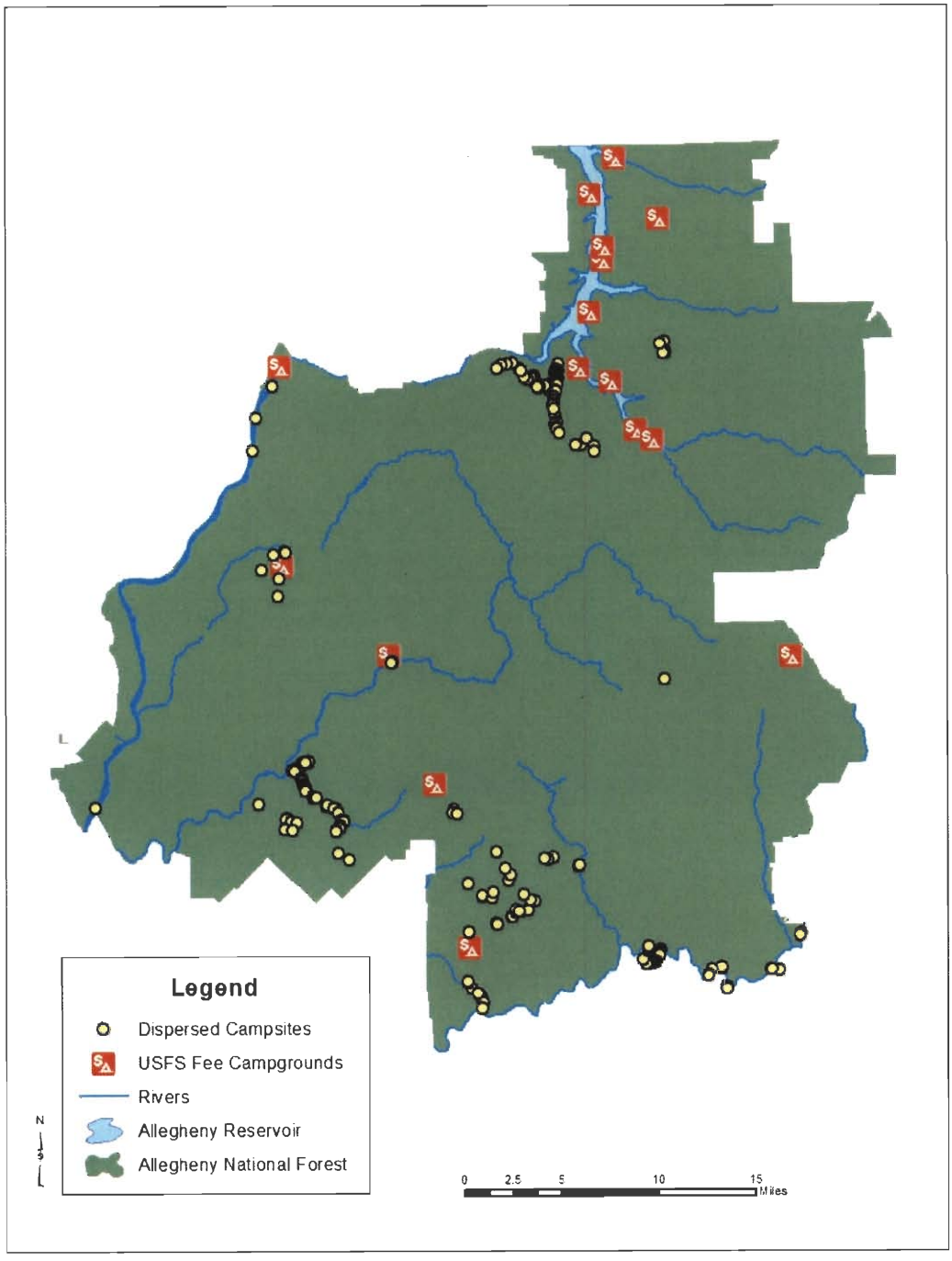


Figure 3.2 USFS Fee Campgrounds and Dispersed Campsites across the ANF

Occupancy rates at developed campgrounds have been static or declining since 1997, probably due in large part to the use of dispersed campsites (USDA 2007).

The National Visitor Use Monitoring Program conducted a survey of visitors during the summer of 2010 to estimate the number of visits, types of visits, and characteristics of visitors to the ANF (USDA 2011). The fifteen most commonly reported zipcodes by respondents were from the surrounding counties of Elk, Forest, McKean, and Warren, and over 50% of visitors drove less than 50 miles to get to the forest (USDA 2011). Thirty percent of visitors cited their income as between $25,000 and $49,999 which matches the 2010 Census data from the surrounding counties. Visitors to the ANF were asked to report their main recreational activity, and the most common were viewing natural features, hunting, hiking, and then developed camping (USDA 2011).

The report also provides estimates about the number of visitors who camp overnight. Most visitors were day users, but 8.6% of visitors stayed in a developed campground and 2.6% participated in some form of primitive camping, indicating that they were at a dispersed campsite (USDA 2011). Although the ANF provides numerous campgrounds, the forest also has a dispersed recreation policy that allows camping along most USFS roads open to vehicles (USDA 2013). The extensive road network in the ANF developed by logging, and oil and gas operations allows access to remote locations across the ANF. Managers in each national forest have a certain

degree of autonomy for establishing policy in an individual forest, therefore camping policies vary from forest to forest.

The current policy at the ANF allows visitors to camp on existing undesignated sites or to create new campsites anywhere along the more than 2,000 miles of USFS roads. Information on this dispersed recreation policy is available from any visitor center and is handed out by recreation personnel via personal contact with campers along with a map that illustrates all roads and trails open to public use. Since camping is allowed on any road not closed or gated to public access, it is nearly impossible for managers to police the ANF to ensure visitors are following regulations. Instead, recreation personnel (during the summer there are five employees depending on funding availability) target their visitor encounters and interactions to specific areas that receive consistent high use.

Since there is such a small staff and there has consistently been a small staff for a number of years due to the federal sequestration and lack of sufficient funding, it has been nearly impossible for managers to accomplish routine tasks (White 2013, personal communication). This means that if any sort of dispersed camping patrol were to happen across the entire forest, there would have to be a tradeoff and tasks such as sign installation, trail construction, and typical maintenance chores would go undone.

Additionally, not many miles can be covered on those rough roads in one day by one person. It is likely that there will continue to be limited time, money, and personnel in the ANF, and unless funding improves, managers must prioritize tasks.

Thus regular dispersed camping patrols will not be a viable option for managers in the foreseeable future.

The dispersed camping policy contains specific guidelines and USFS regulations on dispersed camping (Appendix D). The policy, as established by the USFS, allows campers to occupy a site for up to two weeks and lays out guidelines for low impact or "Leave No Trace" camping. Regulations on the policy given to campers are clear and concise. Examples of regulations on dispersed camping are as follows:

> "Campsites are available on a first come first serve basis. Do not cut or otherwise damage live trees. Do not put nails in trees, picnic tables, or other government property. Do not use trees to hang camp lanterns. The use of live trees for target backstops or to "plant" axes is prohibited. Excavations are limited to those required to make safe campfire rings and sanitary pit toilets. Pit toilets are to be located at least 200 feet from any water source. Pit toilets must be refilled to ground level with a minimum of six inches of soil. Burying or otherwise disposing of garbage at the campsite is strictly prohibited. Do not dispose of cans, bottles, and other material in campfire rings." (USDA 2013, page 1).

The dispersed camping rules are followed loosely, or not at all, by some visitors. The lack of regard for regulations by visitors and deteriorating resource conditions around campsites has been noticed by management personnel. The Final

Environmental Impact Statement of 2007 to accompany the 2007 Land and Resource Management Plan states dispersed camping "has caused environmental conditions to deteriorate to the point of impairing sustainability of the resource(s)" (USDA 2007, page 3-312). The management plan also mentions ways to manage dispersed camping. "In cases where resource conditions deteriorate, restoration and/or use restrictions may occur. In some situations, parking areas, toilets, picnic tables, and fire rings may be constructed in order to protect resources and reduce visitor impacts" (USDA, 2007, page 3-312).

The threats and weaknesses of dispersed camping are mentioned in the recreation management strategy and include a lack of resources to manage dispersed recreation sites, resource impacts along stream corridors, insufficient supply of campsites, flat budgets with no funds, high maintenance costs, and low revenue (USDA 2002). This plan lays out goals to focus more energy on the high use USFS road corridors, improve campsites, mitigate resource impacts, improve signing, and teach "Leave No Trace" and "Tread Lightly" outdoor ethics to raise awareness of environmental practices (USDA 2002). Thus, recreation managers at the national forest are aware of the problems caused by dispersed camping, but with limited funding, personnel, and time, the management of dispersed camping has not yet progressed.

The Study Areas

During the summers of 2010 to 2013, recreation management personnel with the USFS and interns from the Student Conservation Association (SCA) (a non-profit

environmental stewardship program) collected data on the environmental characteristics of dispersed campsites throughout the ANF (Student Conservation Association [SCA] 2013). Overall data or partial data have been collected on 302 dispersed campsites (Figure 3.3). Not all of these campsites are occupied during the entire summer and some are used only once or twice due to their remote locations. There are specific locations in the ANF that receive more frequent use and heavy visitation over the summer that have been identified as hotspots by management personnel. Recreation management personnel attempt to visit these roads during especially heavy visitation weekends, and hand out wildfire information and information on dispersed camping. Many of these roads have marked campsite numbers so that management personnel can keep track of campsite growth and expansion, but these marked sites are not officially designated. These hotspot locations, where I conducted by survey, included USFS roads 127, 131, 132, 133, 143, 145, 150, 160, 259, 395, Timberline Road, Clarion River Road (County Road 3002) and State Road 666 along which the ANF owns land (Figure 3.4).

The roads can be grouped into general area locations based on water features, and on where campers practice certain activities more than others. USFS 131 and 132 are located along Millstone Creek and near Loleta Campground which offers modern restrooms (Figure 3.5). USFS 127 and 145 are located along Salmon Creek which has heavy oil and gas development (Figure 3.6) and areas of hemlock forest cover. USFS 160, 259, and 150 are located on the northern end of the district near the Allegheny Reservoir (Figure 3.7).

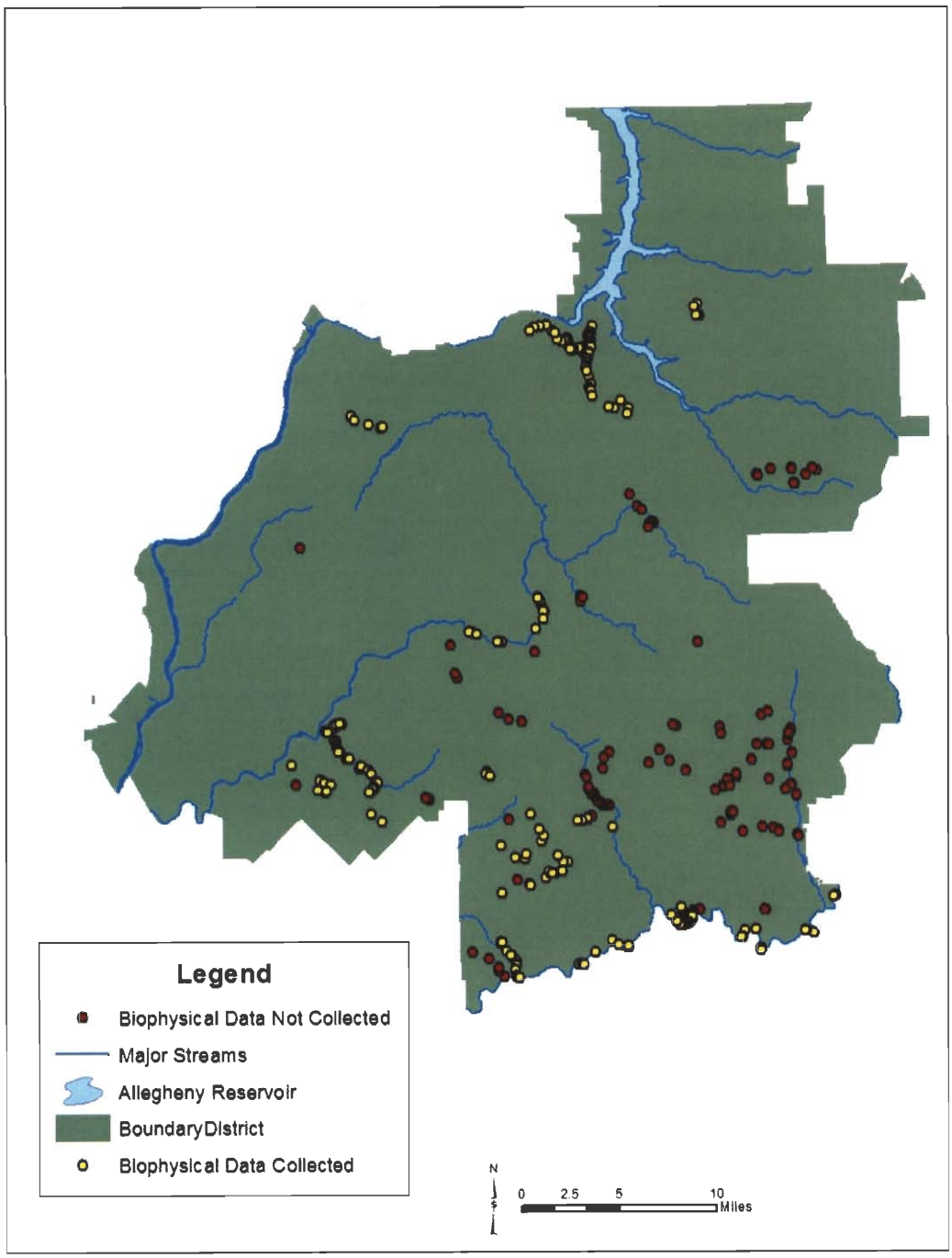


Figure 3.3 Inventoried Dispersed Campsites between 2010 and 2013

Figure 3.4 Roads on which Surveys were Administered 2013

The sites near the reservoir have primarily oak and maple canopies with little undergrowth and there is a recently installed fracking well nearby. USFS 133 and 143 are located on the eastern edge of the forest along Red Mill Creek (Figure 3.8). There is a pit toilet on USFS 143 near an old, once heavily used fishing pond that is no longer fished. USFS 359 and Timberline Road (an unnumbered USFS road) are located close to two ATV trailheads with sites that have plenty of room for larger vehicles. USFS 395 leads to the center of a gravel pit and Timberline Road leads to a large, grassy area. No GPS data on exact campsite locations along these last two roads is available since many of the campsites merge into each other. However, they were included in the study because they are high use areas that management has identified as hotspots and are top management priorities. Clarion River Road (County Road 3002) is located along the Clarion River and is a paved road that provides several canoe launches and primitive toilets for the public (Figure 3.9). It is heavily used by outfitters for dropping off and picking up large canoe trips. State Road 666 has many campsites along Tionesta Creek and is also paved. The road is busier than the typical unpaved USFS roads (Figure 3.10). These seven areas are where I completed my surveys even though there are hundreds of other known and unknown dispersed campsites throughout the ANF. These areas of dispersed camping are of particular concern to the USFS and are the areas where management would like to begin controlling dispersed camping (White 2013, personal communication).

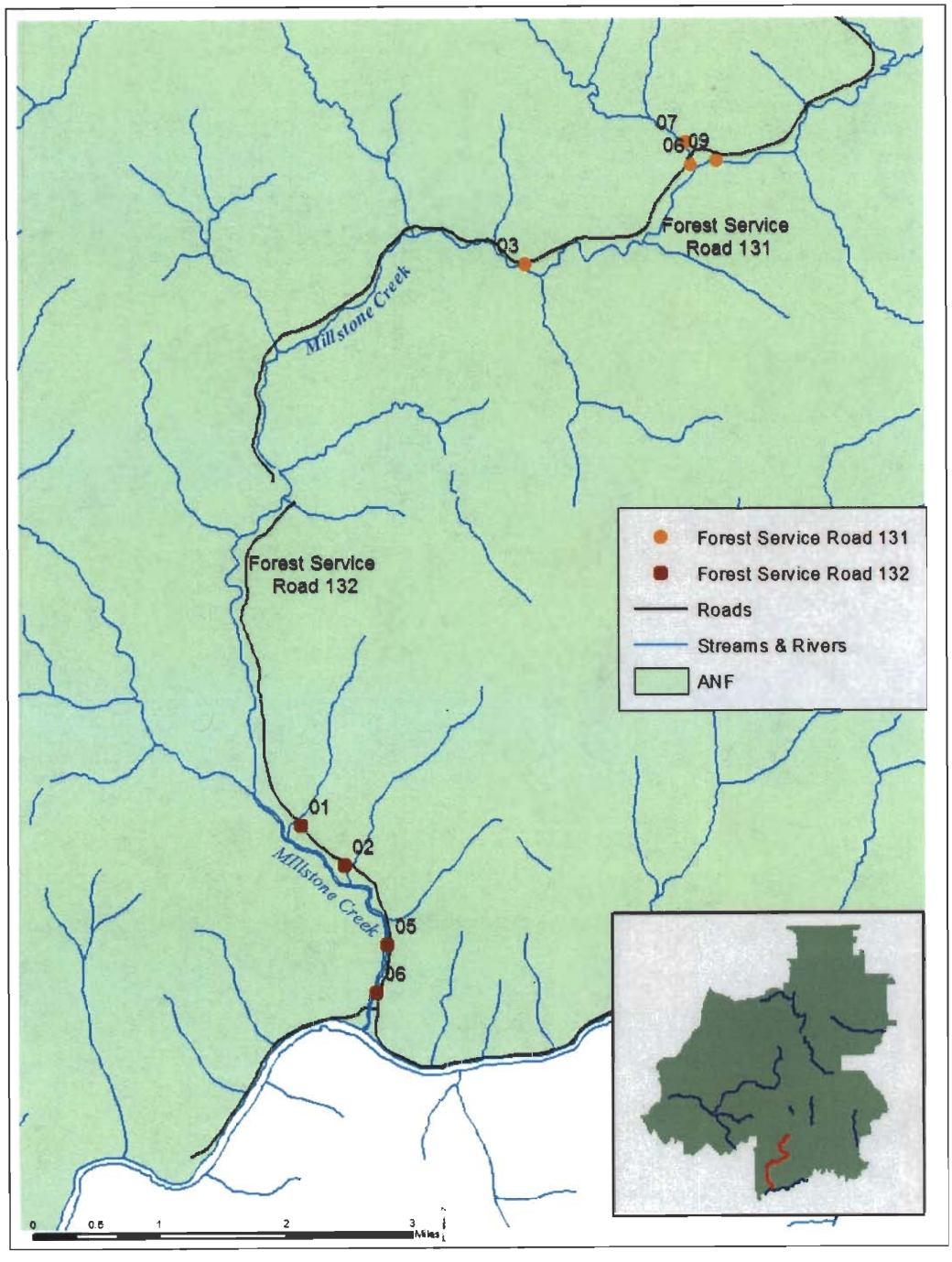


Figure 3.5 Surveyed Dispersed Campsites Along USFS 131 & 132 (Millstone Creek Area)

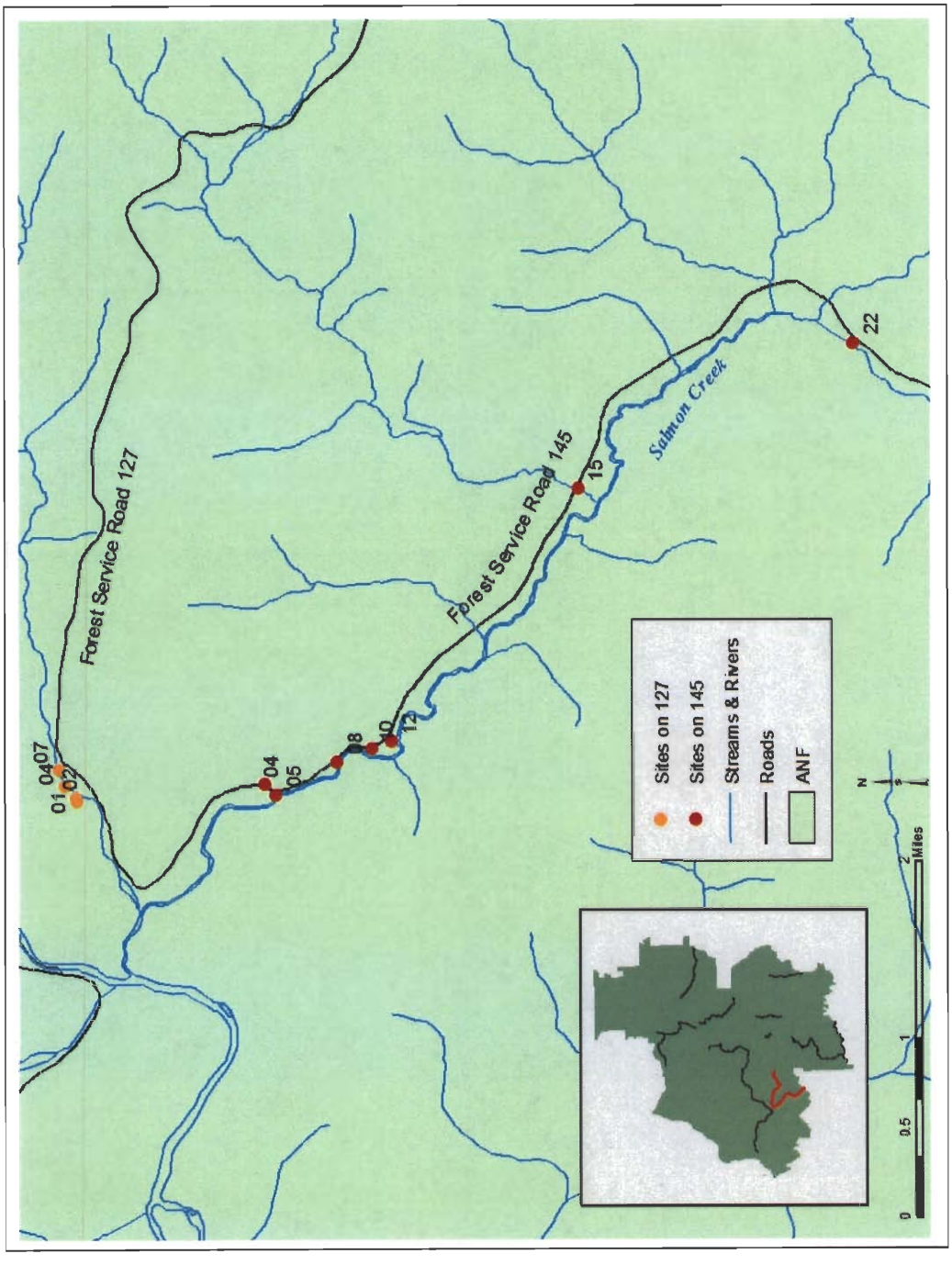


Figure 3.6 Surveyed Dispersed Campsites Along USFS 145 & 127 (Salmon Creek Area)

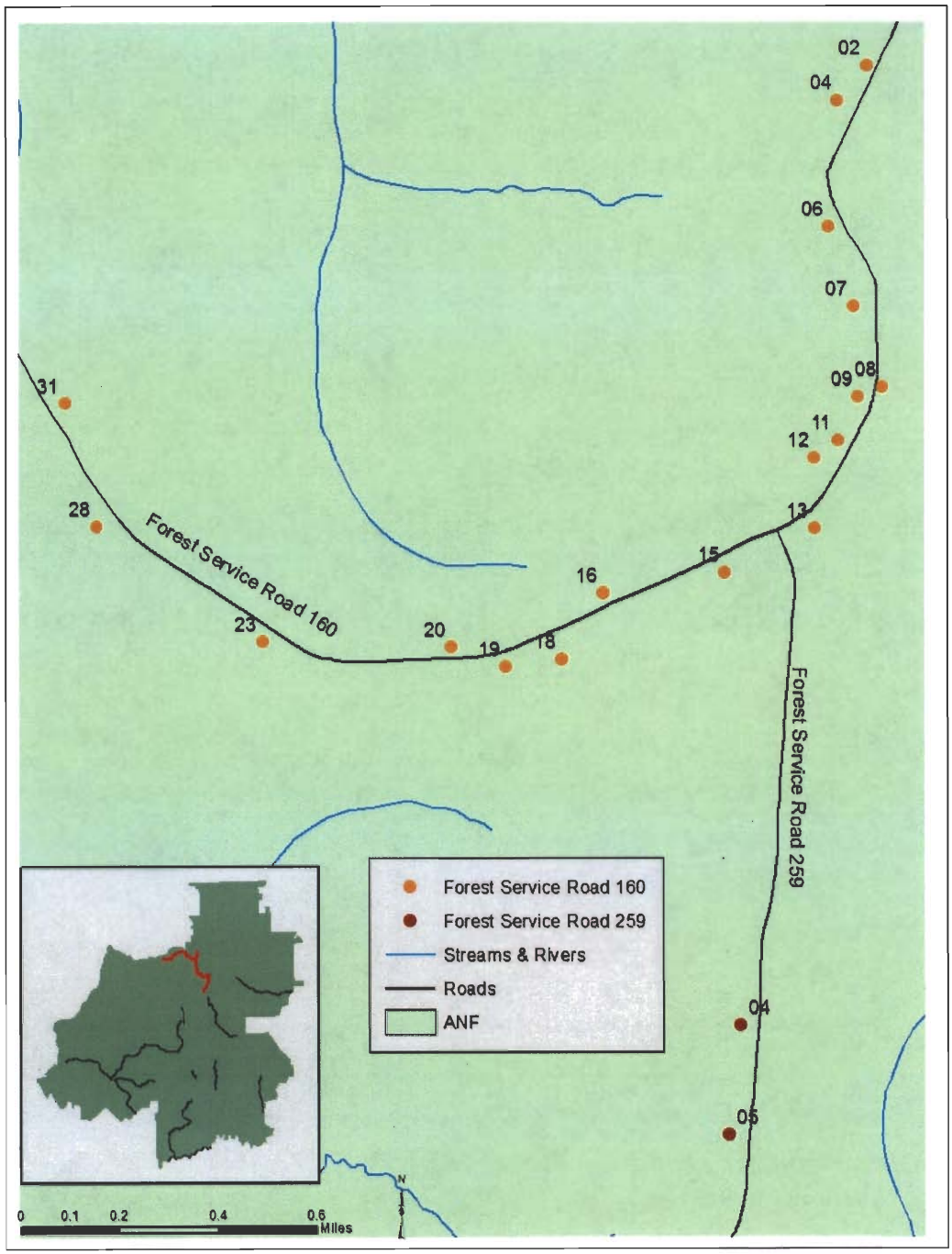


Figure 3.7 Surveyed Dispersed Campsites Along USFS 160 & 259 (Reservoir Area)

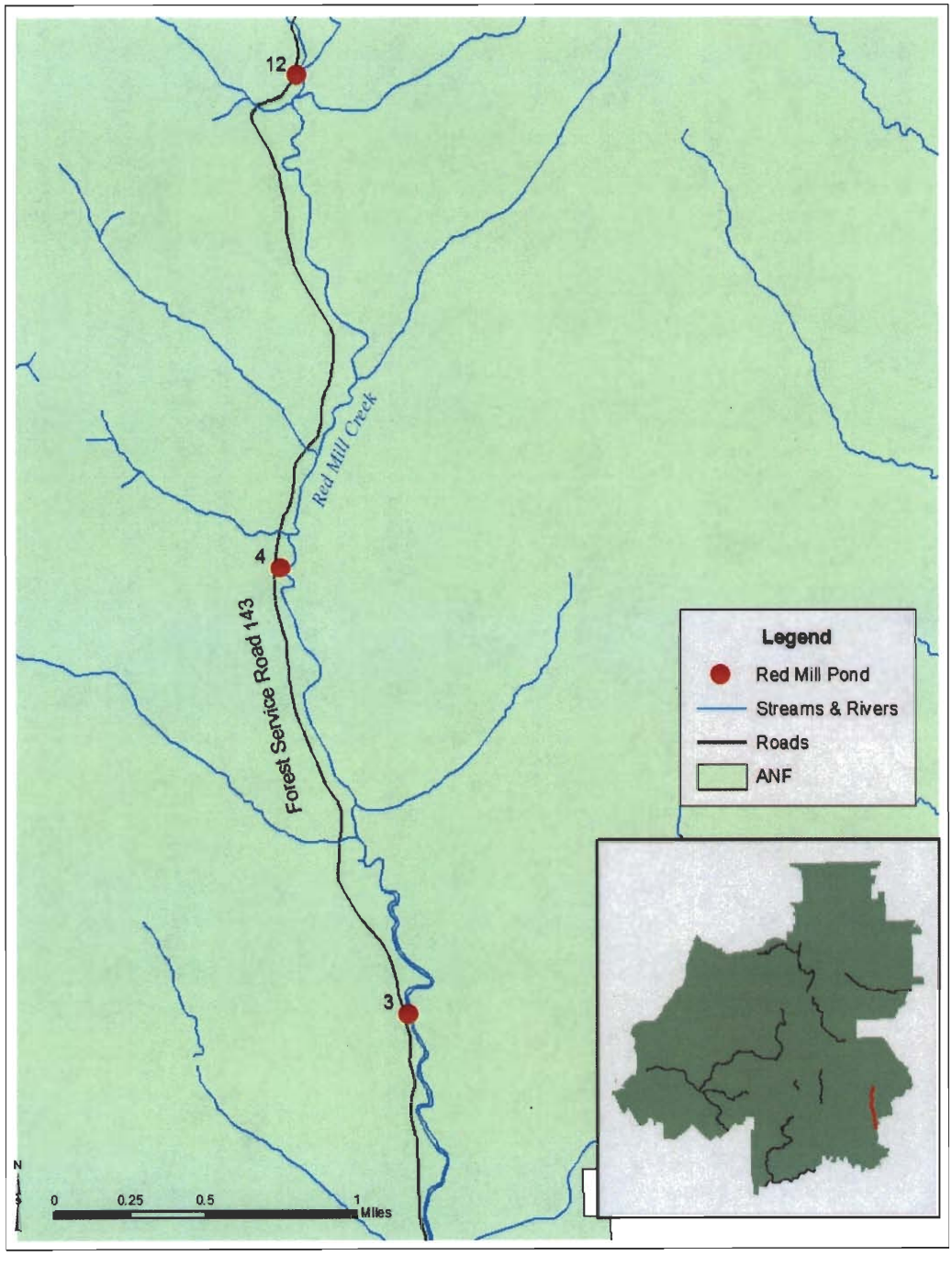


Figure 3.8 Surveyed Dispersed Campsites Along USFS 143 (Red Mill Creek)

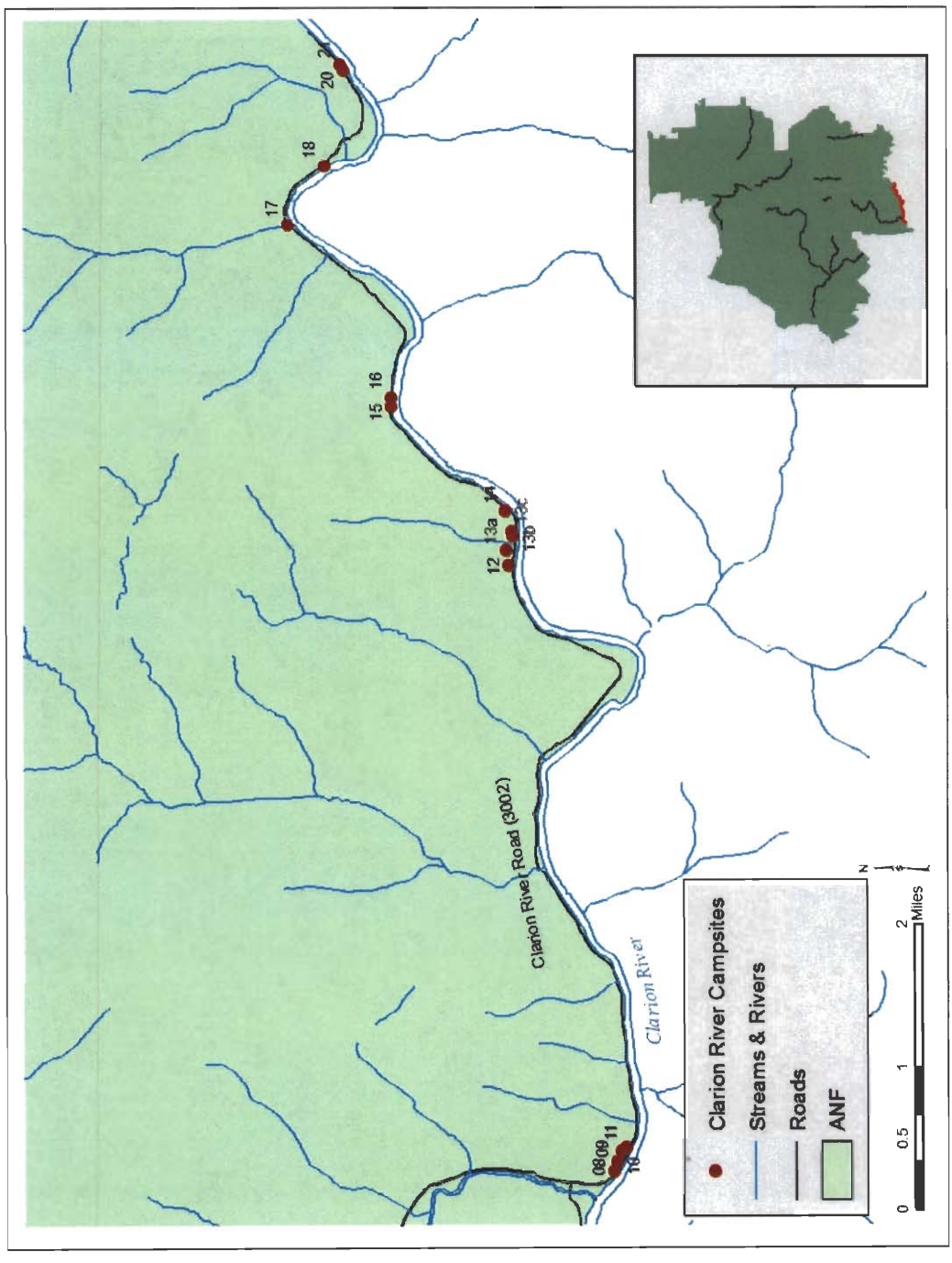


Figure 3.9 Surveyed Dispersed Campsites Along Clarion River Road (County Road 3002)

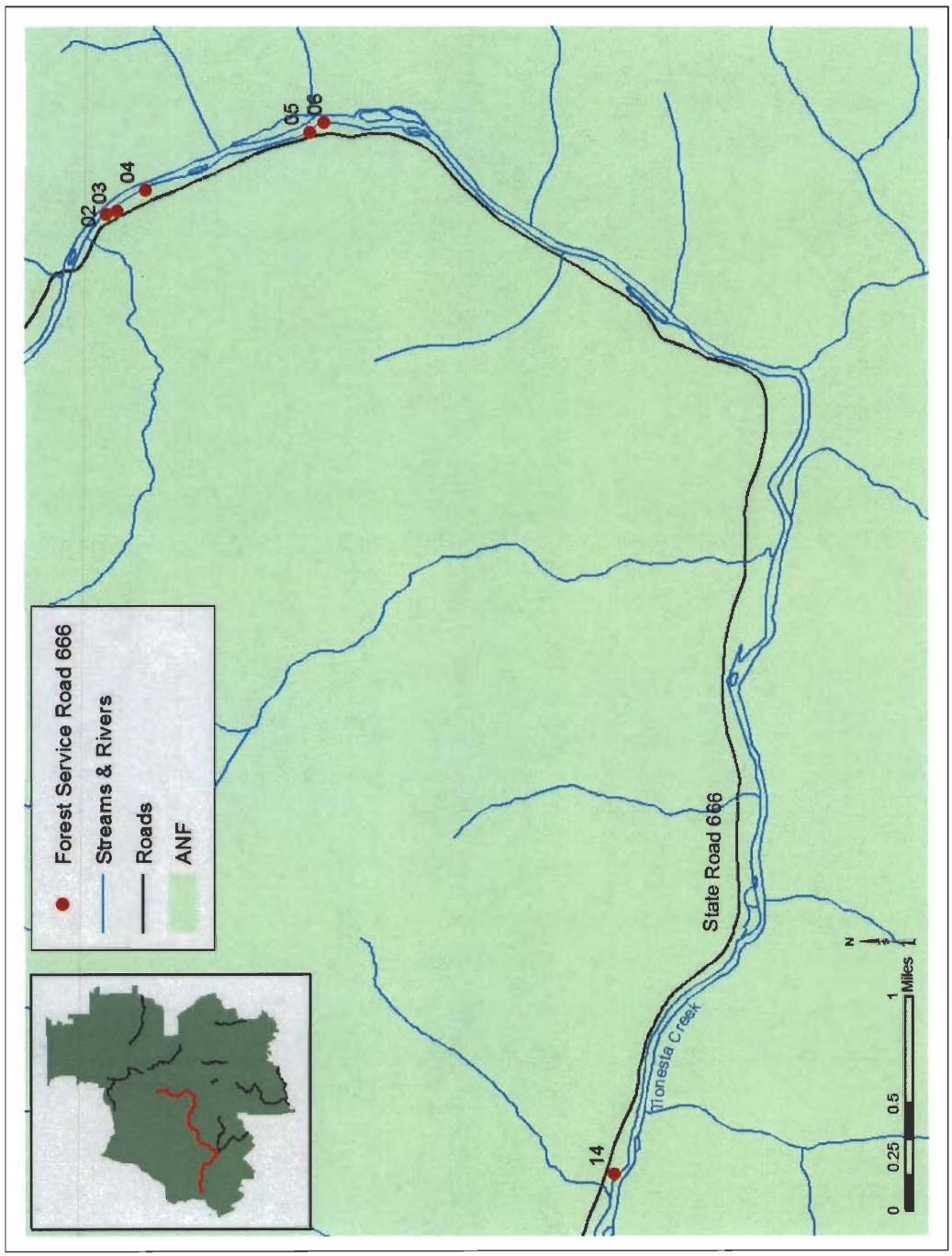


Figure 3.10 Surveyed Dispersed Campsites Along State Road 666

CHAPTER 4

METHODS

The data collection for this project consisted of two parts. A camper survey was conducted during the summer of 2013 and a multi-year biophysical assessment of resource conditions surrounding campsites began during a summer internship in 2010, and continued by USFS personnel into 2013. The management strategies suggested in this thesis are based on the opinions of visitors from surveys, on existing resource conditions from biophysical measurements and campsite impact rankings, and on management constraints gathered from interviews with management personnel. The biophysical data collection method was initiated previous to my arrival, was carried on by myself and others, and represents what ANF management finds important.

Camper Questionnaire

I designed a questionnaire in collaboration with USFS personnel in the Recreation Department at the ANF and faculty in the Geography and Human Performance and Health Education Departments at Western Michigan University in order to gather information from campers at dispersed campsites across the national forest during the summer of 2013. Before administering the questionnaire, I submitted the survey and informed consent document for review to the WMU Human Subjects Institutional Review Board. Since the research required no personal

information be obtained from participants and had no associated risks, the project was deemed exempt by the review board and no further review was necessary under federal regulations (Appendix B).

I chose to develop a printed questionnaire and to present it in person to campers. Presenting the questionnaire in person ensured a high response rate, that participants understood the questions, and that any questions they had about the survey could be answered in a consistent manner. The purpose of the camper questionnaire was to allow campers to express their opinions regarding resource conditions surrounding their campsites and regarding proposed management actions. Demographic information will help recreation personnel understand who uses the dispersed campsites and will help them target information campaigns. Knowing which aspects of campsites users find important will aid in planning and management of dispersed campsites, especially when these preferences are combined with biophysical data that has previously been collected at the campsites

The questionnaire gathered several different types of information. The survey instrument, script used to inform campers, and the take home informed consent sheet for the respondents can be found in Appendix A. The survey was three pages in length and typically took the respondents between 10 and 20 minutes to complete. Minor changes were made to the wording of the survey throughout the process, but the content of the question never changed. The questionnaire consisted of fourteen questions. The first portion of the survey inquired about respondents willingness to pay for camping, their knowledge of low impact camping techniques, and their

preference for certain campsite characteristics. The second portion inquired about respondents satisfaction with the condition of their campsite and their preferences for management techniques. The final portion inquired about respondent's demographics and characteristics of their camping group.

Questionnaire Administration

I conducted surveys between June 10th and July 14th, 2013. Surveys were conducted Thursday evenings after 3:30 pm, Fridays and Saturdays from 9:00 a.m. until dark, and Sunday mornings until noon and each day during the week of July 1st to July 7th between 9:00 am and 6:00 pm. No surveys were administered on the Fourth of July. These times were chosen as times to administer the questionnaire, as it was more likely that people would be around their campsite either preparing for their day or relaxing after their daily activities. At each site, I noted the unique campsite number given by the USFS. If a site number was missing I gave the campsite a provisional number and obtained GPS coordinates to match to USFS records of dispersed campsites later in ArcGIS (Environmental Systems Research Institute [ESRI] 2013). The USFS has GPS coordinates for most of the heavily used or more popular dispersed campsites across the ANF. I chose to survey campers along USFS roads that had heavily used dispersed campsites and where the USFS identified locations as hotspots. These roads were described in the Study Area section and a breakdown of the distribution of survey administration can be seen in Table 4.1 and Figure 2.4.

Table 4.1 Roads Surveyed, Number of Sites Visited, and Number of Surveys Administered Across the ANF, Summer 2013

Road	Number of Sites Visited	Number of Surveys Administered
USFS Road 127	4	8
USFS Road 145	7	16
USFS Road 132	4	7
USFS Road 131	4	8
USFS Road 133	1	1
USFS Road 143	4	9
USFS Road 150	1	1
USFS Road 160	18	23
USFS Road 259	2	2
USFS Road 395	6	13
State Road 666	12	18
Clarion River Road (County Road 3002)	15	41
Timberline Road	3	9
Total	81	156

By visiting the busiest areas, I was able to maximize the number of surveys collected per day and per mile driven. I passed by sites that had signs of occupation such as tents or trailers but had no people present and I did not visit these sites again due to time constraints, the large area to be covered over the weekend, and the lack of resources to repeat visits down USFS roads over the same weekend. I wore university apparel (t-shirts and polo shirts) and upon approaching each site I identified myself as a graduate student from Western Michigan University conducting my master's thesis research. I always approached an adult who was obviously over 18 years old and I never encountered a situation where there were only people under the age of 18 at a campsite. I introduced my thesis project and explained what I would like the

respondents to do every time I approached a campsite. After identifying an adult willing to participate in the survey I either read them the questions or allowed the participants to fill out the survey themselves while I waited by their campfire to answer any questions they might have.

Questionnaire Response Analysis

Survey responses were coded and entered into Excel and copied into SPSS (IBM 2010; Microsoft 2003). All analyses were done in SPSS statistical software (IBM 2010). Survey response analysis focused on distinguishing whether there were any differences in the way campers staying in the seven road areas responded to questions about attributes they find important when choosing a campsite, satisfaction in resource conditions surrounding their campsites, and preferences for management options. Identifying differences between the seven use areas will be used to help make management recommendations. Kruskal Wallis analysis was conducted to evaluate differences among groups at the $p = 0.05$ level and Mann Whitney U test was used for pairwise comparisons (Hillery et al. 2001). Likert responses are non-parametric in nature making the Kruskal Wallis test more appropriate than ANOVA. Non-parametric statistics are appropriate to use when data are ordinal in nature and a mean or standard deviation should not be calculated. Kruskal Wallis provides results in a chi-squared distribution and compares mean ranks of data between datasets. The null hypothesis (H_0) in all cases is that the responses between the groups are not statistically different and the alternative hypothesis (H_a) are that there are differences between groups and specific group differences can be found using the Mann Whitney

U test. I also mapped the zipcode responses using ESRI's Arcmap 10.1 and data made available from Getting to Know ArcGIS to geographically and visually display where visitors were from (ESRI 2013).

Biophysical Data Collection

The USFS has monitored and collected data on dispersed campsites from 2009 through the summer of 2013. Data collection procedures have been the same, although slight variations may have occurred when different USFS personnel and interns collected data. The inventory assessment procedure and techniques were modeled on Cole's (1989) description of monitoring methods, and were modified by the recreation management supervisor, Linda White.

A campsite inventory assessment form was filled out with Forest Road numbers, surveyor, and date of inventory indicated. Site measurements were taken at each campsite, along with information about environmental attributes and human impacts. Information on distance to water, distance to the next nearest campsite, and level of site development were also taken. The location of each campsite was recorded with a Trimble GeoExplorer GeoXH 2008 GPS unit, with coordinates obtained at the center of the fire ring (the GPS unit has on the ground accuracy of a meter). This point data were regularly downloaded and imported to ArcMap. One or more photos were taken at each campsite and the compass bearing from which it was taken was indicated.

Site Area Measurements

Site area measurements were collected using the variable radial transect method as described by Cole (1989). The center of the campsite was assumed to be the center of the fire ring and distance measurements from the center to the perimeter were taken every 22.5 degrees (Figure 4.1). Visual assessment was used to estimate the edge of the campsite where human impacts appeared to stop. Measurements of the barren core area, the most heavily impact area, around the fire ring were estimated based on where mineral soil was most distinctly exposed and where no vegetation growth remained. Because fire rings have a tendency to move over time, the location of the fire ring was indicated by a GPS point and by ascertaining its location with respect to two bearing trees so future comparisons might be made. The two trees had to be greater than 90 degrees apart and their azimuths were recorded. Distance to the bearing trees, the diameter at breast height, and the type of tree were also noted on the campsite assessment form. The measurements taken every 22.5 degrees were then entered into a spreadsheet to calculate the total campsite area and barren core area for each site. Campsites were grouped into three classes based on their total area: (1) 0 - 538 ft^2; (2) 539 - 1076 ft^2; (3) > 1076 ft^2 and into three classes based on the area of the barren core where: (1) 0 - 54 ft^2; (2) 55 - 538 ft^2; (3) >538ft^2. These classifications are the standard procedure for monitoring and measuring resource conditions around campsites (Cole 1989).

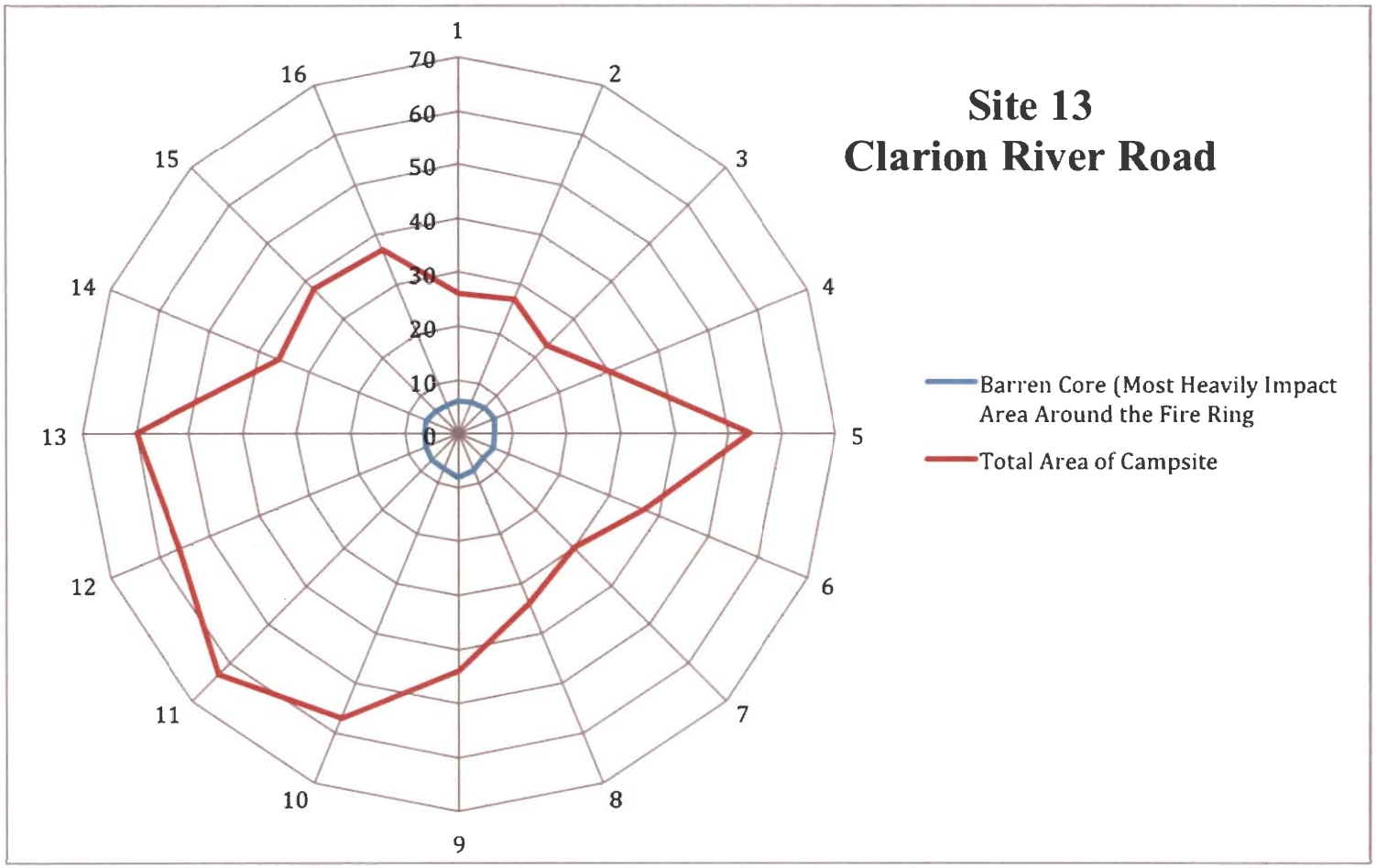


Figure 4.1 Visual Representation of Campsite based on Radial Transect Measurements

Vegetation Assessments

Visual assessments were used to determine the dominant overstory and understory species in the immediate vicinity of the campsite and the level of canopy coverage onsite. Canopy coverage was given an interval ranking based on a five-class scale: (1) 0-5%; (2) 6-25%; (3) 26-50%; (4) 51-75%; (5) 76-100% (Cole 1989). To score vegetation loss and mineral soil exposure, the percentage of vegetation and the percentage of soil exposed over the entire campsite was compared to the percentage of vegetation cover or mineral soil exposed adjacent to the site. The percentage scale used same five ranges listed for canopy coverage and then the vegetation loss and mineral soil exposure were each converted a three class ranking comparing on-site rankings to adjacent rankings where (1) indicated no difference in classes; (2) indicated a difference of 1 class; (3) indicated a difference of two or more classes.

Damage to trees surrounding dispersed campsites includes nails, lantern scars, rope, axe marks and felled trees. Damage to each tree was recorded on a three class scale: (1) no more damage than broken lower branches; (2) One to seven tree mutilations; and (3) greater than seven tree mutilations. Tree damage is especially important for management personnel because trees with enough damage eventually become hazardous and may fall down in a storm potentially injuring campers. Especially dangerous trees were noted so that resource crews could remove them later. The number of trees with exposed roots were counted and ranked on a three class scale: (1) no trees with roots exposed; and (2) no more than three trees with roots exposed; (3) roots exposed on more than three trees. If invasive species were

present on site they were noted so that biologists could return to campsites to apply herbicides. The abundance of dead and felled firewood was visually estimated and ranked on an ordinal scale as low, medium, or high.

Other Conditions

The distance from the fire ring to the nearest firewood and to the next nearest campsite was measured. The closest water source and its type was indicated and the distance from the water source to the fire ring was measured. After many seasons of use, campers develop trails to water sources or toilet locations and these user created trails are not designated by the USFS. The number of user developed trails was counted and then ranked on a three class scale: (1) no trails; (2) one to two trails; and (3) more than two trails or one highly developed trail. Notes were taken on whether livestock impacts such as horse manure and hay were present and whether there was a presence of ruts and mud holes caused by off-highway vehicles such as ATVs or dirt bikes.

Over time, users have a tendency to modify campsites by adding features such as picnic tables or benches, and as the site receives continued use over a summer, trash such as tin cans, mattresses, and toilet paper build up. The level of development of a campsite was ranked on a three class scale where: (1) indicated nothing more than one scattered fire ring; (2) indicated one fire ring and crude log or stone seats; and (3) indicated more than one fire ring, tables, seats, and other developments. Cleanliness or the presence of human waste and trash was noted on a three class scale as well: (1) scattered charcoal from one fire site; (2) more than one fire site, litter, or

blackened logs; (3) and horse manure, human waste, toilet paper, blackened logs, more than one fire site, widespread litter.

Campsite Impact Ratings

Data or observations were recorded for 17 variables at each campsite. Nine critical variables were chosen by the recreation manager, based on the work of Cole (1989), to assign an impact rating to each campsite. The variables that were used to rank campsites were campsite area (in square feet), barren core area (in square feet), level of development, exposure of tree roots, tree damage, cleanliness, number of social trails, mineral soil exposed on site, and loss of vegetation coverage on site. Each of these nine variables were given a ranking of 1 (low), 2 (moderate), or 3 (high). Though other variables were measured, only the numerical rankings of the nine assessments were summed to yield an overall ranking from 9 to 27 for each campsite. An example of the ranking system used to evaluate each campsite is shown in Table 4.2. An example of a completed campsite assessment form can be seen in Figures 4.2 and Figure 4.3. All of these data collected was entered into an attribute table in ArcGIS (ESRI 2013), using the points for campsites as the spatial unit of analysis. The spreadsheet with a diagram of campsite area and photographs of the site were also downloaded into a database. Analysis of campsite results was done using SPSS and Microsoft Excel (Microsoft 2003; IBM 2010).

Biophysical data on the environmental characteristics of dispersed campsites have been collected for several summers and have been rarely utilized for management planning. The survey is designed to collect basic information about

campers and what their perceptions of ANF dispersed camping. The results from the camper questionnaire, in combination with the multi-year biophysical assessment of resource conditions, are used to guide the management of ANF dispersed campsites. Analysis of the attributes campers find important, of the satisfaction of resource conditions surrounding campsites, and of management preferences will aid in making informed management decisions regarding campsite closure and consolidation along the seven highly used road areas.

David Cole's Wilderness Campsite Parameters and Ratings

Total Area of Campsite	0 – 538 ft^2	1
	539 – 1076 ft^2	2
	> 1076 ft^2	3
Area of Barren Core	0 – 54 ft^2	1
	55 – 538 ft^2	2
	> 538 ft^2	3
Vegetation Coverage	0 – 5%	
	6 – 25%	
	26 – 50%	
	51 – 75%	
	76 – 100%	
Mineral Soil Exposure	0 – 5%	
	6 – 25%	
	26 – 50%	
	51 – 75%	
	76 – 100%	
Vegetation loss or mineral soil exposure rating	No difference in classes	1
	Difference of 1 class	2
	Difference of 2 or more classes	3
Damage to trees	No more damage than broken lower branches	1
	1 –7 tree mutilations, no more than 1 of which is obtrusive	2
	Greater than 7 tree mutilations, or more than 1 obtrusive mutilation	3
Exposure of Tree Roots	No trees with root exposure	1
	No more than 3 trees with root exposure	2
	Root exposure on more than 3 trees	3
Development	Nothing more than a scattered fire ring	1
	No more than 1 existing fire ring and crude log or stone seats	2
	Either more than 1 existing fire ring or well-developed seats, tables, windbreaks, and other developments	3
Cleanliness	Nothing more than scattered charcoal from one fire site	1
	Either scattered remnants of more than 1 fire site or litter or blackened logs	2
	Horse manure, human waste, toilet paper, widespread litter, blackened logs, or other remnants of campfires	3
Access Trails	No trails discernable	1
	1 – 2 discernable trails, but no more than 1 well-developed trail	2
	Either more than 2 discernable trails or more than 1 well-developed trail	3

Table 4.2 Campsite Impact Ranking Assessment Variables

Damaged Tree Counts:

Type List

Carving	Girdling
Dead	Limbing
Felled	Nails/Wire/Bolts
Fire Scars	Roots Exposed

Impact Class	Damage Type	Quantity	Unit
	Limbing	3	
	Nails	2	
	Roots Exposed	6	
		11	

Enter total # 11 in GPS

count in front

Site Development:

Types:

Bear Box	Meat Rack
Bear Pole	Other
Constructed Seat	Primitive Seat
Corral	Table or Shelf
Fire Ring	Toilet
Hitch Rail	

Development Type	User – Admin	Count	Count Removed
Fire Ring	U	1	

User Developed Trails:

Condition Class	Length	Unit
Good	41 Ft	feet

Enter 1 Good 41 etc

Stock Impacts:

Dishing	Other
Girdling	Overgrazed
Hay Present	Trampling of Vegetation
Manure Present	

Impact Type	Amount of Impact

Dispersed Recreation Site Inventory

Area Name: Buzzard Swamp FR 197

Road/Travelway:

Site Number: 1

Date of Data Collection: 5-12-10

Collected By: Linda, Anne, Chris (LW, AS, CL) 20100510 – for file creation

Recreation Site Record:

Parameter	Amount	Parameter	Rating (1-3)
Campsite Area:		Campsite Rating	
Barren Core Area		Barren Core Rating	
Mineral Soil, Exposed off-site	0-5%	Mineral Soil Increase Rating	1
Vegetation Cover, off-site %	76-100%	Vegetation Loss Rating	3
Vegetation Cover, on-site %	6-25%	Canopy Cover Level	76-100%
Vegetation, Dominant Overstory Species	Spruce	Tree Damage Rating	3
Vegetation, Dominant Understory Species	Fern, Birch	Root Exposure Rating	3
Campsite Use, Estimate Frequency	Low	Site Development Rating	1
Human Waste/Trash Present?	None	Cleanliness Rating	1
Firewood Abundance	High	Trail Rating	2
Firewood, Distance to Nearest	6ft		
Campsite, Distance to Nearest	greater than 50ft		
Water Source, Distance to Closest	400ft		
Water Source Type	Pond		
Condition Class System	David Cole	Campsite Index (Add ratings above)	

SIR

LORA level up 1-5 based on rating

VDUS

GPS Low to High

WDDI

CNR

Figure 4.2 Filled Out Campsite Inventory Assessment Form Pages 1 & 2

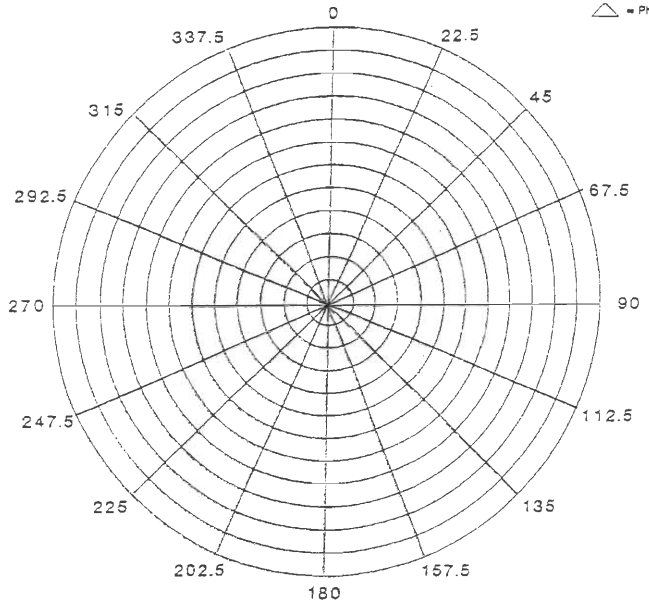
CAMPSITE MAP

SITE NUMBER : 1 5 7 | 0 1

Scale : 1circle = ____ meters

□ = Bearing Point

△ = Photopoint



Bearing Point #1: description Spruce 14" bearing 325 ° distance from center 12.5' m.

Bearing Point #2: description Spruce 14" bearing 63 ° distance from center 9.7' m.

Photopoint: description _____ bearing 163 ° distance from center _____ m.

DISTANCE FROM CENTERPOINT

BEARING	0	22	45	67	90	112	135	157	180	202	225	247	270	292	315	337
CORE (X)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CAMPSITE(O)	22.8'	21.8	20.1	18.0	15.2	11.8	9.4	15.2	16.7	14.6	9.6	20.3	24.2	21.9	20.4	19.4

OHV Impacts: N/A

Gas/Oil Spill/Leak — Other

Mudholes — Ruts

Impact Type	Amount of Impact

Invasive Plants: N/A

Plant Code	Common Name/Scientific Name	Infested Area Unit	# Plants	Comments

Remarks:

Figure 4.3 Filled Out Campsite Inventory Assessment Form Pages 3 & 4

CHAPTER 5

RESULTS AND ANALYSIS

General Information on Dispersed Campers

A total of 158 surveys were completed between June 10th and July 14th, 2013. Five groups declined to take the survey. One cited family time, three groups had just arrived and were too busy setting up camp, and one group was just using the area for a picnic. One group started the survey but stopped half way through because of a heavy downpour. One person finished the survey but was so inebriated and paranoid about the government discovering his location that I did not trust the answers and discarded his survey. This left me with 156 usable surveys. Three times I encountered groups that had been interviewed during previous weekends so I did not interview them a second time.

Although I usually targeted one adult to complete the survey, it was often impossible to interview exactly one person as other members of the group wanted to voice their opinions and were interested in the questions. Participants were given the option of having me read the survey to them or filling out the survey on their own. In some cases, one person would fill out the survey while receiving input from other members of the group about the appropriate answer. This happened most frequently when I was asked to read the survey out loud while the campers made dinner. More frequently, members of the group would have differing opinions about questions.

When that occurred, I handed out surveys to all the individuals in the group interested in completing one.

When I approached a campsite, people were wary that I might be a government official and was there to cite them for a violation, but once they discovered I was not with the USFS, they were happy to fill out a survey. Most people were enthusiastic about completing the survey and generally interested in the research I was doing. Many of them chatted with me while a member of their group filled out the survey. I was able to complete all of my surveys Friday evenings, Saturday mornings and evenings, and Sunday mornings. These were the times when people were more likely to be around their campfire relaxing or cooking a meal. By Sunday around noon, most people were headed back home.

Of the 157 campers interviewed 92% came from within 100 miles of the National Forest (Figure 5.1). These visitors represented the major metropolitan areas of Pittsburgh, Erie, Cleveland, and Buffalo, but most visitors were local and came from counties surrounding the national forest. This is important for managers because educational efforts about proper camping techniques can be targeted first to communities and visitors from the local area. General background information on the camping groups in each road area surveyed is presented in Table 5.1. This table breaks down educational attainment, camping group size, type of camping equipment, and camping group composition for each surveyed road area.

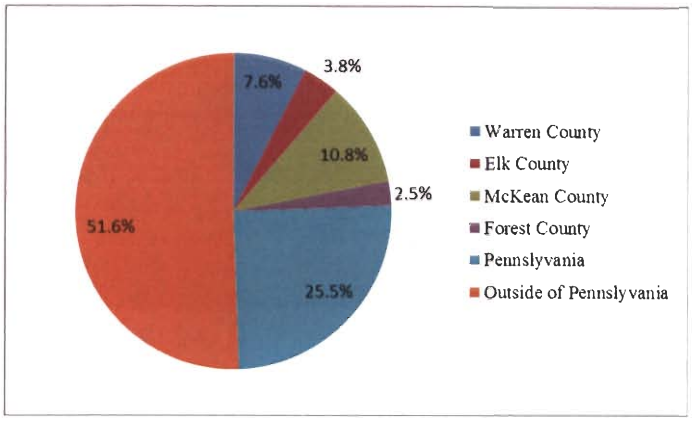


Figure 5.1 Visitors to the ANF

Table 5.1 General Information about Dispersed Campers by Road Area

Variable	FS Road 131/ 132	FS Road 143	FS Road 150/160/ 259	FS Road 127/ 145	FS Road 395/ Timberline Road	Clarion River Road	State Road 666	Total
Average Group Size	4.6	11.54	7.9	4.6	6.4	6.7	4.1	6.38
Type of Camping Equipment								
Mobile Home	0.0%	1.0%	1.0%	0.0%	3.6%	2.6%	0.0%	8.2%
Pick-Up Camper	0.5%	1.5%	1.5%	1.5%	2.6%	3.1%	0.5%	11.2%
Pop-up Trailer	1.5%	1.5%	2.6%	1.5%	0.0%	2.6%	2.0%	11.7%
Tent	5.6%	3.6%	9.2%	10.7%	4.6%	15.3%	8.7%	57.7%
Trailer	0.5%	1.0%	2.6%	0.5%	4.6%	1.5%	0.5%	11.2%
Educational Attainment								
No High School	0.0%	0.0%	0.0%	0.0%	0.6%	1.3%	0.0%	1.9%
High School	3.2%	3.8%	3.8%	5.7%	8.3%	9.6%	6.4%	40.8%
Some College	3.2%	0.6%	5.1%	0.6%	1.3%	3.8%	0.6%	15.3%
Associates	0.6%	0.6%	2.5%	1.3%	2.5%	4.5%	1.9%	14.0%
Bachelors or Higher	3.1%	1.3%	5.0%	7.7%	1.3%	7.0%	2.5%	27.9%
Camping Group Composition								
Alone	0.6%	0.0%	0.6%	0.6%	0.0%	0.6%	0.0%	2.5%
Family	6.4%	4.5%	5.7%	5.7%	7.0%	7.6%	7.0%	43.9%
Friends	2.5%	1.3%	5.1%	5.1%	5.1%	10.2%	3.8%	33.1%
Family & Friends	0.6%	0.6%	5.1%	3.8%	1.9%	7.0%	0.0%	0.6%
Organization	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.6%	19.1%

Camping Equipment

Overwhelmingly, campers were staying overnight in tents. Respondents were able to circle as many types of camping equipment as they were using and tents were the most frequent followed by pop-up campers, trailers, and pickup campers (Table 5.1). Tents were reported as the main piece of camping equipment along State Road 666, along Salmon Creek or USFS 145 and 127, along Millstone Creek or USFS 131 and 132, along Clarion River Road (County Road 3002), and near the reservoir or USFS 160 and 259. Timberline Road and USFS 395 near the ATV trail heads had less distinct responses. Tents were reported as often as trailers. Trailers are needed to carry ATV's and dirt bikes and I noticed many people using them as campers. Along USFS Road 143 near Red Mill Pond respondents reported tents and then pickup campers and pop-ups as common. So even though tents were common, pick up campers and pop-ups reported use was a higher percentage than in other locations such as along the Clarion River or Millstone Creek.

Camping Group Composition

Camping groups were commonly made up of family, friends, and a mixture of the two groups (Table 5.1). There was only one group reporting that they were in an official group and it was a church group camping along the Clarion River and planning a canoe trip. Anecdotal evidence from USFS personnel and the Loleta Campgound managers indicated that most organizations like the Boy Scouts and church groups use developed campgrounds for access to amenities like flush toilets (White 2013, personal communication).

Group Size

The average size of camping groups across the USFS roads I surveyed was 6.38 people (Table 5.1). One group along USFS 160 reported that they would have 50 people camping with them for a celebration (a celebration to send their friend off to jail for getting a DUI) and I encountered several people who were camping by themselves.

Activities on the National Forest

The most commonly reported activities by dispersed campers were fishing, hiking, and swimming (Table 5.2) other activities mentioned by campers included drinking, hanging out, biking, and panning for gold (albeit unsuccessfully). These main activities would change depending on the season from hunting in the fall to snow sports in the winter. These results reflect summer activities.

Many of the dispersed campers are camping in specific areas based on the activities they plan to participate in during their visit. Those who camp along USFS 395 and Timberline Road were the only ones who reported the use of ATVs or dirt bikes because both of these roads are near ATV trailheads. The other areas were less pronounced in terms of distinct activities with a wider range of activities being reported. In the Salmon Creek area (USFS 127/145) the most common activity was fishing, in the Millstone Creek Area (USFS 131, 132) photography and hiking were the most common. Near the reservoir people reported photography and motorized water travel. Near Red Mill Pond (USFS 143) fishing and photography were

common. Along State Road 666 the main activities were fishing and picnicking, and along the Clarion River fishing and picnicking were common activities.

Table 5.2 Respondents' Reported Activities in the ANF

Activity	Percentage of Respondents Reporting that they participated in the activity
Fishing	61.8%
Hiking	61.1%
Swimming	59.2%
Picnicking	56.1%
Photography	40.8%
Canoeing	38.2%
Nature study	36.9%
ATV	14.0%
Horseback riding	12.7%
Motorized Water Sports	12.1%

How many times have you used this campsite in the past?

Since the question was worded in such a manner that left campers free to answer anyway they saw fit, I received a variety of different answers for this question. Many people had different time frames in mind some answered in terms of years that they had visited the site; others answered in terms of number of times they stayed over one summer. Although this makes results difficult to compare there are some definite trends. Only 21.7% of visitors stated that this was the first time camping at their particular campsite. The other 78.3% of visitors made some comment that indicated that they had used the site several times in the past. A variety of answers were phrased in a similar manner listing number of years (for example 30 years), listing the year they first started coming (for example since 1992), or unable to

give year numbers or exact dates campers would write several, a lot, or many. Some followed the question and wrote things such as 100 times, 3 times, or 50 times.

Educational Attainment

Compared to the four county surrounding area and Pennsylvania, interviewed campers had a lower percentage of people with no high school education. Of the campers surveyed 56.1% had some college education or higher (Table 5.3). The percentage of people surveyed with high school degrees and some college education, was similar to the state of Pennsylvania and the four county ANF region. There were twice as many people with associate's degrees as compared to the four county region and a higher percentage of people with higher education than the four county ANF region. The 2013 survey results for educational attainment are similar to educational attainment for the entire state of Pennsylvania.

Table 5.3 Respondents Reported Educational Attainment in Comparison to Educational Attainment in Pennsylvania, the U.S., and the Four County Region within the ANF (The Center for Rural Pennsylvania 2013)

	Pennsylvania	Elk County	Forest County	Warren County	McKean County	2013 Survey Results
No High School	13.1%	11.0%	19.3%	11.5%	12.6%	1.9%
High School	38.1%	51.8%	49.5%	49.0%	49.3%	40.8%
Some College	15.6%	12.8%	14.8%	15.7%	15.1%	15.3%
Associates	7.2%	8.8%	6.1%	7.8%	7.2%	14.0%
Bachelors or higher	26.0%	15.6%	10.3%	16.0%	15.8%	26.8%

Did you choose this campsite because you did not have to pay a fee?

Of campers surveyed 54% said they definitely chose their campsite because they did not have to pay a fee, and 43% said that not paying a fee was not a determinant in their campsite choice (Figure 5.2). Many of these campers cited tradition as the reason for choosing their sites. Of the campers who chose their site because they did not have to pay a fee, 55% would not be willing to pay any fee if fees were initiated. Additionally 25% of the people who did not choose their site specifically because there was no fee would also be unwilling to pay for a camping site. Overall, 42% of all respondents reported that they would not be willing to pay any fee citing reasons such as never having to pay fees in the past and a government conspiracy to charge more money (Figure 5.2). Although it appears that a large number of people are not willing to pay, most services in the financially stressed USFS cannot continue to be free. If fees had to be implemented, 21% of both groups felt that they would be willing to pay one time fee (flat fee for an entire weekend which I specified when administering the survey) of ten dollars to stay a weekend. This data presents the ANF recreation managers with potential alternatives to investigate for additional fee collection for campsites.

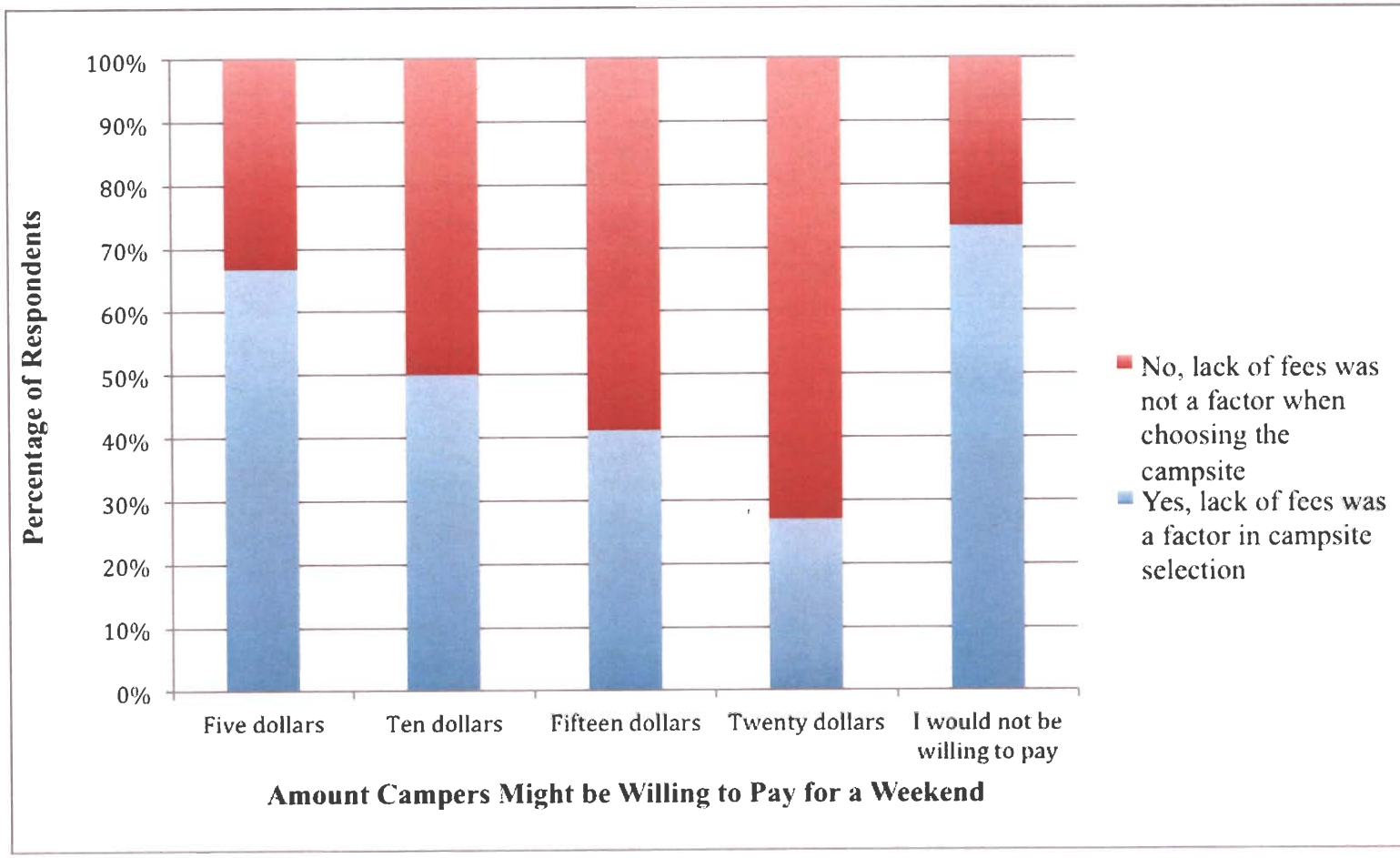


Figure 5.2 Amounts Respondents Would Pay to Stay Overnight at a Dispersed Campsite if they had to Pay a Fee

Do you practice "Leave No Trace" techniques?

Of the 157 visitors to the forest, 87.3% of people answered that they did practice "Leave No Trace" techniques, 8.3% people did not answer the question, 2.5% said they did not know what "Leave No Trace" was, and 1.9% people said they did not practice the techniques. The results from this question make it appear that, overwhelmingly, people think they practice "Leave No Trace" techniques. As much as I would like to believe these results, direct observation, and informal conversation with managers indicated otherwise. I also noted that although people discussed trash removal, many sites were littered with trash.

Many campers believed "Leave No Trace" meant trash removal. In the words of one camper when explaining it to his friend, "It means that we leave no trash behind after we vacate the site." While it is good that campers are cleaning sites and removing trash, "Leave No Trace" techniques go beyond trash removal and include traveling and camping on durable surfaces, minimizing campfire impacts, disposing of waste properly, respecting wildlife, being considerate of other visitors, planning ahead and preparing for time spent in nature, and leaving what one finds (Leave No Trace [LNT], 2013).

Analysis of Likert Responses

What do you find important when choosing a campsite outside of a formal campground?

The percent of respondents that found each attribute important or unimportant are displayed in Table 5.4. These results depict what campers found most and least

important when choosing a campsite along USFS roads. Kruskal Wallis tests were used to determine where these differences lie amongst the road areas surveyed. When choosing a campsite, visitors reported cleanliness, the natural setting of the site, privacy, ease of access, the size of the site, and quiet/solitude as the most important. The least important attributes affecting campsite selection were access to ATV and horse trailheads, adequate seating and built structures, and the ability to make noise or party.

For most of the results there is little difference in the percentage of people who found campsite attributes very unimportant or unimportant and very important or important, except in the cases of the adequate seating/built structures, level ground, parking space, and shade variables Adequate seating and built structures were reported as the most unimportant attribute affecting campsite selection, many campers bring their own camping chairs to sit in. Campers reported that level ground, parking space, and shade as important attributes that affect their campsite selection, but not as very important. This implies that the lack of these things at a campsite may not deter visitors from camping there if a better site was not found.

Table 5.4 Likert Percentage Responses to Attributes Campers Find Important when Choosing a Dispersed Campsite

	Very Unimportant	Unimportant	Neither	Important	Very Important
Ability to Make Noise or Party	11.5%	13.4%	27.4%	26.8%	21.0%
Quiet/Solitude	6.4%	5.7%	21.0%	34.4%	32.5%
Access to ATV or Horse Trailheads	22.3%	26.8%	21.6%	16.6%	12.7%
Cleanliness	5.1%	2.5%	5.1%	46.5%	40.8%
Distance to Water	3.2%	10.2%	22.9%	36.3%	27.4%
Ease of Access	2.5%	4.5%	24.8%	47.1%	21.0%
Free Wood	6.4%	15.9%	29.3%	22.3%	26.1%
Level Ground	2.5%	6.4%	27.4%	46.5%	17.2%
Adequate Seating or Built Structures	19.1%	45.2%	27.4%	4.5%	3.8%
Natural Setting	5.7%	3.2%	7.6%	36.3%	47.1%
Parking Space	5.7%	10.2%	20.4%	46.5%	17.2%
Privacy	4.5%	3.2%	14.6%	38.2%	39.5%
Shade	3.8%	5.7%	25.5%	50.3%	14.6%
Size of Site	1.9%	8.3%	22.9%	47.8%	19.1%

Kruskal Wallis results indicate that campers in different areas value quiet and solitude, access to ATV or horse trailheads, distance to water, the natural setting, and privacy at different levels ($P < 0.05$) (Table 5.5). Mann Whitney post hoc pairwise comparisons indicated that most of these significant differences lie between the people camping near ATV trailheads and those at other locations.

Quiet and solitude are rated less important (lower mean rank) to people staying near ATV trailheads(ATV) than they are to campers staying in the Salmon Creek (SC), Millstone Creek (MC), Clarion River(CR), State Road 666 (SR666), and Reservoir areas (RA) (Table 5.6). This makes sense because ATVs are loud machines and users may be used to the noise. Again post hoc results also reveal that people

staying near ATV trailheads value access to the trailheads more than people staying in all other areas (Table 5.7). This makes sense because people camping near ATV trailheads are there for a specific purpose, to ride their ATVs.

Campers at ATV trailheads rated distance to water less important than did campers along Millstone Creek and Clarion River (Table 5.8) which makes sense because, Millstone Creek and Clarion River are popular water destinations. Campers staying near ATV trailheads and along the Clarion River ranked camping in a natural setting as less important than campers staying in the Millstone and Salmon Creek areas (Table 5.9). These results suggest that campers along the Clarion River and near ATV trailheads may be willing to accept a more modified camping environment. ATV users ranked privacy less important than people staying along State Road 666, along the Clarion River, along Salmon Creek and Millstone Creek (Table 5.10). My speculation is that privacy is less important due to the nature of campsites at the ATV trailheads. Campsites are close together, almost on top of each other, and they are not separated by natural features that would otherwise act as buffers between groups of people.

Table 5.5 Kruskal Wallis Results for Likert Responses to Importance Levels for Various Attributes when Choosing Campsites (Asterisks Indicate Significance at the 0.05 alpha level)

	X^2 Statistic	P Value
Ability to Make Noise/Party	1.799	0.773
Quite/Solitude	30.870	<0.001*
Access to ATV/Horse Trailheads	29.402	<0.001*
Cleanliness	4.994	0.288
Distance to Water	15.435	0.004*
Ease of Access	0.642	0.958
Free Wood	3.587	0.465
Level Ground	5.739	0.219
Adequate Seating/Built Structures	1.651	0.800
Natural Setting	15.059	0.005*
Parking Space	5.373	0.251
Privacy	25.427	<0.001*
Shade	2.111	0.715
Size of site	0.687	0.953

Table 5.6 Mann Whitney U Post Hoc Results Comparing Road Areas Importance for Quiet and Solitude (D= Different Importance Levels; S = Same Importance Levels)

	SC	MC	CR	RMP	RA	SR666	ATV
SC	-	-	-	-	-	-	-
MC	S	-	-	-	-	-	-
CR	S	S	-	-	-	-	-
RMP	S	S	S	-	-	-	-
RA	S	S	S	S	-	-	-
SR666	S	S	S	S	S	-	-
ATV	D	D	D	S	D	D	-

Table 5.7 Mann Whitney Post Hoc Results Comparing Road Areas for Importance in Access to ATV and Horse Trailheads (D= Different Importance Levels; S = Same Importance Levels)

	SC	MC	CR	RMP	RA	SR 666	ATV
SC	-	-	-	-	-	-	-
MC	S	-	-	-	-	-	-
CR	S	S	-	-	-	-	-
RMP	S	S	S	-	-	-	-
RA	S	S	S	S	-	-	-
SR666	S	S	S	S	S	-	-
ATV	D	D	D	D	D	D	-

Table 5.8 Mann Whitney U Post Hoc Results Comparing for Importance Placed on Distance to Water (D= Different Importance Levels; S = Same Importance Levels)

	SC	MC	CR	RMP	RA	SR 666	ATV
SC	-	-	-	-	-	-	-
MC	-	-	-	-	-	-	-
CR	S	S	-	-	-	-	-
RMP	S	S	S	-	-	-	-
RA	S	S	S	S	-	-	-
SR 666	S	S	S	S	-	-	-
ATV	S	D	D	S	S	-	-

Table 5.9 Mann Whitney U Post Hoc Results Comparing Importance Placed on Natural Setting (D= Different Importance Levels; S = Same Importance Levels)

	SC	MC	CR	RMP	RA	SR 666	ATV
SC	-	-	-	-	-	-	-
MC	-	-	-	-	-	-	-
CR	D	D	-	-	-	-	-
RMP	S	S	S	-	-	-	-
RA	S	S	S	S	-	-	-
SR 666	S	S	S	S	S	-	-
ATV	D	D	S	S	S	S	-

Table 5.10 Mann Whitney U Post Hoc Results Comparing Importance Placed on Privacy (D= Different Importance Levels; S = Same Importance Levels)

	SC	MC	CR	RMP	RA	SR 666	ATV
SC	-	-	-	-	-	-	-
MC	S	-	-	-	-	-	-
CR	S	S	-	-	-	-	-
RMP	S	S	S	-	-	-	-
RA	S	S	S	S	-	-	-
SR 666	S	S	S	S	S	-	-
ATV	D	D	D	S	S	D	-

How satisfied are you with the resource conditions surrounding your campsite?

By examining the overall results, it is apparent that most campers are satisfied with the way the campsites appear. For most attributes, most people were somewhat or extremely satisfied (all attributes had over 50% of respondents or more apparently satisfied with the resource conditions surrounding their campsites) (Table 5.11). Conversations with managers indicate that they are the most concerned about the condition of vegetation and trees around a campsite, the size of the campsites, and distance between campsites or privacy (White 2013, personal communication). On these particular points campers seem generally satisfied.

Table 5.11 Likert Reponses to Satisfaction of Resource Conditions Surrounding their Campsite

	Extremely Unsatisfied	Somewhat Unsatisfied	Neutral	Somewhat Satisfied	Extremely Satisfied
Amount of firewood near my campsite	3.8%	9.6%	29.9%	33.1%	23.6%
Condition of trees on my campsite	0.6%	3.2%	10.2%	32.5%	53.5%
Distance to water, trailheads, or bathrooms from my campsite	0.6%	5.7%	15.2%	27.4%	51.0%
Privacy of my campsite	3.2%	3.8%	10.2%	31.8%	51.0%
Levelness of tenting surface	1.3%	4.5%	19.7%	29.3%	45.2%
The size of my campsite	0.6%	1.9%	8.9%	28.7%	59.9%
The cleanliness of my campsite	4.5%	8.3%	8.3%	34.4%	44.6%
Adequate Seating	1.3%	3.8%	43.9%	20.4%	30.6%
The shadiness of my campsite	0.6%	3.8%	12.7%	35.7%	47.1%

Based on Kruskal Wallis results, the only resource condition that showed a difference in satisfaction level was the amount of firewood near campsites (Table 5.12). Campers staying in the reservoir area were significantly more satisfied with the amount of firewood near their campsites than those staying in the Salmon Creek and Clarion River areas (Table 5.13). Anecdotal evidence suggested that the high levels of firewood satisfaction in the reservoir area was caused by a recent logging done by the

USFS that left a lot of downed, woody material along USFS 160. People cited that they had been driving there to collect firewood.

Table 5.12 Kruskal Wallis Results Comparing Satisfaction Levels Between Surveyed Road Areas (Asterisks Indicate Significance at the 0.05 alpha level)

	X^2 Statistic	P Value
Amount of firewood near my campsite	19.467	0.003*
Condition of trees on my campsite	5.882	0.437
Distance to water, trail heads, or bathrooms from my campsite	2.857	0.827
Privacy of my campsite	11.022	0.088
Levelness of tenting surfaces	4.670	0.587
The size of my campsite	5.967	0.426
The cleanliness of my campsite	9.970	0.126
Adequate seating	10.497	0.105
The shadiness of my campsite	7.722	0.259

Table 5.13 Mann Whitney U Post Hoc Results Comparing Satisfaction Level with Amount of Firewood near Campsites (D= Different Satisfaction Levels; S = Same Satisfaction Levels)

	SC	MC	CR	RMP	RA	SR 666	ATV
SC	-	-	-	-	-	-	-
MC	S	-	-	-	-	-	-
CR	S	S	-	-	-	-	-
RMP	S	S		-	-	-	-
RA	D	S	D	S	-	-	-
SR666	S	S	S	S	S	-	-
ATV	S	S	S	S	S	S	-

How willing would you be to accept the following management actions to help improve the quality of dispersed campsites throughout the ANF?

Campers favored providing signs and maps to help them locate campsites

along roadways, providing water pumps, toilet facilities and trash cans, and providing minimal structures to protect fragile areas (Table 5.14). All of these would move the camping environment from a roaded, natural setting to a more developed setting. Whether campers clearly understood these implications I am not sure. Campers opposed limiting group size, limiting camping to designated places, and closing campsites to allow vegetation to recover. These options place more direct regulations on visitors themselves. The generally neutral responses to the options of education on low impact camping, firewood sale, and daily visits by land management personnel, indicate that these management actions could occur without significant impact to visitors camping experiences.

Table 5.14 Likert Responses to Support for Management Actions

	Strongly Oppose	Somewhat Oppose	Neutral	Somewhat Favor	Strongly Favor
Closing some campsites to allow vegetation to regrow	22.9%	22.9%	32.4%	18.5%	3.2%
Daily visits by Land Management Personnel	18.5%	18.5%	38.9%	16.6%	7.6%
Limiting camping to designated sites only	31.2%	24.8%	21.0%	17.2%	5.7%
Limiting group size	42.7%	20.4%	23.0%	9.6%	4.5%
More education on minimal impact camping	4.5%	6.4%	42.0%	29.9%	17.2%
Provide minimal structures such as picnic tables, fire rings, and tent pads to protect fragile areas	7.0%	15.9%	29.9%	26.8%	20.4%
Provide signs and maps to help identify campsites	7.6%	9.6%	24.2%	35.0%	23.6%
Provide firewood for sale	5.7%	5.1%	45.8%	28.0%	15.3%
Provide water pumps, trash cans, and toilet facilities	9.6%	5.1%	35.7%	28.0%	21.7%

Kruskal Wallis results indicated that there was a difference in management preferences for providing minimal structures, providing signs, providing firewood for sale, and providing water pumps, trash cans, and toilets across the seven road areas (Table 5.15). Most of these differences arose between campers at the Clarion River area and those at the other six camping areas. This may be due to the fact that people staying at campsites along the Clarion River Road are more used to seeing other campers and may be in desire of a more developed camping environment. Those staying along Clarion River had a higher support for providing minimal structures such as picnic tables, fire rings, and tent pad as compared to campers staying near the reservoir, along State Road 666, near ATV trailheads, and along Salmon Creek (Table 5.16). Generally, support for signs and maps to help identify campsites was lower along State Road 666 than elsewhere (Table 5.17). People camping along Clarion River and near ATV trailheads were more supportive of management providing firewood for sale than those people staying along State Road 666 and near the reservoir (Table 5.18). Campers along the Clarion River favored the installation of water pumps, trashcans, and toilet facilities more than campers near the reservoir area and along State Road 666 (Table 5.19).

Table 5.15 Kruskal Wallis Results for Management Preferences (Asterisks Indicate Significance at the 0.05 alpha level)

	X^2 Statistic	P Value
Closing some campsites to allow vegetation to regrow	11.195	0.083
Daily visits by land management personnel	7.065	0.315
Limiting camping to designated sites only	7.912	0.245
Limit group size	5.593	0.470
More education on minimal impact camping	4.806	0.569
Provide minimal structures such as picnic tables, fire rings, and tent pads to protect fragile areas	20.626	<0.001*
Provide signs and maps to help identify campsites	24.150	<0.001*
Provide firewood for sale	22.599	<0.001*
The provision of water pumps, trash cans, and toilet facilities	28.852	<0.001*

Table 5.16 Mann Whitney Post Hoc Results for Support of Minimal Camping Structures (D= Different Satisfaction Levels; S = Same Satisfaction Levels)

	SC	MC	CR	RMP	RA	SR666	ATV
SC	-	-	-	-	-	-	-
MC	S	-	-	-	-	-	-
CR	D	S	-	-	-	-	-
RMP	S	S	S	-	-	-	-
RA	S	S	D	S	-	-	-
SR666	S	S	D	S	S	-	-
ATV	S	S	D	S	S	S	--

Table 5.17 Mann Whitney Post Hoc Results for Support of Signs to Identify Campsites (D= Different Level of Support for Management; S = Same Level of Support for Management)

	SC	MC	CR	RMP	RA	SR666	ATV
SC	-	-	-	-	-	-	-
MC	S	-	-	-	-	-	-
CR	S	S	-	-	-	-	-
RMP	S	S	S	-	-	-	-
RA	S	S	S	S	-	-	-
SR666	S	D	D	S	S	-	-
ATV	S	S	S	S	S	D	-

Table 5.18 Mann Whitney Post Hoc Results for Support of Providing Firewood for Sale (D= Different Level of Support for Management; S = Same Level of Support for Management)

	SC	MC	CR	RMP	RA	SR666	ATV
SC	-	-	-	-	-	-	-
MC	S	-	-	-	-	-	-
CR	S	S	-	-	-	-	-
RMP	S	S	S	-	-	-	-
RA	S	S	D	S	-	-	-
SR666	S	S	D	S	S	-	-
ATV	S	S	S	S	D	D	-

Table 5.19 Mann Whitney Post Hoc Results for Support for Providing Water Pumps, Trashcans, and Toilets (D= Different Level of Support for Management; S = Same Level of Support for Management)

	SC	MC	CR	RMP	RA	SR666	ATV
SC	-	-	-	-	-	-	-
MC	S	-	-	-	-	-	-
CR	S	S	-	-	-	-	-
RMP	S	S	S	-	-	-	-
RA	S	S	D	S	-	-	-
SR666	S	S	D	S	S	-	-
ATV	S	S	S	S	S	S	-

Biophysical Data Results

From the summer of 2010 through the summer of 2013 a total of 302 dispersed campsites had been identified across the ANF. Of those, 276 campsites had full biophysical data collected. The biophysical data collection procedure required two people, significant time, and funding which is hard to find within the already financially stressed ANF. Of the seven roadway areas in which I conducted my surveys, only the Salmon Creek area (USFS 127/145), Millstone Creek Area (USFS 131/132), State Road 666, Clarion River Road, and the reservoir area (USFS 160/259, but not USFS 150) had full biophysical data analysis completed. The other areas, including Red Mill Pond (and USFS 133), and the ATV trailheads (USFS 395/Timberline Road) did not have biophysical data collected on the campsites. The ATV trailheads were large, grassy areas with campsites that frequently overlapped. Because it was hard to distinguish where one campsite ends and another began, precise biophysical data collection was difficult in these areas. Red Mill Pond has had GPS markers put up to identify sites but no data have yet been collected.

Based on the biophysical data collection and campsite impact rankings from 9 to 27, I grouped the campsites into low, medium, and high with each group representing equal categories. These rankings were verified through visual binning in SPSS (IBM 2010). The number of surveys in the seven surveyed areas that were collected in the low, medium, and high impact categories is shown in Table 5.20. Campsites with low impact rankings are generally those that are infrequently used, thus they generated only a few surveys during the study period.

Table 5.20 Grouping of Campsites into Low, Medium, and High Impact Categories

Campsite Impact Categories	Number of Surveys Conducted in Each Category
Low (9 – 15)	4
Medium (16 – 21)	32
High (22 – 27)	77
No Biophysical Data	43

The number of campsites in the seven road areas where I collected surveys that fall into these low, medium, and high impact rankings are shown in Table 5.21. No data were available for campsites near ATV trailheads and in the Red Mill Pond Area.

Table 5.21 Low, Medium, and High Impact Categories for Surveyed Road Locations Low Impact (9 to 15); Medium Impact (16-20); High Impact (21-27)

	Low	Medium	High
Millstone Creek Area	15	10	11
Salmon Creek Area	18	14	32
Reservoir Area	15	25	33
Clarion River	5	1	13
State Road 666	4	5	11

Biophysical data collection was initiated to help inform management actions. In conversations with management personnel, they identified campsite size and area of barren core (the area around the campfire most heavily impacted by camper's activities), the number of damaged trees, the distance to water, and distance between campsites as top management priorities. The results in Table 5.22 are designed to give an overall picture of characteristics of dispersed campsites. For management to be effective each campsite should be considered individually within the context of the road area. The best way to quickly identify campsite differences is by examining

campsite impact rankings. Maps of impact rankings for campsites located in the road areas where biophysical data was collected include Salmon Creek or USFS 127 and 145 (Figure 5.3), Millstone Creek or USFS 131 and 132 (Figure 5.4), Clarion River (Figure 5.5), the Reservoir Area or USFS 160 and 259 (Figures 5.6 and 5.7), and along State Road 666 or Tionesta Creek (Figure 5.8).

Table 5.22 Biophysical Results for Top Management Priorities across the Entire ANF

	Barren Core (sq. ft)	Campsite Area (sq. ft)	Damaged Trees (#)	Distance to Water (ft)	Distance to Nearest Campsite (ft)	Distance to Firewood (ft)
Median	747.36	4,414.57	8	150	250	10
Range	3.44-9,009.68	80.73-37,523.67	0-71	0-500	0-1,500	0-500
Average	1026.889,424	5919.566691	14	245	295	98

Discussion

Based on the results the majority of people using dispersed camping areas were repeat visitors from within one days drive of the ANF. Many visitors had used the same campsites in previous summers and were enjoying their current camping trips. The activities visitors planned on participating in largely influenced where they were camping. So visitors planning on riding their ATVs stayed at the dispersed campsites near ATV trailheads and visitors planning on kayaking or canoeing were staying at campsites along Clarion River Road. These results reflect summer activities, but the results should be similar for fall, winter, and spring visitors. Tents were reported as the most common type of camping equipment, but along Clarion

River Road and near the reservoir, along FS 160 and FS 259, more modern camping equipment, such as trailers and pop-ups, were also frequently used. These areas also tended to have larger camping groups.

Since most visitors have repeatedly been coming to the ANF for their camping trips and use the same campsites, as well as live close to the ANF, managers can use this information to start to target low impact camping educational messages, such as "Leave No Trace" to local schools and organizations. Although most campers think they practice "Leave No Trace" techniques, because they clean up other's trash or leave the site cleaner than when they arrived, they are not receiving or understanding the rest of the "Leave No Trace" message. Although the LNT message includes trash removal and littering, it is more about wild land ethics and camping so it appears that no one has been using the campsite. Based on informal conversation with visitors, they believed that the problem of trash, littering, and improperly disposed of human waste was caused by visitors who used the site before them and it was not their current issue. The recreation manager stated this problem succinctly, "Well, see, that's the thing about Leave No Trace—it's not rules and regulations. It's tips and suggestions, so people are free to choose which things they wish to do to protect the environment. That means that they do the things that are easy and least impactful to the experience they want, not the things that are of the least impact to the environment" (White 2013, personal communication). This goes along with the results that found that campers were either satisfied or extremely satisfied with the resource conditions around their campsite. They seem not to be bothered by loss of

vegetation or compacted soil either because they are not aware that these types of resource impacts are harmful to the environment or because these resource impacts make the campsite more usable. This is important because it has been identified in the literature that visitors tend not to notice resource degradation in the same way as managers (Martin et al. 1989; Farrell et al. 2001; Newsome et al. 2002). There is a disconnect between what managers find a resource impact at a campsite to be and how important visitors think those impacts truly are.

Finally campers were questioned about their willingness to pay to stay at dispersed campsites and overwhelmingly, the answer was no, they would not be willing to pay. Although if they had to pay, the ANF should consider charging no more than ten dollars, because that was the most acceptable fee level reported by visitors. Visitors have lower education levels which typically translates to less disposable income. It may explain why visitors are less willing to pay to camp, because camping is a free activity that can be enjoyed by all.

These general trends can help the recreation manager understand what types of visitors use each camping area and can aid in management decisions. These results are used in Chapter 7 to recommend two different styles of recreation management by dividing the seven camping areas into more developed use camping areas and less, developed or more primitive camping areas.

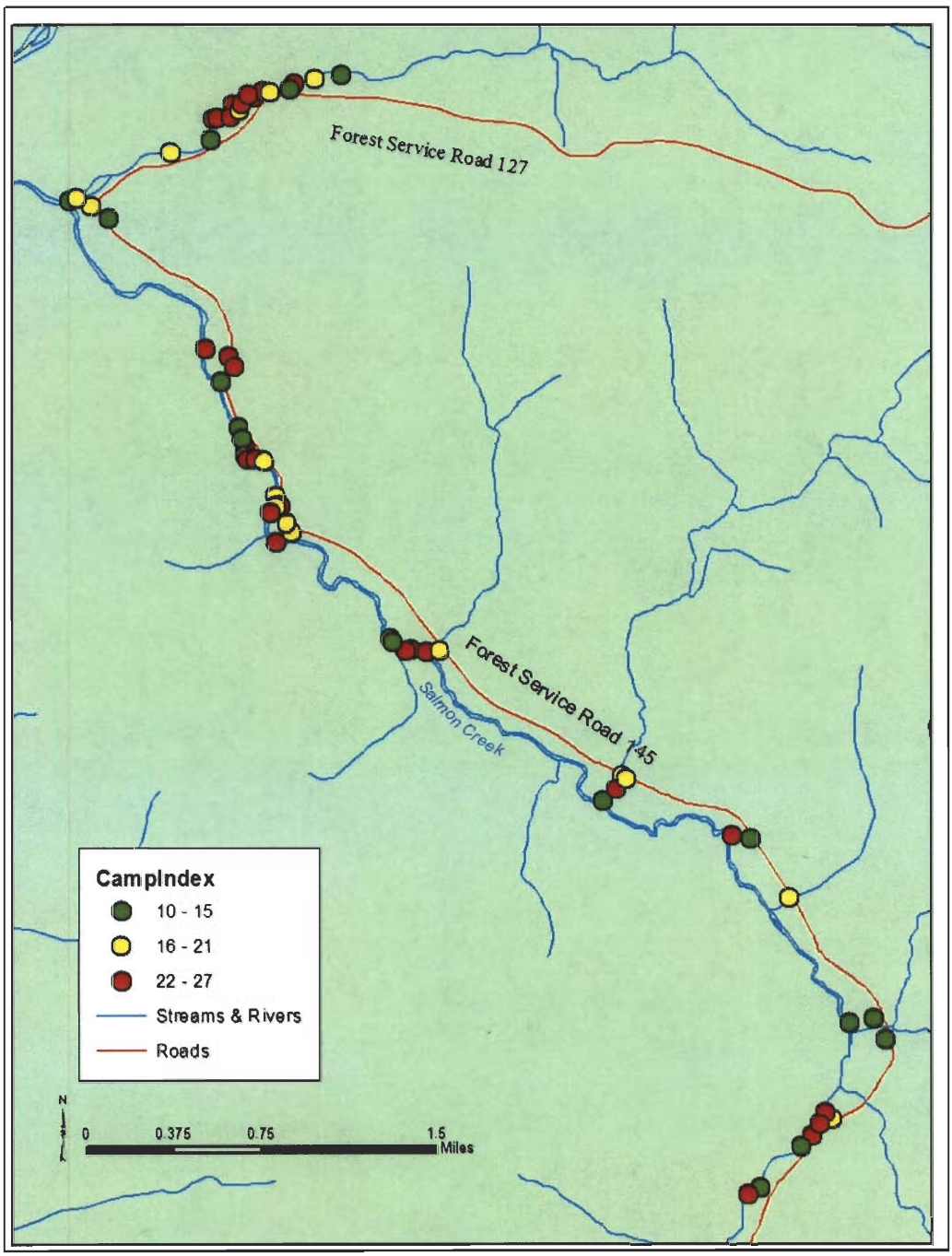


Figure 5.3 Campsite Impact Rankings in the Salmon Creek Area

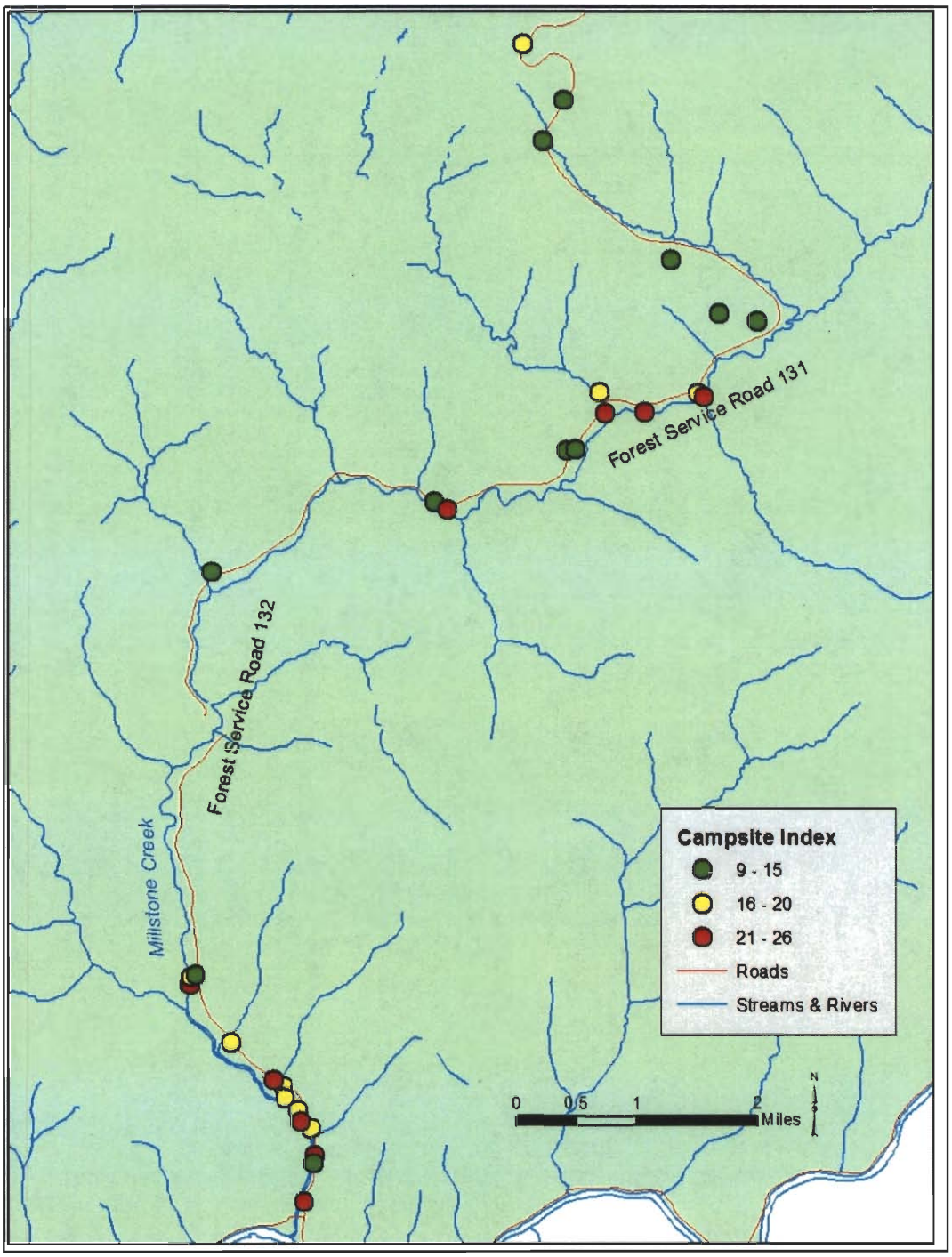


Figure 5.4 Campsite Impact Rankings in the Millstone Creek Area

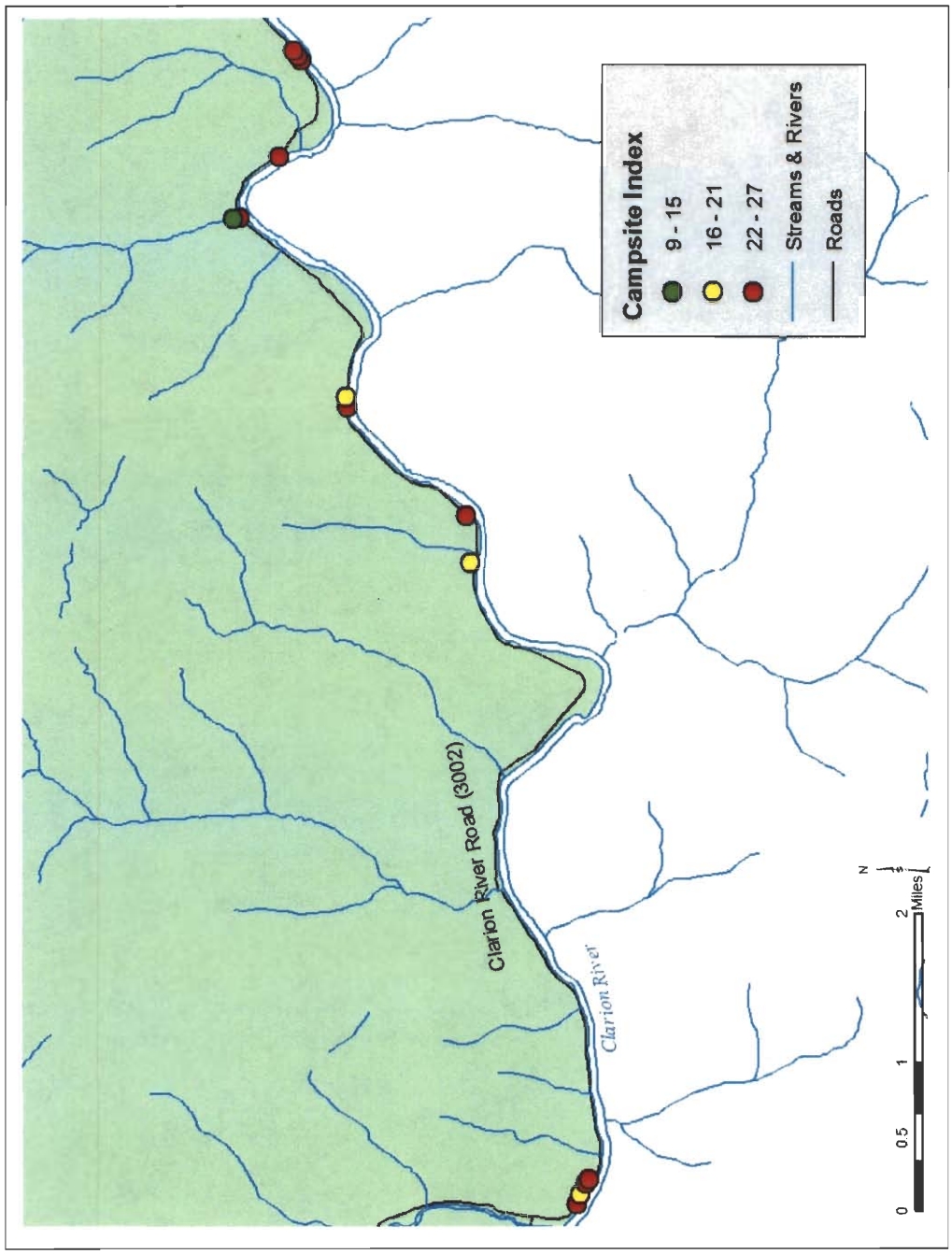


Figure 5.5 Campsite Impact Rankings Along the Clarion River

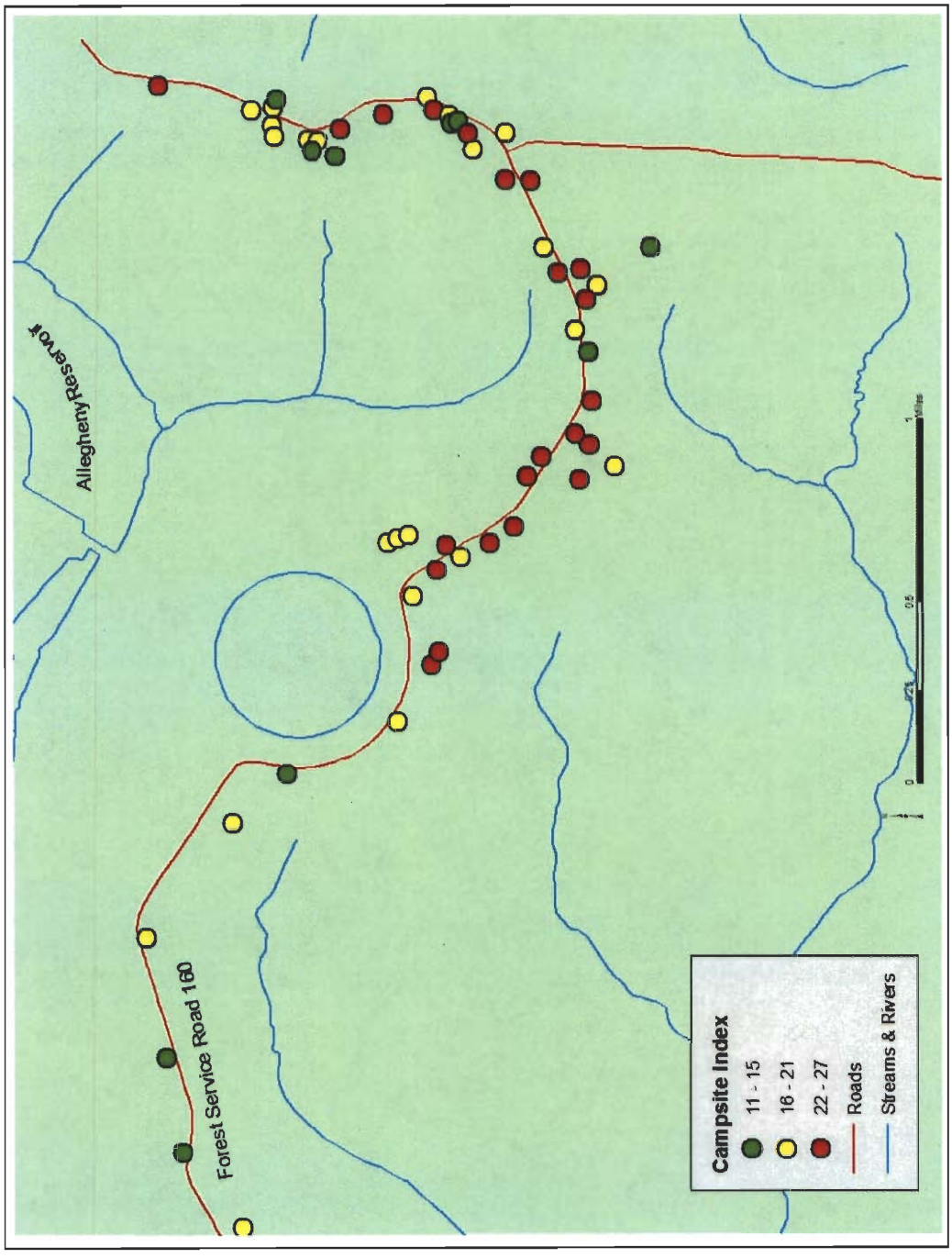


Figure 5.6 Campsite Impact Rankings in the Reservoir Area USFS 160

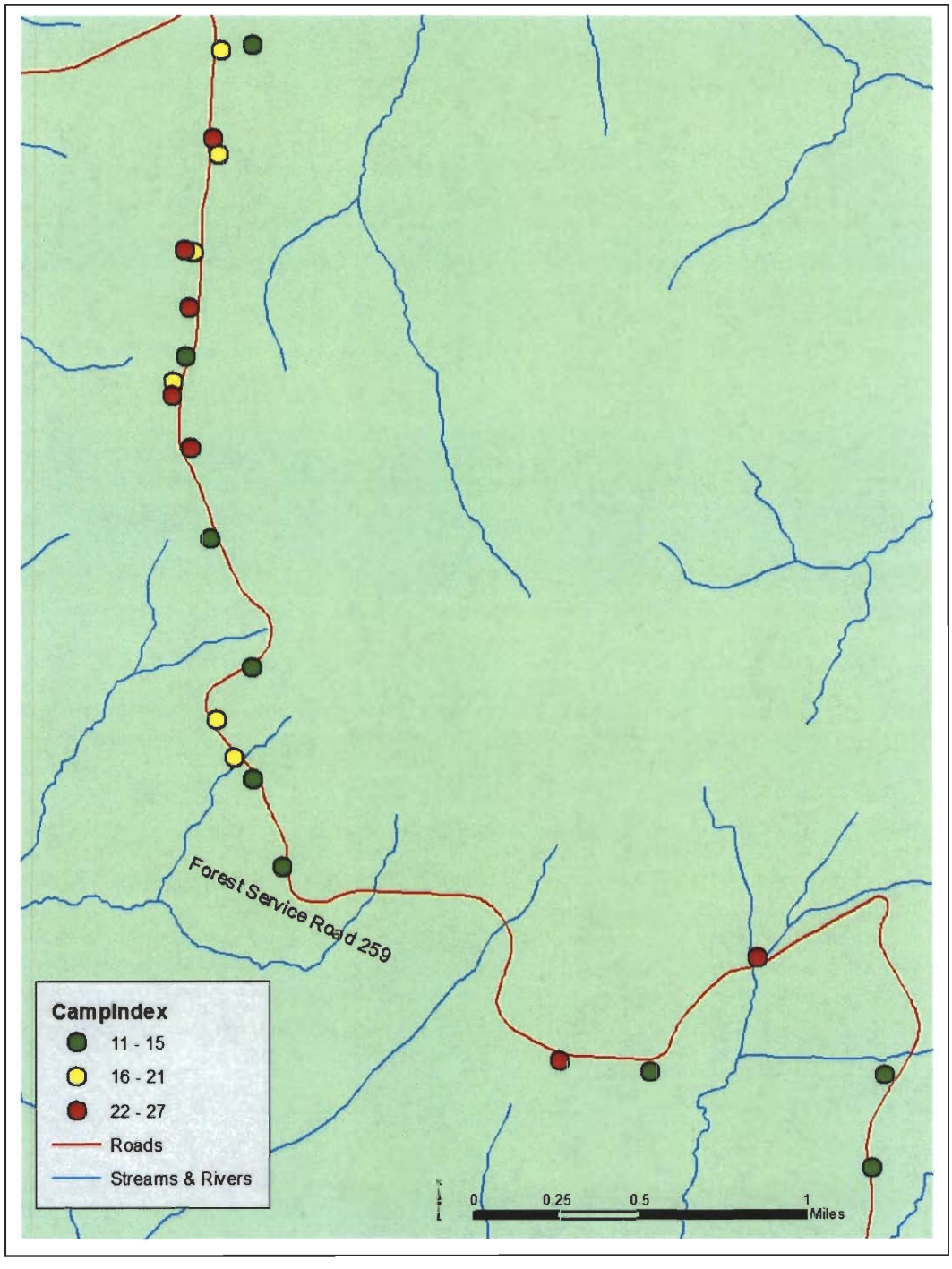


Figure 5.7 Campsite Impact Rankings in the Reservoir Area USFS 259

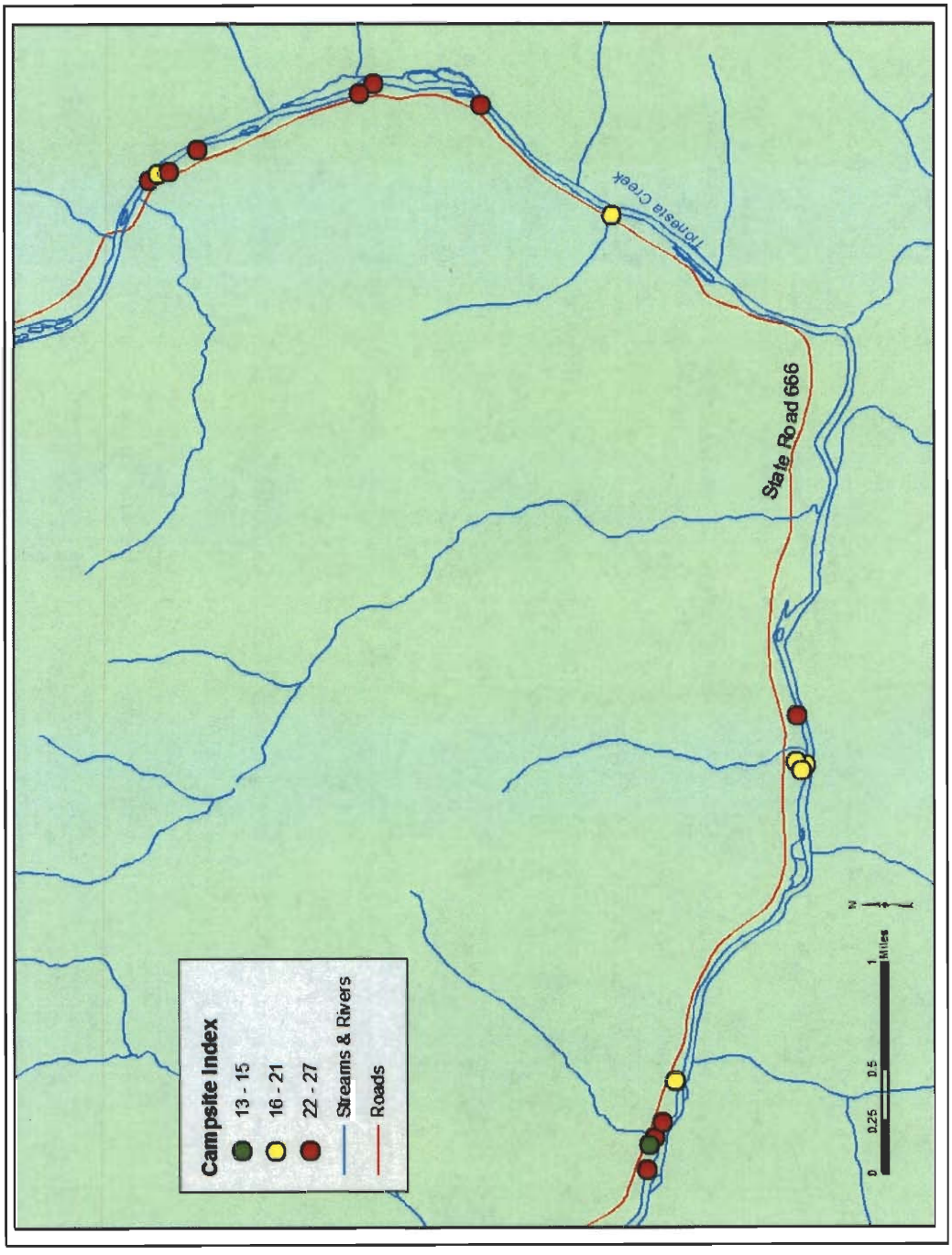


Figure 5.8 Campsite Impact Rankings on State Road 666 (Tionesta Creek)

CHAPTER 6

MANAGEMENT RECOMMENDATIONS

Management recommendations for handling the proliferation of dispersed campsites in the ANF focus on indirect management techniques whereby visitor use and environmental factors are manipulated to control social and resource impacts. In general there are two approaches researchers take to manage camping related impacts. They can modify use related factors such as the amount of use, the concentration of use, types of use, and user behavior, or they can modify environmental factors by making the environment resistant to heavy use and improving environmental resiliency through site selection and development, site management and maintenance, site closures, or addition of facilities (Cole 1989, Cole 2004; Leung & Marion 2004; Reid & Marion 2004; Dawson & Hendee 2009).

Restrictive actions such as prohibiting campfires or regulating activities through law enforcement are a last resort. Regulatory actions require USFS personnel to monitor conditions and make sure visitors are following rules. This means that someone has to make time to visit dispersed campsites frequently to conduct visitor contacts, and money has to be allocated to pay wages and transportation for this task. The USFS has a limited ability to enforce regulations, and regulations frequently antagonize visitors rather than win their support (Marion & Reid 2007).

Thus most of the recommendations focus on controlling the locations where visitors camp through campsite design, maintenance, and construction to limit the spread of campsites and associated resource degradation. User education should be emphasized. These recommendations address the major issues identified by the recreation manager and include limiting the overall size of the campsite, the area of barren core around the fire ring, the number of damaged trees, the erosion, and the noise or crowding near campsites (White 2013, personal communication). General management recommendations are applied to the handling of all dispersed campsites within the ANF, and then more specific recommendations for the seven road areas where my research was conducted during the summer of 2013.

All management actions cost money and it is not the focus of this research to a conduct a cost-benefit analysis of various actions. Implementation of these recommendations will cost the USFS money and time, but are needed for the long-term management of dispersed campsites. Three general recommendations that will be the easiest and most useful to implement include expanding the Leave No Trace education program, selling firewood, and continuing the campsite inventory program. Implementing fees, setting group size limits, and installing trash cans are management techniques commonly used in other areas. They are impractical for the ANF at this time, but may be considered in the future.

Leave No Trace Education

Although survey results suggest that visitors think they understand the Leave No Trace (LNT) educational message, the fact is that many visitors think it applies

solely to cleaning up a campsite and not to other low impact camping practices. Even if the message is not being received properly, this should not discourage management from continuing to educate the public. LNT applies both to backcountry and to the frontcountry conditions that exist in the ANF. Management should focus on pushing the LNT message as much as possible, especially the frontcountry LNT ethics (LNT 2013). This message includes "camp overnight right," (good campsites are found, not made, and camp only on existing sites) "trash your trash," (throw away trash, bury human waste, and keep water clean) "leave it as you find it," and "be careful with fire," (use only existing fire rings) and finally, "respect other visitors" (LNT 2013).

The LNT educational message was developed in the mid-1990s to promote responsible outdoor recreation and protect resources by "raising awareness of visitors regarding the potential for negative impacts associated with their visits" (Marion & Reid 2007, pg. 7). LNT or other education is the best way to target unskilled, careless, or uninformed behaviors. LNT education targets avoidable resource impacts such as litter, the creation of new campsites, erosion on trails, creation of new fire sites, improper disposal of human waste, enlarged campsites, feeding of wildlife, and damaged trees (Marion & Reid 2007; Dawson & Hendee 2009). These impacts relate to visitor knowledge and skill levels, and the goal of education is to persuade visitors of the need to learn and practice behaviors that avoid or minimize impacts (Manning 2003; Marion & Reid 2007; Dawson & Hendee 2009).

The way the LNT message is delivered affects visitors' abilities to internalize it. The messages should be clear and concise, come from many outlets (trailheads or

brochures), come from highly credible sources, be modeled by USFS personnel, be provided to visitors early in their recreation planning process, and clearly identify desirable and undesirable behaviors. Finally the message should be repeated many times by many sources and the message should be repeated consistently each time (Manning 2003; Marion & Reid 2007). Education about resource impacts around campsites appeals to visitors' moral sense so that they alter their behavior to be more socially responsible, and to their sense of ethics to enhance their respect of the environment. It relies on their attention, consideration and internalization of the message to fully grasp the concept and apply it to real world situations (Marion & Reid 2007).

Pushing the message of low impact camping practices and not the backcountry aspects of the message would be more relevant to visitors at dispersed campsites who are car camping. Results from the survey indicate that most people camping in the ANF have at least a high school degree, making them educated enough to understand the LNT message (although it might not make them willing to receive the message). Managers of the ANF should make Leave No Trace as big an informational campaign as the Smokey Bear campaign has become in helping to prevent wildfires. Smokey Bear was created by the United States Department of Agriculture during World War II as an informational campaign to educate the public and prevent human induced wildfires (USDA 2013). Although one of the most highly successful ad campaigns in U.S. history, this policy of aggressive wildfire suppression has been the subject of debate among ecologists (Donovan & Brown

2007). Managers in the ANF still take an active approach to teaching the public to prevent wildfires by not leaving them unattended and to put out all fires by handing children trinkets and booklets with Smokey Bear's message.

This campaign has been pushed across the nation for over fifty years, and if a concerted effort was made to create a charismatic logo to promote the LNT message, it would most likely be received and accepted by the public. This requires handouts, pamphlets, and paraphernalia, as well as working with the Pennsylvania chapter of the Leave No Trace organization. It also requires targeting large groups of young visitors such as the Boy or Girl Scouts. Targeting groups is a cost effective way to communicate a message to a large number of people (Marion 2003). Visits to schools during the off season and outreach to visitors through personal contact at their campsites should be the number one priority for managers. Recreation personnel already do a lot of visitor outreach, but this should be extended to front desk interactions and all other interactions that visitors have with all USFS personnel.

LNT education should also occur at developed campgrounds, because this is where large groups tend to camp, especially youth groups. Most outdoor enthusiasts are introduced to the outdoors in a group related program and this is the first way Leave No Trace should be introduced as an educational campaign (Marion 2003). One would hope with extensive Leave No Trace messages being pushed from many outlets that LNT practices will start to become second nature to many visitors. Having visitors aware of the resource impacts caused by their use of a campsite might start to change the mindset of visitors. But education is like preventative medicine, and in

popular destinations, more than education is needed to prevent excessive resource impacts to campsites (Cole et al. 1997; Marion & Reid 2007).

Campsite Monitoring and Inventory Assessment

Although management personnel have spent a lot of time monitoring campsites and have discovered hundreds of dispersed sites across the forest, monitoring and assessment of current and new campsites needs to continue into the future. Monitoring should continue not only to discover the location of any new campsites but also to assess changes at current campsites. Monitoring does not need to occur at every campsite every year, but instituting a rotating monitoring program would maintain a reliable information base to help develop policy. Monitoring is a good way to determine when conditions have exceeded standards (Marion 1995; Leung & Marion 1999; Marion 2003; Leung & Marion 2004; Monz & Twardock 2010). Standards need to be adopted to define acceptable and unacceptable environmental conditions (such as campsite size, presence of trash, degraded vegetation and soil, or damaged trees) and social conditions (such as campsite spacing for privacy). Once management sets standards they can compare monitoring data to standards to evaluate change and implement management actions when necessary (Marion 2003). Standards may vary by road area but should be based on environmental resource data collected through the biophysical inventory. Based on my results the recommendations for standards could look something like this:

- If overall impact score is 15 or less, campsite area is < 2,500 ft^2, site development rating is 1, area of exposed mineral soil around the campfire is

<100 ft^2, and use frequency is low: Close the site and allow to revegetate naturally.

- If overall impact score is 16-21, area of exposed mineral soil around the campfire is <1,000 ft^2, campsite area is < 5,000 ft^2, and use frequency is moderate: Manage the site and monitor.

- If overall impact score is 22 or more, barren core is >2,000 ft^2, impact area is >10,000 ft^2, mineral soil increase and vegetation loss ratings are 3, use frequency is high, and site development rating is high: Rehabilitate the site to bring it within the "manage" range.

The radial transect method for measuring areas of dispersed campsites is the most time intensive part of the monitoring process and the one that can most easily be improved. The ANF is equipped with accurate Trimble GPS units that have the ability to gather a satellite signal and mark positions to within a few meters. The compass and tape measure that were used to measure the area of the site should be replaced with a GPS unit so that the person conducting the survey would only need to walk around the perimeter of the site and barren core. This information could then be placed into a GIS and overlaid onto layers such as slope, aspect, vegetation, and water features to better understand the relationship of campsites to the surrounding resources. Finally, monitoring social conditions, like crowding, is just as important as monitoring resource conditions. Estimates can be made on the number of sites needed in each road area, but management should conduct field surveys during typical high use weekends to record overnight visitation by location and note group sizes to make sure sufficient campsites are maintained (Marion 2003; Cole 2004; Reid & Marion 2004).

Firewood Sale

Campfires are part of the experience visitors seek when camping, but collecting wood for a fire can lead to the depletion of firewood, the loss of downed woody material for nutrient cycling, openings in the overstory canopy, and extensive vegetation trampling as people search for wood (Marion 2012, personal communication). As visitors consistently use popular sites, firewood is depleted and they must range farther and farther to find more. It would be a mistake to prohibit fires, as many people expect them as part of their experience and need them for camping purposes, and enforcement of the regulation would be difficult. Managers could prohibit axes and chainsaws to prevent visitors from cutting trees and limit wood collection to downed wood and branches they can break by hand, but enforcement of this regulation would also be difficult (J. Marion 2012, personal communication; Dawson & Hendee 2009).

The ANF should prohibit collection of downed wood for fires, and supply campfire wood at a low cost (to be determined by management). Managers would not be able to enforce this regulation either, but would have to rely on the cooperation of visitors. The wood could be available in a three-sided shelter at each road head and sales would be based on a honor system with a small locked box in which visitors deposit their payments. This system is used at some developed campgrounds in the ANF. Firewood could be supplied by logging activities and leftover slash. This will also aid in preventing the spread of invasive species, such as Emerald Ash Borer, by

allowing people to purchase local wood and not bringing in wood from outside of the ANF.

Firewood sale is a debatable subject because firewood would have to be supplied by management personnel. Based on the visitor survey, 43.3% of visitors supported the provision of firewood for sale by the USFS, 10.8% were not supportive of the activity, while the rest of the visitors were neutral. Managers should test the sale of firewood and gather some feedback to understand how visitors respond.

Fees

Surveys showed that 54% of visitors said that they chose their site because they did not have to pay a fee. Free camping is an important reason people choose dispersed campsites, but based on the survey a ten-dollar flat rate may be an acceptable charge for weekend use. Although it is useful to know how visitors feel about fees, charging fees at this point in time would be highly impractical. Instituting fee collection would require both a site administrator (a GS-5) and a front desk person (GS-3) to be involved to issue permits in-house. Alternatively, another seasonal employee could be hired to drive around and collect fees at campsites all summer which would add the cost of gas and an additional salary (White 2013, personal communication).

The extensive mileage of roads with dispersed camping means that it would be impossible to check all the sites every weekend. Charging only for high use camping sites would spread use to other areas and might be perceived as unfair. Visitors who are unwilling to pay would likely camp in more remote, less easily

patrolled locations and thus spread the problem. In the end, charging a fee at a level acceptable to campers would not cover the cost of collecting it at this time.

An educational message on signs throughout the forest and in the visitor center, emphasizing that these sites are free, but that a fee could be charged if resource conditions deteriorate would be another tool to encourage people to follow LNT and clean campsite practices. An informational campaign such as this might alter users' attitudes towards their own camping behavior and the camping behavior of others. It would help people appreciate the free campsite and respect the environmental integrity of the area.

Trash Cans

Trash on campsites, both in the fire pit and around the site, was a common complaint both from management personnel and from visitors themselves. At this time trash cans would not be a practical solution to handling waste. Along with the cost of installation, trash cans attract wildlife. Even bear proof trash cans are not foolproof, (and are even more expensive) and eventually someone would put a bag beside the can or make some other mistake to allow wild animals to habituate themselves to the trash. Someone has to collect the trash, haul it away, and pay landfill fees. This diverts time and money from better uses (White 2103, personal communication).

Anecdotal evidence suggests that at one time visitors could leave their trash bags at the side of the road and management personnel would drive through and pick them up. The truth in this statement could not be validated and this solution is

impractical because the recreation department is strapped for personnel. An informational campaign to the effect of "Help Keep it Free," explaining why there are no trash cans in the forest and why individuals must collect their own trash ("pack it in pack it out") is the best management strategy for the ANF (LNT 2013). This message could also explain how fees would be needed to institute trash collection.

Setting Group Size Limits

Average group size along the seven road areas surveyed was 6.38 people, but there were several areas where large groups of people were camping. Group size limits have been enforced in developed campgrounds on national lands for a long time, but in the more primitive environment of the ANF dispersed campsites, there is no magic number for an appropriate group size. Ten people may be no worse than six or eight and the behavior of people using the campsite has more effect on the quality of resources surrounding the site (Marion 2003). Limiting group size involves regulations that, again, someone from the USFS would have to monitor and enforce. Initial survey results indicate that support for this management option was low.

Recommendations for the Seven Surveyed Road Areas

Management recommendations for the seven specific areas where I conducted my research have been grouped into two similar categories; road areas that are perceived as quieter and more primitive, and popular, less primitive road areas where use is consistent throughout the summer. All these roadside campsites were originally

user created without planning or consideration of the environment's ability to sustain use (Newsome & Smith 2002; Marion 2003; Daniels & Marion 2006).

Recommendations for Salmon Creek Area (FR 127 and FR 145), Millstone Creek Area (FR 131,132, and 133, and Tionesta Creek Area (SR 666)

Description of Areas and Major Problems

Campsites along Salmon Creek (FS 127 and FS 145), Millstone Creek (FS 132, FS 130, FS 131), and along Tionesta Creek (State Road 666) share similar qualities. These sites are located less than 100 feet from a waterway. Sites on Millstone Creek and Salmon Creek are limited in spread and site expansion because many of them are down steep slopes from the road and therefore resource impacts have not extended over large areas. There is also dense vegetation cover and thick understory growth that helps prevent the expansion of campsites. This is compared to sites near the reservoir, along FS 160 and FS 259, that are located in open, flat forest land and are around 10,000 ft^2 in area on average. Campsites along Tionesta Creek are limited in spread by the location of the road and the water body. Sites are squeezed between the road and the creek and are all less than 100 feet from the road.

The proximity of campsites to waterways is a major concern to land management personnel due to the problems with erosion along stream banks. Campers in these areas are fishing and relaxing, and those surveyed reported tents as their main camping gear. These three areas tend to have smaller groups sizes, approximately five people in a camping group, and they desire a more natural setting than those camping in the other surveyed areas. The major problem besides erosion

along stream banks is the migration of fire pits. Although the area impacted at individual sites is smaller than at other campsite locations in the forest, there are several sites clustered together making campsite expansion a concern. These clustered sites use the same parking area and are too close together for separate groups to occupy at the same time. The layout of these campsites means that people often create new fire pits instead of using existing fire pits. This increases the extent of impacts that would otherwise not occur if the fire pit stayed fixed. The final problem in these locations is the lack of adequate parking. Forest Road 145 is narrow, hilly, and winding. Many campers park along the roadway and create a potentially hazardous situation. It is also potholed, rutted, and difficult to navigate with an RV. People camping along Tionesta Creek (State Road 666) are parallel parking on the shoulder of the busy road. Millstone Creek area has some accommodations for parking, but here also many people park their cars directly on the shoulder of the dirt road. Campsite size, proximity to a water body, and lack of adequate parking were concerns that were taken into account when considering potential management actions. These recommendations are discussed next.

Recommendations

Due to the small group sizes, the remoteness of sites and the use of tents as the major camping gear, recommendations for controlling dispersed camping focus on keeping these three areas more primitive than the other road areas surveyed. The goal is to concentrate camping in a small number of campsites which receive more

frequent use (Leung & Marion 2004). Decisions regarding exactly which of the sites to keep open will require managers to make on the ground evaluations of various factors such as expansion potential, topography, endangered species, proximity to rivers and streams, campsite durability, and other environmental characteristics on a site by site basis. The first step to campsite management in these areas is to identify which sites to close and which to keep open based on overall campsite impact rankings, site environmental factors, site spacing, and managers' preferences. The individual maps for these road areas show many campsites located in clusters with several low impact sites grouped around one or two highly impacted sites. The best management option for these areas is to close the low and medium impacted sites (yellow and green on the maps) to allow them to recover while maintaining the highly impacted sites for continued use. These impact rankings are the basis for deciding which sites should be rehabilitated and which sites should be constructed to handle frequent use. Confining campers to high use sites makes sense because at high use levels, even large increases in use will result in only minor additional impacts around campsites (Cole 2004). If sites are in a cluster and there is no highly impacted site within the cluster, the best management action is to keep one site open (preferably a site ranked in the medium impact category) and to close the rest.

Maps depicting potential closed campsites for the Salmon Creek, Millstone Creek, and State Road 666 areas can be seen in Figures 6.1, 6.2, and 6.3. Campsites that should be kept open include high impact ranked sites that are at least 200 meters away from other campsites. Some medium impact ranked sites could be left open if

they are the only ones in a cluster and far away from other sites. Site selection is the single most important factor in developing a campsite that can sustain heavy use while remaining small and in good condition after several years of visitation. A highly impacted site is likely to be used again or is one that has higher desirability, and closing popular and highly impacted campsites is often ineffective and inappropriate (Marion 2003).

There are several techniques that researchers have developed to effectively close a campsite to prevent further use and to rehabilitate the area so it recovers to its natural state. These steps include creating an uneven surface, covering the campsite with large dead logs, trees, and branches, and partially burying large rocks to prevent people from moving, kicking, or pulling them free (Marion 2003; Reid & Marion 2004). Managers can also plant native trees, bushes, or grasses so that over the long term, vegetation will cover the signs of human use.

The goal is to lessen the desirability of the site, to hide it, and to make it difficult for people to continue to camp there. Signs that say, "No camping beyond this point" or "No camping within ___ feet of sign" also enforce the idea that the site is closed to further use (Marion 2003; Reid & Marion 2004). Campsite closures are difficult and managers must be committed to several repeat site visits to continue to rehabilitate the area. Vigilance and enforcement of the rules is necessary because it is likely that camping will still occur after the site has been closed. It may take up to three years before closed areas will no longer resemble campsites and camper use patterns are altered.

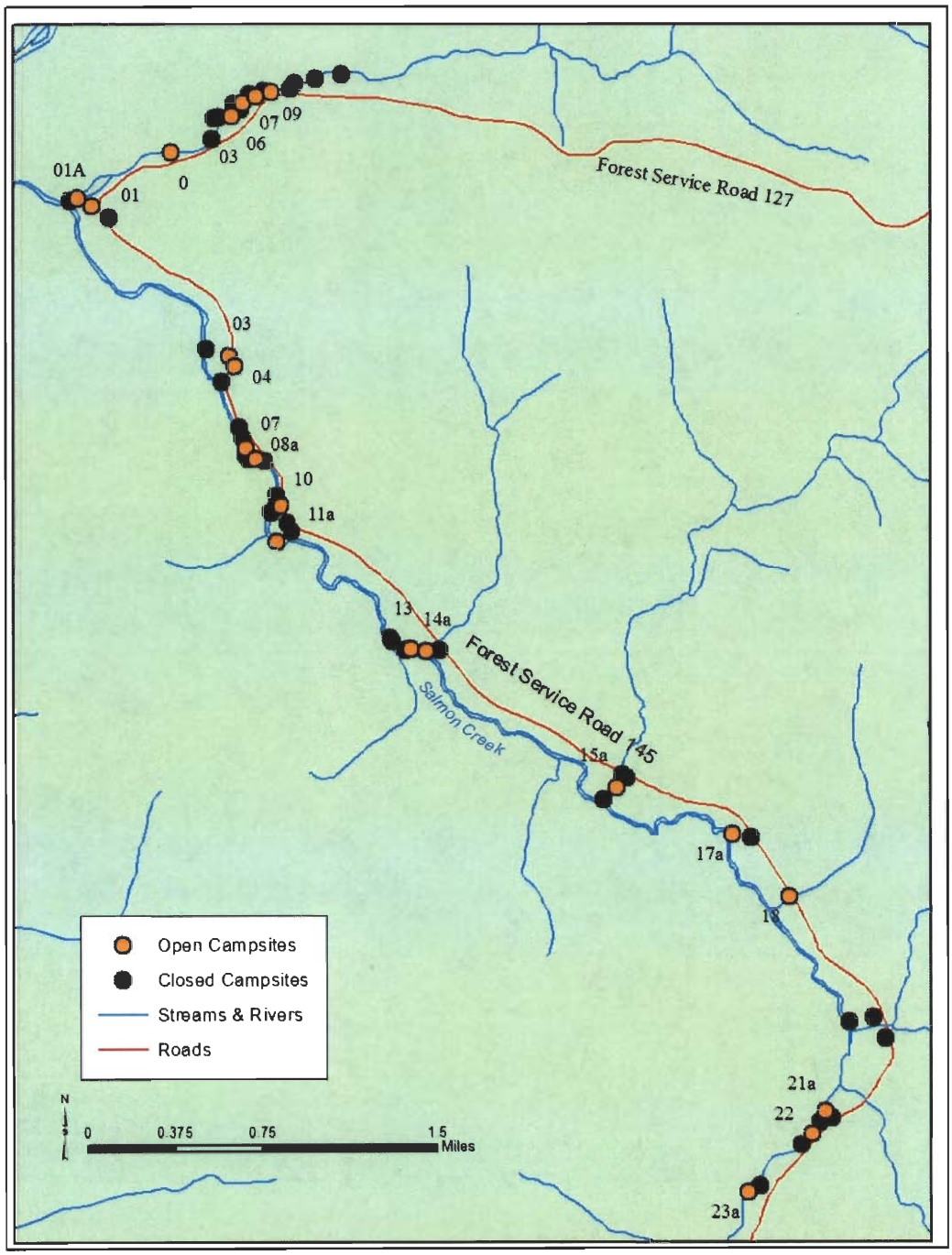


Figure 6.1 Potential Campsites to Close and Keep Open in the Salmon Creek Area

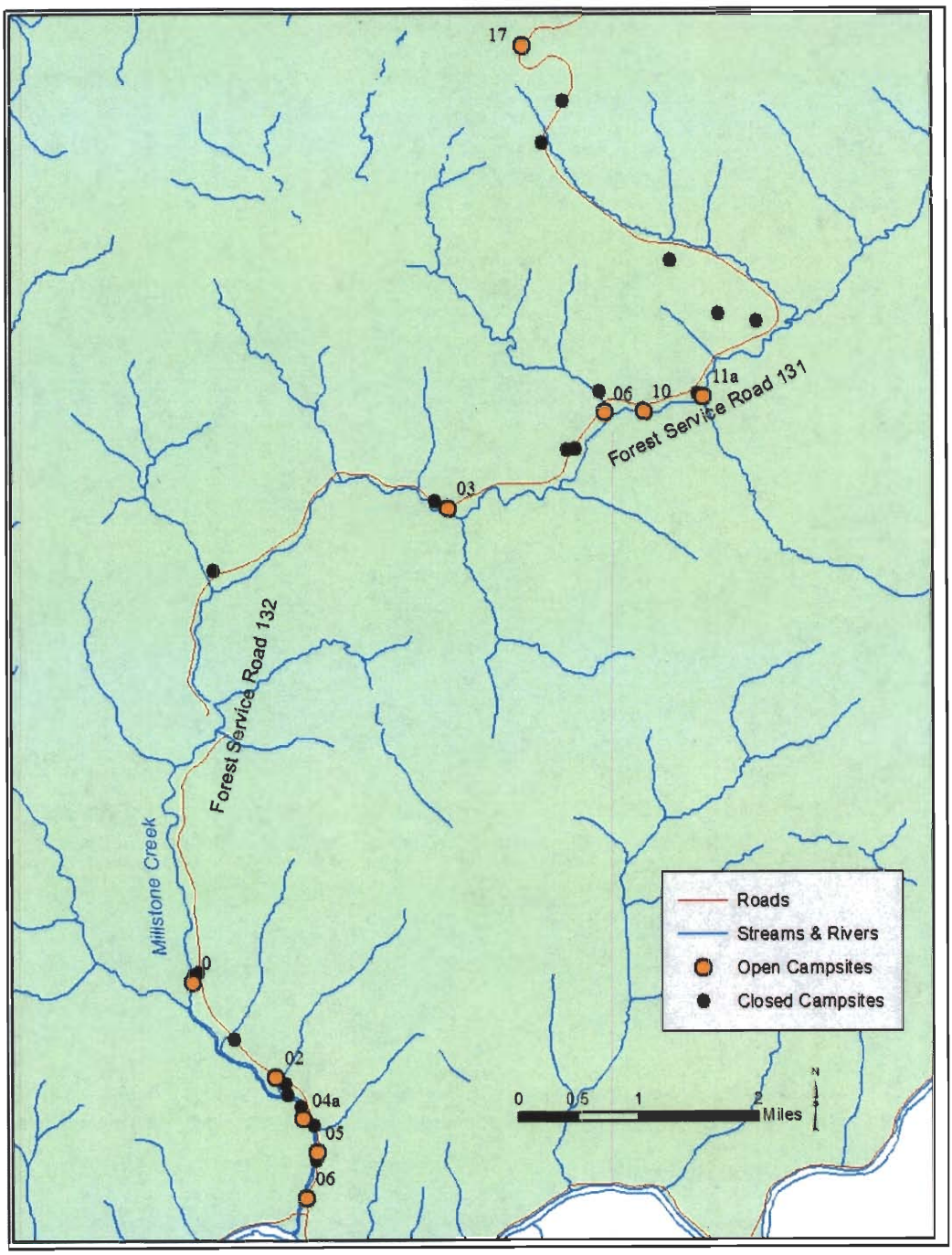


Figure 6.2 Potential Campsites to Close and Keep Open Millstone Creek Area

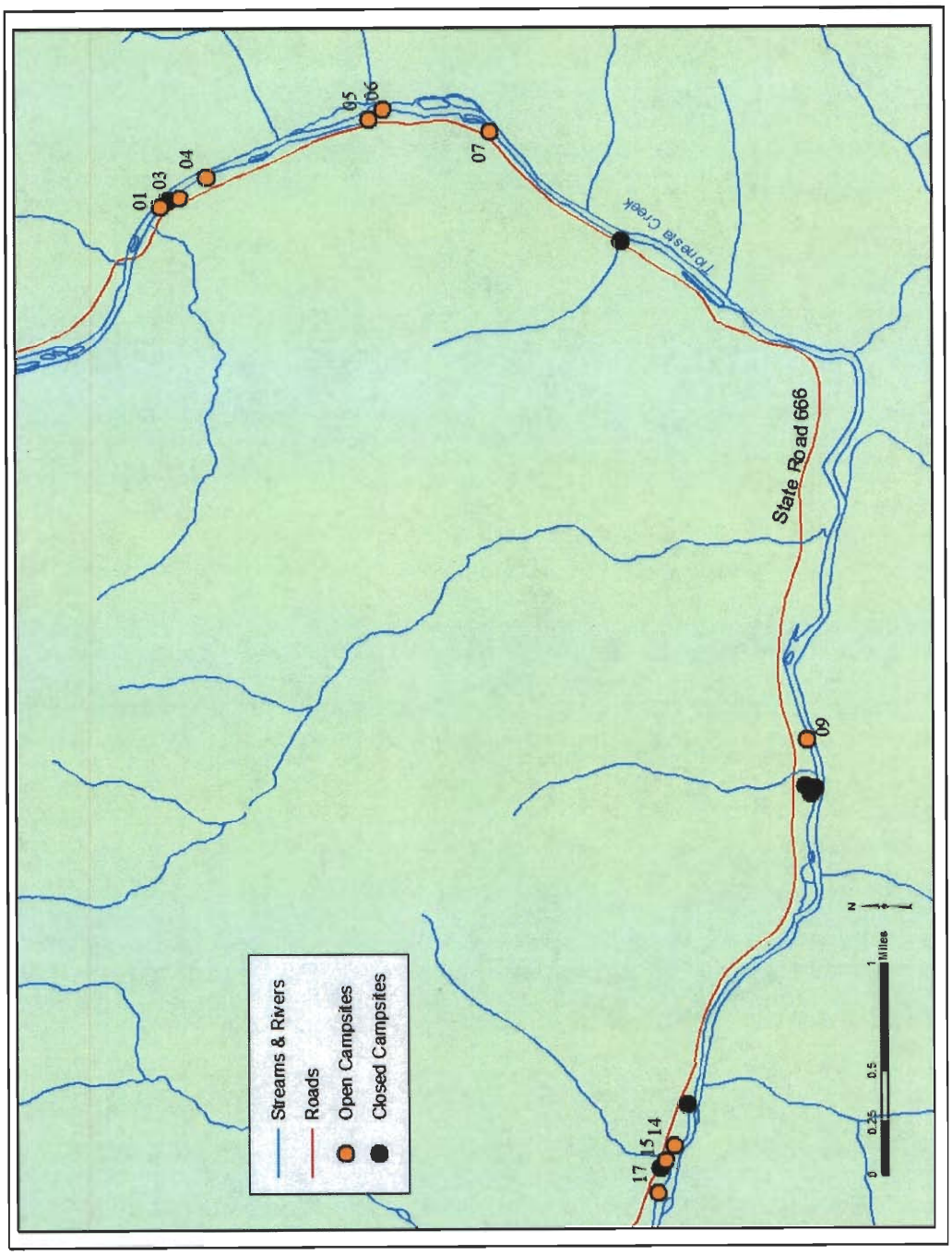


Figure 6.3 Potential Campsites to Close and Keep Open State Road 666

For the campsites that stay open, there are several management techniques that can be applied to prevent further resource damage. The campsites should be re-designed, or contained in such a way to keep campers within the campsite boundaries as much as possible (Marion & Farrell 2002; Marion 2003; Reid & Marion 2004; Dawson & Hendee 2009). This keeps resource impacts, such as trampled vegetation and compacted soil, from spreading beyond the designated camping area. At both ends of the roadways signs and maps should be placed that explain which campsites are open, why camping is currently free in the ANF, LNT camping techniques, and where to purchase firewood. This information should highlight proper human waste disposal including how to select a location for a cat hole and how to dig a cat hole to bury solid waste. This information should also be put into the handout about dispersed camping in the ANF that managers can give campers on occasions when they visit popular camping locations on weekends. The handout should stress that cooperation from visitors is required to keep camping free. Since many campers are repeat visitors, good behavior should eventually prevail. It is important that campers take a personal interest in the protection of the resources.

All of the campsites in these three areas are located near waterways and erosion is a major concern to management personnel. One way to prevent erosion on trails to and from water sources is to construct and clearly delineate formal trails on a durable trail tread that are designed to eliminate erosion, widening, and muddiness and to promote consistent traffic patterns (Marion 2003; Reid & Marion 2004; Cole & Ferguson 2009). Planting native vegetation along the shoreline to help stabilize

banks is another technique that can be put into practice to prevent erosion (Marion 2003; Reid & Marion 2004; Cole & Ferguson 2009).

One of the best ways to prevent campsite expansion and spread of overall impact area is to keep fire pits from migrating (Marion 2003; Marion 2012, personal communication). This can be accomplished by digging a hole in the center of the campsite, filling it with concrete, and then dropping a chain down the hole attached to a metal fire ring (Marion 2012, personal communication). Keeping the fire pit in a single location concentrates activities around that central location and has been proven to work in certain back country locations like Isle Royale National Park to prevent the spread of resource impacts such as trampled vegetation and compacted soil (Marion & Farrell 2002). Spatial concentration of camper activities to durable parts of the campsite by clearly delineating the edges of each site is a design and containment strategy used by researchers elsewhere (Marion 2003; Reid & Marion 2004). There is a fine line between obviously marking areas of use and artificially creating visually pleasing, unobtrusive edges to keep areas outside of the campsites natural (Marion 2003). Managers can place rot resistant logs around desired areas of use, partially bury large rocks, and plant vegetation. One key to prevent visitors from spreading outward is to provide firewood so that campers do not scavenge for wood in fragile areas.

Another common problem is that many visitors use lanterns for light and they have a tendency to hang the lanterns from nails in trees. The recreation manager believes that the best way to prevent blackened scars on trees caused by these lanterns

is to provide lantern poles that can be moved around the site (White 2103, personal communication). These can accommodate visitor's preferences as to where they hang their lanterns. If lantern poles are damaged or stolen, they could be anchored at one location in the campsite.

Finally, parking is a major problem in these three areas because of the narrow, winding roads along Salmon and Millstone Creeks and because State Road 666 is a busy road. Every campsite should have obvious parking that is clearly delineated and is either covered in gravel or maintained dirt to promote continued use. Some sites require walking in from the road and in these cases, regardless of whether parking spaces are hardened, formal trails that are well designed to prevent erosion should be clearly defined. Parking spots should also have large boulders placed on the edges (sunk into the ground) to keep people from driving their cars or campers right up to the fire pit. Parking can be considered on a site-by-site basis or completed when funds are available for gravel because parking is the least important issue in these camping areas.

The above recommendations emphasize site design and spatial containment of visitor activities to prevent continued resource impacts rather than providing permanent structures such as tent pads, toilets, or picnic tables. The focus in these three areas is to keep the environment primitive. Not all recommendations need to be implemented on all three road areas in one year. These techniques could be tested in one area so managers can closely monitor visitor response. If visitors are receptive and the techniques seem to be working, then managers can institute them in other

areas over several summers. State Road 666 presents a unique problem not found anywhere else in the forest because the sites are narrowly confined between the roadway and the waterway. Special effort should be made to prevent erosion on the banks of the creek and to keep people from parking on the busy road.

Recommendations for ATV Trailheads (Timberline Road and FR 395), Clarion River Road Area, Reservoir Area (FR 160 and FR 259), and Red Mill Pond Area (FR 143)

Description of Areas and Major Problems

Campsites along Salmon Creek (FS 127 and FS 145), Millstone Creek (FS 132, FS 130, FS 131), and along State Road 666 have different camper characteristics, types of use, and thus somewhat different problems than campsites near ATV trailheads (Timberline Road and FS 395), along Clarion River Road, near Red Mill Pond (FS 143), and in the Reservoir Area (FS 259 and FS 160). These areas could be considered less primitive and receive more consistent and heavy use throughout the camping season (as confirmed by management personnel and personal observation). Campers staying in these areas are riding ATVs, participating in water activities (motor boating, canoeing, kayaking, tubing, fishing) on the Clarion River and on the Allegheny Reservoir, and relaxing or picnicking. Across all of these areas the average number of people using one campsite was greater than five. Tents are often used in these road areas, but campers and trailers are also common. These road areas are less primitive in nature and in some ways are similar to more developed camping environments. Campers place less value on quiet and solitude, and find it less important to be camping in a natural setting. For people camping near ATV

trailheads this is especially true as solitude is less important than having easy access to the trailheads. Finally, campers in these areas are more in favor of management actions like picnic tables, trashcans, fire rings, and toilet facilities that provide an easy camping environment.

The dispersed campsites at the ATV trailheads (along Timberline Road and FS 395) have several problems. Sites overlap each other in an old gravel mine and in a grassy area, and are not separated by trees or other natural barriers. This creates potential for conflicts between campers regarding noise or other issues. The sites are randomly placed and people park wherever they see fit. Many of these campers want to be as close as possible to the trailhead and for users not staying overnight, conflicts can arise over available parking space. Campsites along Clarion River Road, in the Reservoir area, and in the Red Mill Pond area have similar issues. The vegetation and site topography do not provide natural barriers to limit the spread of impacts around the campsites so they are large. People into the middle of the campsite, and trash is left after people leave. The lack of barriers allows large groups to camp at the sites. For example, one group in the reservoir area said they were going to fit fifty people on the site. The average size of campsites in the reservoir area is 9,000 square feet. These sites have heavily damaged trees, denuded vegetation, and a loss of natural appearance.

Management Recommendations

Unlike Millstone Creek, Salmon Creek, and State Road 666, campsites along the Clarion River, in the Reservoir area, Red Mill Pond area, and at the ATV

trailheads have users that, based on survey results, are more accepting of a less primitive environment and are accustomed to campsites exhibiting more consistent and frequent use. They are also using camping equipment such as trailers or campers more frequently than users elsewhere. This means that management actions in these areas can be more obtrusive to visitors and can include minimal structures such as picnic tables and pit toilets. Camping environments along these roadways will move away from the semi-backcountry primitive camping to a more frontcountry, developed environment. Signage is also critical in these areas and signs should be installed at the entrance to every roadway and on each proposed picnic table and pit toilet. The message should depict locations of open campsites, explain why camping is free and how visitor cooperation is required to keep it free. The ANF recreation policy and LNT guidelines can be reinforced.

Campsites near ATV trailheads need the most attention as they are crowded and lack screening vegetation to allow for privacy and prevent potential conflicts between groups. From personal experience, most campers in the National Forest are friendly and not prone to bad interactions, but when alcohol is mixed with camping, people become unpredictable and it is better to separate groups to prevent potential conflicts. Recommendations for this area include designating sites and separating them from each other into the woods. Sites should be clearly marked and there should be ample parking to accommodate trailers with ATVs. Parking areas should be graveled and well drained and should be bounded by rocks to keep people from driving vehicles into the middle of the campsite. Again, managers should make on-

the-ground decisions about the best locations to place campsites which should be on durable surfaces and bounded by rocks or logs to limit spread.

Besides adding and designating specific camping sites near the ATV trailheads, campsites should also be added along Clarion River Road (Figure 5.5). The campsites along the Clarion River are the most heavily patrolled by recreation personnel and used every weekend by visitors. None of the sites on the Clarion River should be closed and managers should look along the roads for specific areas where new campsites could be designated to accommodate more campers during high use weekends. This may require input from archaeological teams to ensure that historic resources are not impacted by campers. Managers should ensure that ample parking off the road is provided because the road receives frequent commercial traffic from canoe liveries running trips on the river. Trails from campsites to the river should be clear to campers and designed in a way that prevents erosion, muddiness, and widening (Marion 2003; Reid & Marion 2004).

Red Mill Pond (FS 143) has many campsites, but none of them have been measured or examined for resource, but there are several locations along the road where large groups camp. It is important for managers to know exactly what sites exist so they can begin to develop management priorities. Once sites have been measured and marked, management steps to confine the spread of resource impacts and to contain use to desired, durable locations should be enacted.

Finally, the Reservoir Area, USFS 160 and 259, have several sites, many of which are clustered together. Sites should be evaluated on a case by case basis, but in

general, highly impacted sites in clusters should be kept open and designed for best long term use whereas low or medium impacted sites should be closed. This is the same technique that should be applied to campsites in primitive areas as described previously. If there are campsites in a cluster where no high impacted sites exist, one campsite should be kept open, preferably a campsite in the medium impact category. Recommended campsite closures for the Reservoir Area are shown in Figures 6.4 and 6.5. Sites kept open were in the high impact category and were over 200 meters away from other campsites.

At all campsites in the Reservoir Area, along the Clarion River, Red Mill Pond Area, and at ATV trailheads, metal fire pits should be installed and anchored into the ground to keep them from migrating and to contain resource impacts (Marion 2013, personal communication). Lantern poles should be installed so people can hang their lanterns without damaging trees (White 2013, personal communication). Campsites along these four road areas tend to be large in size due to the more open nature of the forest (caused by old logging activities) and less understory growth. Campsite engineering should occur at every site using buried rocks and rot resistant logs to keep people's activities confined to durable areas and to obviously delineate the edges of each campsite (Marion 2003; Reid & Marion 2004; Cole & Ferguson 2009).

These recommendations follow a similar pattern to those in the previously discussed primitive areas with the exception of investing in and anchoring picnic tables. Picnic tables initially cost money, but their effectiveness at containing the

spread of campsite resource damages and concentrating use to designated areas has been proven in Isle Royale National Park (Marion & Farrell 2002). Managers believe picnic tables may be ineffective due to previous vandalism issues in the ANF, but picnic tables could be installed on a trial basis to assess their effectiveness and how susceptible they are to damage (Marion & Farrell 2002).

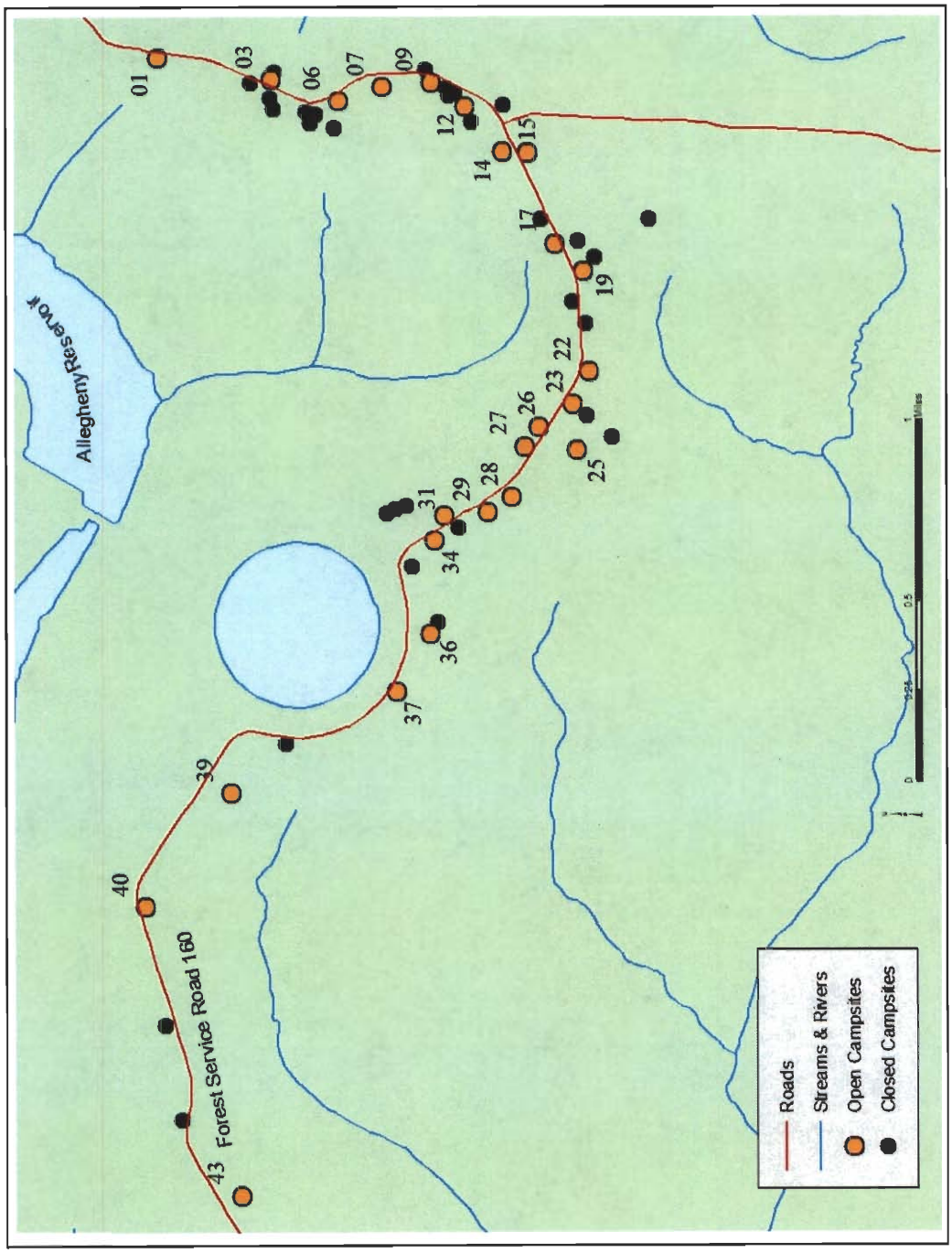


Figure 6.4 Potential Campsites to Close and Keep Open Reservoir Area Forest (USFS Road 160)

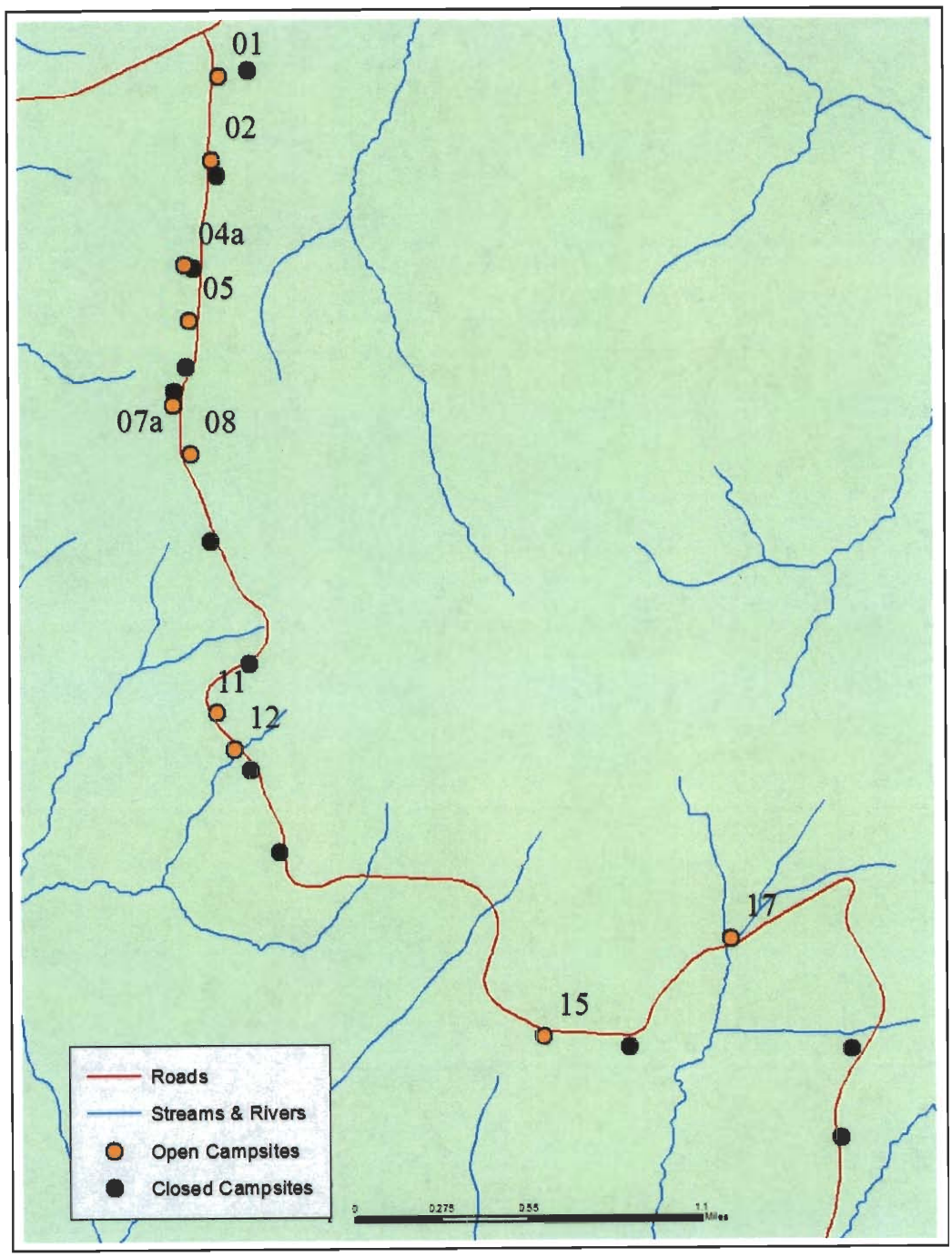


Figure 6.5 Potential Campsites to Close and Keep Open Reservoir Area (USFS Road 259)

The vandalism issue has also been expressed by management personnel about installing vault toilets in high use, dispersed camping areas. Recreation managers are apprehensive of installing vault toilets due to their cost and maintenance requirements. Vault toilet installation costs are about $30,000, but there is also the cost of conducting an archaeological survey to ensure that resources are not damaged before installing the toilet (White 2013, personal communication). Vault toilets also require continual maintenance and upkeep which translates to lost personnel time that could be invested in other activities such as installing signs or clearing trail (White 2013, personal communication). Even though they are expensive and management personnel are somewhat opposed to installing them, they are the best way to address the problem of human waste.

Hypothetically, we can calculate how many catholes would be dug, if on average, six people in a camping group relieve themselves one time a day every weekend. There would to 12 new catholes each weekend, or 180 catholes over the course of a camping season per campsite if there is a group of campers staying there every weekend. This number reflects how important it is to make a communal bathroom area available to campers in order to preserve the environmental integrity of areas surrounding dispersed campsites. These areas see high use throughout the summer and it is better to contain waste in one area than having toilet paper and solid waste left around campsites and multiple trails leading back to toilet locations (Marion & Farrell 2002; Marion 2003).

A pair of toilets per roadway would be sufficient and since the Clarion River already has toilets (where vandalism has been something of a problem), managers would need to install six additional vault toilets in these high use hotspots. Initial costs would be high, but over the long term, these toilets would reduce or eliminate unsightly and potential harmful human waste. If management is opposed to vault toilets, another option is to with a portable toilet company to rent port-a-johns for the summer camping season from Memorial Day through Labor Day weekend. One company in the ANF area rents these portable toilets for two hundred dollars a month apiece. This payment plan includes insurance for vandalism and routine cleanings, but long-term, it is more economical to construct vault toilets.

One of the last recommendations for these high use areas is to construct tent pads at campsites. These would be raised structures with wood and leveled dirt. Like picnic tables, tent pads sloped to provide good drainage are another tool that can be used to concentrate visitor activities where managers want them to occur (Marion & Farrell 2002; Marion 2003).

Summary of Management Recommendations

A listing of campsites recommended for closure along each USFS road surveyed is listed in Table 6.1. This table excludes campsites along Timberline Road, USFS Road 395, and USFS 143 because these areas should be more thoroughly surveyed before deciding which campsites to close. The table also excludes campsites along Clarion River Road (County Road 2002), because this area receives consistent use and the USFS should consider adding more campsites at this popular location.

Table 6.1 Campsite Closures along Surveyed Road Areas

Road Area	Campsites to Close
USFS 131	1, 2, 4, 5, 7, 11, 12, 13, 14, 15, 16,
USFS 132	00, 000, 1, 3, 3a, 4b, 5a
USFS 160	2, 3, 4, 4a, 5, 5a, 5b, 6a, 8, 10, 10a, 11, 12, 13, 16, 18, 18a, 18b, 20, 21, 23a, 24, 30, 32, 33, 33a, 35, 36a, 38, 41, 42
USFS 259	1a, 3, 4, 7, 9, 10, 13, 14, 16, 18, 19
USFS 127	1, 1a, 2, 4, 5, 8, 10, 11, 12, 13, 14
USFS 145	1b, 2, 5, 5a, 6, 7a, 7b, 7c, 8, 9, 10a, 10b, 11, 12, 13a, 13b, 13c, 14, 15, 15b, 16, 17, 19, 19a, 20, 21, 22a, 22b, 23
State Road 666	2, 8, 10, 11, 12, 13, 16

The following is the five year planning process for the management recommendations listed for the seven-surveyed road areas.

Year One: Initial Planning Phase

1) Contact local organizations to discuss the plan to improve dispersed camping across the ANF. Gather feedback and initial response from local organizations that use the ANF such as ATV and horseback riding groups.

2) Contact the Leave No Trace organization, school groups, and outdoor groups such as the girl and boy scouts to develop a plan for spreading the LNT message in the ANF area.

3) Inventory campsites along USFS 143, Timberline Road, and USFS 395 to map sites and gather biophysical data in order to determine where to close campsites, to add more campsites if they are needed, or to re-design campsite layout so that sites are spaced further apart.

4) Set standards for what will be considered unacceptable environmental and social impacts at dispersed campsites to aid in determining when management intervention should occur.

5) Conduct field surveys during high use weekends along the seven surveyed road areas to count group sizes, campsites occupied, and number of vehicles parked at each campsite to add to information about campsite use frequency.

6) Discuss with Timber Management how to provide firewood to dispersed campsites from leftover logging operations on the ANF and develop a plan to move firewood to road heads and other popular locations.

7) Construct signs for each road area that explain why camping is free and how campers can help keep it that way. Include maps for each road area that show locations and campsite numbers of open campsites. Those signs should also describe Leave No Trace low impact camping techniques and how firewood sales work. Provide a book for visitor feedback and comments.

8) Construct three sided lean-tos at each trailhead to hold firewood and place money-box with sign explaining paying on the honor system.

Years Two to Four: Plan Implementation

1) Close recommended campsites along USFS roads 127, 131, 132, 145, 160, 259, and State Road 666. Close the sites by placing no camping signs and naturalize the campsites with brush, logs, and other vegetation to hide obvious signs of human use with the help of volunteers and friends groups.

2) Monitor closed sites for illegal use and monitor open sites to ensure that there are plenty of campsites available.

3) Identify locations for new campsites along Clarion River Road (3002). Open new campsites.

4) Modify all open campsites so that visitor use is concentrated to durable areas so that they don't become overly large. This includes:

- Anchoring fire grates to keep campfires from migrating across the campsite
- Designating parking areas with gravel or rocks to keep cars from driving into the campsite.
- Maintain and improve trails from parking areas, streams, and rivers to prevent the trails from widening, eroding, and becoming excessively muddy and to keep the trails durable.
- Plant native vegetation along eroded stream and river banks at campsites to prevent further erosion.
- Naturalize the boundaries of campsites using logs and rocks as another way to keep campers confined to durable areas.
- Place lantern poles at campsites so campers do not hang lanterns on nails in trees.
- Install picnic tables, vault toilets, and tent pads at high use popular road areas.

Year Five: Monitoring Plan's Effectiveness

1) Monitor open campsites to ensure that sites are not spreading, that campers are staying within the designated areas, that there is plenty of safe parking available, and that no new illegal sites are open.

2) Continue Leave No Trace Education with groups and children in the area.

3) Gather feedback from visitors and community members about dispersed camping and continue to make improvements following their reasonable recommendations.

Some of these recommendations at both high use and more primitive dispersed camping areas require significant initial management investment, but over the long term, management of dispersed campsites will be easier if these recommendations are put into practice. It is a good idea for management to approach friends groups such as the Friends of the Allegheny Wilderness, North Country Trail Pennsylvania Association, and ATV, snowmobiling, horseback riding clubs, Boy and Girl Scouts, and conservation clubs or societies to promote the importance of protecting resources and to seek help in many of the planning steps. Again, not all of these activities need to occur at once, but can be gradually put into place at various locations over time to test their effectiveness at reducing resource impacts and their acceptance by visitors.

CHAPTER 7

CONCLUSIONS AND FURTHER RESEARCH

Biophysical data on environmental characteristics of campsites and surveys of campers are useful tools in a decision support system when deciding how to manage dispersed campsites. Recommended management actions are based on the results of several years of biophysical data collection and the visitor surveys collected during one summer camping season. Primarily, ANF personnel should focus on educational techniques to spread the message of how to camp properly without leaving an impact. The ANF should try to modify camper behavior without direct government regulations and modify the environment around campsites so that camper activity is confined to resilient areas. Gradual implementation of management actions at highly popular locations will allow managers to get a feel for how campers respond to the changes at dispersed campsites and to adjust management to better meet the needs of visitors while still protecting resources. The management recommendations for the seven more popular road areas require initial personnel time and financial investments, but over the long term these management strategies will improve the resource conditions around dispersed campsites and the experiences of visitors.

Campers were seeking a quiet, semi-natural environment and were generally satisfied with the condition of their campsites. Campers were supportive of management actions as long as they did not intrude on their personal freedom. They

were more supportive of indirect management actions that focused on improving environmental characteristics and not on direct management of camping groups. The seven road areas where surveys were conducted could be grouped into two categories. The first category is high use, popular locations where campers were more tolerant of noise and crowding. The second category is lower use, primitive campsites where campers were seeking a quiet, less intrusive camping setting. ANF personnel must recognize that not every road open to disperse camping should be managed similarly. Many campers are repeat visitors using the same campsites and exhibited a strong attachment to their campsites. But this attachment does not always correlate to appropriate and respectful behavior toward the environment (for example, litter and human waste, scarred trees, and destroyed vegetation). This is why management of dispersed campsites is necessary and why this project was initiated.

Although there are still characteristics of dispersed campers to study in the future, this initial survey of visitors provided a frame of reference for managers in their understanding of the type of people who use dispersed campsites. Campers staying at dispersed campsites are a varied group and it would be impossible to please everyone with management, but with surveys of visitor opinions about campsite attributes, satisfaction with resource conditions, and management actions, it becomes easier to make informed decisions.

Suggestions for Future Research

Most campers were interested and enthusiastic about completing a survey on their camping experience. Surveys in future years can be completed with little

resistance from campers. Future researchers, including USFS personnel, could make improvements to data collection by directing questions toward why campers choose a specific campsite. This could be done by asking an open-ended question about what they like or dislike about their current site which allows them to list their reasoning behind choosing a site. Alternatively, surveyors could present a list of campsite characteristics and ask campers to rank them along a numerical scale. Questions regarding their willingness to pay for a campsite could be included among attributes campers would need to rank in importance. Campers could be questioned about whether or not they have used formal campgrounds in the forest, how they learn about rules and regulations guiding camping in the forest, and how many nights they use a campsite.

There are many other ways to improve this preliminary survey of dispersed campers in the ANF. The question asking campers how many times their group has used the campsite in the past did not provide the desired results. Many people had a hard time quantifying the previous time spent in the ANF and on the specific campsite. It would be better to ask campers more specific questions about previous use. This includes how many years the campers have been using the site or what year did they start using this campsite. Other questions could focus on how many times a year the camper uses that site, whether they have camped anywhere else in this same area or in other areas of the ANF, and if they have camped in a developed campground in the ANF. The question on willingness to pay needed to be more specific by explaining whether suggested amounts were a payment for an entire

weekend or per night. I told campers that it was a flat fee for an entire weekend, but this should be blatantly stated in the question.

Understanding occupancy levels at dispersed campsites along USFS roads would be useful for management purposes. Ideally, it would be good for managers to know the number of sites along a road that are occupied each weekend, especially during peak weekends. So that managers can determine if there are plenty of campsites available or if there are more campsites than necessary open. This would require driving down all the more popular USFS roads every day during the weekend and counting occupied sites. This is hard to do with limited time, funding, and resources. It might be worthwhile to make campers register at the head of each road. Hearsay from campers along all roads made it sound as if one had to arrive early to even have a campsite for the weekend, but I never observed that all the campsites were full along any USFS road. If occupancy information was available, USFS personnel would be better able to allocate the number of campsites per road that would accommodate the maximum number of visitors observed.

A future study could compare campers at dispersed campsites with those campers who pay a daily fee to stay in formal campgrounds. This type of study could compare the demographic characteristics of the two groups, the differences in activity types, and what attributes they are looking for when they choose a campsite. In addition it would aid USFS management and the managers of the formal campgrounds in understanding who their users are and what they desire in a recreational setting.

In order to fully discern campers' views of management options and to make better recommendations about managing dispersed camping, future studies should consider stated choice analysis and weighted scoring techniques. Stated choice analysis asks recreationists to make choices among alternative scenarios or alternative campsite situations. For example, one scenario would be to ask campers to choose between a campsite that has no fees charged, small parking area, and in a more natural setting versus one where a fee is charged, a large parking area, and the setting is less natural. The point is to make campers choose between pairs of campsites with attributes that have been randomly assigned to each scenario. With stated choice models it is easy to identify relative importance of attributes and then apply weights to each attribute or management option. These weights can then be used to recommend varying levels of management techniques based on the understanding of which techniques will be most acceptable to campers (Adamowicz 1994). Weighted scoring would be useful when trying to determine the spatial allocation of campsites across the ANF. Applying a weighted score to each campsite would enable managers to chose which campsites to close or keep open. Further discussions and surveys distributed to managers from several areas where dispersed camping is a problem could ask them to weight management attributes, campsite attributes, and resource conditions based on relative importance. This would aid in future analysis.

The ANF had several years worth of biophysical data collected on dispersed campsites, but limited time to use these data to inform management and recreation planning. Previous to this study, no other research had been done on visitor opinions

and perceptions of dispersed camping in the ANF. Managers can now more accurately plan dispersed campsites management based on their knowledge of resource conditions and the knowledge gathered about visitors. This survey and the results of this study can lay the foundation for future planning and research.

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APPENDIX A

SURVEY INSTRUMENT

Researcher Script

"Hi, my name is Anne Santa Maria and I am a graduate student at Western Michigan University. I'm working on a master's degree in geography and I am studying dispersed camping in the Allegheny National Forest. I am conducting a survey of campers and I wonder if you would be willing to participate. This study has not been commissioned by the forest service or connected with them in any way. I do plan to share my overall results with the forest service and hope this study will help them better understand the needs of campers as they make decisions about managing roadside campsites. This should take about fifteen minutes of your time, and if you change your mind you can stop the survey at any time."

INFORMED CONSENT

Principal Investigator: Dr. David Lemberg

Student Investigator: Anne Santa Maria

Title of Study: Developing a Dispersed Recreation Campsite Management Plan in the Allegheny National Forest

You have been invited to participate in a research project titled "Developing a Dispersed Recreation Campsite Management Plan in the Allegheny National Forest." This project will serve as Anne Santa Maria's thesis for the requirements of a Masters degree in Geography. This consent document will explain the purpose of this research project and will go over all of the time commitments. Please read this consent form carefully and completely and please ask any questions if you need more clarification.

This research will collect basic information on the condition, management, and desirability of dispersed campsites in the Allegheny National Forest. I want to understand how you view this particular campsite, your opinion of current management strategies, and what you find desirable in a campsite. I am collecting this information independent of the forest service to determine the best management practices that will improve not only the environment surrounding the campsite but also your experiences here in the Allegheny.

Your responses will be completely anonymous please do not put your name or address anywhere on this form. This survey will take less than thirty minutes of your time and will be conducted at your campsite. Returning the completed survey indicates your consent for the use of the answers you supply. You can choose to stop participating in the study at any time for any reason.

Should you have any questions prior to or during the study, you can contact the primary investigators, Anne Santa Maria at 765-366-4045 or santamaa88@gmail.com and David Lemberg at (269) 387-3410 or david.lemberg@wmich.edu. You may also contact the Chair, Human Subjects Institutional Review Board at 269-387-8293 or the Vice President for Research at 269-387-8298 at Western Michigan University if questions arise during the course of the study.

This consent document has been approved for use for one year by the Human Subjects Institutional Review Board (HSIRB) as indicated by the stamped date and signature of the board chair in the upper right corner. Do not participate in this study if the stamped date is older than one year

2013 Dispersed Campsite Visitor Survey in the Allegheny National Forest (ANF)

1. Do you practice "Leave No Trace" camping? (circle one) Yes No I Don't Know

2. What do you find important when choosing a campsite outside of a formal campground? (Check or Circle Answers)

	Very Unimportant	Unimportant	Neither Unimportant or Important	Important	Very Important
Ability to Make Noise/Party	☐	☐	☐	☐	☐
Quite/Solitude	☐	☐	☐	☐	☐
Access to ATV/Horse Trailheads	☐	☐	☐	☐	☐
Cleanliness	☐	☐	☐	☐	☐
Distance to Water	☐	☐	☐	☐	☐
Ease of Access	☐	☐	☐	☐	☐
Free Wood	☐	☐	☐	☐	☐
Level Ground	☐	☐	☐	☐	☐
Adequate Seating/Built Structures	☐	☐	☐	☐	☐
Natural Setting	☐	☐	☐	☐	☐
Parking Space	☐	☐	☐	☐	☐
Privacy	☐	☐	☐	☐	☐
Shade	☐	☐	☐	☐	☐
Size of site	☐	☐	☐	☐	☐

Other (Please specify and rank) _____

3. Did you choose this campsite because you did not have to pay a fee? (Circle One) Yes No

4. How much would you be willing to pay to stay at this campsite?

$5 $10 $15 $20 I would not be willing to pay

5. How satisfied are you with the resource conditions surrounding your campsite? (Check or Circle Answers)

	Extremely Unsatisfied	Somewhat Unsatisfied	Neither Satisfied nor Unsatisfied	Somewhat Satisfied	Extremely Satisfied
Amount of firewood near my campsite	☐	☐	☐	☐	☐
Condition of trees on my campsite	☐	☐	☐	☐	☐
Distance to water, trail heads, or bathrooms from my campsite	☐	☐	☐	☐	☐
Privacy of my campsite	☐	☐	☐	☐	☐
Levelness of tenting surfaces	☐	☐	☐	☐	☐
The size of my campsite	☐	☐	☐	☐	☐
The cleanliness of my campsite	☐	☐	☐	☐	☐
Adequate seating	☐	☐	☐	☐	☐
The shadiness of my campsite	☐	☐	☐	☐	☐
Other (Please Specify and Rank) _____	☐	☐	☐	☐	☐

6. How willing would you be to accept the following management actions to help improve the quality of dispersed campsites throughout the ANF? (Check or Circle One)

	Strongly Oppose	Somewhat Oppose	Neutral	Somewhat Favor	Strongly Favor
Closing some campsites to allow vegetation to regrow	☐	☐	☐	☐	☐
Daily visits by land management personnel	☐	☐	☐	☐	☐
Limiting camping to designated sites only	☐	☐	☐	☐	☐
Limit group size	☐	☐	☐	☐	☐
More education on minimal impact camping	☐	☐	☐	☐	☐
Provide minimal structures such as picnic tables, fire rings, and tent pads to protect fragile areas	☐	☐	☐	☐	☐
Provide signs and maps to help identify campsites	☐	☐	☐	☐	☐
Provide firewood for sale	☐	☐	☐	☐	☐
The provision of water pumps, trash cans, and toilet facilities	☐	☐	☐	☐	☐
Other (Please Specify and Rank)	☐	☐	☐	☐	☐

7. Home Zipcode: _____

8. Which of the following activities have you participated in or will you participate in during this recreational trip? (Please check all that apply)

Fishing	☐	Hiking/Backpacking	☐	Photography	☐
Canoeing, kayaking	☐	Motorized water travel (boat, jet ski etc)	☐	Picnicking	☐
Horseback Riding	☐	Nature Study (Identification/Viewing of plants, animals, birds scenery, etc.)	☐		
Swimming	☐				

Other (Please Specify): _____

9. Camping Equipment (Circle One)

Mobile home | Pickup camper | Pop up Trailer | Tent | Trailer | Other (Please Specify) _____

10. What is the highest level of education you have completed? (Circle One)

Less than high school | High School/ GED | Some College | Associates Degree | 4 Year College Degree (BA/BS) | Master's Degree | Doctoral Degree

11. Which of the following best describes the composition of your group? (Circle One)

I'm camping by myself | Family | Friends | Organization, such as a club or camp | Other (Please Specify) _____

12. How many people are in your personal camping group today? _____

13. How many times have you/your group used this campsite (or Forest Road) in the past? _____

14. Any other general concerns, questions, comments, or thoughts about your campsite or camping experience(s) in the ANF?

_____

_____

APPENDIX B

HSIRB APPROVAL LETTER

WESTERN MICHIGAN UNIVERSITY

Human Subjects Institutional Review Board

Date: February 27, 2013

To: David Lemberg, Principal Investigator
Anne Santa Maria, Student Investigator for thesis

From: Amy Naugle, Ph.D., Chair

Re: HSIRB Project Number 13-02-55

This letter will serve as confirmation that your research project titled "Managing Dispersed Recreation in the Allegheny National Forest" has been **approved** under the **exempt** category of review by the Human Subjects Institutional Review Board. The conditions and duration of this approval are specified in the Policies of Western Michigan University. You may now begin to implement the research as described in the application.

Please note: This research may **only** be conducted exactly in the form it was approved. You must seek specific board approval for any changes in this project (e.g., ***you must request a post approval change to enroll subjects beyond the number stated in your application under "Number of subjects you want to complete the study***)." Failure to obtain approval for changes will result in a protocol deviation. In addition, if there are any unanticipated adverse reactions or unanticipated events associated with the conduct of this research, you should immediately suspend the project and contact the Chair of the HSIRB for consultation.

Reapproval of the project is required if it extends beyond the termination date stated below.

The Board wishes you success in the pursuit of your research goals.

Approval Termination: February 27, 2014

Walwood Hall, Kalamazoo, MI 49008-5456
PHONE: (269) 387-8293 FAX: (269) 387-8276

APPENDIX C

USFS APPROVAL LETTER

USDA United States Department of Agriculture | Forest Service | Allegheny National Forest
Marienville Ranger District
131 Smokey Lane
Marienville, PA 16239
(814) 927-6628
FAX (814) 927-2285

File Code: 2300
Date: February 15, 2013

Anne Santa Maria
10551 Lakeshore Dr.
West Olive, MI 49460

Dear Anne,

Thank you for meeting with my staff and me to discuss your master's thesis research. We find this proposal interesting and believe that it will provide valuable insight into how our visitors use and perceive the Allegheny National Forest while camping. We are happy to meet with you and discuss our perspective and management strategy, and you are welcome to survey campers on the Allegheny National Forest. We look forward to working with you.

Sincerely,

ROBERT T. FALLON
District Ranger

APPENDIX D

ALLEGHENY NATIONAL FOREST DISPERSED RECREATION POLICY

DISPERSED RECREATION POLICY

ALLEGHENY NATIONAL FOREST

The goal of the dispersed recreation policy is to protect the resources of the National Forest and provide a quality recreation experience for users now and in the future.

Vehicle Use:

- The Motor Vehicle Use Map (MVUM) shows all roads and trails open for public use and is the officialtool for managing vehicle use on the Allegheny National Forest (ANF) (36 CFR 212.51). Over-snowvehicles, watercraft and aircraft are exempt from MVUM.
- The use or possession of motor vehicles off of National Forest System roads is prohibited. (36 Code of Federal Regulations (CFR 261.56)).
- Vehicles may not be parked in a manner blocking or restricting the use of any roadway OR in such a manner that it is an impediment or hazarad to any person. (36 CFR 261.12(d), 36 CFR 261.10(f)).
- ATVs, snowmobiles, and unregistered motorcycles (non-street legal) are prohibited from usingNational Forest roads and are restricted to the designated trail systems (36 CFR 261.56, 36 CFR 261.54(a)).

Occupancy and Use:

- Do not camp or park in front of closed gates or in roadways to allow entry for emergency vehicles and administrative access (36 CFR 261.12(d), 36 CFR 261.10(f)) .
- All campsites are on a first come basis and will not be reserved.
- Leaving camping equipment unattended for more than 24 hours is prohibited (36 CFR261.58(e)) .
- Permissible length of stay is no more than 14 consecutive days in a 30 day period (36 CFR 261.58(a)). Forest Order (F.O.) 09-01.
- Construction of customary, temporary structures in conjunction with camping will be allowed.
- Examples include tents and tarps. All structures must be removed from the National Forest by theuser at the end of their stay at the site (36 CFR 261.10(e)).

Firearms

Firearms may be used in a manner consistent with Federal, State, and Local laws, and good safety practices. All firearms users must provide for an adequate backstop behind their target area. Trees, signs, and other public property shall not be used as targets or backstops. All trash including brass and spent targets must be removed from National Forest lands (36 CFR 261.9(a), 36CFR261,10(d), 36 CFR 261.11(d)).

Unreasonable Noise

All Forest users are prohibited from causing public inconvenience, annoyance, or alarm by making unreasonably loud noise (36 CFR 261.4(d)).

Surface Resources:

- Do not cut or: otherwise damage live trees. Do not put nails in trees, picnic tables, or other goverorment property. Do not use trees to hang camp lanterns. The use of live trees for target backstops or to "plant' camp axes is prohibited (36CFR 261.9(a), 36CFR 261.6 (a)).
- Cutting incidental amounts of dead wood for campsite firewood within the National Forest is

allowed and does not require a permit. Removing wood from the-National Forest requires a firewood permit which is available at local ranger district offices 36 CFR 261.6(a), 36 CFR 261.6(h)).

• Excavations are limited to those required to make safe campfire rings and sanitary pit toilets. Any excavation will be re-leveled prior to vacating your campsite.

• Digging for/removal of archaeological resources (artifacts) is prohibited (36CFR 261.9(g),(h)).

Sanitation:

• Pack It In, Pack It Out. All garbage, including paper, cans, bottles or rubbish must be placed inappropriate containers when on site and removed from National Forest lands when the site isvacated. Burying or otherwise disposing of garbage at the campsite is strictly prohibited. Do not dispose of cans, bottles, and other material in campfire rings (36 CFR 261.11(b), 36 CFR 261.11 (d)) .

• A pit toilet or "cathole" is required for each camp. Pit toilets shall be located at least 200 feet from any lake, pond, or stream unless camping is limited to "self-contained" trailers. Pit toilets must be refilled to ground level with a minimum of six (6) inches of soil.

• "Self-contained" trailers must use designated dump stations for sewage and gray water.

Fire:

• Do not leave campfires unattended. Thoroughly extinguish campfires before leaving your campsite(36 CFR.261.5(d).

• Possessing, storing, or transporting any amount of wood or firewood of any species that has originated outside of the counties of Elk, Forest, Warren, and/or McKean within Pennsylvania is prohibited (36 CFR 261.53(e), F.O. 09-22).

Special Regulation Areas:

Dispersed camping is permitted in most areas of the Allegheny National Forest; however the following areas are restricted or prohibited:

Allegheny Reservoir

• Camping is prohibited on the shores and within 1500 ft. inland of the tree line around the Reservoir EXCEPT at National Forest designated campgrounds (36 CFR 261.58(e) and F.O. 09-09).

• Camping is prohibited within 1500 ft. or the centerline of Longhouse Scenic Byway (includes Longhouse Scenic Drive and portions of State Routes, 59, 346, and 321) and the main access roads into Jakes Rocks and Rimrock Recreation Area except at designated recreation sites (F.O. 09-09).

Arroyo Archeological Site

• Camping is prohibited (36 CFR 261.58(g) and F.O.09-25).

• Building, maintaining, attending, or using a campfire is prohibited (36 CFR 261.52(a) and F.O. 09-25).

Buzzard Swamp Propagation Area, Corydon-Riverview Cemetery

- All entry is prohibited (F.O. 09-05 and 08-04, respectively)

Clarion River and Millstone Creek (along River Road and FR 132)

- Camping is restricted to designated sites only.

Forest Roads 401 and 125

- Camping is prohibited within 500 feet of the centerline of FR 401 from the Forest boundary to thestone pit at he Marienville ATV trailhead (36 CFR 261.58(e) and F.O. 09-14);
- Camping is prohibited within 500 feet of the centerline of FR 125 (Pigs Ear Rd) between theintersections with FR 124 and State Route 66 (36 CFR 261.58(e) and F.O. 09-14).

Hickory Creek Wilderness/ Allegheny Islands Wilderness

- Motorized equipment and mechanical transports are strictly prohibited in Wilderness areas (36 CFR261.16(a), 36 CFR 261.16(b)).

Jake's Rocks, and Rimrock

- Camping is prohibited.
- Climbing or rappelling on any cliff, rock, or stone face at Rimrock is prohibited (36 CFR261.53(f), 36 CFR 261.53(e), F.O. 08-05).

Kinzua Creek from Red Bridge to Mead Run

Camping is prohibited on either side of the main channel.

Tionesta Research Natural Area, Heart's Content Scenic Area

The following are prohibited under F.O. 09-12 and 09-13:

- Camping
- Building, maintaining, attending, or using a fire is prohibited.
- Possessing or using a saddle, pack, or draft animal.
- Possessing or using a bicycle

Tionesta Reservoir

- Camping is prohibited on National Forest lands within 1500 feetinland of the shore except at designated sites.
- Possession of a beverage which is defined as an alcoholicbeverage by state law is prohibited (36 CFR 261.58(bb)), F. O. 09-08.

APPENDIX E

QUESTION 14 RESPONSES

Other Comments/Questions/Concerns Raised by Dispersed Campers

Put some effort into making more campsites and stop closing existing ones stop with the big rocks closing off the sites

Very nice experience. Should open beaver meadows for ATV camping.

My most favorite place to be. We drive from Erie, Pa regularly to camp here.

Great space to get away.

We enjoy it the way it is very much.

Don't do anything, perfect as it is, been coming here for 45 years.

I would rather not have our sites invaded by public services. We get along fine roughing it. Keep them primitive.

I have been coming to the area my entire life. I enjoy the fact that there has been very little development to change the area. Nature should be natural.

Satisfied.

Effects of fracking?

Pretty satisfied.

Dead firewood should be allowed to be cut.

I love ANF.

More sites with more options because they tend to fill up fast.

Stop drilling. Water quality in salmon creek has been compromised.

We returned a second year in a row to this site because we enjoyed the previous experience.

Just keep things alive. Don't start governing it.

Beautiful campsite with easy road and water access but still very private.

There are only three sites that are accessible to R.V.s and campers/trailers if we want to camp. We sometimes do not get a site.

Afraid we are going to lose our forest. Daily drive by's, by management personnel to deter bad behavior and collect trash.
Enjoying our visit and time with family/friends. Enjoy the rustic camping conditions and appreciate the nature setting. Disappointed with the amount of glass in the campsite this year-lots of glass on site upon arrival.

We love jakes rocks and the private camping. We hope its here forever.

People need to be cleaner.

Garbage needs to be taken care of. Dumpsters to put trash in.

Provide trash depositing.

Not being able to park, and trash not being picked up.

We came here to camp as a family and think this is the perfect destination just as it is.

We will definilitely be back again, willing to pay as long as it remains as private as it is now.

Nice, please keep open.

We love 395, we got married here. Friends came for hundred of miles away. It was beautiful. Clean restroom, Marienville is the best.

Need a restroom at pigs ear.

Need a sign to describe the 295 trailhead at the road of 666.

Need more toilet paper.

Gross around camping sites. Could be mowed during holiday weekends.

Put rocks in driveways to keep them from mudding up the sites. Need for rehab once in a while. Training courses for camping. Camp 13, CCC, was a nice recreation area and older people walked it. The forest service closed it and now older people don't go there. Reactive management is not good. Need a joint effort between forest services and schools to handle more education on proper land management. Toilet paper was everywhere.

We have been camping in this area for years and always have enjoyed this and try to take good care of our land.

Some of the campsites could be bigger. Separating some of the campsites from each other would provide for more privacy. Opening more campsites would help to get more campers. Rangers need to make daily stops to stop drunk campers from destroying the campsites. Providing dumpsters and recycling bins would help keep the campsite cleaner.

Need more camper space and drainage.

Tables, dumpsters by bathrooms, and spread campsites farther apart so we can't hear or have to deal with neighbors.

More sites and better drainage.

No lawn mowing. Need silence and privacy annoyed with loud neighbors. Would find another site if we had to pay. Visit the forest no fee is the best.

Camped on the river 6-8 times a year for the past ten years.

Everything is great we should have a campsite across the river.

Been in other campsites here for years and we need more campsites.

I have camped in this area in the past and returned today because I like it here. One concern I have is the lack of available designated campgrounds. I wish there were more to use. Also it would be nice there if there was more development in terms of business along the river road to buy camping supplies without this development compromising the integrity of the land. Although only staying for one night I have stayed longer in the past. If I was staying longer I would do some fishing, canoeing, and hiking. I don't plan to tonight, had to drive around to find a site and not enough campsites = need more sites.

Maintaining site. Need to mow grass and keep grass down.

You need to enforce the rules of the camping sites. Have seen many law breakers like people holding sites. Why don't you sell camping permits to camp in this area. I would pay for something like that.

Would like to see more campsites. Not happy with leftover garbage.

More designated camper and trailer sites.

Designate trailer and camper sites. Need more trailer and camper sites. Designate the difference between tent and trailer sites.

Build more camping sites.

Love the outdoors and wish everybody did their part to keep it clean for the future.

More portajohns.

It would be nice to have more sites for campers along the river.

Need fire wood and level ground.

Less is better. Maintain roads, but all else left to nature.

Camping rules. Down with Obama.

Using site for ten years. Now somewhat designated when they weren't before. Would pay the fee but they wouldn't like it.

No cell service.

The campsite was very dirty when we got here.

Widen the roads. We love camping here.

Love the few sites available to pop up campers. Need more sites opened (remove rocks) to small campers.

Come repeatedly to this area.

Give this girl an A.

The sites are well maintained. Waste areas would be helpful.

Love it. Bathrooms along this part would be nice.

Keep grass mowed.

More camping space because sites fill up fast.

Very clean and safe environment. It would be nice to have dumpsters and trashcans to help clean up.

Need to have a dumpster to keep clean and access to water.

Are there bears or other animals near our campsite? Move fire pits away from trees.

This is one of my favorite places to come.

Very clean and quiet.

I wish there was a spot for people to take a shower.